

## Chapter 3

# Open Innovation: A Successful Case Study of a Portuguese Company Seeking Complementary Resources

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### ABSTRACT

*Open innovation practices are recurrent in the business environment due to resource and technology limitations in most companies. The search for complementary resources, especially among SMEs, begins to be a current practice due to the possibility of resorting to partnerships and collaborative processes. Thus, through a case study analysis of a Portuguese SME based in Aveiro, Portugal, it was possible to analyze the innovation process and the adoption of open innovation practices in this SME. Through a qualitative study, it was possible to understand the importance of SMEs in the Portuguese business fabric, as they increasingly seek to apply innovative processes in their processes. However, the case analyzed reveals that open innovation may involve an inter-organizational partnership where the company analyzed uses an intermediate model of open innovation, since it does not sell surplus technology, internalizing only external resources. This case study serves as a teaching case as well as a pedagogic tool.*

DOI: 10.4018/978-1-7998-8665-5.ch003

## **INTRODUCTION**

Innovation is one of the most commonly used business strategies (Dantas & Moreira, 2011) to: (i) generate new products/processes and processes, (ii) adapt and developed new technologies, (iii) deploy changes within organizations in order to improve business competitiveness.

Innovation is one of the main drivers of business performance (Ribau et al., 2019; Zimmermann et al., 2020). It is normally related to the successful commercialization of the result of the generation and development of new ideas, transformed into products, services or processes (Dantas & Moreira, 2011; Hungund & Mani, 2019). The organizational climate is important for successfully promoting innovation within the firm. For that an innovation culture supporting free expression of ideas, divergent thinking practice, and risk aversion is mandatory (Popa et al., 2017).

If historically, most of the organizational knowledge and innovation was generated internally (Chesbrough, 2003), with the globalization of the technology and the business world, there are only a limited number of firms that would be able to compete by using exclusively their internal resources. Moreover, in an increasingly competitive world, where competitive advantages are ephemeral and hardly sustainable in the long term due to technological change (Bianchi et al., 2010; Lööf & Heshmati, 2006; Parida et al., 2012), innovation and technology have become key elements in the development of the knowledge economy. If innovation is important, inter-organizational relationships based on open innovation (OI) and technological alignment are important for the business success (Carvalho & Moreira, 2015; Silva & Moreira, 2021).

Open innovation, as defined by Chesbrough (2003), consists of using internal and external sources of knowledge and technology. Although the resource-based view of the firm has been extensively used to defend the importance of the internal source of knowledge and innovation as a competitive advantage, external sources of knowledge seek to accelerate internal innovation processes, to increase the potential for entering into new markets and to obtain better business performance (Bernal-Torres & Frost-González, 2015; Chesbrough, 2003, 2006; Hungund & Mani, 2019; Lööf & Heshmati, 2006).

Unlike the traditional model of innovation, where all the knowledge, technology and innovation is coordinated and internalized and controlled by the company, OI is characterized by a porous organization in which firms interact with their partner organizations to internalize and externalize knowledge and technology (Torres et al., 2015). The concept of OI assumes that organizations use both external and internal ideas and knowledge to enhance their innovations (Boger et al., 2018). As firms are applying business models to enhance their R&D capabilities, and taking into account the characteristics normally associated with small and medium-sized firms

(SMEs), OI is very important to leverage the development and competitiveness of SMEs. In fact, resource constraints and the small size of SMEs force them to interact with the outside world in order to gain access to the resources and knowledge they need, but do not have. Consequently, OI plays a very important role in its growth and competitiveness.

Open innovation has been widely studied, especially in large companies. Although it is still a relatively unexplored area in the scope of SMEs, the apparent relationship between OI and SMEs has aroused growing interest on the part of the scientific community, which has been studying it in an attempt to understand what are the factors that lead SMEs to adopt this type of innovation, namely the conditions and benefits of OI in SMEs. Thus, as there are few studies on OI in countries that are at an intermediate level of technological development, as is the case of Portugal, which has the characteristics from a peripheral country (Milici et al., 2021; Silva et al., 2021; Teixeira & Lopes, 2012), and taking into account the composition of the Portuguese business fabric, in which the majority of companies are SMEs, representing around 99.9% of the total business fabric, it was decided to assess a Portuguese firm that values OI as an engine for growth and differentiation (Silva et al., 2021; Teixeira & Lopes, 2012).

To this end, a company was chosen – for confidentiality reasons is going to be named VERTICAL – which due to its history of partnerships with the University of Aveiro and its interaction with external agents, follows an OI strategy and seeks to leverage its technology, knowledge and competitiveness on external resources, having a predominant role in the development of the company, through an innovative and entrepreneurial capacity. As such the main objective of this chapter is to explore how this SME uses OI strategy as part of its innovation strategy. Taking into account that OI serves as a management business model that uses internal and external sources of knowledge and technology with people and organizations outside the company to tap into external sources of knowledge and technologies, analyzing the characteristics of a small firm is of added value to present how small companies muddle through the implementation of OI business model as they compete in the market. As a result, this case study seeks to cover two different situations: to serve as an example of OI strategy and to prepare this case study for class discussion, serving academic as well as practitioners perspectives. The chapter constitutes an important tool for SMEs managers as well as for graduate students to discuss the importance of the implementation of OI approaches to generate competitive advantages.

This chapter is divided into six sections. After the introduction, the Section 2 presents the literature review, which aims to frame the work with regard to OI in SMEs and their impact on the Portuguese business fabric. In Section 3, the methodology used for the preparation of this case study is reported. In Section 4, the company is presented, followed by the presentation of the case study, where the company will

be presented and a systematic description of the results of the interview conducted with the CEO of the chosen company will be made. Section 5 presents the results. Section 6 presents the discussion of the results. Finally, the conclusion is presented in Section 7.

## **LITERATURE REVIEW**

### **Impact of SMEs in the Portuguese Economy**

The importance of SMEs is transversal to most industrialized economies, especially in the European Union, constituting their economic base (Moreira, 2009). In fact, SMEs are usually referred to as the backbone of the European economy (Schmiemann, 2009), since they represent 99% of all European companies (Coelho & Matias, 2010). In other words, the importance of SMEs is not exclusive to the Portuguese reality.

According to the criteria defined in European legislation, the main factors that determine whether a company is an SME are related to the number of employees and turnover (European Commission, 2020). A medium-sized enterprise employs fewer than 250 employees and its annual turnover does not exceed 50 million euros. A small company has fewer than 50 employees and a microenterprise fewer than 10 employees (Carvalheira & Moreira, 2015; European Commission, 2020).

