

Open Innovation in SMEs: a Process Model for Successful Implementation

Author: Anna C. Pellegrino
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT

Over the past decades, open innovation has received a lot of attention and was found to be extremely important for SMEs due to their lack of financial resources and technical capabilities. Even though SMEs can use open innovation to overcome these limitations, studies proved that SMEs struggle to implement open innovation. Therefore, a process model to guide SMEs in the open innovation implementation was necessary. This paper provides a process model that includes the identification of a need for open innovation as well as the evaluation of the conditions under which open innovation is likely to be successful for SMEs, the choice of the type of open innovation (i.e. inbound, outbound or coupled open innovation) and in which phase of the innovation process to implement open innovation (i.e. exploration or exploitation), and the selection of the open innovation method and partner.

Graduation Committee members:

1st Supervisor: Dr. Matthias de Visser

2nd Supervisor: Dr. Michel Ehrenhard

Keywords

Open Innovation, SMEs, Inbound Open Innovation, Outbound Open Innovation, Coupled Open Innovation, Open Innovation Motives, Open Innovation Antecedents, Open Innovation Methods, Open Innovation Partners

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

9th IBA Bachelor Thesis Conference, July 5th, 2017, Enschede, The Netherlands.

Copyright 2017, University of Twente, The Faculty of Behavioural, Management and Social sciences.

1. INTRODUCTION

Over the past decades, the focus on innovation has shifted from internal R&D activities to a more open and collaborative approach (Enkel et al., 2009). Open innovation (OI), defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation and to expand the markets for external use of innovation” (Chesbrough et al., 2006, p. 1), has received a lot of attention from researchers as well as managers (Choi et al., 2016). Following the idea that “not all the smart people work for us”, open innovation assumes that knowledge is widely dispersed inside and outside the organization, and therefore companies need to collaborate with external parties in order to be successful and achieve a competitive advantage (Chesbrough, 2003).

This is especially important for Small and Medium Enterprises (SMEs), since not only are they facing harsh market conditions due to increased globalization, but they also lack financial resources and technical capabilities to successfully innovate (Vanhaverbeke et al., 2012). The importance of SMEs has been recognized in many studies: Wolff and Pett (2006) found that SMEs and entrepreneurial firms are key drivers for most national economies, Gassmann et al. (2010) affirmed that SMEs are the largest number of companies in an economy and Storey (1994) stated that the majority of new jobs are generated by innovative SMEs. Furthermore, Oke et al. (2007) discovered that there is a positive relation between innovation and organizational performance in SMEs, findings also supported by the studies of Rosenbusch et al. (2011). Nevertheless, the success rate of innovations was found to be much lower than desirable (Parida et al., 2012) due to different factors, such as the limited resources (Grando & Belvedere, 2006) and the unstructured approach to innovation (De Toni and Nassimbeni, 2003). It can be concluded that innovation performance is highly important for SMEs and they should strive to overcome their limitations and constraints in order to be innovative and grow successfully. In her studies, De Propriis (2002) found that collaborating with other firms can help companies to overcome internal shortcomings, Lee et al. (2010) affirmed that collaboration between firms is increasingly regarded as an important factor for success and Ebersberger et al. (2012) discovered that open innovation has a strong impact on innovation performance; hence SMEs could highly benefit from an open innovation approach.

Unfortunately, knowledge is missing regarding how companies, especially SMEs, can successfully make use of open innovation. Lichtenthaler (2011) found that further insights into practices and tools of open innovation are needed, whereas Huizingh (2011) argued that it is necessary to develop an integrated framework that helps managers to decide when and how to open innovate. Dahlander and Gann (2010) concluded that it is difficult to build a coherent body of knowledge concerning open innovation, as researchers tend to use different definitions and focus on different aspects. Therefore, even if much literature and research is available concerning open innovation, there is no clear framework or guideline that managers can utilize when embarking in the process of open innovation. Furthermore, SMEs are certainly different from larger firms, therefore open innovation activities and practices need to be adapted to such smaller companies (Vanhaverbeke et al., 2012). According to Schwab et al. (2011) and Parida et al. (2012), SMEs struggle to implement open innovation; hence, a framework to guide SMEs' managers in the open innovation implementation is needed.

The goal of this research is to develop a process model in order to guide managers of SMEs towards an open approach to innovation that will improve the company's performance. This research goal leads to the following research question: *'How can*

SMEs successfully implement open innovation to improve organizational performance?' In order to answer the research question, different sub-questions can be formulated:

- i. *'What is open innovation?'*
- ii. *'What are different methods of open innovation?'*
- iii. *'What are different partner possibilities for open innovation?'*
- iv. *'Under which conditions should SMEs invest in open innovation?'*
- v. *'What are advantages and disadvantages of each open innovation method for SMEs?'*
- vi. *'What are advantages and disadvantages of each open innovation partner for SMEs?'*

The developed process model will first outline possible motives of open innovation for SMEs and provide antecedents of open innovation; therefore, it will either encourage or discourage open innovation for each specific firm or situation depending on whether a motive and antecedents are present. Thereafter, it will provide different advantages and disadvantages for each open innovation type, method and partner. SMEs will evaluate the provided advantages and disadvantages and, based on this evaluation, will select a different trajectory.

2. METHODOLOGY

In order to answer the previously presented research question, a literature review has been carried out. According to Hart (2001) a literature review is “the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfill certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed” (p. 13). Google Scholar, Scopus and Web of Science have been used to gather relevant articles and books on open innovation and the following key words have been searched in the aforementioned database: ‘open innovation’, ‘outbound open innovation’, ‘inbound open innovation’, ‘coupled open innovation’, ‘open innovation methods’, ‘open innovation partners’. Moreover, open innovation in relation to ‘SMEs’ has been searched, with a focus on ‘motives’, ‘antecedents’, ‘methods’ and ‘partners’. Furthermore, terms that are synonymous of the proposed keywords have been searched. The collected literature has been evaluated based on relevance and categorized depending on the research question that contributed to answer. Table 1 shows the classification of the literature for each sub-question.

The first sub-question, ‘what is open innovation?’, has been answered by carrying out a literature review on open innovation and has resulted in a definition of open innovation, followed by a new proposed classification of open innovation types.

The second sub-question, ‘what are different methods of open innovation?’, has been answered by carrying out a literature review on open innovation methods and approaches. The identified methods have then been classified based on the proposed classification of open innovation types and examples of each method have been given.

The third sub-question, ‘what are different partner possibilities for open innovation?’, has been answered by carrying out a literature review on open innovation partners. Furthermore, which partner possibility fits which method has been researched.

To answer the fourth sub-question, ‘under which conditions should SMEs invest in open innovation?’, two aspects have been taken into account. First, open innovation motives for SMEs have been researched in the existing literature in order to identify when a need for open innovation is present. Secondly, antecedents of

open innovation, defined as conditions that have to be present in order for open innovation to be successful, have been researched with regards to SMEs. If no literature was available on motives and antecedents specifically on SMEs or if the identified studies did not focus entirely on SMEs, case studies of open innovation in SMEs have been analyzed to ensure the validity of the identified motives and antecedents.

Sub-questions five and six, ‘what are advantages and disadvantages of each open innovation method for SMEs?’ and ‘what are advantages and disadvantages of each open innovation partner for SMEs?’, have been answered by analyzing the literature gathered to answer the first, second and third question and by searching for additional literature on open innovation practices with a focus on SMEs.

