



Facultat de Ciències Jurídiques
i Econòmiques · **FCJE**

**THE IMPLEMENTATION OF THE OPEN
INNOVATION MODEL IN FACSA**

Author: Adrián Vicente Porcar

Supervisor: María Luisa Flor Peris

**DEGREE IN BUSINESS ADMINISTRATION
AE1049 – FINAL PROJECT WORK
ACADEMIC YEAR 2017/2018**

INDEX

A. INDEX OF FIGURES	4
B. INDEX OF TABLES	4
1. INTRODUCTION.....	5
2. THE OPEN INNOVATION MODEL.....	7
3. IMPLEMENTATION OF AN OPEN INNOVATION APPROACH.....	9
<i>3.1. Types of open innovation</i>	<i>10</i>
<i>3.2. Open innovation as a process of change.....</i>	<i>16</i>
<i>3.3. Managerial levers in the implementation of the OI model</i>	<i>17</i>
4. OPEN INNOVATION IN SERVICE COMPANIES	21
5. METHODOLOGY.....	24
<i>5.1. Research design.....</i>	<i>24</i>
<i>5.2. Description of the company.....</i>	<i>25</i>
6. ANALYSIS AND RESULTS.....	30
<i>6.1. Open innovation practices in Facsa.....</i>	<i>30</i>
<i>6.2. Stages of adoption of open innovation in Facsa.....</i>	<i>33</i>
<i>6.3. Open Innovation managerial levers</i>	<i>34</i>
<i>6.4. Facsa as a service company</i>	<i>38</i>
7. CONCLUSIONS.....	40
8. REFERENCES.....	44

A. INDEX OF FIGURES

Figure 1: Closed innovation model.....	7
Figure 2: Open innovation model	9
Figure 3: Framework for the study of open innovation.....	10
Figure 4: Knowledge flows in the open innovation process.....	11
Figure 5: Open innovation practices	12

B. INDEX OF TABLES

Table 1: Progress of the managerial levers according to the stages of the open innovation process.....	19
Table 2: Research projects developed by Facsa	27
Table 3: Change process of Oi in Facsa	36

1. INTRODUCTION

Since the end of the 20th century, all the economies in the world are observing an opening of the markets thanks to the development of information technologies and the improvement and lowering of transport costs. In this macroeconomic framework, companies are seeing how knowledge is easily distributed, competitive rivalry increases rapidly, and product life cycles are shortened (OECD, 2008). Companies have been forced to consider new ways of operating and competing. In this context, innovation has been postulated as one of the differential elements for the competitiveness of companies.

In recent years, the term "Open Innovation Model", which was coined by Henry Chesbrough in 2003, has gained strength. According to this author, it constitutes a new paradigm for managing the innovation process. This model is characterized by the opening of the limits or boundaries of the organization using external knowledge flows for the initial phases of the innovation process and the commercialization of these results to accelerate these processes (Chesbrough and Crowther, 2006).

The application of open innovation can be beneficial for many companies. Among other advantages, it can lower costs in their innovation process, reduce the time needed to generate new products, or achieve creativity by external talent incorporated in the organization (Chesbrough and Bogers, 2014). Despite these advantages, the implementation of this model may be slowed down or even rejected by companies, since it requires several changes that companies are not always prepared to face. Examination of OI model implementation as a process of change can be helpful to identify the changes that companies undergo when adopting the open innovation model. This approach can also serve as a guide for companies that decide to initiate the opening of their innovation process. Additionally, these insights can assist those responsible for change during the process of opening their company's boundaries.

The study of firms open innovation has traditionally focused on the analysis of manufacturing companies and their peculiarities. However, in the more developed economies, service companies have an increasingly important role (OCDE, 2008). The fact that services have certain characteristics that are not shared with products, simultaneity of production and consumption and their inheritance and perishable nature, suggests that the open innovation process in service firms may have some specificities, which suggests that it is worth to examine.

The objectives of this work are (1) analyze the most relevant characteristics of the open innovation model; (2) study the process followed by companies to adopt the open

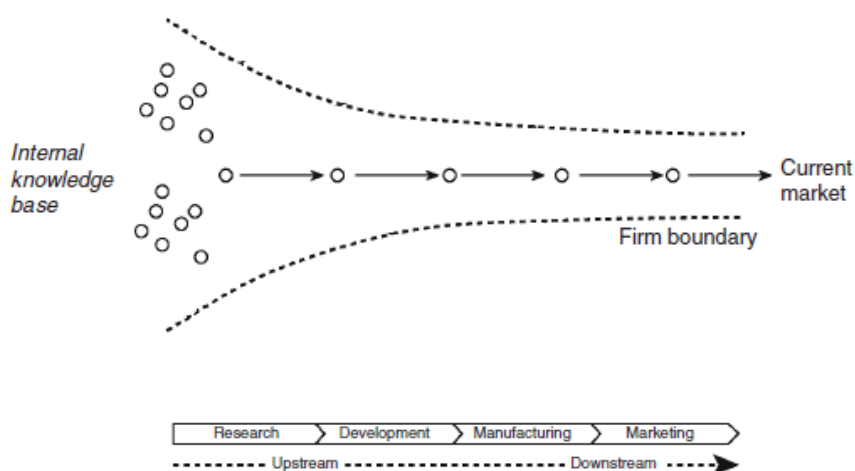
innovation model and (3) examine how the open innovation model has been developed in a specific company.

To achieve these objectives, the work in the first part reviews the basic aspects related to the open innovation model. Then, the work focuses on the process of implementing this model and, finally, describes the particularities of the application of this model in service companies. In the second part, the work examines the implementation of the open innovation model in *Facsa*, a service company. In recent years, *Facsa* has been developing multiple innovation projects and has opted for the implementation of the open innovation paradigm. The work analyzes the process carried out by the firm and suggests possible areas for improvement that could be a useful resource for future decision making in their innovation activities and, more specifically, with their open innovation model.

2. THE OPEN INNOVATION MODEL

A widespread definition of OI is the one by Chesbrough (2015:7), who described it as "The use of internal and external flows of knowledge to accelerate internal innovation and expand markets for external uses". The open innovation model (OI) is usually presented as a type of innovation process that breaks with the premises of the traditional innovation model or closed innovation model (CI). In the field of firm's innovation, the traditional innovation model is based on the internalization of company's knowledge, without it transcending the boundaries of the organization. Therefore, the company conceives, develops, commercializes and finances its own innovation through internal processes of the organization (Chesbrough, 2003). According to the closed innovation model, organizations, with the aim of being more competitive in the market, make large investments in internal innovation processes trying to be the first in innovation. In fact, for decades, the closed innovation model has generated large and sustainable benefits for organizations, since innovation played a secondary role for the competitiveness of companies, where demand was higher than supply and rivalry between companies were noticeably lower, so, innovation was not a key element for the survival and competitiveness of companies (Openbasque, 2014). Figure 1 shows a representation of the closed innovation process. As it can be seen, all the stages of the innovation process take place within the organization, without external agents interfering.

Figure 1: Closed innovation model



Source: Chesbrough (2006)

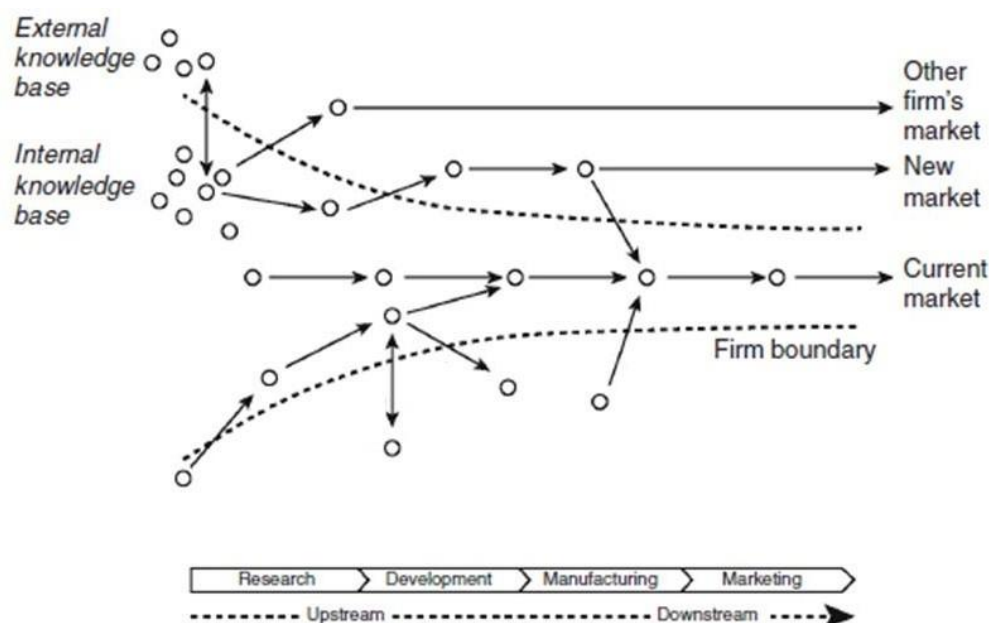
In contrast to the traditional closed innovation model, the concept of open innovation begins to gain importance since the end of the 20th century (Chesbrough and Bogers, 2014). This term was coined by Henry Chesbrough in 2003 to reflect how companies open their innovation processes. This opening, according to Chesbrough (2003), is a consequence of a series of environmental elements that change and induce companies to adopt a significantly different model of innovation. Chesbrough (2003) named these elements "erosion mechanisms" or "corrosion factors", and describes their effects on innovation firms in the following terms:

- Globalization has forced companies to open their boundaries to achieve external ideas that complement internal innovation to maintain or increase their competitiveness.
- The intensification of global competition and technological progress have produced a reduction in product life cycles, forcing companies to innovate more quickly with the objective to develop products and services more efficiently.
- The growing integration of technologies has made innovation more expensive and riskier.
- The need for interdisciplinary, cross-border and intersectoral research reduce the possibilities for individual research.
- There is a growing supply and mobility of researchers and engineers that encourages innovation.
- A risk capital supply destined for innovative purposes promotes business innovation.