The weight of SMEs in the Portuguese economic fabric is quite significant, as they represent 99.9% of the total number of firms. Of these, 95.4% are micro; 4% are small companies and only 0.6% are medium-sized (Carvalheira & Moreira, 2015). According to 2017 data, there are 1259234 SMEs in Portugal, of which 1212059 are micro enterprises (PORDATA, 2017). Overall, SMEs still account for 79% of total employment, playing an important role in the development of the Portuguese economy (Carvalheira & Moreira, 2015), generating employment, and being a source of entrepreneurial skills and innovation. SMEs are also crucial to the Portuguese economy, especially for the support they provide to large companies, serving as a complement to their activities throughout the value chain. Indeed, multinationals tend to turn to SMEs for subcontracting activities due to their technological expertise and mastery of certain technologies (Moreira, 2009).

However, despite the fact that 99.9% of companies are SMEs, the truth is that large companies are responsible, despite representing only 0.1% of the total number of companies, for 20% of employment and more than 20% of sales volume (Moreira, 2009).

## **Advantages, Limitations and Strategies of SMEs**

SMEs have major limitations, such as lack of both R&D resources and structured innovation processes. In terms of advantages, SMEs stand out for being less bureaucratic, more flexible and having a greater propensity to take risks. Given their limitations they are also forced to interact more with customers, suppliers, research centers and other firms (Carvalho & Moreira, 2015). The globalization process has also motivated companies to establish these outward-based proactive behaviors (Coelho & Matias, 2010; Ribau et al., 2017).

In the current economic context, marked by stiff competitiveness, competing internationally is essential for economic survival. Thus, due to their more flexible organizational structure, SMEs have competitive advantages that large companies generally do not have, since SMEs are nimble and more resilient to crises and can more easily reconvert their business. However, one of the major obstacles SMEs face is the fact that they cannot take advantage of economies of scale (Carvalho & Moreira, 2015; Moreira, 2009), despite their specific know-how (Coelho & Matias, 2010; Silva et al., 2021).

Another problem of SMEs is related to their organizational structure, characterized by the lack of financial resources and the scarcity of human resources (Coelho & Matias, 2010; Hungund & Mani, 2019; Moreira, 2009).

Given the limitations of SMEs, OI is an excellent opportunity for them to collaborate with external entities, especially at regional level, in order to increase their probability of success and to create opportunities for improvement and growth. These outward-oriented interactions allow for mutual knowledge sharing between entities involved (Odrizola-Fernández et al., 2019; Radwizon & Bogers, 2019).

## **Open Innovation and SMEs**

Due to their small size and consequent resource limitation, SMEs are likely to adopt OI processes, since they do not have all the necessary resources, knowledge and technologies (Santoro et al., 2019; Van de Vrande et al., 2009). Therefore, OI is a means to obtain external resources and competences quickly and efficiently, facilitating the development and commercialization of new ideas. Open innovation is opposed to the traditional model of closed innovation, and has two dimensions that must exist simultaneously: on one hand, the absorption of knowledge and technology and, on the other hand, the transfer of knowledge and technology to other organizations. Those two dimensions encompass what is referred to as inbound and outbound OI.

All practices entail the establishment of inter-organizational relationships with external organizations that leverage the other organizations discoveries, technologies and knowledge, which encompass the inbound dimension of OI (Chesbrough, 2006;

## ***Open Innovation***

Chiaroni et al., 2011). Huizingh (2011) poses that inbound OI refers to the internal use of external knowledge.

Inbound innovation is characterized by outside-in processes that involve the opening up of the innovation processes of the firm to integrate external knowledge and technologies from suppliers, customers or other firms to enrich the firm's own knowledge base (Enkel et al., 2009), increase the firm's innovativeness (Gassmann et al., 2010; Inês et al., 2021; Laursen & Salter, 2006). Within this process, innovation networks (Dittrich & Duysters, 2007; Enkel, 2010) and the use of innovation intermediaries are notoriously important (Gassmann et al., 2010; Lee et al., 2009).

The outbound dimension reflects the possibility of the firm to explore the market, or other external organizations, to complement the internal paths of the firm to reach the market. As such, this outbound dimension represents an opportunity to seek external organizations with business models that are more appropriate to market a particular technology that the firm is not willing to utilize (Chesbrough, 2006; Chiaroni et al., 2011; Inês et al., 2021). This dimension refers to the external exploitation of internal knowledge (Huizingh, 2011). Inside-out OI refers to the sale of intellectual property and multiplying technology by transferring ideas from the external environment (Enkel et al., 2009). Companies establishing inside-out OI processes as the main key of their business are focused in sourcing their knowledge and innovation, with the purpose of quickly bringing ideas to the market. The decision of changing the focus of exploitation outside company borders seeks the creation of profits via intellectual property licensing and/or multiplying technologies and transferring ideas to other companies, thereby generating revenues from licensing, joint-ventures and spin-offs (Enkel et al., 2009).

These dimensions are related to three knowledge processes: research, knowledge retention and exploitation, and the former can be undertaken both inbound and outbound (Lichtenthaler and Lichtenthaler, 2009). According to existing studies, there are several OI modes; however Abulrub and Lee (2012) have developed a classification of 13 OI types: (1) purchasing external technology; (2) licensing-in; (3) joint-ventures; (4) joint development; (5) R&D outsourcing; (6) venture capital; (7) mergers and acquisitions; (8) customer involvement and (9) external networking; (10) selling internal technologies; (11) licensing-out; (12) spin-offs; and (13) Open source.

There are several reasons explaining why SMEs can benefit more from OI adoption than large firms, namely the fact that they are less bureaucratic, more flexible and more responsive to market needs (Silva et al., 2021; Carvalho & Moreira, 2015). Indeed, several studies address the benefits of OI adoption in SMEs (Carvalho & Moreira, 2015; Chiaroni et al., 2011). However, in relation to the Portuguese context, it should be noted that many companies are still in an intermediate state of technological development. Thus, in comparison with firms located in countries with

higher rates of technological development (such as the USA, Sweden, Finland or the Netherlands), Portuguese companies, in general, tend to adopt a closed innovation model (Teixeira & Lopes, 2012). However, there are still few studies regarding the adoption of OI in Portugal, especially in SMEs, so it is in our interest to assess the extent to which Portuguese companies value innovation as an engine for growth and differentiation (Milici et al., 2021; Silva et al., 2021).