After answering the sub-questions, it was possible to answer the main question by developing a process model based on the findings. In order to develop a tool for SMEs to use when adopting an open innovation approach, business process modelling has been used. According to Aguilar-Saven (2004), “a business process is the combination of a set of activities within an enterprise with a structure describing their logical order and dependence whose objective is to produce a desired result” and “business process modelling enables a common understanding and analysis of a business process” (p. 129). The business process that has been modelled refers to the process that a firm goes through when embracing open innovation. The desired result of the aforementioned business process is for an SME to successfully apply an open innovation approach. Business process modelling has been used, because it allows to visually represent a process in order to analyze and improve it. The visual representation of the process was regarded as very important in this paper, since it provides an effective way to show and communicate information to understand a process and support strategic decision making (Killen & Kjaer, 2012). As firms’ managers should be able to understand and easily apply the tool, visual representation and, thus, business process modelling, was found to be the best option. Aguilar-Saven (2004) proposes different process modelling techniques, one of them being Flow Chart. Lakin et al., (1996) define a Flow Chart as a graphical representation of a logic sequence or process where symbols are used to represent different activities (Aguilar-Saven, 2004). The choice of this technique was based on the fact that this model is very easy to use (Aguilar-Saven, 2004) and, therefore, managers will not encounter issues or problems in understanding the process.

The process model has been developed based on the concept of equifinality, which “refers to the observation that in any open system a diversity of pathways [...] may lead to the same outcome” (Cicchetti & Rogosch, 1996, p. 597). Sydow and Windeler (1998) argue that, since the structuration of processes within firms is very complex, “one should not expect research to at once unveil the one best way to design or organize interfirm networks” (p. 278). Following these insights, given the fact that the same state can be reached through different pathways and trajectories, it becomes difficult to develop a model that indicates definite open innovation choices, as multiple options could be beneficial and could lead to the same result. Therefore, this model aims at providing an overview of the different possibilities available for SMEs, indicating advantages and disadvantages of each option. By using such a model, SMEs’ managers can make informed choices and can identify which trajectory best fits their company and situation.

Sub-Question	Literature
<i>What is open innovation?</i>	Ahlstrom (2010), Chesbrough (2003), Chesbrough et al. (2006), Dahlander & Gann (2010), Enkel et al. (2009), Gassmann (2006), Huizingh (2011), Lee et al. (2010), Lichtenthaler (2011), March (1991), March (1995), Porter & Stern (2001), Schilling (2013), Solow (1957), Van de Vrande et al. (2009)
<i>What are different methods of open innovation?</i>	Bogers et al. (2012), Dahan & Hauser (2002), Engardio et al. (2005), Gassmann et al. (2010), Inkpen & Currall (2004), Koza and Lewin (1998), Laursen et al. (2010), Parkhe (1993), Piller et al. (2010), Prahalad & Ramaswamy (2004), Quinn (2000), Sanders & Stappers (2008), Schilling (2013), Sikimic et al. (2016), Spithoven et al. (2013), Zwass (2010)
<i>What are different partner possibilities for open innovation?</i>	Chung & Kim (2003), Elmuti et al. (2005), Famuyiwa et al. (2008), Gnyawali & Park (2011), Greer & Lei (2012), Hamel et al. (1989), Johnson & Houston (2000), Lee et al. (2010), Link & Scott (2005), Miotti & Sachwald (2003), Padilla-Melendez & Garrido-Moreno (2012), Prandelli et al. (2008), Pun & Heese (2014), Quinn (2000), Sahay (2003), Schilling (2013), Shepard (1987), Tether (2002), Tsai (2002), Von Hippel (2005)
<i>Under which conditions should SMEs invest in open innovation?</i>	Bigliardi & Galati (2016), Brunswicker & Ehrenmann (2013), Chesbrough (2003), Durst & Stähle (2013), Gassmann (2006), Van de Vrande et al. (2009), Verbano et al. (2011)
<i>What are advantages and disadvantages of each open innovation method for SMEs?</i>	Barajas et al. (2012), Chesbrough & Crowther (2006), Dyer & Singh (1998), Enkel et al. (2009), Ferradas (2014), Fershtman & Kamien (1992), Judge & Dooley (2006), Kamien et al. (1992), Kline (2003), Kogut (1988), Köhler (2011), Kowalski & Director (2009), Koza & Lewin (1998), Laursen & Salter (2006), Lee et al. (2010), Liao et al. (2003), Nerkar (2007), Nonaka & Konno (1998), Oke et al. (2007), Parida et al. (2012), Pukkala (2015), Quinn (1992), Reid (2004), Rosenbusch et al. (2011), Rothwell (1994), Schilling (2013), Van de Vrande et al. (2009), Van Gils & Zwart (2004), Vanhaverbeke et al. (2012), Yoon et al. (2016), Zeng et al. (2010)
<i>What are advantages and disadvantages of each open innovation partner for SMEs?</i>	Brunswicker & Vanhaverbeke (2015), Dyer & Singh (1998), Gnyawali & Park (2009), Harryson et al. (2008), Hendry et al. (2000), Janeiro et al. (2013), Levy et al. (2003), Morris et al. (2007), Nonaka & Konno (1998), Parida et al. (2012), Raasch (2011), Ragatz et al. (1997), Rodríguez-Ferradas & Alfaro-Tanco (2016), Schilling (2013), Zaborek & Mazur (2015)

Table 1 – Classification of Literature

3. OPEN INNOVATION

3.1 Definition and Classification

Schilling (2013) defines innovation as “the practical implementation of an idea into a new device or process” and argues that “innovation begins with the generation of new ideas” (pp. 18-19). One of the typologies most used in literature is the dichotomy of radical versus incremental innovation, where radical innovations refer to fundamental changes in technology with clear departures from existing practices, whereas incremental innovations are minor changes or improvements in the current technology (Dewar & Dutton, 1986; Ettlie, 1983).

When Solow discovered in 1957 that innovation and technical progress were the main drivers for economic growth (Solow, 1957), managers and researchers began to associate a strong internal R&D with innovativeness (Gassmann, 2006). Traditionally, companies carried out internal R&D and relied on internal resources to develop and commercialize new products (Ahlstrom, 2010). This process was defined as ‘closed innovation model’ (Chesbrough, 2003). In recent years, due to stronger global competition and faster knowledge growth, these strategies have started to change towards a more open approach (Gassmann, 2006; Porter & Stern, 2001).

In 2003, Henry Chesbrough coined the term ‘open innovation’ and argued that “open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology” (Chesbrough, 2003, p. 24). Open innovation is not a clear concept, since it encompasses different dimensions and can be achieved in different ways (Huizingh, 2011). Nevertheless, most studies identified two general distinctions: ‘inbound open innovation’ and ‘outbound open innovation’ (Chesbrough et al., 2006; Van de Vrande et al., 2009). Inbound open innovation relates to inward flows of knowledge and consists of opening up the innovation process and acquiring knowledge from external sources, whereas outward flows of knowledge denote outbound open innovation, which refers to the commercialization of technological knowledge by using external parties (Lichtenthaler, 2011). Furthermore, Enkel et al. (2009) introduced the ‘coupled process’, a combination of inbound and outbound open innovation to define “co-creation with complementary partners through alliances, cooperation and joint ventures during which give and take are crucial for success” (p. 313).

Dahlander and Gann (2010) further classified inbound and outbound open innovation and identified four main types of openness: revealing internal resources to the external environment without immediate financial reward (‘revealing’), commercializing inventions and technologies through selling or licensing out resources (‘selling’), using external sources of innovation by scanning the external environment prior to initiating internal R&D (‘sourcing’) and acquiring input to the innovation process through the market place (‘acquiring’). This classification can be found in Table 2 – Classification of Open Innovation.