Therefore, the increase in competition and other factors related to demand, such as globalization, have diminished the success of innovation based in closed innovation processes.

In this new context in which organizations compete, they are forced to open their boundaries to become permeable to the input and output of valuable resources, allowing the transfer of knowledge through relationships with external agents to promote this permeability and knowledge flows (Chiaroni et al, 2010). In other words, OI implies the use of inputs and outputs of knowledge flows to, respectively, accelerate internal innovation and expand markets for external use of innovation. This new model is represented in Figure 2. It shows the incorporation of elements and external mechanisms in different stages of the innovation process, unlike the closed innovation model, where these elements and external mechanisms are not present.

Figure 2: Open innovation model



Source: Chesbrough (2006)

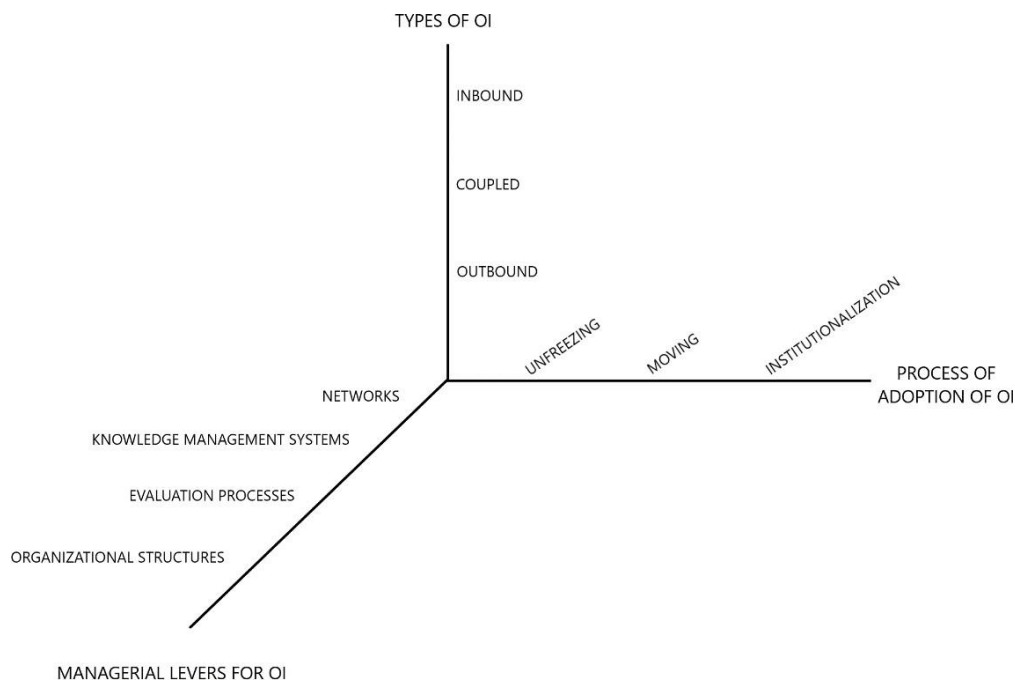
This model favors the saving in costs and time since it allows to take advantage of the knowledge developed externally by other agents and incorporates it into the innovation processes of the company and also obtains income from the knowledge generated by the company through the commercialization with others. Thus, underutilized knowledge can be exploited by others generating a way to obtain incomes for the companies.

3. IMPLEMENTATION OF AN OPEN INNOVATION APPROACH

Chiaroni et al (2011) suggest that examination of how firms implement an OI approach can be carried out by adopting a theoretical framework integrated by contributions from three streams of research. First, firms must purposively manage inflows and outflows of knowledge to, respectively, accelerate internal innovation, and expand the markets for external use of innovation. It means that they can identify and select different OI practices or mechanisms to manage these knowledge inflows and outflows. Accordingly, the open Innovation can be further divided into three basic types, namely inbound (outside-in), outbound (inside-out) and coupled open innovation (which combines inbound and outbound). Second, they indicate that the process of transition from Closed to Open Innovation model can be interpreted as an organisational change process, this allowing us to identify the different steps through which a firm conforms itself to the new innovation model. Finally, they suggest that in order to realize the transition from a Closed to an

Open Innovation mode, firms must adapt its organisational and managerial systems to the Open Innovation paradigm, hence there are a number of organizational aspects or managerial levels that must be considered. Figure 3 summarizes the three different axes along this theoretical framework and the next subsections describe them with more detail.

Figure 3: Framework for the study of open innovation



Source: Adapted from Chiaroni et al. (2011)

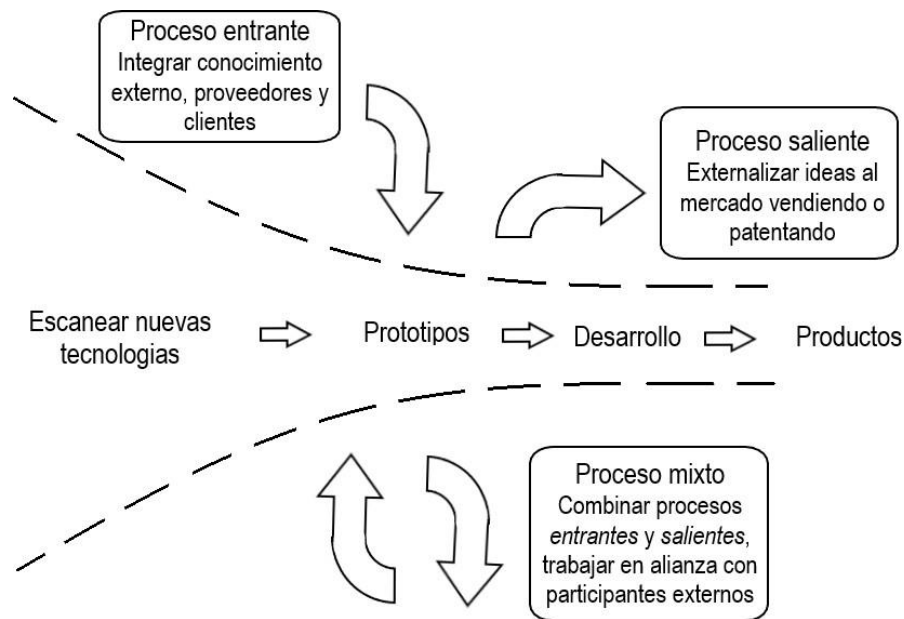
3.1. Types of open innovation

The paradigm of OI is based on the input and output of information, knowledge and capabilities beyond the company's borders. Taking into account the knowledge flows that are generated in the process of open innovation, Gassman and Enkel (2004) identify three different processes (Figure 4):

1. **Inbound process:** represents the acquisition and integration of external knowledge generated by external agents such as clients, competitors, universities, research centers, etc.

2. **Outbound process:** describes the contribution of knowledge and ideas to the market, sale and licensing of intellectual property and developed technology.
3. **Coupled process:** it is based on the merging of the inbound process and the outgoing or outbound process as collaboration in alliances with external agents with complementary knowledge, resulting in knowledge contributions to a specific innovative output.

Figure 4: Knowledge flows in the open innovation process

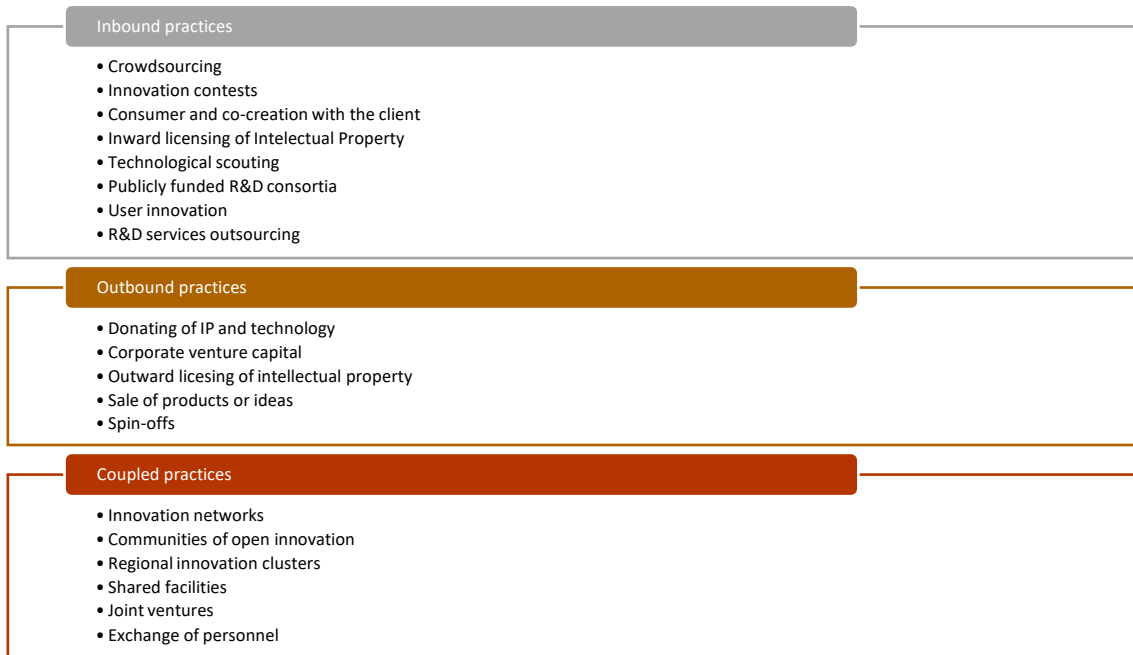


Source: Gassmann and Enkel (2004)

Open innovation practices describe the specific mechanisms that companies develop to carry out these processes or knowledge flows of input and output. A common way of classifying them considers the direction of OI processes, which distinguish between inbound, outbound and coupled practices. These types of open innovation can be implemented in firms by different practices, each one represents a form of generate knowledge flows and focuses in a specific form to obtain it, but always with the aim of create a more open innovation process.