Although the Portuguese innovation model is generically closed, Portuguese firms consider acquiring external technologies and knowledge as vital for their business. In other words, usually the most widespread aspect of OI in Portuguese firms is the absorption of external knowledge (Teixeira & Lopes, 2012).

Although the innovation model most frequently used in Portugal could be considered as ‘closed innovation’, Portuguese firms consider the use and acquisition of external technology as vital to their businesses. That is, usually the most widespread aspect of OI in the Portuguese business environment is the absorption of external knowledge (Teixeira & Lopes, 2012).

Silva et al. (2021) consider that the propensity of SMEs to adopt OI depends on five dimensions: (1) human, technological, financial resource allocation; (2) leadership; (3) planning and processes; (4) general context; and (5) transactional context. Of these, the importance of leadership should be emphasized. Indeed, the attitude of the owner or head of SMEs is a key determinant of the firm’s performance and adoption of innovation models (Chiaroni et al., 2011; Van de Vrande et al., 2009). It is the leader who is also responsible for designing and conveying the organizational culture, affecting how innovation is perceived within the firm. Through an organizational culture that supports creativity and knowledge dissemination among the various employees of the company it becomes easier for the company to solve problems and create synergies (Raposo et al., 2014). Felício et al. (2019) consider that the SME’s ambidextrous capacity, i.e. the ability to respond simultaneously to disruptive or incremental innovation processes, allows a better adaptation to new routines, based on the ability to assimilate knowledge.

*Vis-à-vis* large firms, the innovation process of SMEs is different, since SMEs are particularly focused on creating networks with other firms, research centers, customers and suppliers (Carvalho & Moreira, 2015). Portuguese SMEs are positively influenced in their performance and innovation levels through cooperation. Collaborative activities with other firms and institutions allow them to access technological knowledge and resources useful for the rapid development of organizations, access to new markets, economies of scale, and risk and cost sharing (Teixeira & Lopes, 2012; Carvalho & Moreira, 2015). Sources of collaboration include educational entities, research centers, suppliers, customers, and companies from other sectors. Typically, competing entities are avoided and government institutions appear only as a funding source. These collaborative activities with partners are most

evident in the experimentation or prototyping, design, and engineering phases. The relationships established are long-term oriented, typified by partnerships, alliances, and organizational networks (Carvalho & Moreira, 2015). Typically, in Portuguese SMEs, cooperation between companies results in the creation of radical innovation processes rather than incremental innovation (Raposo et al., 2014). Social networks also appear as facilitating agents for the formation of strategic partnerships and increased contact with suppliers and customers (Franco et al., 2016).

## **RESEARCH METHOD**

Based on the objectives defined in the introduction section, a case study-based qualitative methodology was adopted, where it is possible to interpret and explain the observable phenomena within certain specific contexts (Wahyuni, 2012).

The qualitative approach followed allows a greater understanding of the phenomena analyzed. It follows an interpretive and descriptive approach of the reality, using a single case study, whose objective is complemented by the desire to be analyzed and discussed in the classroom. This conjecture is supported by Yin (2009), who defends the use of case studies for the analysis of complex social phenomena, given the dynamism and complexity that they involve.

One of the main advantages of the case study is the fact that information may originate from several sources. The most used source of information, however, is interviews (Rowley, 2002). In fact, it is the interview that allows interviewees to express themselves, allowing interviewers to collect information about a certain topic (Alshenqeeti, 2014).

Based on the objective initially outlined, the choice of the company to be analyzed was based on the following criteria: being a Portuguese SME; being at an early stage of its development and internationalization process; having limited resources in order to seek to complement these resources with external partners; and actively using OI.

The Portuguese SME chosen, which for confidentiality reasons is called VERTICAL, was selected for fulfilling the criteria defined above, enhancing the possible discussion of the case study in the classroom, which we consider of added interest.

In order to guarantee reliability, all the processes and analyses used during the research were described and the main instruments used in data collection were identified, such as the interview guide.

The previously prepared script was structured taking into account the theme to be developed – OI in Portuguese SMEs – and was inspired by the survey conducted by Teixeira and Lopes (2012) and Abulrub and Lee (2012). The script addressed 12 key aspects: (1) presentation of the company, referring to its history, mission,

objectives, human resources, sector of activity, awards, etc.; (2) CEO's opinion about the importance of SMEs; (3) organizational culture; (4) new product development process; (5) R&D activities; (6) use of external technology; (7) partnerships and collaborations; (8) relationship with the public policy and funds; (9) innovation processes in the company; (10) open innovation; (11) importance of the CEO in the innovation processes; and (12) the role of social networks.

The main method used for data collection was the semi-structured interview, using open-ended questions, in order to deepen the above-mentioned themes (Fisher, 2007). The open structure allows exploring data obtained during the interviews, with the objective of gaining a more in-depth understanding of the topic (Fisher, 2007). The interviews allowed the collection of primary data, which provided relevant information and concrete answers to the objectives defined above.

The interviews took place at VERTICAL's facilities, in Gafanha da Nazaré, Portugal and took about 50 minutes. It was audio-recorded in order to collect all the information more efficiently. It should be noted that the CEO authorized both the recording and the disclosure of the content of the interview. During the course of the interview, the script was adapted, according to the answers given during the interview.

As VERTICAL's CEO had been part of the company's staff since its inception, he was contacted to provide the most reliable information about the company. We had the opportunity to schedule two semi-structured interviews to address the evolutionary perspective of the company regarding strategy, main innovation activities, financial indicators as well as partnerships. As we had previous knowledge about the company, the two interviews lasted approximately 30 minutes each. The two interviews were audio recorded so that subsequent content analysis could be carried out. Subsequently, the interviews were transcribed to ensure the conformity of the results and facilitate further analysis of the data. With the second interview it was possible to complement the previous one. This second interview helped with the triangulation of some content, and supported further elaboration on key points that were not analyzed during the first interview. Both interviews took place at VERTICAL's facilities, so the interviewers could observe events in their natural setting, rather than relying on pre-arranged single interviews.

The interviews and the complementary visit to the company's facilities allowed the researchers to analyze managerial actions regarding innovation activities. The interviewers sought to maintain a passive and unobtrusive presence, in order not to interfere with on-going events and activities. Data from all sources were collected and transcribed into a single case story, helping to identify missing information.

After conducting the interview a transcript was made and the CEO's responses were analyzed and interpreted critically. In order to reduce subjectivity, we also applied a triangulation, crossing the information obtained through the interview,

## ***Open Innovation***

with secondary sources, namely information available online, both on the company's website, as well as in newspaper and magazine articles (Fusch et al., 2018). This method of collecting data from various sources helped triangulate data and aided the researchers not only to collect more comprehensive relevant information, but also to verify its consistency, in order to increase the robustness of the results.