	Non-Pecuniary	Pecuniary
Outbound Open Innovation	Revealing	Selling
Inbound Open Innovation	Sourcing	Acquiring

Table 2 – Classification of Open Innovation by Dahlander and Gann (2010)

Another classification of open innovation is based on the concept of exploration and exploitation advanced by March (1991, 1995): in the exploration stage, a firm is carrying out R&D activities to develop the innovation, whereas in the exploitation stage the firm is aiming at commercializing the innovation (Lee et al., 2010).

For the purpose of this research, the classification provided by Dahlander and Gann (2010) will be modified and adapted to the concept of exploration and exploitation, as it can be argued that, depending on the phase of the development process where an open approach is needed, open innovation will take a different form and, therefore, a different approach should be adopted. Furthermore, the ‘coupled process’ proposed by Enkel et al. (2009) will be included as well in the new proposed classification. When looking at the outbound open innovation, revealing internal knowledge and resources to the external environment and selling innovations are still applicable for, respectively, exploration and exploitation. As far as inbound open innovation is concerned, in the exploration phase, ‘sourcing’ will refer to collecting knowledge and resources in order to develop an innovation, whereas ‘acquiring’ in the exploitation phase will define the acquisition of an innovation from the external environment. Finally, for the coupled open innovation, ‘pooling’ will identify the combination of revealing internal resources and sourcing external resources, whereas ‘jointly commercializing’ will refer to the process of collaborating to bring an innovation to the market. The proposed classification can be found in Table 3.

	Exploration	Exploitation
Outbound Open Innovation	Revealing	Selling
Inbound Open Innovation	Sourcing	Acquiring
Coupled Open Innovation	Pooling	Jointly Commercializing

Table 3 – Proposed Classification of Open Innovation

3.2 Methods of Open Innovation

In the following, specific methods of open innovation will be identified and discussed. Thereafter, these methods will be classified according to the proposed classification of open innovation found in Table 3.

Schilling (2013) argues that the most common forms of collaborative arrangements are strategic alliances, joint ventures, licensing, outsourcing and research organizations. Another method discussed in literature and considered extremely important for open innovation is co-creation (Zwass, 2010).

Strategic alliances are voluntary cooperative agreements between firms (Parkhe, 1993), which can be used to access knowledge or capabilities that are not available internally or to fully exploit own knowledge or capabilities by putting them in use in another firm’s development process (Schilling, 2013). A firm could collaborate with another company that possesses different knowledge and capabilities and pool the resources to collectively develop a product, or they could cooperate with an organization that has similar resources to share the risk or to speed up the time to market (Schilling, 2013).

Joint venture is “a particular type of strategic alliance that entails significant structure and commitment”, it involves “a significant equity investment from each partner and often results in establishment of a new separate entity” (Schilling, 2013, p. 160). According to Inkpen and Currall (2004) forming a joint venture initiates a relationship that in order to be successful has to evolve and has to be built on mutual trust.

Licensing defines an arrangement where a firm obtains the rights to use a technology of another firm and it enables an organization to quickly acquire a technology that it does not own (Schilling, 2013). Licensing can take the form of in-licensing or out-licensing, the former being obtaining the right to use a technology of another firm and the latter being granting the right to another firm to use your proprietary technology (Sikimic et al., 2016). If two parties have an interest in each other's knowledge or technology, a cross-license arrangement could be agreed on, where the parties mutually grant each other licenses (Bogers et al., 2012).

Outsourcing allows firms that do not possess the competencies or facilities to perform all the activities in the value chain to develop new innovations (Schilling, 2013). Contract manufacturing, hiring another firm to manufacture your products, is a common form of outsourcing and it enables companies to manufacture products in large scale without making a high capital investment, as well as allowing the firm to specialize on their core activities while other organizations provide external support and resources for the activities that are not central to their competitive advantage (Schilling, 2013). Moreover, according to Schilling (2013), other activities can be outsourced to external organizations, such as product or process design, marketing or distribution. Gassmann et al. (2010) argue that outsourcing is often a starting point for the open innovation process: firms begin to outsource by contracting other organizations and later move on to other modes of open innovation. Outsourcing-in refers to the process of being contracted by another company to perform an activity that is core to your firm but not to the company that contracted you.

Collective research organizations are cooperative research organizations such as trade associations, university-based centers or private research corporations (Schilling, 2013). Most of these organizations are formed by the government (Schilling, 2013) and therefore can be regarded as public. Nevertheless, Schilling (2013) argues that some of these organizations are formed by individual and private companies, thus they classify as a form of open innovation.

Based on a framework developed by Dahan and Hauser (2002), Piller et al. (2010) provide three different modes of using customer information: "listen into", "ask" and "build". Firms can either design products on behalf of the customers by listening to customers' information from different input channels (e.g. feedback, sales data), they can ask customers for input via surveys, interviews and focus groups, or they can involve customers in the design and development of the products (Piller et al., 2010). This last mode is at the core of co-creation and represents open innovation with customers (Piller et al., 2010). Co-creation defines "any act of collective creativity, i.e. creativity that is shared by two or more people" (Sanders & Stappers, 2008, p. 6), but the term is nowadays used to define the collaboration with end users to develop a product or service. In fact, over the past years, designers have been moving closer to end customers during the development process (Sanders & Stappers, 2008) and consumers are now looking for ways "to exercise their influence in every part of the business system" (Pralhad & Ramaswamy, 2004, p. 5).

3.2.1 Classification of Methods and Examples

In this section, the previously presented methods will be classified according to the proposed classification of open innovation found in Table 3. The classification of the methods for open innovation can be found in Table 4.

	Exploration	Exploitation
Outbound Open Innovation	Revealing	Selling
	- Outsourcing-In	- Out-Licensing - Outsourcing-In
Inbound Open Innovation	Sourcing	Acquiring
	- In-Licensing - Outsourcing - Co-Creation	- In-Licensing - Outsourcing
Coupled Open Innovation	Pooling	Jointly Commercializing
	- Strategic Alliance - Joint Ventures - Cross Licensing - Research organizations	- Strategic Alliance - Joint Ventures - Cross Licensing

Table 4 – Classification of Methods

The first open innovation method to be classified will be strategic alliances. Depending on the purpose of the partnership, strategic alliances could either be inbound, outbound or both; generally, though, strategic alliances have a combined inward and outward view, and therefore can be classified as coupled open innovation. When looking at the proposed classification (Table 3), it can be argued that strategic alliances do not fall under a specific type, as the type of open innovation is determined by the purpose of the partnership as well as for which phase of the innovation process the partnership is contributing. Koza and Lewin (1998) argue that "the firm's choice to enter into an alliance can be distinguished in terms of its motivation to exploit an existing capability or to explore for new opportunities." (p. 256). If the alliance is crucial for the development phase of an innovation (exploration), it would classify as 'pooling', since the firm would share their resources with another party, but would also use the partner's resources. An example of 'pooling' is the partnership between Apple and IBM. Since 1991, Apple and IBM have partnered many times for different reasons and with different goals. One of these partnerships, 'Mobile First', was announced in 2014 with the purpose of sharing their unique resources in order to develop new ideas and new products (Apple, 2017). If, on the other hand, the strategic alliance would contribute to exploit an innovation and bring it to the market, the firm will rely on 'jointly commercializing'. The partnership between Starbucks and Barnes & Noble is an example of 'jointly commercializing': the two companies partnered to provide in-house coffee shops to Barnes & Noble customers (Barnes & Noble, 2017).