The companies find a wide variety of mechanisms or practices to implement the open innovation model (Figure 5). This variety makes that companies have a lot of different options to implement the OI model according to their own needs.

Figure 5: Open innovation practices



Source: Adapted from Gassmann and Enkel (2004) and Battistella et al. (2017)

3.1.1. Inbound practices

Open innovation inbound implies the opening of a company's own innovation processes to many types of external contributions from very diverse agents (Chesbrough and Bogers, 2014). The use of external knowledge sources helps companies identify potentially valuable opportunities for innovation during the early stages of technological development. In the same way, it configures the roles of the partners in the creation and capture of value in the final stage of commercialization of the results of innovation (Huang et al., 2014; Wagner, 2013). Therefore, the management of knowledge inputs covers a series of practices aimed at incorporating external knowledge. Some of these inbound practices can be organized informally and do not involve large investments or may require a substantial commitment since they require financial investments, formalized contracts and a structured approach (Van de Vrande et al, 2009). In the same way, depending on the existence of economic or non-economic compensations in the development of these practices, a distinction can be made between acquisition and sourcing (Dahlander and Gann, 2010).

The most common inbound practices that allow the application of this type of open innovation are (Gassmann and Enkel 2004, Battistella et al., 2017):

1. **Crowdsourcing:** the act of outsourcing a problem in the form of an open call with the aim of obtaining new or reviewed ideas, services or content.
2. **Innovation contests:** Competitions in which a specific target group is asked to present a solution for a specific task previously defined by the organizer in exchange for certain incentives.
3. **Consumer involvement and co-creation with the client:** Involvement of consumers or customers in the innovation process, whether in the generation, evaluation or testing of new product ideas, services, processes, etc.
4. **Inward licensing of Intellectual Property:** Acquiring licences and accessing to external intellectual property rights, such as patents, copyrights or trademarks to obtain benefits derived from this external knowledge.
5. **Technological scouting:** Collaboration with partners outside the company to evaluate and observe technological trends that can be relevant to the company, in order to detect opportunities and threats quickly.
6. **Publicly funded R&D consortia:** Participation in R&D consortia with other public or private organisations in which R&D activities are fully or partly funded by governmental organisations
7. **User innovation:** Identification and collaboration with leading users in the development of new products.
8. **R&D services outsourcing:** Purchase of R&D services from other organizations.

These practices are carried out with different intensity by companies. A study by Chesbrough and Brunswicker (2014) among 125 large European and American companies belonging to different industries revealed that the inbound practices most used are those practices related to co-creation with customers and financing of research developed by universities and research centers. On the other hand, the use of crowdsourcing and innovation competitions are developed to a lesser extent, being relegated to discontinuous use and implemented in specific innovation business projects.

Also, in the study carried out by Van de Vrande et al, (2009) among 605 small and medium Dutch companies, it is concluded that the participation of clients and / or consumers in the innovation process, the relationships between the agents and the subcontracting of R & D services represent the key elements for the development of the inbound process of open innovation. On the other extreme, external participation in

innovation projects and the purchase of intellectual property are used only by a minority of this type of companies.

Thus, we see how practices based on inbound knowledge flows have great importance within the paradigm of open innovation regardless of the size of the companies. In particular, practices based on the involvement of customers and / or consumers in the innovation process represent the most used practices, both in large and small and medium-sized companies.

3.1.2. Outbound practices

Open innovation outbound requires organizations to allow unused and / or underutilized ideas and assets to leave the organization to others to use in their business and business models (Chesbrough and Bogers, 2014). In this context, the interactions in this type of open innovation may or may not involve the realization of economic compensations, that is, both selling and revealing these ideas and assets (Dahlander and Gann, 2010). The business model for outsourcing will depend on the company and the business model defined to bring ideas to the market, since the company must find the best way to share this knowledge that is not used by itself or is underutilized. The most common practices to manage the knowledge flows of the company are (Gassmann and Enkel, 2004, Bastistella et al., 2017):

1. **Donating of IP and technology:** Transfer ideas or knowledge developed internally to other stakeholders without economic compensation.
2. **Corporate venture capital:** Venture capital initiatives in which support is offered to entrepreneurs in order to develop potentially profitable ideas and identify ways to exploit technology.
3. **Outward licesing of intellectual property:** Selling licenses for internal intellectual property right to external agents with the objective to obtain benefits of intellectual property developed within the organization.
4. **Sale of products or ideas:** a sale of a new product or idea without being formalized through intellectual property mechanisms.
5. **Spin-offs:** This concept refers to a company or organization born as an extension of another by separating a subsidiary division.

In general, some studies reflect that these practices tend to be less important for companies than inbound practices. In the study developed by Chesbrough and

Brunswick (2014), inbound practices stand out from outbound practices, since 35% of innovation projects developed by these companies incorporated inbound practices compared to 18% of projects that incorporated practices outbound. The study of Van de Vrande (2009) and Lichtenthaler (2008) conclude that companies seldom focus on either inbound or outbound OI and that companies tend to combine these two aspects of open innovation.

Likewise, regarding outbound practices, the implementation in companies was uneven: the sale of ideas or products was the main practice. The study of Van de Vrande et al. (2014) concluded that the transmission of outflows of knowledge are not very used in the practice. Despite this, the study remarks the corporate venture capital and outward intelligent property licencing as the most implemented outbound practices.

3.1.3. Coupled practices

Coupled open innovation links inbound and outbound innovation processes with the aim of developing and / or commercializing innovations with collaboration (Gassmann and Enkel, 2004). This type of innovation involves a minimum of two partners who deliberately manage the flows of mutual knowledge through their organizational boundaries through joint activities of invention, development and commercialization (Chesbrough and Bogers, 2014). While it is true that coupled open innovation can involve any combination of incoming and outgoing innovation practices, companies can implement specific mechanisms involving complementary partners. Specifically, within this group of practices we find (Gassman and Enkel, 2004, Battistella et al., 2017).

1. **Innovation networks:** Participants from different institutional environments collaborate to create new knowledge, so that they learn from each other, building new knowledge.
2. **Open innovation communities:** voluntary association of individuals united by a common innovation objective. They are developed mainly through online platforms that allow contacting different people in a fast, continuous and simple way.
3. **Regional innovation clusters:** Generation of new knowledge and competitive advantages due to the internal relationships generated by participation in regional clusters.
4. **Shared facilities:** Joint investment in new facilities to share and operate joint facilities in order to guarantee a high level of use and cost reduction.

5. **Joint ventures:** Collaborations between agents of the value chain aimed at a specific product or market that can be research projects, consortiums or knowledge exchange programs, people and resources.
6. **Exchange of personnel:** It refers to the temporary mobility of researchers between organizations to promote or develop research activities.

Among the elements that favour the adoption of coupled practices we can consider the ease of developing them or the more informal nature of some of them. Innovation networks¹ and participation in innovation communities¹ are the most frequently implemented practices (Referencia?). However, among the coupled practices that imply greater formalization, the joint venture has been identified as the most used one in large companies (Chesbrough and Brunswicker, 2014).

The results of the study of Van de Vrande suggests a sequence in the adoption of open innovation in SMEs, starting with customer involvement, following with employee involvement and external networking, and ending with more advanced practices like IP licensing, R&D outsourcing, joint venture and¹ external participations.

3.2. Open innovation as a process of change

Implementing the paradigm of open innovation in an organization involves making changes in many aspects. Based on this premise, the process of implementing the OI has been studied taking the theory of organizational change as a reference (Chiaroni et al, 2010).

In the literature of organizational change, Lewin (1974) stated that the processes of organizational change are fundamentally developed in three different phases: unfreezing, moving and institutionalization. The unfreezing stage refers to the situation that causes the initiation of the change process. In this first stage, the process is characterized by the role of management, being a basic key to the trigger for change. However, Lewin (1974) points out that some people must be the responsible of the change. This people must have the objective to create a sense of urgency, with the purpose of influencing in the emotion and energy of the organization to implement the change and originate the initiation of process of change.

¹ Chesbrough and Brunswicker (2014) and Van de Vrande et al (2009) consider this type of practice as inbound or outbound since they only take inbound and outbound practices into account. In this work, being faithful to the classification of Gassmann and Enkel (2004) we consider the three types (inbound, outbound and coupled).