Finally, authenticity was achieved by crossing information from various sources and validating the information in a second interview. In order to portray the reality faithfully and fairly, the interview was conducted in the presence of at least two interviewers, which reduces the bias in understanding the reality and the possible bias during the interview.

## **CASE STUDY PRESENTATION**

### **Company History**

VERTICAL started its business with a single patented product – PLTS, acronym for People Lifting and Translation System – and six employees. It was created in 2011 by Mr. Manoel. The current CEO joined in as partner with marketing responsibilities, trying to reach foreign markets in the construction industry, where the PLTS could be employed. Mr. Manoel had previous experience working at height, as the owner of a specialized Brazilian company, created in 2002 and focusing mainly on the construction industry. In 2010, As a result of safety problem in the construction industry, this Brazilian company came up with the innovative idea, but did not have the resources to develop it. As such, VERTICAL was created with the objective of developing high-tech equipment and new solutions for working at height. This led to the creation of an innovative PLTS system, which was patented afterwards. Mr. Manoel stepped out as a result of a company turnaround and VERTICAL was taken over by its current CEO with the support of external investment.

Between 2011 and 2013 VERTICAL had no sales activities: the focus was on product development, patenting and bureaucratic work. Only in 2013, VERTICAL was formally registered as a company. A young, dynamic and flexible factory was set up in Aveiro as a result of the turnaround process. Nowadays, VERTICAL is a company with a strong customer focus, concerned with the development of solutions that meet the needs of its customers.

The company's activity began in January 2014, when the current CEO joined VERTICAL on a full time basis. Between 2013 and 2014, VERTICAL managed to certify product quality, produce catalogs, design a website and establish several partnerships. By 2016, the company, to compensate for its limited resources, typical of micro-companies, actively participated in several competitions, having earned

some awards for its innovative activities. Currently, VERTICAL is dedicated to the development of new products/services, having launched three new products in 2019.

## **Mission, Vision, Values and Objectives**

VERTICAL's mission is to develop simple yet effective equipment that is both safe and productive for working at height. The three main pillars of this company are safety, productivity and innovation. Innovation is undoubtedly one of VERTICAL's competitive advantages, given that it was created to develop new equipment. Safety is also critical, as the main downstream business sector is construction, an industry with high occupational accident rates. Sustainability and social responsibility are also important values that govern the company's operations. The CEO claims he is concerned about using environmentally friendly materials in the manufacture of PLTS.

The company focuses on the development of new projects with innovative technologies that can solve problems that are emerging in working at height. The main need the company wishes to address is the risk and low productivity associated with working at height. According to the CEO, about 40% of a worker's day is lost to the resettlement of their life-lines and other safety issues. Therefore, VERTICAL's value proposition is (a) a 40% reduction in cleaning and maintenance costs, and (b) social inclusion, as PLTS enables the employment of handicapped individuals.

## **Organizational Structure**

VERTICAL is a micro-company with only three employees. It is currently looking for a fourth employee to join the sales team. Being a micro-company, it relies heavily on technical partners who collaborate temporarily with the company in certain areas. Partnerships with universities mean that an intern is currently part of the team, but this cannot solve structural problems. The CEO is responsible for both the financial and marketing functions of the company. VERTICAL also has a technical department.

## **Product and Service Portfolio**

PLTS is innovative equipment that allows work to be performed at heights of up to 120m with both horizontal and vertical movement. A worker can reach any part of a structure/building using a single harness and a remote control. Its innovative design also allows anyone, including the physically disabled or paraplegic individuals to carry out vertical work safely and efficiently. PLTS is versatile as it fits any structure, whether a building, bridge, oil rig or wind tower. This patented technology enables safer, faster work, as it takes only six seconds to reach a height of 120m. It also

## **Open Innovation**

makes work cheaper, as it increases the productivity of work at height. PLTS is still considered the safest lifting system in the world, consisting of seven mechanisms. Of these, the lifting system is based on the first winch in the world that lifts people using a single harness, i.e. without the need for safety baskets. This replaces the use of more conventional methods such as scaffolding, lifting platforms and ropes.

PLTS is VERTICAL's core product. However, it has several models, which have a total of 13 different applications, of which the following stand out: *PLTS no limits*, which allows horizontal and vertical movements, using a simple harness, initially designed for the construction industry, but can be used in maintenance services, such as cleaning exterior or interior glass; *PLTS freedom*, which is most suitable for elevators; *PLTS4two*, which combines *PLTS no limits* with a basket (which allows the transportation of heavy loads such as stones, windows or glass) and a distance limiting bar; *PLTS wind* for the repair of wind power towers; *PLTS home*, designed to be installed in homes or hospitals, to allow quick access to multiple rooms without the use of a wheelchair; and *PLTS deep*, suitable for accessing mines. However, the interview with the representative of the company's technical department revealed that only *PLTS no limits* is currently for sale, and that it meets European standards and has European certification. In addition to PLTS, the company also sells accessories, which are developed by its R&D team. These are mainly equipment to make the work more practical and safer.

In terms of services, VERTICAL has created the PLTS Academy, a program, integrated into its strategy, to train and certify individuals, including the disabled and amputees, and other companies to install and use the PLTS technology and products. When the PLTS system is sold, at least one VERTICAL representative, accompanied by a team that is subcontracted in Portugal or in the destination market, must supervise the installation of the product on site. A representative of VERTICAL must be physically present wherever the PLTS service is being provided.

## **Market and Competitors**

VERTICAL was created to meet the needs of markets in different industries: construction, renewable energy, services and maintenance for vertical structures, and tourism. The company's target is mainly maintenance companies in those sectors. VERTICAL is a company that works in the B2B segment. The company was established to develop the necessary parts and equipment for which there was not yet an offer in those markets. The two main industries that the company is dealing with are the construction and renewable energy sectors, as the company also develops internal elevators for wind energy turbines.

The main competitors are predominantly international companies. There is no manufacturer of similar equipment at national level. For example, one competitor,

TRACTEL, a multinational company, provides lift and maintenance equipment, suspended work platforms, and fall arrest systems in more than 120 countries, featuring similar products to those sold by VERTICAL, or that can replace them.