Joint ventures can be regarded as coupled open innovation, as they entail both inward and outward flows of knowledge. They can be exploited in the exploration phase to develop an innovation ('pooling') or in the exploitation phase to commercialize an innovation ('jointly commercializing'). An example of a joint venture for 'pooling' is Sony Ericsson, established in 2001 between Sony Corporation Japan and Swedish company Ericsson to combine Sony's consumer electronics expertise with Ericsson's technological knowledge regarding mobile communications (Trott & Hartmann, 2009). The joint venture between Kellogg Company and Wilmar International Limited is, on the other hand, an example of 'jointly commercializing': the purpose of the joint venture was to manufacture, sell and distribute cereal and snacks to consumers in China, and therefore to enter a new market (Kellogg Company, 2012).

Following the remarks regarding licensing, this method can either follow an inbound approach (in-licensing), an outbound approach (out-licensing) or a coupled approach (cross-licensing).

Even though licensing is mainly used in the exploitation phase to either acquire or provide a technology, Laursen et al. (2010) argue that licensing can take place in the exploration phase as well, when a firm wants “to explore into a new technology that is more or less distant to what it already does” (p. 6). An example of ‘acquiring’ (in-licensing in the exploitation phase) is when P&G licensed a patented product, a fabric-care solution to deliver fabric softener in the dryer, developed by an independent inventor and brought it to the market as ‘Bounce’ (Ozkan, 2015). When looking at this example from the perspective of the independent inventor, he exploited his innovation and out-licensed it (‘selling’). If, instead of directly bringing the innovation to the market, P&G had used the research carried out by the independent inventor to develop a new product or improve an existing product, it would have classified as ‘sourcing’ (from P&G’s perspective). Out-licensing in the exploration phase is not possible, since in this phase of the innovation process there is not yet an innovation to exploit. The cross-license agreement signed in 2014 by Google and Samsung is an example of both ‘pooling’ and ‘jointly commercializing’ (Pfanner, 2014). This agreement allowed the two companies to enhance innovation, by using each others’ technologies to develop new products as well as to bring them to the market.

Outsourcing can be outbound or inbound, depending on the position of the company and thus whether the company is the contractor or the contracted firm. Therefore, a company that outsources an activity to another firm is performing inbound open innovation, since there is an inward flow of knowledge from the contracted firm. If a firm, on the other hand, is performing an activity for an outsourcing firm (outsourcing-in), it is using an outbound approach, as its internal knowledge is being transferred to another firm. According to Quinn (2000) and Engardio et al. (2005), outsourcing can take place in different phases of the innovation process: it can take place in the R&D phase (exploration) and in the production and distribution (exploitation). Hence, outsourcing classifies as ‘sourcing’ or ‘acquiring’, whereas outsourcing-in relates to ‘revealing’ or ‘selling’. An example of outsourcing in the exploitation phase (‘acquiring’) is Dell buying some of its computer components from other companies, whereas an example of ‘sourcing’ is Procter & Gamble’s R&D outsourcing strategy, known by the name ‘Connect & Develop’, with the goal of gaining innovative ideas from external parties, such as companies and universities.

The next method to be discussed is research organizations. According to Spithoven et al. (2013), research cooperation can be considered a coupled approach. They are mainly used in the exploration phase to contribute to the R&D phase, and therefore fall under the ‘pooling’ category. An example of a collective research organization in the exploration phase is provided by Schilling (2013): “in 2002, six Japanese electronics manufacturers (Fujitsu, Hitachi, Matsushita Electric Industrial, Mitsubishi Electric, NEC, and Toshiba) set up a collective research company called Aspla to develop designs for more advanced computer chips. [...] The collaborative research organization would enable the companies to share the development expense and help the Japanese semiconductor industry retain its competitive edge” (p. 163).

Following the idea that co-creation refers to the collaboration with customers to develop a product, this mode falls under inbound open innovation, since the aim of this method is to obtain information and knowledge from customers. It could be argued that co-creation can be classified as coupled open innovation, because ‘revealing’ will take place to an extent, as the firm shares internal knowledge to customers in order to co-create an innovation. Nevertheless, the outward flow of knowledge is not the main purpose of this open innovation

method and co-creation does not entail a cooperation between complementary partners, which is typical of the coupled process. Furthermore, co-creation usually takes place at the R&D phase of the innovation process (exploration), since the aim is to develop a product. According to Sanders and Stappers (2008), co-creation practices in the early stages of the development process can have a positive impact and long-term positive consequences (Sanders & Stappers, 2008). LEGO serves as a perfect example for ‘sourcing’: LEGO has an online community where fans can create and share new designs, vote for new ideas and provide feedback. If a design is highly appreciated by the community, LEGO reviews the idea and develops it. Another example of ‘sourcing’ is the strategy of DEWALT, a leading manufacturer of high-quality power tools. Like LEGO, DEWALT has an online community where customers can provide product, packaging and marketing feedback as well as ideas for new products. In this way, customers contribute to DEWALT’s R&D process.

3.3 Partners of Open Innovation

According to Schilling (2013), the success of a collaboration is highly dependent on the partner chosen. Lee et al. (2010) argues that potential partners for open innovation are large firms, SMEs, universities and research centers. As previously mentioned, customers were found to be another potentially valuable partner possibility (Dahan and Hauser, 2002; Piller et al., 2010).

Inter-firm cooperation, with either large firms or SMEs, is the most common type of open innovation. Companies can collaborate with different firms in the supply chain to achieve a competitive advantage (Sahay, 2003). According to Sahay (2003), supply chain management (SCM) capabilities can lead to major economic benefits, but a mistake that is often made is to think that SCM is limited to functions such as inventory control, purchasing and order fulfillment and that it is confined to the company’s boundaries. Sahay (2003) argues that SCM has to be conducted between companies in order to optimize the entire supply chain. In fact, “the firm is simply one player in the long chain that starts with supplier and includes transporters, distributors and customers” and “organizations must interact cooperatively with their channel partners for the mutual benefit of the channel as well as the gain of each player” (Sahay, 2003, p. 76). Chung and Kim (2003) affirm that a trend exists towards involving suppliers in the new product development process with benefits such as reduced lead time, development costs and risks of product development, enhanced flexibility and product quality and improved market adaptability. Collaborating with suppliers might lead to higher competitiveness due to “innovative workable parts co-developed and provided by the suppliers” (Chung & Kim, 2003, p. 600). In order to collaborate with suppliers, different methods can be used: outsourcing (Pun & Heese, 2014), strategic alliances (Famuyiwa et al., 2008) and joint ventures (Johnson & Houston, 2000).

Greer and Lei (2012) acknowledge that collaboration with customers in the development of innovative products and services has taken a big role in companies’ developmental efforts. Prandelli et al. (2008) argue that, since customers are the only reason a firm exists, “it seems logical to us that they should be the most valuable contributors to the firm’s innovation efforts” (p. 11). In his book ‘Democratizing Innovation’, Von Hippel (2005) affirmed that studies show that many users take part in the development or modification of products and these innovating users have the characteristics of ‘lead users’, “they are ahead of the majority of users in their populations with respect to an important market trend, and they expect to gain relatively high benefits from a solution to the needs they have encountered there” (p. 19). He also argues that users generally innovate

because what they want is not available in the market and, therefore, companies can collaborate with customers and lead users as a source of new innovative ideas (Von Hippel, 2005). Co-creation is the method that best fits collaborations with customers.