In the moving stage, the action towards the change is undertaken, trying to involve the whole organization and facing the barriers to change. This phase is characterized by the importance of communication and time. All the people involved must know the necessary changes and have enough time to assimilate it.

In the last phase, institutionalization stage, the organization consolidates the changes made and the efforts are focused on the control and monitoring of the new measures and methodologies adopted in the organization because of the change introduced.

Translated into open innovation model, the companies that decide to adopt this model of innovation have to be proactive with the aim to achieve the necessary changes to adapt the company and its elements to this new form to implement in the innovation processes the OI model. The first stage is characterized by the initiation to opening of barriers to the company and the firsts networks with some external agents take place. In the moving stage, the OI model is implemented and finally in the institutionalization stage, the company make its efforts formalizing the implementation and guarantying the implementation of the OI model.

3.3. Managerial levers in the implementation process of open innovation model

Since opening the innovation process can be identified as a process of change, the implementation of the model of open innovation involves considering changes in various aspects within the organization, which can be seen as levers of the OI change process. These levers are grouped in four main dimensions: networks, organizational structure, evaluation processes and knowledge management systems (Chiaroni et al. , 2011).

Networks refer to the connection of the organization with other external agents such as customers, competitors, universities, suppliers, etc. The OI process involves an extensive use of interorganizational relationships to acquire external knowledge and to commercialize internal ideas of the company, using mechanisms to extrapolate knowledge beyond the limits of the organization. This requires that the company establishes relationships with various external agents. The purpose of these networks can vary, from the creation of useful networks for the commercialization of innovations to obtaining new information, ideas, skills, capacities, etc. The company must be able to handle different networks efficiently and as a way to achieve strengths or new development opportunities.

The knowledge flows not only require interorganizational networks but also an organizational structure which facilitate internal relationships to relate the organization as a whole and the environment with it, so that the information flows between the environment and the company and throughout the organization. Therefore, the creation of interfunctional teams, organizational roles and incentive systems can be efficient tools to develop these flows within the organizational structure. Also, it may be necessary to include roles specifically designed to promote OI within the organization, roles such as *champions* or *gatekeepers*. *Champions* are those in charge of directing the process of open innovation, while the *gatekeepers* act as intermediaries with the external environment.

The evaluation processes of the innovation projects must evaluate the opportunities for open innovation, as well as existing alternatives. These evaluations are becoming more complex due to a large extent to the increase in the technical and commercial uncertainty that innovation implies. Under these circumstances, companies need to use new evaluation criteria to focus on external sources of innovation.

Finally, the importance of developing changes in the knowledge management system is evident, since the OI model is based on the use and exploitation of knowledge generated both inside and outside the organization to develop and exploit innovation. These changes should favour the dissemination, transfer and exchange of knowledge within the organization and with the environment. Therefore, information and communication technologies and the adoption of intellectual property management systems take great importance.

The research by Chiaroni et al (2010) revealed that the four levers have a different role depending on the stage of implementation of open innovation paradigm in which the company they were analysing was. Table 1 shows the results of their study, that is, the changes made by the company in each managerial lever for the establishment of open innovation model.

Table 1: Progress of the managerial levers according to the stages of the open innovation process

	Unfreezing stage	Moving stage	Institutionalising stage
Networks	-Exploitation of individual social networks to develop relationships with universities and research centers	-Exploration of new networks.	-Establishing long-term collaborations with universities and research centers.
Organizational structures	-Get the commitment of senior management -Separation of the R & D activities of the existing routine activities. -Creation of an independent intellectual property unit -Identification of a change promoting agent.	-Establish an organizational unit dedicated to the management of collaboration with universities. -Identification of an experimental pilot project of open innovation.	-Incorporation of the supervisory role to monitor the development of technologies and advances in areas of interest. -Identification of the main research areas and respective responsible for research.
Evaluation systems	-Establish periodic meetings for the evaluation and monitoring of innovation projects.	-Introduction of explicit evaluation processes that evaluate the possibilities of access to external resources.	-Adopt general indicators and performance measures.
Km systems	-Register of patents with the existing knowledge in the company.	-Integration of ICT in the organization to improve the operability of the equipment.	-Monitoring and control of patents and intellectual property activities.

Source: Chiaroni et al. (2010)

Thus, the unfreezing stage implied a redesign of the organizational structure so that it began to establish a separate unit within the organization dedicated to R & D and intellectual property, as it was appropriate to make visible these changes within the organization, without interfering with the basic processes. Also, in this initial phase, the interorganizational relationships of the company with external agents began to gain importance in order to improve innovation and build information flows useful for AI.

In the moving stage, after that the change was communicated and the need for a change in innovation was established, the implementation of the OI model took place. At first, this was implemented through an open innovation pilot project with the aim of testing the practical implementation of OI in the company, before implementing it in the whole organization and in all research projects. It should be noted other important aspects at this stage, such as the establishment of networks with other companies are highly important, due to the fact that companies need to explore new areas of knowledge. In addition, it was essential to promote the introduction of more formalized evaluation processes for innovation projects with the objective to evaluate better the potential and opportunities of access to external sources of technology. Finally, in this stage, it was important to introduce and empower information technologies to support project management activities and innovation exploration activities.

In the last phase, the institutionalization stage, changes and results were consolidated and institutionalized. This was achieved through the partial redesign of the organizational structure, incorporating new organizational roles and the adoption of measures to evaluate the company's results and innovation activities. Knowledge management systems were essential for the exploitation of new knowledge since they monitor patent and intellectual property activities.

Therefore, the theory of change enunciated by Lewin (1947) can be seen as a valid instrument to examine the process of open innovation within an enterprise because the adoption of open innovation means taking organizational changes in the company that differ significantly from the innovation characteristics adopted traditionally by organizations, which in many cases based on a closed innovation model (Chiaroni et al, 2010).

In 2006, Henry Chesbrough and Adrienne Kardon Crowther carried out a study which examine the degree of implementation of the OI paradigm in early adopter companies belonging to mature and / or asset-intensive industries, specifically, aerospace industry, chemical products, medical devices, bioscience, inks and coatings. In their study, Chesbrough and Crowther (2006) identify four key factors on which, in their opinion, action must be taken to achieve a successful open innovation implementation. These four elements are: strategies/goals, integration and management, sourcing and methods of evaluation and organization.

Regarding the strategies and / or goals, the authors stress the need to provide an efficient direction for the adoption of the OI model and practices, as well as to focus the organization's efforts in ensuring the alignment of the OI practices with the business

growth objectives. With the objective to achieve an integration of all the activities of the organization, pursuing the same objectives and strategies so as not to create divergences within the organization.

Integration and management refers to the need to assign responsibilities, create a feeling of ownership for the success of the OI and the importance of not creating separate management systems unless it is essential, since creating separate management systems would produce duplication of activities and resources.

The success of OI practices depends to a large extent on the interorganizational networks built by the organization. Therefore, efforts should be directed towards building deep and relevant networks for the company that facilitate the development of OI practices. In addition, it is also important efforts to introduce innovations in the areas that can add value and obtain the exclusivity of the market or the purchase of technology as a means for innovation and differentiation in the market.

Finally, the authors point out the need and importance of aligning the evaluation measures and incentives to promote success and to communicate the link with the business strategy and objectives, as well as the publication of the triumphs, as a measure of dissemination of the results of open innovation practices.

Therefore, we observe how these success factors mentioned by Chesbrough and Crowther (2006) are very similar to the managerial levers pointed out by Chiaroni et al (2010). In this way, it can be concluded that there is a certain consensus among the most relevant elements that influence the process of implementation of the open innovation of the companies, since in both studies the importance of the networks, the measures of evaluation and the structure of the company are accentuated, as well as its management and integration to take advantage of knowledge flows.

4. OPEN INNOVATION IN SERVICE COMPANIES

Open innovation has been mainly studied in manufacturing companies, although its benefits can also be extended to service companies. In fact, the opening of innovation processes has been identified as one of the key factors for the success of service companies (de Jong et al., 2003, Du et al., 2014).

However, the specific characteristics of the services and the innovation process of service firms, which are different from those of manufacturing companies, can lead to

different ways of understanding the open innovation model in these companies. Services, unlike goods, are characterized by (Vermeulen, 2001): intangibility, the simultaneity of production and consumption, heterogeneity and perishability.

The intangibility of the services implies that consumers cannot know exactly what they are buying, and the ownership of the service is non-transferable. Simultaneity in production and consumption implies a high level of contact and interactivity with clients in the process, unlike the manufacturing products, since both activities are inseparable from each other in the services. This characteristic also implies higher levels of uncertainty introduced by the consumer's presence. Each client can have different needs and requirements; therefore, it makes more volatile and increases the difficulty to control the services. The heterogeneity of the services refers to their variability, since the same service can be perceived and interpreted by customers in different ways due to the fact that needs, and expectations of consumers are different from each other. The perishability means that services cannot be stored or transported, and the synchronization of supply and demand is problematic. It can cause problems in planning and innovation processes.

The above characteristics allow us to explain why innovations in services present differences between manufacturing and services companies. In general terms, they tend to be non-technological and the changes are not only related to the characteristics of the products, they usually involve changes in the processes and in the relationships with customers (de Jong et al, 2003). In a certain way, the simultaneity of the services causes that the innovations in product and process coincide. Also, these innovations can be driven by several actors: suppliers, customers, the company itself, and even the company can provide the knowledge so that other companies develop innovation within it (de Jong et al, 2003).