## **Awards and Partnerships**

PLTS was recognized as an internationally innovative technology, having being awarded several distinctions. In 2013, VERTICAL won the award “Best Idea of the Year” in a competition sponsored by the Business Incubator of the University of Aveiro, Portugal. This was an important step as it allowed the VERTICAL staff to participate in an immersion program in Silicon Valley, California, USA. VERTICAL also received an Honorable Mention in the EDP Innovation Prize, in the same year, which was the first honorable mention given by EDP since the beginning of these awards. Then, VERTICAL was invited to join the EDP Starter program, an accelerator program for companies and technologies related to the energy sector, which underpinned VERTICAL staff to establish important networking relationships.

Also as a start-up, VERTICAL participated in The Lisbon Transatlantic Challenge. Apart from a 5,000€ prize, VERTICAL was part of the 10 winners from a pool of 500+ participants. As a result, VERTICAL could present the PLTS to investors and public policy decision makers from Brazil, USA, and UK, which allowed the company to expand its network of contacts and increase its business opportunities. In 2014, the company is invited by EDP to create a partnership to develop a pilot project for wind towers. The partnership later materialized in the entry of EDP into VERTICAL’s capital as an investor (Isento, 2015). In 2015, VERTICAL received investment from Rising Ventures, a business angel, and EDP Ventures, which joined as VERTICAL’s shareholders.

## **RESULTS**

After briefly introducing VERTICAL, its CEO highlighted the importance SMEs have in the Portuguese business fabric and in the development of the national economy. He believes that there is an increasing concern with innovation; however, he also stated that compared to large companies, the lack of financial, technological, or human resources of SMEs are indisputable. Thus, the CEO considers that this forces SMEs to establishing partnerships and collaborations with other entities, which underpins OI initiatives. He also mentioned that due to the lack of financial resources to hire technicians, the collaboration with the University is crucial, as it allows the absorption of knowledge in a more accessible way, for example through protocols for internships.

## **Open Innovation**

The CEO recognizes that organizational culture is one of the organizational pillars supporting competitive advantages and it is open to explore both outbound and inbound OI. However, as a microenterprise, it does not have many technologies to license out.

VERTICAL's new product development process always starts with the identification of a market problem/need. There are two possible processes: (1) internally the company recognizes that a product could be improved in order to create more added value for the customer; and (2) the company receives feedback from customers, or even requests, regarding possible product improvements or new product developments. Therefore, contact with customers is fundamental. In the energy sector, the main input to VERTICAL's innovation processes comes mostly from the outside, namely from partners with whom VERTICAL works, such as EDP. It is the technical operatives in the field who, given the difficulties encountered, provide ideas for new developments processes and products. After recognizing the market needs, especially through the difficulties experienced by customers, the company creates a product concept. Only after the validation of this concept, VERTICAL moves on to its technical development. In terms of innovation, the CEO claims that the company does both incremental and radical innovation. The former through the adaptation of existing products to customer needs and projects the company faces. The latter, working all the way into the market, but normally facing more resistance from the market.

VERTICAL's core R&D activity is carried out internally, and is focused on the development of mechanical parts that give the firm a competitive edge. VERTICAL invests heavily in R&D, having R&D expenses reached 15% of sales volume. In the case of electronic developments, or those related to robotics, VERTICAL subcontracts specialized companies. That is, due to the company's limited resources, all activities that do not belong to the company's core know-how are subcontracted. For the company it does not make sense to invest in in-house production, since it does not have sufficient production scale that could amortize this investment. Its priority is to focus on its core activities, using OI to complement its resources.

VERTICAL has only one patented technology, the first PLTS system – the *no limits*. However, the company does not generate surplus technologies, nor does it buy patents or licenses. VERTICAL only uses technology already available on the market to apply in their products.

Besides EDP in the energy sector, VERTICAL has partnerships with other external entities, among which the University of Aveiro stands out, through internships and dissemination of job offers. VERTICAL also works with a professional school, in order to allow students to have a first contact with the labor market. There are other partnerships at the R&D level, namely with suppliers. There is no kind of collaboration with competitors, due to the fact that they are mainly international.

The objective of the partnerships is mainly the absorption of knowledge from the partners, integrating their inputs. Suppliers end up helping more in the innovation process, to the extent that they have more technical knowledge. VERTICAL resorts to their suppliers when it wants to solve the problems it encounters along the way. These long-term relationships are based on a mutual exchange, as VERTICAL also shares knowledge with suppliers. Usually, partnerships for the development of new products are made at the prototyping stage. There are no partnerships with the government. It should be noted that EDP, the largest Portuguese energy company in Portugal, is one of three investment funds that currently co-sponsors the company; these funds are key to access strategic partnerships.

VERTICAL has already participated in a European project, but the impact on the company turned out to be negative. However, the CEO recognizes that EU funds are essential to leverage any investment, also helping in the company's internationalization process. In addition to this financial advantage, the funds bring with them some disadvantages, namely the fact that they condition the company in terms of the adoption of long-term strategies, since they commit the company to the short-term project that was developed for the contribution of the funds.

Financial issues are one of the major constraints for VERTICAL, as the company may sacrifice innovation activities to comply with large orders it may receive. However, VERTICAL's CEO assumes that he has a propensity for risk-taking and recognizes that the company is sought after for its innovation culture and its risk-taking perspective.

Currently VERTICAL has no social media strategy, as it prefers to participate in international fairs to gather contacts for future business.

In summary, VERTICAL claims to be an SME that adopts an OI approach, collaborating with various external entities, with which they share some knowledge and from which they receive inputs. Its product development processes are not solely in-house, thus using external sources of technology to accelerate its innovation processes.

## **DISCUSSION**

### **Obstacles of the Innovation Process**

Innovation consists of the creation of ideas, which are then transformed into products, services, or processes, subsequently successfully commercialized (Hungund & Mani, 2019). Moreover, technological innovation emerges as a differentiating driver in creating value for customers. Thus, VERTICAL can be considered an innovative

## ***Open Innovation***

company as it brings new products to the market, solutions that do not yet exist, and there is recognition and appreciation of this newness by customers.

As explained by VERTICAL's CEO, contact with the environment is seen as crucial and mandatory: the innovation process starts mainly from internal initiative, i.e., it starts from observing reality, from contact with customers and/or partners, from whom they collect feedback and inputs that are integrated into innovation processes. In fact, as it happens with SMEs, limited resources, or even the underdevelopment of internal capabilities, led VERTICAL to take risks and adopt OI processes through the exploitation of knowledge created outside the company. Building networks with customers or suppliers can improve the product development process, because it is the customers who, by using the product, can give feedback on aspects they would like to see improved or give ideas for new products that would help their work. In turn, suppliers, having the technical knowledge, often help VERTICAL in the development of new solutions.