Co-opetition, defined by Gnyawali and Park (2011) as “a strategy embodying simultaneous cooperation and competition between firm” (p. 650), has received a lot of attention in the last decades, especially in high technological industries where product life cycles are shrinking, higher investments are needed and industries’ boundaries are shifting (Gnyawali and Park, 2011). Tsai (2002) explains that while companies are competing with each other, they also cooperate to acquire new knowledge from each other. Miotti and Sachwald (2003) present different reasons why a company might decide to collaborate with competitors, such as R&D costs sharing, resource pooling and faster market penetration. Different methods can be used to exploit co-opetition: licensing (Shepard, 1987), outsourcing, strategic alliances, joint ventures and research organizations (Hamel et al., 1989).

When looking at universities and research centers, it can be argued that these partners are important contributors of scientific and technological knowledge and are especially useful for basic and long-term strategic research (Tether, 2002). According to Padilla-Melendez and Garrido-Moreno (2012), the transfer of knowledge from universities and research centers to firms play a crucial role in the economic development of regions and countries. Firms can collaborate with research centers and universities by making use of licensing (Padilla-Melendez & Garrido-Moreno, 2012), outsourcing (Quinn, 2000), strategic alliances (Elmuti et al., 2005), joint ventures (Link & Scott, 2005) and research organizations (Schilling, 2013).

Table 5 shows which open innovation method supports each partner type.

Partner	Method
Suppliers	- Outsourcing - Strategic Alliances - Joint Ventures
Customers	- Co-Creation
Competitors	- Licensing - Outsourcing - Strategic Alliances - Joint Ventures - Research Organizations
Universities & Research Centers	- Licensing - Outsourcing - Strategic Alliances - Joint Ventures - Research Organizations

Table 5 –Method Possibilities per Partner

4. OPEN INNOVATION IN SMES

SMEs encounter different issues with innovation compared to large firms; in fact, according to Lee et al. (2010), when innovating, SMEs suffer from ‘labor shortages’, ‘lack of information’, ‘lack of infrastructure’ and ‘lack of financial resources’, whereas larger companies found difficulties such as ‘oligopolistic’, ‘needlessness of innovation’ and ‘R&D department without power’. Since different studies have found a link between innovation and SMEs’ organizational performance (Oke et al., 2007; Rosenbusch et al., 2011), it is important for SMEs to find a way to overcome these weaknesses. These barriers to innovation identified by SMEs can be overcome by adopting open innovation (Lee et al., 2010; De Propriis, 2002).

4.1 Antecedents of OI in SMEs

Gassmann (2006) argued that open innovation does not fit to every situation and every company, therefore a contingency approach is needed concerning the management of innovation. Different aspects and characteristics have to be taken into account to evaluate under which conditions SMEs should invest in open innovation.

First of all, it is important to identify motives of open innovation and, therefore, clarify whether there is even a need for open innovation. Drawing on a database of 605 innovative SMEs in the Netherlands, Van de Vrande et al. (2009) identified different motives for open innovation adoption. In their research, Van de Vrande et al. (2009) studied how different motives apply to different methods. The motives that apply for the methods presented in Section 3.2 can be found in Table. The only method presented by Van de Vrande et al. (2009) not covered in Section 3.2 is ‘employee involvement’ and refers to using the knowledge of employees who are not directly involved in R&D. As open innovation follows the idea that “not all the smart people work for us” and, when presenting open innovation, Chesbrough (2003) argues that firms should use external ideas with internal paths to market (inbound open innovation) and internal ideas with external paths to market (outbound open innovation), this research will not regard ‘employee involvement’ as an open innovation method, since it refers to using a firm’s own knowledge internally and there is no collaboration with external parties. Therefore, the motives for employee involvement identified by Van de Vrande et al. (2009) are not included in Table 6.

Category	Examples
Control	Increased control over activities, better organization of complex process
Focus	Fit with core competencies, clear focus of firm activities
Innovation Process	Improved product development, process and market innovation, integration of new technologies
Knowledge	Gain knowledge, bring expertise to the firm
Costs	Cost management, profitability, efficiency
Capacity	Cannot do it alone, counterbalance lack of capacity
Market	Keep up with current market developments, customers, increase growth and/or market share

Table 6 - Motives to Adopt Open Innovation by Van de Vrande et al. (2009)

The studies of Van de Vrande et al. (2009) discovered that the most important motives for open innovation are market related motives. The authors argue that “for the majority of respondents, using new innovation methods is regarded as a way to keep up with market developments and to meet customer demand, which eventually should result in increased growth, better financial results, or increased market share” (Van de Vrande et al., 2009, p. 432). Other important motives to adopt open innovation are innovation process effectiveness and knowledge acquisition, whereas motives related to control, focus, costs and capacity are less frequent. Van de Vrande et al. (2009) also found that different innovation practices seem to have the same underlying

motives, therefore a distinction of motives depending on the different methods is not necessary. To conclude on Van de Vrande et al.'s (2009) findings, it can be argued that when an SME possesses one or more of the motives found in Table 6, there is a need for open innovation.

Furthermore, different factors need to be considered to identify drivers and barriers of open innovation. In fact, even if there is a need to adopt open innovation, it is important to evaluate whether there are the right conditions for a successful adoption of an open approach.

Durst and Stähle (2013) identified success factors of open innovation and grouped them in nine dimensions: relational issues, people, governance, facilitators, resources, strategy and leadership, culture and open innovation process. As far as relational issues, the authors underline the importance of trust and partner compatibility, whereas with regards to the people involved in the open innovation process, it should be a diverse team of people (i.e. gender, age and education) that are committed and motivated (Durst & Stähle, 2013). Durst and Stähle (2013) affirm that the open innovation process benefits from structures and mechanisms, a clear distribution of tasks, well-defined objectives and performance measurement systems and they argue that facilitators (e.g. innovation brokers, coaches and open innovation champions) play an important role in the open innovation process; therefore, a company could benefit from the involvement of these actors (Durst & Stähle, 2013). The provision of resources (i.e. human resources, time, equipment and budget) and the inclusion of open innovation in the organization's overall strategy were found to be two other important factors that affect the success of open innovation (Durst & Stähle, 2013). As far as leadership and culture, the authors state that there is the need for someone to take the lead in the process and to transform the culture into one that encourages networking and knowledge-sharing (Durst & Stähle, 2013). Finally, Durst and Stähle (2013) discovered that understanding the open innovation process has a positive impact on open innovation's success. The literature review conducted by Durst and Stähle (2013) was based on 29 papers, some of which were focused on SMEs and others did not have a focus on a specific-sized company. Therefore, it can be argued that these findings apply for SMEs as well as for larger companies.

The antecedents of open innovation are outlined in Table 7. Some of these factors can be influenced and changed by the company and, therefore, are not necessary prerequisites. Relational issues highly depend on the partner selected, and therefore does not classify as a prerequisite. Governance, facilitators, strategy, leadership and understanding of the open innovation process are all factors that the firm can work on to improve the chances of success: a firm does not need to have a well-structured governance system in place, facilitators involved, matching strategies, an in-depth understanding of open innovation and an appointed leader in order to start the open innovation process. It does, though, need to make sure that these factors are set in place when starting the process. Therefore, 'people', 'resources' and 'culture' are prerequisites, whereas 'relational issues', 'governance', 'facilitators', 'strategy', 'leadership' and 'open innovation process' are drivers of open innovation.