Despite the above features, common in a huge number of services, there is much heterogeneity among service companies. A classification that tries to capture differences in innovation between different service industries is the one suggested by de Jong et al. (2003), which is based on the classification proposed by Pavitt (1984) on sectoral patterns of technological innovation for manufacturing companies and distinguishes among: service sectors dominated by suppliers, service intensive production sectors and specialized service sectors. Broadly speaking, this classification highlights the particularities of the innovation process in each category and the type of innovation (radical, gradual) that prevails in each.

In services dominated by suppliers, innovation occurs through suppliers of machinery and other inputs. Companies are usually mass service organizations, the contact with the customer usually occurs in a short period of time and on specific occasions, as would be the case of hotels and restaurant industry. Innovations in these sectors tend to be characterized by their incremental character. The intensive production services focus their efforts on simplifying the supply of services. Finance, transport and telecommunications industries are some industries that belong to this type of services. Their objectives focus on the efficiency and standardization of services and the types of innovation are both incremental and radical. In specialized services, organizations depend to a large extent on the knowledge and skills of employees. In addition, interactions with customers are usually common and close to meet their needs. The most common innovations in these sectors are innovations managed by customers. This category includes companies related to business services, R & D, engineering and information services.

Regarding open innovation, studies show that, despite the variety of services, service companies share certain characteristics when it comes to opening their innovative process, which are different from manufacturing companies. In general terms, companies specializing in knowledge have a great importance in many sectors, including service sector. The study by Mina et al. (2014) focuses on companies that provide services to other companies (business service firms) such as companies dedicated to design, architecture, engineering consultancies, R&D services, marketing, among others. These companies are an example of structured business models that try to capture a large amount of external knowledge and take advantage of this knowledge base through its commercialization (Tether and Tajar, 2008). The study indicates that interaction with collaborators, participation in innovation networks or sharing knowledge are the most common practices among this type of companies. Although interactions or cooperation with consumers are usually relevant in service companies, the results of Mina et al (2014) showed that the relationships with universities and public research centres are also very important. Another study related to the implementation of open innovation in service companies is the research by Virlée et al (2015), which was carried out among 18 companies, of which 15 were high-tech and the rest were service-intensive knowledge firms. The results they found showed that, like manufacturing companies, service companies are inclined towards the use of inbound open innovation practices and that they also adopt inbound practices sooner than outbound ones. Regarding inbound practices, the collaboration with public organizations and universities and the purchase of technologies are the most important practices. Together with them, coupled practices

have a high importance, the most used practice is innovation networks (although in their study they were identified as inbound). Regarding outbound OI, they found that firms did not implement any open innovation practice. According to these authors, the characteristics of the services explain that companies do not develop outbound practices. For example, the intangibility of services hinders their formal protection and outbound practices are associated to a large extent with the use of patents (Harhoff et al., 2003). In addition, the heterogeneity of services also hinders outbound practices since there is a difficulty associated with such heterogeneity in assigning or selling the same service to other companies (Wilson et al., 2008; Dahlander and Gann, 2010).

On the whole, the previous empirical studies show the potential relevance open innovation processes in the service sector. Its implementation in service companies shows similarities with manufacturing companies since both types of companies are inclined towards the use of inbound and coupled practices. However, there are also differences in the form to implement the open innovation model, for example, the type of external agents with companies establish relationships, which in the service firms is mainly implemented through consumers, universities and public research centres.

5. METHODOLOGY

5.1 Research design

For the second part of the work, we have used a case study methodology . The case study is based on the analysis of a specific situation in the field of study (Fondevila and Del Olmo, 2013). This type 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 phenomena and context are not reported with precision, and multiple sources of evidence are used. This implies the review of archival records, economic data and review of previous statistics, as well as interviews, comments, etc. (González et al, 2014). The case can be a company, an institution, a person or a group of people, a program, an event, various materials and even documents, always defined at a time and place (Fondevila and Del Olmo, 2013).

In this work, we examine the process of adoption of the open innovation model in Facsa, a water management company located in Castellón (Spain). We adopted a qualitative approach and the data gathering was carried out during the months of June and July of 2017. To collect the information, secondary and primary sources were used. Secondary

data were obtained through documents available on the Internet and from reports provided by the company. Primary information was provided in a semi-structured interview, based on a previously prepared questionnaire, with the director of innovation of Facsa.

5.2 Description of the company

Facsa was founded in Castellón de la Plana in 1873. The company belongs to the Grupo Gimeno business group which is present in the sectors of tourism, leisure, construction, port logistics waste collection and integral water cycle. Facsa offers all the services of the integral water cycle, from the collection, purification and treatment to distribution and subsequent collection and purification of wastewater. In addition, it is a specialist in other areas such as industrial water and engineering projects. The company tries to guide the processes, activities and decisions towards the satisfaction of the expectations and needs of its customers taking into account the conservation of the environment, safety and health of workers.

The company has experienced a growth in the last decade, going from 585 workers in 2005 to 667 in 2016. This increase in the number of employees has been accompanied by a growth in turnover, from 52 million euros in 2005 to 99 million euros in 2014. The company develops its activity in 7 different Spanish autonomous communities. Facsa manages, maintains and operates 240 wastewater treatment plants and serves to 2,000,000 inhabitants, treats more than 100 million cubic meters of wastewater per year and supplies potable water to One million people in 70 towns daily.

Facsa is characterized by the importance that innovation has in its activities. Since 2008, it has developed an R + D + i management system certified by AENOR through the UNE 166002 standard. In this context, the company has developed specific practices and models to develop internal innovation processes with the aim of enhancing the creativity, motivation and involvement of the staff.

The commitment to innovation can be seen in the variety of innovation projects, which have been developed both internally and in cooperation with external agents through public collaborations or consortia. Table 2 describes the main projects developed by the company in the last years. The innovation projects focus on 6 areas: energy efficiency, water reuse, ICT tools in the integral water cycle, development of ceramic membranes, computational simulation and the treatment and management of sludges. Among the partners the company collaborates with, there are over 20 public regional and national

institutions. The company has also international partners as it participated in 4 European projects. In these cases, the collaborators are international public institutions and private companies.

Table 2: Research projects developed by Facsa

Project	Short description	Financing	External agents
1 SIDECA	Development of a new optimal purification system for small municipalities.	IMPIVA	FACSA
2 HYDROSLUDGE 3D	Development of a 3D computer simulation tool applied to wastewater treatment processes.	Spanish Department of Economy and Competitiveness and FEDER funds	FACSA and Universitat Jaume I (UJI)
3 HYDROALGAL	System of prevention and mitigation of algal blooms in coastal waters.	Spanish Department of Economy and Competitiveness and FEDER funds	FACSA, UJI and Universitat de les Illes Balears.
4 GESTOR	Development of a tool for preventive management and efficiency of water resources in urban sanitation systems.	Spanish Department of Economy and Competitiveness and FEDER funds	FACSA and ABM
5 WINDRO	Investigation of an integrated mechanical transmission system in a wind turbine for water desalination and reverse osmosis treatment.	LIFE programme and LIFE ACTION GRANTS	FACSA, Generación de Agua S.A., ADEPRO INGENIERIA S.L., Centro de Investigaciones Energéticas Medioambientales y Tecnológicas (CIEMAT), Universidad de Granada and URBITAR S.L.
6 REBIABLE	Development of sustainable and competitive bioreactors for wastewater treatment.	Spanish Department of Economy and Competitiveness and FEDER funds	FACSA, NATUCER S.L., Instituto de Ingeniería de Aragón de la Universidad de Zaragoza and ITC-UJI.
7 MIC-ROALBAC	Research on the treatment of urban wastewater of small size with microalgae and bacteria.	Spanish Department of Economy and Competitiveness and FEDER funds	FACSA, IMDEA Energía and CEBAS-CSIC.
8 HYDRODINAMICS	Diagnosis of hydraulic problems in EDAR through hydraulic computational simulation (CFD) and applied experimental studies.	-----	FACSA and UJI's Department of multi-phase fluids
9 HYDRODECA	Development of a computational simulation platform for secondary decanting processes in sewage treatment plants.	IVACE and FEDER funds	FACSA and UJI's Department of multi-phase fluids
10 REMEB	Manufacturing and validation of ceramic membranes developed from agroindustrial waste.	European Commission and Horizon 2020 programme	FACSA, IPROMA, Council of Chambers of Commerce of CV, ITC-UJI, IMECA PROCESS, ATLANTIS, BIOWATER, Centro Cerámico de Bolonia, SAM, ESAMUR and Universidad Antonio Arifio de Colombia.
11 LIFE-STO3RE	Validation of a new sustainable and self-sufficient WWTP concept through a management system for sludge and waste of agricultural origin with high nutrient content.	LIFE programme and LIFE ACTION GRANTS	FACSA, IPROMA, AINIA, ESAMUY and CEBAS-CSIC.