During the interview it was possible to perceive that VERTICAL faces external and internal obstacles to innovation. The external ones are related to the degree of innovation of the product, i.e., when the product represents a radical innovation it is necessary to take measures – namely training and evangelization of the market – in order to speed up the acceptance of the product. On the other hand, internal obstacles are related to limited financial resources, resistance to change, and technical resources. Although the CEO states that there is no resistance to change within VERTICAL – explained by its small size – there are challenges that derive from such limited financial and technical resources.

In fact, as already mentioned in the literature review, SMEs have more difficulties due to their limited production, distribution, marketing and funding for R&D resources and capabilities that are essential for the innovation process. In addition, VERTICAL, as most of SMEs, have financial limitations, lack of qualified personnel or specific knowledge in certain areas that cover activities from the development to the commercialization stages (Marcolin et al., 2017). Another obstacle is the fact that SMEs are not able to take advantage of economies of scale, which is also seen in VERTICAL.

Limited financial resources are seen as the main barrier to innovation, causing the company to focus on providing services rather than developing more technologically advanced products. The CEO states that the lack of an R&D department forces this choice, which does not happen in large companies that have enough resources to focus on both activities.

Finally, limitations in terms of technical resources, i.e. know-how and knowledge, are also seen as a barrier to innovation. Because of VERTICAL's small size it does not have specialized staff in different areas, it is forced to focus on its core competencies (in this case, mechanics), and when it needs specific expertise, it

resorts to outsourcing or collaboration. External agents are seen as a faster and more efficient way to obtain resources and necessary skills (Silva et al., 2019), which is in agreement with the case study analyzed in this chapter. Thus, VERTICAL's core competencies are complemented with external technologies, namely in the area of robotics and electronics, which are outsourced. Such behavior is explained by the literature, in that SMEs need to invest in mastering certain technologies so that they excel in serving specialized niche markets (Moreira, 2009). To respond to these difficulties, the CEO states that VERTICAL resorts to partnerships to circumvent the obstacles common to SMEs.

## **Research and Development**

The R&D activity is done internally, although there is no functional department concentrating this activity. Mechanical technology is the core activity and VERTICAL's main know-how. That is, for the design of other components, VERTICAL resorts to collaboration with external entities, usually for developments in robotics and electronics. We conclude that the company exploits its core competencies and uses the context environment to obtain resources.

VERTICAL is involved in incremental and radical innovation, which demonstrates some organizational ambidexterity. That is, VERTICAL either improves its existing products by adding features, adapting to new projects or to emerging customer needs or it identifies opportunities and develops completely the new solutions. As such, it is possible to claim that VERTICAL flows the principles of ambidexterity, as according to Felício et al. (2019), ambidexterity involves the organization's ability to develop disruptive innovation, which requires a creative and dynamic environment with flexible rules, something we can find at VERTICAL, and which, at the same time, ensures incremental innovation in its current activities.

From the R&D efforts resulted, so far, only one patented technology, the PLTS system, in its first model, the *no limits*. However, special attention is being paid to this aspect and, at the time of the interview, other technologies were being analyzed for patenting purposes. However, no surplus technologies are generated in the company, nor does the company buy patents or licenses. As highlighted by the interviewee, VERTICAL only uses technology available in the market for application in the products.

It should also be noted that, according to the CEO, there is a high investment in R&D activities. This does not seem to be in accordance with the existing literature, which states that most SMEs do not invest significantly in R&D as a result of lack of resources. However, this may mean that VERTICAL, due to its need and active search for international markets, has behaviors typical of a Born Global, in that this

## ***Open Innovation***

type of company differs from other SMEs by the high investment in R&D, which allows SMEs to generate radical innovations (Franco & Hasse, 2016).

## **Open Innovation**

Because VERTICAL relies on collaboration with various external entities to complement their internal development processes, resulting in knowledge sharing and integration of inputs into the innovation processes.

Additionally, and taking into account VERTICAL's innovation activities, it was found that external technologies are integrated into the company's products – as much as possible using open source technologies – i.e., there is no acquisition of patents or licenses. However, when analyzing the flow of technologies from R&D in an outbound perspective, VERTICAL shows an apparent divergence with the definition of open innovation, i.e., the technologies developed are not sold to other entities, not generating surplus technologies (all technologies developed are incorporated only in its product portfolio), nor does it make acquisitions, mergers or spinoffs. As such, based on the definition of OI, we recall that it has two dimensions that must exist: the absorption of knowledge and technology, but also its transfer to other organizations (Teixeira & Lopes, 2012). The latter is done mainly through the licensing of intellectual property, the launch of spin-off companies, mergers and acquisitions, and cooperation with the academic world.

Given the above, we conclude that VERTICAL adopts an outside-in OI model, in which companies absorb only outside technology, and there is no technology transfer to other entities. In other words, this proves what was concluded by Teixeira and Lopes (2012) that, although companies believe they practice OI, this does not always correspond to reality. In short, VERTICAL corroborates the studies done in Portugal, which state that the OI model is more widespread in terms of absorption of knowledge than in term of its transfer.

## **Factors Influencing Open Innovation Adoption: Culture**

Culture is seen as a crucial factor to the adoption of open innovation, being creativity mandatory to foster an innovation-based culture. Thus, the work environment created by leaders in the organization should foster divergent thinking, leading employees to share their ideas, which is essential for any organization to practice OI processes (Hungund & Mani, 2019).

In line with the existing theory, it is possible to conclude VERTICAL fosters the adoption of an OI culture. According to the CEO, the company has implemented a very strong culture of innovation, conducive to exchanges and learning with the

outside world. In fact, he states that there is a constant care in understanding failure and that, through error, they manage to draw knowledge and know how.

The CEO's recurring connection between leadership and culture is notorious, stating on several occasions that in addition to culture being a pillar of the organization, it is defined and deployed by top managers.

### **Factors Influencing Open Innovation Adoption: Cooperation and Partnerships**

Cooperation and partnerships are central topics in OI since it is through them that most SMEs have access to the external resources and technologies they need. As such, this OI model is about collaboration with external actors (Marcolin et al., 2017). In this context, the use of external entities allows SMEs to overcome their technical and/or financial limitations, as occurs with VERTICAL, which use its partners in order to obtain technical know-how. In fact, OI is a very effective way for SMEs to obtain resources and skills that they do not possess. As such, SMEs seek strategic alliances, acquiring knowledge from other companies, combining technology and internal resources with external resources, to increase their competitive advantage. Furthermore, through external resources, organizations shorten the innovation time, reducing costs and risks and increasing the flexibility of their operations (Xiaobao et al., 2013).