4.1.1 Antecedents Tested on SMEs Case Studies

In order to ensure the validity of the identified antecedents, case studies on SMEs will be analyzed. There is not a need to test the motives to adopt open innovation identified by Van de Vrande et al. (2009), since their research was conducted specifically on SMEs.

The first case study to be discussed will be the research conducted by Verbano et al. (2011) on 105 manufacturing SMEs,

where they identified barriers to open innovation. The first barrier they identified is financial issues, which reflects the 'resources' factor (Verbano et al., 2011). They also found that other barriers were "actual times longer than planned times", "actual costs greater than planned costs" and "managerial complexity" (Verbano et al., 2011). It can be argued that these barriers are related to the 'governance' factor, the 'strategy' factor and the 'open innovation process' factor: if a firm has put in place a well-structured process, with clear distribution of tasks and objectives, has matched the open innovation strategy to the company's strategy and has understood the open innovation process, delays, higher costs and managerial issues could be limited. Moreover, if the firm can provide a strong leader to lead the process ('leadership' factor), people that are committed to the open innovation approach ('people' and 'resources' factors) and facilitators to contribute and help with the process ('facilitators' factor), these barriers will be limited. Another barrier that Verbano et al. (2011) identified is the "lack of adequate competences for the management of collaborative relationships", which reflects the 'facilitators' factor, since by involving relationship managers and open innovation champions this barrier would be removed, as well as the 'people' and the 'resources' factors, as the hire of people with adequate competences would solve this issue. Barriers related to the 'relational issues' found by Verbano et al. (2011) are the "quality of partner" and "opportunistic behavior of partners", whereas "cultural resistance inside the firm" reflects the 'culture' factor. To sum up, Verbano et al.'s (2011) studies validated all the antecedents previously presented.

Another important contribution in the field on open innovation for SMEs is the work from Brunswicker and Ehrenmann (2013), where they investigated organizational capabilities for managing open innovation in SMEs. The authors identified different requirements for the design of successful open innovation. The first requirement is the establishment of the concept of open

Factors	Open Innovation Antecedents
Relational Issues	Trust and partner compatibility
People	Diverse team of people (i.e. gender, age and education), committed and motivated
Governance	Structures and mechanisms, clear distribution of tasks, well-defined objectives and performance measurement systems
Facilitators	Involvement of innovation brokers, relationship managers, team trainers and coaches, open innovation champions and intermediaries
Resources	Ability to provide human resources, time, equipment and budget
Strategy	Matching open innovation decisions and a firm's overall strategy
Leadership	Strong leader to lead the change process
Culture	Open, encourages networking and knowledge sharing
Open Innovation Process	Understanding the different phases within the process, the phases of a technology's lifecycle and the uniqueness of the open innovation process

Table 7 –Antecedents of Open Innovation

innovation in the innovation and corporate strategy of the firm: the company should consider open innovation within innovation and corporate strategy, align the open innovation strategy with the company-specific product and service life cycles and implement a flexible innovation strategy. This requirement reflects the 'strategy' antecedent previously identified, as well as parts of the 'open innovation process' factor, based on the "understanding the phases of a technology's lifecycle" requisite. In fact, in order to align the open innovation strategy with the product and service lifecycles, understanding the different phases of the lifecycle is necessary. The second requirement identified by Brunswicker and Ehrenmann (2013) is the design of a systematic and structured process model, where clear objectives and a shared innovation agenda are outlined and a backlog for results, concepts and ideas is established. This requisite clearly matches the 'governance' requirement, as it outlines the importance of a structured system, clear objectives and roles, and a performance measurement system. A third requirement is corporate structure, where a relationship promoter is implemented to facilitate cross-company innovation, a steering committee is established to promote openness and flexible customer-focused business units are set up. A match can be found between this requirement and the 'people' factor (people are motivated through the relationship promoter and the steering committee), the 'facilitators' factor (involvement of relationship managers and coaches) and the 'culture' factor (the relationship promoter is implemented to facilitate cross-company innovation within networks, and thus to make the culture more open to knowledge-sharing and networking). A further requirement was found to be the establishment of an adequate cross-company network structure in order to maintain strong partnerships and close business relationships. This requirement reflects the 'relational issues' factor, where trust and partner compatibility were found to be essential. IT-infrastructures were identified as another requirement, since modern information and communication technologies are needed for complex and distributed innovation processes. This requirement matches the 'resources' factor, since, in order to provide IT-infrastructures, equipment and budget are necessary. The last requirement identified by Brunswicker and Ehrenmann (2013) is an open culture, where employees are willing to consider external ideas and apply external technologies. According to the authors, a firm should recruit open-minded people, create a role model to guide the open innovation process, strengthen entrepreneurship, counteract fear of failure and build trust. This requirement not only fits the 'culture' factor, but also the 'relational issues' (building of trust), the 'resources' (providing HR) and the 'leadership' (appointing a role model to guide the change). To conclude, all of the antecedents were found to be requirements in the case study by Brunswicker and Ehrenmann (2013).

A recent study conducted by Bigliardi and Galati (2016) on 157 SMEs identified factors that hinder the adoption of open innovation in SMEs. They grouped these factors into four main barriers: knowledge barriers, collaboration barriers, organizational barriers and financial and strategic barriers (Bigliardi & Galati, 2016). Knowledge barriers refer to lack of internal and external relevant knowledge and loss of know-how, which relates to the 'people' and 'resources' factors (lack of adequate people) and the 'open innovation process' factor (lack of knowledge on innovation and open innovation). Collaboration barriers are related to the partners' opportunistic behavior and the difficulty in finding the right partner, which mainly reflects the 'relational issues', but partially also the 'facilitators' factor, since the provision of relationship managers or open innovation champions could improve the collaboration with partners. Organizational barriers are linked to the lack of managerial skills and the cultural resistance to change in the organization. These

barriers are related to the 'people' factor, since employees do not possess the necessary skills and are not fully committed to the open innovation process, the 'resources' factor, since the firm is not able to provide the right people for the job, the 'leadership' factor, since there is a lack of a strong leader to lead the change and, finally, the 'culture' factor, since the resistance to the change is due to the closed and protective culture. Finally, the financial and strategic barriers refer to both economic aspects as well as strategic issues, which relates to the 'resources' factor (inability to provide the necessary resources) and the 'strategy' and 'governance' factors. In conclusion, the studies of Bigliardi and Galati (2016) verified all the factors identified in Table 7.

Based on these case studies, it can be argued that the antecedents of open innovation presented in Section 4.1 are applicable for SMEs.

4.2 Method Selection in SMEs

Yoon et al. (2016) argue that, when choosing which method of open innovation to adopt, it should not be a "one-size-fits-all" solution. In fact, depending on different factors, a specific method could be more beneficial for a firm than another one.

The first choice to be made is whether a firm should take an inbound approach, an outbound approach or a coupled approach.