12	e-TONGUE4WAT	Develop systems based on electronic languages in WWTP and urban supplies, obtain an integral control of the water quality in the different types of stations.	Spanish Department of Economy and Competitiveness and FEDER funds	IDM and FACSA
13	CLEANCER	Development of photocatalytic surfaces for ceramic supports that are efficient and durable, for air purification and decontamination of water.	Spanish Department of Economy and Competitiveness and FEDER funds	ITC and FACSA
14	NITRAMEM	Development of catalytic ceramic membranes for the elimination of nitrates in groundwater of the Mediterranean basin.	Spanish Department of Economy and Competitiveness and FEDER funds	ITC, CREG and FACSA
15	PHARmpias	Development of a technology to produce bioplastics from mixed crops and sludge generated in the treatment of urban wastewater.	IVACE and FEDER funds	FACSA and ORBITA INGENIERIA
16	ZERO BRINE	Develop new technologies with the objective of recovering the resources generated in the industrial activity of saline effluents and later use them in other industrial sectors such as the chemical, textile or even food industry.	Horizon 2020 programme	EUROPIREN, WITTEVEEN+BOS, TYPESA, FACSA, HUNTSMAN, EVIDES, IOE, TU DELFT, NTUA, UNIPA, POLSL, ABDN, CTM, TUBITAK, DLR, IVL, SEALEAU, LENNTECH, ARVIA, ROTTERDAM PORT, WSSTP and ISPT

Source: Facsa

Innovation management in the company is relatively recent, due to the fact that the first innovation projects date back to 2005, when the company started the collaboration with universities. Since then, the company's commitment to innovation has increased markedly. According to the company, it is possible to distinguish three stages differentiated with respect to innovation management:

1. 2005-2009. In 2005, the organization began to develop the first research projects, among them, projects such as "SIDECA", "BIOFAC" and "REACTIVOS" stand out. These were projects carried out with public funding raised from regional government. The projects originated from ideas, personnel and activities within the borders of the company, so they followed a closed approach towards innovation. However, it was in this period when the responsables of innovation department realized the need to open the innovation process in the coming years.

2. 2010-2014: This period of time is characterized by the growth of the company within the water sector and, as a consequence, the innovative activity was greatly enhanced. On the one hand, the company had more financial resources for reinvestment. On the other hand, the fact of increasing its size within the national market facilitated inter-organizational relations with other agents due to the image of the company and the prestige it acquired, which in turn encouraged new relationships with external agents, such as universities and suppliers. The first projects developed by the company in cooperation with external partners are: "SLUDGE4ENERGY", "e-TONGUE4WAT", "CLEANCER" and "NITRAMEM". Overall, the presence of external collaborators was scarce and the size of the projects was small.

3. 2015-2018: During this stage, relevance of innovation continues growing in the company. In this period, innovation projects in collaboration with other partners begin to have relevance at the international level. An example is the "REMEB" project developed in 7 phases, with 11 different agents in 7 different countries with a budget of 2.36 million euros. In this project, Facsa is responsible for coordinating the stages of the project and the agents involved.

6. ANALYSIS AND RESULTS

6.1 Open innovation practices in Facsa

The external knowledge acquired through them allows the company to incorporate this knowledge into innovation processes, improving and accelerating them. However, these mechanisms can also involve new ways of exploiting the company's knowledge.

Inbound open innovation developed by Facsa are consisting of cooperation with suppliers, R&D outsourcing, cooperation with universities and research centres and innovation contests. These inbound practices since the knowledge flows can be clearly identified as incoming towards the company, which takes advantage of them for the development of innovation projects that would otherwise not be possible.

The cooperation with the suppliers of the company is historic. The company uses the knowledge and information derived from these relationships to adjust the offer to the needs of the suppliers. In this way the company tries to get the management of municipal wastewater treatment plants through public concessions for their exploitation. The control and management of these facilities represents an important part of the company's activity.

The cooperation with scientific institutions (universities and research centres) is an important practice in Facsa's innovation activities. In this type of collaboration, the innovation project is developed based on a relationship between them, which collaborate and complement each other to develop a common project. Normally, a third financing entity makes an investment for the development of the project. In the case of Facsa, cooperation is implemented with different universities and entities for the development of some projects. This is the case of projects such as "Hydrodynamics" and "Hydrodeca", both projects are based in the computational simulations. The first project tried to diagnostic hydraulic problems in WWTP through hydraulic computational simulations and the second one developed a computational simulaton platform for secondary decanting processes in sewage treatment plants.,

Cooperation with universities constitutes the main source of external knowledge since, as they point out in the company, due to the characteristics of the sector, the number of competitors is very small and the rivalry within the sector is growing, therefore collaboration with competitors with the aim of obtaining new knowledge, ideas or capabilities is unimaginable.

In addition, Facsa tries to be present and participate in forums, conferences, fairs such as Efiagua and specialized events. With this presence in specialized environments, the company tries to establish relationships with new agents and maintain existing ones as they represent a meeting point for specialized agents with whom relationships can be a very important element for the company.

External knowledge obtained by **incorporating ideas through contests** is scarce, as participation in this type of forums for the generation of new ideas is limited to the internal scope of the organization. However, the first open innovation contest has recently been developed as a way of acquiring knowledge from people outside the organization. The contest was developed in the *Focus PYME y Empredimiento de la Comunidad Valenciana*, an event aimed at entrepreneurs looking to detect business opportunities and generate synergies among attendees. Facsa raised a challenge about utilization of big data applied to the cycle of the water. Despite these initiatives, the main contribution of new ideas for the innovation process is still fundamentally based on the company workers through participation in forums, conferences, public competitions and vigilance of competitors managed from the company's intranet.

Recently, the company has increased collaboration with Universitat Jaume I, where it has created the *Cátedra FACSA de innovación en el ciclo integral del agua*, through which the company develops innovative projects as well as seeks new ideas and knowledge through the call for scholarships for the development of innovative projects within the university community.

As previously described, the explicit management of innovation within the organization began in 2005 and it is after 2009 when the development of more relevant international research projects took place. Thus, the organization is now beginning to obtain the results of these investigations. This fact can explain that basically it has not developed any outbound practices for the exploitation of these results yet and only from now on it begins to consider them for some of its projects. Some of these ideas include investment in spinoffs, selling ideas and intellectual property and patents due to the need to commercialize these results. The company considers that the commercialization of these innovations through its current markets is unfeasible as they are not part of the main activity of the company.

The company develops **coupled OI activities**, which are the most used in the company. An example of these practices is participation in the "MICROALBAC", "RELIABLE", "REMEB" and "LIFE + STO3RE" projects, developed through the union of 3, 4, 11 and 5 partners respectively. In these cases, a formal contract is signed for the creation of a

consortium. The company makes its contribution to the joint activity and feeds on the result of the contribution of each of the partners in the research project.

Specifically, REMEB is a research and development project funded by the European Commission within the framework of the call H2020-WATER-2014, which is coordinated by Facsa. With a total budget of 2,361,622.50 euros, it has a duration of three years, from September 2015 to August 2018. The main objectives of the REMEB project are the implementation and validation of a recycled ceramic membrane bioreactor (MBR) of low cost for the reuse of water in a Wastewater Treatment Plant (WWTP). The REMEB project is composed of a total of eleven partners from seven countries that intervene in different stages of the project. This project is structured in seven different work packages that involve the different partners in at least one work package. All of these work packages are detailed in advance so that the partners are aware of their contributions to the project and respective benefits derived from this research, from the first one, that determines the management procedures to monitor the progress of the project, to the last two ones that determine an integral business plan and the exploitation of the results to commercialize the product, as well as the diffusion of all the partners.

Overall, we can point out that the company is characterized by an intermediate use of inbound practices, a low use of outbound practices and a medium use of coupled practices evidenced by participation in consortia and the importance of the relationships. This is explained by the incorporation of innovation as a key pillar in the company's strategy, where the results of these innovation projects started relatively recently are beginning to yield viable results.

6.2 Stages of adoption of open innovation in Facsa

We examined the implementation of the OI model in Facsa according to the stages described by Chiaroni et al (2010) when they related the process of adopting open innovation model with a change process. From the description of the firm in the previous section it can be seen that there is a correspondence between the innovation stages.

In the case of Facsa, innovation conceived in its beginnings a mechanism that could enhance the economic and competitive development of the industry within the sector. The company then raised the need for change to favour the interests of the company. In this way, the first stage of the change can be identified with the period between 2004 and 2009 when said breakthrough made the company begin to develop the first pilot projects based on the closed innovation model.

However, given the costs of its type of innovation, the company observed open innovation as an opportunity to enhance these processes. It was then when the company developed the first pilot projects of open innovation with regional public institutions. The good results of these projects and the possibility of boosting innovation processes through external knowledge flows to improve market position and reduce investments compared to the closed innovation model, were the main decisive factors for the adoption of the open innovation model.

In 2010, starts the action towards the change trying to involve the whole organization towards open innovation processes, facing the barriers to change, so we can consider this period as the moving stage. In this phase it is important the communication and time, all the people involved must know the necessary changes and have enough time to assimilate it. In the case of Facsa, the company began to form a more important innovation department and boost innovation among its employees, facilitating the generation of new ideas and the coordination of different innovation projects with other companies, research centers and public universities.

In the same way, relations with public and private institutions began to take greater importance during this stage, enhancing outbound and inbound knowledge flows. During this stage, Facsa began to form new relationships, not only with regional public institutions but also with national and international institutions.

Finally, since 2015, we see how the company creates and maintains long-term relationships with public institutions such as universities for the development of knowledge flows that enhance the company's open innovation model.

6.3 Open Innovation managerial levers

We examined the degree to which the managerial levers changed and favoured OI through the change process. In doing so, we analysed its networks, organizational structure, evaluation processes and knowledge management system.