There are several actors that play an essential role in the firms' innovation process of. Thus, the Triple Helix Model emerges, in which the university, the industry and the government are the main institutional actors in this process (Simões et al., 2020; Torkkeli et al., 2007). According to this, the innovation spiral involves research activities, government institutions, and business/enterprises in various reciprocal relationships in order to create a flexible innovation system (Marcolin et al., 2017). Innovation thus results from numerous institutional combinations produced by networks of relationships, which entail mutual exchange (Torkkeli et al., 2007).

Such conclusions are corroborated by this case study. VERTICAL considers its partnerships and collaborations as a pillar of its business. Indeed, the company recognizes external entities as a source of resources and knowledge, thus focusing on mutual exchange and knowledge sharing. Moreover, according to the CEO, the relationships established with suppliers tend to have a long-term orientation. This is tuned to the literature that states that most SMEs seek to establish long-term relationships with their partners (Carvalho & Moreira, 2015). Most of the time, the outward connection is made by internal initiative, since the firm considers contacts with external partners as crucial for the development of useful equipment for the target audience.

## ***Open Innovation***

In the specific case of VERTICAL, there is only cooperation with suppliers, customers, educational institutions. The reason for not connecting with either government or competitors is related to: the size of the company; the inability to benefit from institutional support; and the size of its competitors, especially the international ones. The non-collaboration with competitors also corroborates the literature, which states that this type of collaborations is avoided (Carvalho & Moreira, 2015).

The partnerships with suppliers and other entities (namely EDP and technical partners) are those that stand out the most, since they allow VERTICAL to better absorb knowledge, integrating their inputs into innovation processes. In the specific case of suppliers, they end up contributing to the innovation process, insofar as they have technical knowledge. However, it is only about integration of inputs from suppliers, as VERTICAL shares some feedback with them. Suppliers are involved mainly at the R&D level, at the prototyping stage, and in conducting technical studies. EDP has a slightly different input in the development of new products, since it is also a client, entering more at the stage of product ideation and testing. Another aspect of the partnership with EDP is access to funds and network of partners since EDP participates in VERTICAL through an investment fund. In conclusion, collaborative activities with partners are more evident in the prototyping stages.

Although not as prominent, partnerships with customers and educational institutions are also important to VERTICAL, as they support the development of new products, helping to overcome limitations in technical and human resources. Contact with customers is often sought, as it allows their feedback to be integrated into VERTICAL's innovation processes and to better adapt products to their needs. In terms of partnerships with educational institutions, we highlight the partnerships with the University of Aveiro and with professional schools. Through the partnership with the University, VERTICAL allows students to do internships, participates in events, and supports masters' students by providing information for research and statistical studies. Through the partnership with professional schools, VERTICAL aims to integrate students into the business world, with the purpose of obtaining human resources that accompany and strengthen the team.

## **Factors Influencing Open Innovation Adoption: Leadership**

Due to SME's simplified organizational structure, the decision-making process is usually centralized and important decisions, such as the adoption of OI, are highly influenced by the characteristics of CEOs. Strong leadership from the CEO is necessary to mitigate the various challenges that arise when establishing a culture conducive to open innovation (Ahn et al., 2017). As the CEO argues, "innovation always depends on leadership," leaving it up to top management to build an innovative

vision and culture. Thus, in agreement with Ahn et al. (2017), we can conclude that the role of CEOs is really determinant in establishing an atmosphere favorable to the adoption of OI in SMEs, since the strong support of top management encourages the adoption of OI, helping to address possible internal resistance.

Regarding the propensity to take risks, we can conclude that, in VERTICAL's case, there was a change of perspective regarding risk-taking, much due to the CEO's own characteristics, who likes to embrace risks. This propensity, combined with the speed and quality in product development, is recognized and valued by customers, who seek the company for cooperative efforts. Thus, this behavior fosters innovation activities and contact with the outside world, also increasing the value perceived by the customer.

### **Factors Influencing Open Innovation Adoption: Organizational Structure**

Although the literature is not unanimous about the influence of age and size or the organization in the adoption of OI, the recurrent mention of the interviewee to the company's size raised the analysis of this factor.

We can conclude from the case study that the size of the company has influence in two specific factors: culture, and the establishment of cooperative partnerships. Due to the fact that VERTICAL is a small-sized company, with limited technical and human resources, and with specific know how, we conclude that:

- The organizational culture is strongly influenced by the leader as VERTICAL has a very small number of employees, with a similar background and know-how, which facilitates the diffusion of the leader's dynamism.
- Cooperation is justified by the lack of financial, technological and/or human resources, as a result of VERTICAL's small size. Consequently, to overcome these limitations, VERTICAL embraces outside-in OI practices with external entities.

### **Factors Influencing Open Innovation Adoption: Social Networks**

With social networks it is possible to tap customers generated knowledge/ by. In fact, customers can contribute with ideas for new products, also helping to identify possible problems (Candi et al., 2018). Considering the size of SMEs, social networks emerge as an attractive low-cost tool to access knowledge from their customers, which will allow them to develop new products, improve existing ones or even anticipate

**Open Innovation**

market trends (Franco et al., 2016). However, VERTICAL’s CEO mentions that it is necessary to have a long-term social strategy to get this kind of results.

Although VERTICAL’s CEO refers the firm gets feedback from their customers, they do not use social media. This is a consequence of the lack of resources and the type of market Vertical addresses.

**CONCLUSION**

Taking all of the results into account, it is possible to assert that VERTICAL is an interesting case study that contributes to the theory of OI and it is an interesting case study for classroom discussion on the need of SMEs, especially microenterprises with huge resource limitations that can affect their business horizons taking OI into account. The main conclusions, based on data collected, gathered and analyzed, are shown in Table 1. Table 2 also shows the main types of OI used by VERTICAL.