As previously mentioned, inbound open innovation refers to acquiring external knowledge to contribute to innovation activities and identified methods for this approach are in-licensing, outsourcing and co-creation. Since inbound open innovation is related to the acquisition of an innovation or of knowledge to develop an innovation, it is an appropriate method for a firm that is searching for a way to support innovation efforts. Different advantages and disadvantages for this approach can be identified and will now be discussed with a focus on SMEs. Rothwell (1994) argues that "accessing external know-how has long been acknowledged as a significant factor in successful innovation" (p. 19), which could be highly beneficial for SMEs in order to overcome the barriers to innovation previously identified. Furthermore, since innovation was found to be linked with SMEs' organizational performance (Oke et al., 2007; Rosenbusch et al., 2011), it can be concluded that inbound open innovation will contribute to improve SMEs' organizational performance. Laursen and Salter (2006) also found that, by searching across a variety of channels, firms can gain ideas and resources to exploit innovative opportunities. Nevertheless, they also argue that innovation search can be time consuming, expensive and laborious and that 'over-search' could negatively affect innovation performance (Laursen & Salter, 2006). Therefore, firms should be aware of this issue and they should manage innovation search carefully. This is especially important for SMEs due to their lack of financial resources and technical capabilities (Vanhaverbeke et al., 2012). Some of the antecedents of open innovation presented in Section 4.1 could contribute in limiting this disadvantage: setting in place a well-structured governance system, building a clear strategy and involving facilitators could reduce the risk of over-search.

On the other end of the spectrum, if a firm possesses internal knowledge and is looking for external organizations to commercialize a technology, they should adopt outbound open innovation (out-licensing or out-sourcing in). In fact, according to Chesbrough and Crowther (2006), "corporate R&D organizations encountered difficulties when internal research generated spillovers that could not be internally commercialized" (p. 230) and often such technology just 'sat on a shelf'. Along the same lines, Nerkar (2007) argues that often firms develop patents because of incentives used in R&D to encourage patenting, but without considering business relevance. By using outbound open innovation, firms can leverage these innovations and their

investments in R&D. One issue regarding outbound open innovation is the idea of “sharing the corporate crown jewels” and protecting your proprietary intellectual properties (Kline, 2003). Nevertheless, more and more companies are finding out that sharing own technologies with others can have significant financial and strategic benefits (Kline, 2003). SMEs could highly benefit from the additional income in royalties that would follow a licensing agreement or the revenue of outsourcing-in another company’s activity.

There is a clear distinction of motives for the two different approaches: if a firm wants to exploit an already existing internal innovation or knowledge, they should adopt an outbound approach, if, instead, a firm wants to develop or acquire an innovation from external parties, they should opt for an inbound approach.

As far as the coupled approach is concerned, if a firm possesses both the aforementioned motives and, therefore, wants to both exploit internal knowledge and acquire external knowledge in order to co-develop, commercialize and co-capitalise on innovation (Enkel et al., 2009), the coupled approach should be implemented. Of course, advantages and disadvantages of both outbound and inbound open innovation have to be kept in mind when adopting the coupled approach. By using a coupled approach, a firm would have the opportunity to improve innovation performance as well as organizational performance, leverage innovations and knowledge and achieve significant financial and strategic benefits. Nevertheless, they should take into account the possibility of over-search and the issue of revealing proprietary intellectual properties.

After choosing the approach, a firm should identify the phase of the innovation process where the open innovation approach would be implemented. If, on one hand, a firm wants to carry out R&D activities to develop an innovation, open innovation is applied in the exploration phase. If, on the other hand, the innovation already exists and the firm wants to commercialize it, open innovation is adopted in the exploitation phase (Lee et al., 2010).

Depending on the aforementioned two decisions, a firm will now know whether they will implement ‘revealing’, ‘selling’, ‘sourcing’, ‘acquiring’, ‘pooling’ or ‘jointly commercializing’. At this moment, a firm has to decide which method to adopt. Different methods are available depending on the chosen approach and innovation process phase (Table 4 – Classification of Methods).

The first categories to be discussed are ‘revealing’ and ‘selling’; out-licensing and outsourcing-in fall under these categories.

In the process of out-licensing a technology in the exploitation phase (‘selling’), a firm gives the right to its technology to another company. According to Schilling (2013), licensing usually entails many restrictions for the licensee, so that the licensor can have control over the technology and how it is used; nonetheless, the licensee can gain important knowledge over time, which might lead to the development of its own proprietary technology. Furthermore, Schilling (2013) argues that out-licensing a technology can prevent competitors from developing their own technology and it enables a company to rely on a steady stream of royalties rather than having the technology compete against big competitors. Moreover, out-licensing is a fast and nearly free way for a firm to extend the reach of its technology and to earn royalties (Schilling, 2013). Köhler (2011) affirms that SMEs can make use of out-licensing to exploit technologies for which they do not possess the complementary or down-stream assets (e.g. production facilities or marketing capacity). Nevertheless, Ferradas (2014) argues that an important factor that has to be taken into account when out-licensing is

intellectual property management and Kowalski and Director (2009) affirm that “to realize the maximum value of innovation, SMEs need to recognize, understand and manage IP in order to protect their IPR and thereby accelerate their innovations towards commercialization” (p. 2). To conclude on out-licensing, it can be argued that it could be highly beneficial for SMEs that possess a technology and want to exploit it, but have difficulties to commercialize it; in order to implement out-licensing successfully, SMEs should be very cautious about intellectual property management.

The second method that falls under ‘revealing’ and ‘selling’ is outsourcing-in, which refers to a firm that is performing an activity for an outsourcing firm either in the R&D phase (‘revealing’) or in the commercialization phase (‘selling’). If a company possesses technologies, knowledge or capabilities and wants to further exploit them, outsourcing-in would be the appropriate method. Outsourcing-in offers firms a way to leverage existing knowledge and capabilities while earning money. It is an interesting possibility for SMEs that do not fully exploit or use their capabilities and want to increase their revenue, as well as their reach.

As far as inbound open innovation is concerned, the methods identified for ‘sourcing’ and ‘acquiring’ will now be discussed.

In-licensing refers to buying or gaining the rights to use knowledge or technologies of another firm, either to contribute to R&D (‘sourcing’) or to commercialize it (‘acquiring’). As previously mentioned, licensing comes with many restrictions for the licensee, but there is still the opportunity to gain important knowledge with time (Schilling, 2013). Van de Vrande et al. (2009) and Parida et al. (2012) argue that SMEs can in-license technologies in order to address typical SMEs’ challenges such as shortened product life cycles, rapid changes in technology and limited capital, since in-licensing can fuel and accelerate innovation. According to Schilling (2013), in-licensing offers a quick way to obtain access to a technology typically at a lower cost than developing it internally. Therefore, SMEs can make use of in-licensing if they need to access a specific technology and developing it internally would entail high costs, or if the technology is not central to the firm’s competitive advantage (Schilling, 2013).

In the process of outsourcing, a firm gives up control of an activity to another firm to quickly gain access to another company’s expertise and/or at lower costs (Schilling, 2013), either for R&D purposes (‘sourcing’) or to commercialize an innovation (‘acquiring’). Quinn (1992) argues that if firms allow outside organizations to concentrate on a task, firms can increase their performance by focusing more on the things they do best. According to Reid (2004), the main benefit of outsourcing is that it allows your firm to focus on its core business and it leads to saved time, money and effort. Reid (2004) also argues that by looking at your firm’s core strengths and evaluating whether a service could be better performed by an outside firm, you can assess whether your firm could benefit from outsourcing. Even though outsourcing has many advantages, some disadvantages can be identified: outsourcing could prevent a firm to acquire important knowledge and to develop new skills and resources and it could entail high transaction costs (Schilling, 2013). In his paper, Reid (2004) presents an in-depth practice to evaluate whether outsourcing would be beneficial for an SME by evaluating both costs and money saved and he provides best practices. SMEs can follow Reid’s (2004) work in order to decide whether to outsource and how.