Initially, Facsa's networks were not very strong. This was largely due to the small size of the organization as the company went unnoticed by external agents and the firm itself did not actively searched for these type of relationships. Since 2005, with the growth of the organization and with a clear commitment to innovation, external relationships increased. Currently, these relationships are basically with clients, suppliers, universities and research centers.

All these relations have the department of innovation of the company as central axis. In addition, the good reputation of the company within the market promotes the creation of new relationships so that universities and research centers come to the organization to present possible research projects, so the company has not to be so proactive in the search of new relationships.

In the years previous to the start of innovation activities in the company, the organizational structure of the company tended to a high formalization and centralization of activities that were regular and highly repetitive for the most of the activities in the company, so the creation of interfunctional teams had little meaning.

The current organizational structure for innovation activities, is characterised by the low formalization of innovation activities, due to its non-repetitive nature and, on the other hand, the decentralization seeking the autonomy of employees. Additionally, from the beginning of the commitment to innovation, Facsa has encouraged the creation of interfunctional teams for the development of itsr projects. These interfunctional teams are formed by the personnel belonging to different departments, so that they leave part of their daily work and spend a percentage of hours of their day to work on the particularly project. Each one of them is expected to make contributions and present different points of view to the project. For this, the creation of a flexible organizational structure capable of adapting to the needs of the market and the company is essential.

Facsa does not develop a formal evaluation system for its research projects, this evaluation depends on each project, although they are always evaluated by the steering committee in technical and economic aspects. In addition, continuous monitoring is carried out in order to assess the adequacy and efficiency of the activities. The control varies in each project, without a formal system that governs all research projects equally.

Likewise, the new ideas of innovation that arise within the company are evaluated by the R & D department and by the steering committee for the formal approach of a new innovation project. For this, a qualitative evaluation is carried out bearing in mind the fit with the strategic line of the R & D department, the business of the organization and the economic viability. Within the economic part, an economic analysis is made studying the necessary investment, the available funds and the solvency of the research. In case of requiring a high level of funding that the company cannot support, before discarding the project, it assess the possibilities of presenting the project to the calls of public tenders to obtain the necessary financing.

In this context, the fit of the evaluation processes to the open approach has not been made visible in a tangible way. Therefore, the evaluation of innovation projects is done in a very rudimentary way without a clear adaptation to open innovation projects that incorporate metrics that allow the evaluation of these projects.

In terms of knowledge management systems, the company has not configured a formal knowledge management system, although it is true that it develops some basic tools for knowledge management. Basically, these activities focus on the development and promotion of the use of the company's intranet. This is used and presented to the workers as the main tool to manage the ideas of new projects, documenting interesting information regarding the company's activities and innovation and to collect articles and information about conferences and active projects. In addition, the intranet has a virtual library for the dissemination of knowledge related to the company, the activities it develops and information related to the innovation projects.

Therefore, there is a informal knowledge management system articulated for the dissemination and transmission of knowledge generated through open innovation processes and specialized systems to exploit this knowledge through outflow of knowledge that improves exploitation results.

From the previous paragraphs, it can be seen that managerial levers behave throughout the process of change in a similar way to what is theoretically established, as detailed in Table 3. In the unfreezing stage, the first relationships were initiated and the organizational structure, through the commitment of management with the implementation of the OI model, sought to promote change within the organization. The evaluation systems were based on very rudimentary evaluation processes with periodic meetings and qualitative evaluations.

Table 3: Change process of Oi in Facsa

	Unfreezing stage 2010-2014	Moving stage 2015 -	Institutionalization stage
Networks	-Initiation of relationships	-Exploration and exploitation of new social networks -Initiation of networks with clients	-Establishing long-term relationships with universities and research centers (UJI, ITC ...) -Presence in sector innovation environments
Organizationl structure	-Promotion the need of the change -Commitment on the part of senior management	-Creation of interfunctional teams -First important projects	-Identification of areas and responsables for innovation projects
Evaluation processes	-Reuniones periódicas para el control y seguimiento de los proyectos -Evaluación cualitativa de los proyectos		
Knowledge management system	-Primeras patentes y registros de conocimiento	-Integration of ICT for the management of new ideas and knowledge	

In the moving stage, a broad development of networks is visualized, with the exploration and exploitation of new relationships. Among them, it is worth stressing the beginning of relations with customers. In this context, the organizational structure is adapted to the integration of the OI model through the creation of interfunctional teams. There is the integration of ICT for knowledge management through an intranet of the company for the management of new knowledge and ideas of the employees of the company. However, evaluation and knowledge management systems show minor changes.

Finally, in the institutionalization stage, there is establishment of a long-term relations with certain external agents and a consolidation of the organizational structure with the identification of relevant areas and the assignment of those responsible for innovation. However, the evaluation and knowledge management systems do not present evidence of institutionalization.

Therefore, the networks and the organizational structure have changed to be adapted to the open innovation model and there are some differences in evaluation systems and knowledge management systems, established in the company in an incipient way. In this

sense, it can be concluded that the company is in the first steps towards the institutionalization of the change process, and some of the organizational elements do not end up being oriented towards the adoption of open innovation processes.

Regarding the four factors pointed out by Chesbrough and Crowther (2006) for companies to successfully implement open innovation processes (the strategies or goals of the organization, sourcing, integration and management of OI activities and evaluation measures), its role has been unequal in the case of Facsa.

In the first place, Facsa's strategy refers to the development of new business lines. Given that nowadays the company's business lines are traditional, the company perceives the impossibility of growing following the current model of the company, so that actively seeks an appropriate way to adopt new lines of business and integrate them within the company, while seeking to release products and technologies developed internally.

In this context, the new business lines are the result of its innovative activity, and, currently developed. The company expects to have in the following months the structure to bring these developments to the market, involving the R&D department and the company. The management of the company proposes the creation of spin-offs and the transfer of licenses to carry out the commercialization of these developments. Also, it values the possibility of commercializing some of these technologies itself, following the example of some companies of the business group Facsa belongs to. A clear example is the company Fobasa, which is commercializing a software related to the collection of urban waste through contracts with public institutions allowing the use of these technologies. Facsa could emulate these practices for the commercialization of some of its developments.

The integration and management of the company seeks the decentralization of decision making and a low formalization of activities, giving freedom to employees for the contribution of new ideas that can be the engine of new innovation projects, involving the employees in the organization and being flexible with the structure, as a method to favour the organizational environment. These organizational measures have allowed the implementation of the open innovation model within the company.

In this context, the company seeks to promote the sense of belonging to the company and the motivation to improve the feelings of workers towards the company to achieve better levels of productivity, efficiency, personal satisfaction and commitment to the organization and its performance. An example of this can be seen in the high flexibility that exists for the compatibility of employees' family and work life.

In addition, sourcing refers to the supply of technology in the company. It is based on two key points. On the one hand, through the company's internal innovation and its results and, on the other hand, through the involvement with external agents in inbound and coupled practices, benefiting from technology and external knowledge. For example, through the association with universities which contributes to innovation processes knowledge and means of which the company does not have. This is the case of the "Hydrodynamics" project where Facsa and Universitat Jaume I cooperated for the development of certain stages of the process.

Finally, evaluation measures are the least developed aspect in the company. These are based on the qualitative evaluation of research projects and the traditional control of their performance. Specifically, the control is based on periodic meetings to observe the development of the project in accordance with the general lines and the progress made, without formalized and clearly specified detailed assessment measures.

Therefore, these success factors are developed to a different degree in the company. However, we can consider that they are in a position to facilitate the development of open innovation processes. The interactions with suppliers and customers, the flexibility and decentralization of the organizational structure and the objectives of the company in terms of innovation are some of the elements that facilitate this development.

6.4. Facsa as a service company

According to the services classification of De Jong et al (2003), we can consider Facsa as a specialized services company, in which innovations depend to a large extent on the knowledge and skills of employees. Although De Jong et al (2003) concluded in their study that innovations in service companies tend to be non-technological in nature, analyzing the innovation projects carried out by Facsa we see how it does not occur in this case since all the innovation projects of the company have an important technological component.

Regarding open innovation practices developed by service companies, Mina et al (2004) pointed out the interaction with collaborators, participation in innovation networks or the exchange of knowledge through relationships with universities and research centers as the most frequent practices among service companies. In the case of Facsa, the company focuses on these practices through the integration with external agents in innovation projects, participation in innovation networks and the exchange of knowledge with public universities, especially with the Universitat Jaume I.

Likewise, according to the research of Virlée et al (2015), Facsa has mainly developed inbound practices, which were implemented much earlier than outbound practices. However, this does not imply that the company has not developed any outgoing innovation practice or is going to develop them soon. However, the company has an inclination towards the use of inbound and coupled practices, as the manufacturing companies do.

As a whole, we observe that the implementation of OI in Facsa is in line with main findings about the open innovation model in service companies.

7. CONCLUSIONS

Historically, companies have had to open their borders for the adoption of ideas, knowledge or skills to a greater or lesser extent. However, it is currently where the new characteristics of the environment have favored this openness and permeability of organizations. In this sense, the open innovation model can be helpful to define a firm innovation strategy, since it allows to accelerate the internal innovation processes through the integration of external and internal knowledge and the reduction of costs and time in the processes of innovation of the company and to exploit externally, in other markets, the knowledge generated internally.