*Table 1. Open innovation VERTICAL’s approach*

	<b>OI in SMEs</b>	<b>VERTICAL</b>
Mode of OI	<ul style="list-style-type: none"> <li>● Extensive adoption of inbound OI;</li> <li>● Exploitation/Absorption of external knowledge and technology to accelerate the innovation processes;</li> <li>● In-house developed technology is seldom transferred to third parties;</li> <li>● Main external contributors: customers, suppliers and universities.</li> </ul>	<ul style="list-style-type: none"> <li>● Absorbs external technology and knowledge;</li> <li>● Involvement of external actors play an important role to advance innovation processes and in the creation of new products;</li> <li>● Leverages partnerships with clients, suppliers and universities;</li> <li>● In-house developed technology is not transferred to other entities.</li> <li>● Adopts inbound OI</li> <li>● Does not exhibit any inside-out processes of OI.</li> </ul>
Resources and capacities	<ul style="list-style-type: none"> <li>● Limited resources (financial, human and know-how) forces SMEs to interact with the external environment to access to knowledge and resources in need;</li> </ul>	<ul style="list-style-type: none"> <li>● Reduced dimension: microenterprise actively seeking growth.</li> <li>● Constraint financial and human resources pressures the company into involving external actors;</li> <li>● Interacts with customers, suppliers and universities, so to advance innovation processes and to access new markets;</li> <li>● Focus on the core activities (R&amp;D), leveraging a specialized know-how, and outsources production activities.</li> </ul>

*Continued on following page*

Table 1. Continued

	OI in SMEs	VERTICAL
Organizational culture	<ul style="list-style-type: none"> <li>● Higher flexibility and less bureaucracy than larger companies: SMEs are more willing to take risks;</li> <li>● More reactive and proactive to external stimuli to overcome limitations;</li> <li>● Propensity to foster OI: employees can freely express themselves, sharing ideas.</li> </ul>	<ul style="list-style-type: none"> <li>● Innovative culture, which promotes exchanges with the external environment;</li> <li>● “Learn by doing” approach;</li> <li>● Encourages employees to share their ideas;</li> <li>● Low resistance to change.</li> </ul>
Networks	<ul style="list-style-type: none"> <li>● Networks are the preferred sources of external knowledge and a way to overcome their constraints;</li> <li>● External actors are seen as essential in the innovation process;</li> <li>● Networks are mainly established at a local level;</li> <li>● Usage of strategic alliances, or mergers and acquisitions;</li> <li>● SMEs tend to avoid partnering up with direct competitors;</li> <li>● Universities, suppliers, customers and governments are often involved in the innovation process;</li> </ul>	<ul style="list-style-type: none"> <li>● Development of strategic long-term alliances and partnerships with suppliers;</li> <li>● Supplier’s input is used to develop specific equipment and to access technical knowledge;</li> <li>● The universities are used as a source of specialized human capital and knowledge;</li> <li>● Customers’ feedback is essential to improve and to develop new products;</li> <li>● Partnerships with main competitors or the government are not sought;</li> <li>● The established networks grant access to external knowledge, bridging internal resources’ constraints.</li> </ul>
Leadership and Top management	<ul style="list-style-type: none"> <li>● The CEO’s orientation towards innovation is crucial for reducing internal resistance to and implementing OI;</li> <li>● The role of the top management is essential due to reduced size;</li> <li>● Entrepreneurial leaders are more prone to adopt OI and to use social networks to gain extra resources.</li> </ul>	<ul style="list-style-type: none"> <li>● An innovative culture was implemented and fomented by the top management;</li> <li>● Critical thinking and idea sharing is encouraged;</li> <li>● The CEO is comfortable with taking risks;</li> </ul>
Social Media	<ul style="list-style-type: none"> <li>● Useful and low-cost tool;</li> <li>● Allows quick access external knowledge and information;</li> <li>● Leveraged for idea creation, problem-solving in existing products and for predicting market tendencies.</li> </ul>	<ul style="list-style-type: none"> <li>● Residual social media presence;</li> <li>● VERTICAL’s target market does not have a significant social presence;</li> <li>● Digital tools are used to interact with customers and suppliers, to participate in fairs and to send product catalogues.</li> </ul>

Through the information collected and the literature covered and after analyzing the case study, it is possible to claim that there are various characteristics that define VERTICAL’s innovation model. As such, the results suggest that VERTICAL adopts an intermediate model of OI, with VERTICAL sharing knowledge with external entities and acquiring technology. However, there is no concern in exploiting it outwardly. As highlighted by the CEO, the company only uses technology available in the market for application in its products. However, VERTICAL has a strong component of sharing and acquiring knowledge and technology from external entities. Through the information analyzed in the literature review it is possible to

## Open Innovation

suggest that VERTICAL, like most Portuguese companies, seeks partnerships to internalize external knowledge and technology due the lack of internal resources.

Both VERTICAL's organizational culture and the entrepreneurial orientation of the CEO seem to enable the adoption of OI strategies, highlighting the crucial role of leaders in SMEs with major impact on the organization innovative culture.

Through partnerships and cooperation with other external entities, SMEs in general, and VERTICAL in particular, have access to external resources needed to carry out their activities and create value. Thus, VERTICAL creates partnerships with its suppliers and other technical entities. Through them, the company seems to have the ability to overcome its difficulties and obstacles, such as scarcity of resources, by absorbing knowledge and integrating resources.

Although the social strategy (the active presence in social networks) has been considered as a source of advantage for SMEs, enabling the adoption of OI activities, VERTICAL is not actively present in social networks. As the firm operates in the B2B segment, where 80% of its target market is not strongly influenced by social networks, VERTICAL's presence on social networks was not an effective channel for communication between the company and its customers.

In a future research, it would be interesting to analyze a larger sample of innovative SMEs, in order to observe the different cases and how their processes may differ given these determinants.

*Table 2. Types of OI and VERTICAL's approach*

Types of Open Innovation	Processes	VERTICAL's OI Approach
<b>Outside-in</b> (The absorption of external knowledge and technology)	Purchasing external technologies	X
	Licensing-in	
	Joint ventures	
	Joint development	X
	Outsourcing R&D	X
	Venture Capital	
	Mergers and Acquisitions	
	Customer Involvement	X
	External Networking	X
<b>Inside-out</b> (The transfer of knowledge and technology to other organizations)	Selling Internal technologies	
	Licensing-out	
	Spin-Off	
	Open Source	

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## KEY TERMS AND DEFINITIONS

**Inside-Out Open Innovation:** It is the part of the open innovation business that requires companies to allow unused and/or underutilized ideas or technologies to be released / commercialized outside the company in order to be incorporated in other companies and their business models.

**Open Innovation:** It consists of a business management model that uses internal and external sources of knowledge and technology with people and organizations

## *Open Innovation*

outside the company. It involves the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for its external use. This open innovation model is important for companies that acknowledge that there are many professionals, technologies and knowledge outside the company that may underpin the competitive strategy of the organization.

**Outside-In Open Innovation:** It is part of the open innovation business model that involves opening up a company's innovation processes of external inputs and contributions from individuals and companies in order to complement the internal competitive base of the company.