In this way, we rely on the open innovation paradigm to examine Facsa's innovation strategy. Facsa is a company dedicated to providing services related to the integral water cycle. As such, it is a service company and, although there is much heterogeneity in service companies, in general terms, in this type of companies, innovation is characterized as having a slightly less technological character than in manufacturing companies and for the greater importance of relationships to develop innovation processes. Although in this work we have not examined the innovative results of the company, we would like to highlight the fact that, despite being a service company, most of the innovations that have been developed at Facsa are technological in nature. This is explained because, within the different types of service companies, it is identified with specialized service companies (de Jong et al, 2003). Companies of this type depend to a large extent on the knowledge and skills of employees and interactions with customers are usually common and close to meet the needs of them.

Regarding the development of the OI model, this is usually carried out through inbound and coupled practices and there is no sign of the intensive use of outbound practices that allow the commercialization of the results in markets different from the usual ones of the company itself. However, coinciding with the fact that the innovation of the company is beginning to give results, senior management visualizes the need to develop forms of outgoing knowledge flows that allow the exploitation of them. In the specific case of Facsa, we observed how the adoption of the OI has represented an opportunity for the company to expand its possibilities of achieving greater innovative results, focusing its efforts on collaboration in new innovation projects with external partners.

The recent commitment to innovation within the company can be seen from the perspective that assimilates the adoption of AI to a process of change. According to the model of the process of change enunciated by Lewin (1947), consisting of the stages of initiation, change and institutionalization, we could consider that the company is at an

early stage of institutionalization of open innovation. The initiation of the process of adoption of the IA model was established with the commitment of the management towards the opening of the internal limits and the beginning of relations with universities and public research centers. In Chiaroni et al. (2010), the actions undertaken for the initiation towards AI are preceded by successive changes within the organization, consisting of the creation of an independent intellectual property office and the implementation of meetings to validate and evaluate open innovation projects. In the case of Facsa, the change is seen in the proactive search for new relationships and the integration of ICT, through an intranet of the company, for the management of new ideas and knowledge. The institutionalization is manifested through the creation of specific roles within the organization for the development of technologies and scientific advances of the company, the adoption of indicators that allow the evaluation of the performance of innovation and establishment of long-term relationships with universities and research centers. However, the company has not carried out all the adjustments in the necessary levers for the streamlining of the change process that are theoretically indicated. Thus, given the characteristics of the company and the environment, the evaluation systems and the knowledge management system are little formalized and are developed in a rudimentary manner.

Among the managerial implications for the firm drawn from the analysis carried out, it can be determined, on the one hand, the need to consolidate the institutionalization of the model, acting on evaluation and knowledge management systems. The incorporation of an evaluation system for OI projects and a formalized knowledge management system, based on the search for new opportunities for innovation within the sector, would help to improve innovation and consequently to improve the company's results, since they suppose a more efficient management of the activities and the results of the innovation. The knowledge management system within the company could be improved from the intranet available to the company and broadening its use among employees. In addition, the possible extension or integration of some aspect of the intranet to third party agents such as suppliers, customers and even people outside the company could be considered. In this context, the company must allocate resources to the capture of these ideas and establish evaluation measures that allow the valuation of these new ideas and knowledge. These evaluation measures should include metrics that provide decision-makers with information that allows them to base such decisions on ratios and evaluation measures that envisage the potential usefulness of this external knowledge for integration in innovation processes.

In addition, the company should consider intensifying the activities to commercialize the resulting knowledge through outbound practices. These outgoing knowledge flows, which include the innovation results and ideas of the organization, can be an important business form for the company and even for the business group. Among the possible practices to develop, the company could explore the out licensing of technology or the creation of spin-offs. The technology license refers to the sale of licenses that allow the use and implementation of knowledge and technologies developed internally to other companies. On the other hand, spin off are new companies created as an extension of another company for the exploitation of knowledge or technologies generated in the company but which is not viable to be exploited in the parent company. Although these are mechanisms with very different characteristics, in both cases they can contribute to reinforce the role that open innovation can have in the business model of the company.

It is worth considering the potentialization of inbound and coupled practices with external agents to increase the use of external knowledge. Some examples may be participation in consortium worldwide, the creation of innovation contests or the creation of facilities shared with other agents. The participation in international consortia for the development of innovative projects with international companies and institutions would allow the development of innovation projects of greater scope and complexity that imply important advances within the industry. Innovation competitions, which launch challenges, are competitions in which the company asks a specific target group to present a solution for a certain previously defined task in exchange for certain incentives. In this way, the company could be first-hand knowledge of the latest trends and areas of innovation that are interesting and improve the innovative results of the company and include in its innovation processes new ideas and knowledge unknown until now.

Finally, we would like to highlight that the work done allows future extensions related to the methodology and information on the variables associated with the results of innovation and their impact on the company. As for the methodology, the data collection could be improved through a greater number of interviews with other managers of the company that increase the amount of information collected and the quality of it. In the same way, the information collected could be expanded through a study of the results of these open innovation processes and their impact on the company's results, since the work has focused solely on the analysis of innovation processes and the changes that have strengthened these processes. Likewise, issues related to the particular characteristics of the company could also be addressed in detail. The classification of

the company as a service company could imply significant differences from manufacturing companies.

8. REFERENCES

- Battistella, C., De Toni, A.F. and Pessot, E. (2017). Practising open innovation: a framework of reference. *Business Process Management Journal* 23, 1311-1336.
- Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School Press.
- Chesbrough, H. and Bogers, M. (2014). Explicating Open Innovation: Clarifying and Emerging Paradigm for Understanding Innovation. En Chesbrough, H., Vanhaverbeke, W. y West, J. *New Frontiers in Open Innovation*. Oxford University Press.
- Chesbrough, H. and Brunswicker, S. (2014). The Adoption of Open Innovation Practices in Large Firms. *Research – Technology Management*, 16-25.
- Chesbrough, H. and Crowther, A.K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R&D Management*, 229-236.
- Chiaroni, D., Chiesa, V. and Frattini, F. (2010). Unravelling the process from Closed to Open Innovation: evidence from mature, asset-intensive industries. *R&D Management* 40, 222-245.
- Chiaroni, D., Chiesa, V. and Frattini, F. (2011). The Open Innovation Journey: How Firms Dynamically Implement the Emerging Innovation Management Paradigm. *Technovation*, 31,34-43.
- Dahlander L. and Gann D.M. (2010). How open is innovation? *Research Policy* 39, 699-709.
- De Jong, J.P.J., Bruins, A., Dolfsma, W. and Meijaard, J. (2003). *Innovation in service firms explored: what, how and why?* Zoetermeer: EIM Business & Policy Research.
- Du, J., Leten, B., and Vanhaverbeke, W. (2014). Managing open innovation projects with science-based and market-based partners. *Research Policy*, 43(5), 828-840.
- Duesund, A. y Ronneberg, L. (2012). *Open Innovation practices applied to service innovation* (Tesis). Norwegian school of economics. Bergen.
- Escorsa, P. and Valls, J. (2004). *Tecnología e Innovación en la Empresa*. 2ª edición ampliada, Edicions UPC, Barcelona.
- 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.
- Gassmann, O. and Enkel, E., (2004). Towards a Theory of Open Innovation: Three Core Process Archetypes. En: Papel presentado a R&D Management Conferencia, Lisboa.
- González, J.M., León, A. and Peñalba, M., (2014). *Como escribir un trabajo de fin de grado: algunas experiencias y consejos prácticos*. Madrid: Síntesis.

- Harhoff, D., Henkel, J., and von Hippel, E. (2003). Profiting from voluntary information spillovers: How users benefit by freely revealing their innovations. *Research Policy*, 32(10), 1753-1769.
- Huang A. and Rice J. (2014). *Exploring the use of Open Innovation in Processes, Products and Services*. World Scientific Books, World Scientific Publishing Co. Pte. Ltd., 900.
- Lewin, K., 1947. Frontiers in group dynamics. *Human Relations* 1,5–41.
- Lichtenthaler, U., 2008. *Open innovation in practice: an analysis of strategic approaches to technology transactions*. *IEEE Transactions on Engineering Management* 55 (1), 148–157
- Mira, A., Bascavusuglu-Moreau, E. and Hughes, A. (2014). Open service innovation and the firm's search for external knowledge. *Research Policy* 43, 853-866.
- OCDE (2008). *Open Innovation in Global Networks*.
- Openbasque (2014). *Openbasque: un acercamiento a la innovación abierta desde la perspectiva territorial y empresarial*.
- Pavitt, K. (1984). Sectoral patterns of technical change. *Research Policy* 13, 343-373.
- Tether, B.S. and Tajar, A. (2008). Beyond industry–university links: sourcing of specialist knowledge for innovation from consultants, private research organisations and the public science base. *Research Policy* 37 (6-7), 1079–1095.
- Van de Vrandre, V., de Jong, J.P.J., Vanhaverbeke, W. and de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation* 29, 423-437.
- Vermeulen, P. (2001), *Organizing Product Innovation in Financial Services*, Nijmegen University Press.
- Virlée, J., Hammedi, W. and Parida, V. (2015). Open Innovation Implementation in the Service Industry: Exploring Practices, Sub-practices and Contextual Factors. *Journal of Innovation Management* 3, 106-130.
- Wagner, S. M. (2013). Partners for business-to-business service innovation. *IEEE Transactions on Engineering Management*, 60(1), 113-123.
- Wilson, A., Zeithaml, V., Bitner, M. J., and Gremler, D. (2008). *Services marketing - Integrating customer focus across the firm*. Berkshire: McGraw-Hill Education.