Co-creation relates to the collaboration with customers to develop a product or service. Dyer and Singh (1998) argue that collaborating with customers can increase the ability of a

company to innovate and create value since it allows it to understand better customer needs and expectations and, according to Nonaka and Konno (1998), customers often have the necessary expertise to improve product designs by identifying desired features or flaws. As previously presented, due to the link between innovation and SMEs' organizational performance (Oke et al., 2007; Rosenbusch et al., 2011) improving innovation will lead to improved organizational performance. It is difficult to predict the financial value that would result from co-creation, which is why companies tend to be reluctant to implement it (Pukkala, 2015). Nevertheless, after conducting a study on Finnish SMEs, Pukkala (2015) discovered that SMEs' managers recognize the importance of customer co-creation and that 99.3% of the managers that took part in the study believe that collaborating with customers to develop new products or services does not lead to a financial burden that is not offset by the benefits of the collaboration. In conclusion, it can be argued that the use of co-creation can help an SME to develop a new product or service as well as to improve the current offering based on what customers actually want. This could be highly beneficial for SMEs, as with their limited financial resources they cannot afford to develop a product that is not appreciated or desired by customers.

Finally, coupled open innovation's methods will now be discussed.

Strategic alliances give firms the opportunity to leverage core competences, penetrate new markets, protect old ones and/or gain new strategic capabilities (Judge & Dooley, 2006). Koza and Lewin (1998) argue that a firm can enter an alliance to exploit an existing capability ('jointly commercializing') or to explore for new opportunities ('pooling'). It can be argued that this method of open innovation has two important advantages: first, they can enhance a company's flexibility by exploiting a window of opportunity to which they might want to commit more fully in the future, secondly, they enable partners to learn from each other and develop new competencies. (Schilling, 2013). In order for an alliance to be successful, a serious level of commitment is required: a number of dedicated people needs to be assigned to the alliance to supervise and facilitate the partnership. Moreover, in order to protect the company from giving too much away to potential competitors, employees should be informed about what information and resources should not be shared with the partner company and they should monitor what information is requested by the partner (Schilling, 2013). The studies of Liao et al. (2003) and Van Gils and Zwart (2004) stressed the importance of strategic alliances for SMEs and presented different advantages, such as increased turnover, higher profits and extension of the product range. It can therefore be concluded that SMEs could highly benefit from strategic alliances if they want to penetrate a new market, protect an old one or gain new capabilities and knowledge.

Joint ventures are a specific type of strategic alliance where two firms pool their resources into a common legal organization (Kogut, 1988) either to develop a product or service ('pooling') or to commercialize it ('jointly commercializing'). Kamien et al. (1992) argue that advantages of joint ventures are to enable the partners to overcome the R&D costs barriers as well as to eliminate duplication of effort, but possible disadvantages are the possibility of free riding by one of the partners and competitive conflicts (e.g. imitation of the partner's technology, distortion of transfer prices between the partners and the venture) (Kogut, 1989). Barajas et al. (2012) found that joint ventures have a positive impact on SMEs' performance. Nevertheless, they entail a significant equity investment (Schilling, 2013), which might represent a barrier for SMEs.

Cross licensing refers to the process where companies provide access to their technologies to others in exchange for access to their technologies (Fershtman & Kamien, 1992). This transaction can take place in order to develop a product (exploration phase) or to commercialize it (exploitation phase). According to Fershtman and Kamien (1992), cross licensing allows a firm to save on the costs of development of the technology and, if the technology is complementary to an internal technology, cross licensing also shortens the time to market of the final technology. Nevertheless, possible disadvantages are the possibility that the partner firm will gain important knowledge over time and develop its own proprietary knowledge (Schilling, 2013) and the creation of a rival provider of the final product (Fershtman & Kamien, 1992). Köhler (2011) argues that a practical issue for SMEs when cross licensing is the availability of resources, mainly human, to realize such a complex IPR transaction. Nevertheless, the author adds that SMEs can turn to external IP specialists to support their licensing agreement.

Finally, collective research organizations are a more long-term commitment compared to most of the other methods and allow firms to leverage and build upon existing competences while learning from the other partners (Schilling, 2013). Zeng et al. (2010) found that there is a significant positive relationship between participating in research organizations and innovation performance in SMEs. It is important to mention that, if the firm is aiming at short term results, collective research organizations might not be the best fit, since they usually do not lead to immediate returns (Schilling, 2013). Nevertheless, this mode of open innovation could be highly beneficial for SMEs, since it allows them to share costs as well as risks and, therefore, can limit SMEs' barriers to innovation.

As it can be seen, different methods offer different advantages and disadvantages. Some of the proposed methods are more costly and difficult to implement, which might be a barrier for SMEs. Ferradas (2014) argues that practices that require a significant financial investment and a formalized contract should be implemented by SMEs only after having previously used successfully other open innovation methods. It can be concluded that SMEs should start the open innovation process with methods that are easier to implement and less costly, namely outsourcing, co-creation and research organizations, and then, if successful, move on to licensing, strategic alliances and joint ventures.

4.3 Partner Selection in SMEs

After identifying which method best fits the firm's needs and situation, the next step in the open innovation process is to select a partner to collaborate with. First of all, it is important to identify a pool of potential partners, thereafter the selection of the best partner for the specific company and situation takes place.

The identification of potential partners is becoming more and more difficult due to globalization and the complexity and increasing number of technologies (Jeon et al., 2011). Conventional methods for partner identification are expert opinions, human relationships, e-mail requests and online communities (Joan et al., 2011). Guertler et al. (2015) argue that stakeholder analysis can be considered an established approach to identify potential partners and refers to the exploration of the individuals, groups and organizations that might influence or get influenced by a project. After identifying the stakeholders, an analysis of their power, interests, attitudes and legitimacy is carried out in order to identify which ones of the stakeholders can be considered potential partners. Furthermore, Joan et al. (2011) propose a patent-based approach to search for potential technology partners which consists of using patent information to identify potential partners. As SMEs suffer from limitations that do not concern larger firms, such as lack of financial

resources and limited information sources, they often encounter difficulties when searching for potential partners. Therefore, the involvement of intermediaries (facilitators) to help with the searching process is advised in order to ensure the success of open innovation (Lee et al., 2010).

After identifying a pool of potential partners, the firm should select the partner to collaborate with. Schilling (2013) argues that, when selecting a partner for a collaboration, two factors have to be considered: resource fit and strategic fit. “Resource fit refers to the degree to which potential partners have resources that can be effectively integrated into a strategy that creates value” and “strategic fit refers to the degree to which partners have compatible objectives and styles” (Schilling, 2013, p. 166). Therefore, it is important that SMEs review these factors when selecting the right partner for the collaboration.

Different partner possibilities are available depending on the method chosen. In Table 8, the partner possibilities for each method are presented and will now be discussed with a focus on SMEs.

Method	Partner
Licensing	- Competitors - Universities & Research Centers
Outsourcing	- Suppliers - Competitors - Universities & Research Centers
Co-creation	- Customers
Strategic Alliances	- Suppliers - Competitors - Universities & Research Centers
Joint Ventures	- Suppliers - Competitors - Universities & Research Centers
Research Organizations	- Competitors - Universities & Research Centers

Table 8 – Partner Possibilities per Method

Morris, Kocak and Özer (2007) argue that collaboration with competitors allows SMEs to create economies of scale, mitigate risk and leverage resources together. According to Chen (1996), competitors face similar challenges and have resources that could be relevant for each other. Gnyawali and Park (2009) add that competitive SMEs should collaborate together instead of collaborating with larger firms in order to better compete against large players. Moreover, studies by Levy, Loebbecke and Powell (2003) found that co-opetition (simultaneous collaboration and competition with competitors) is likely positively linked to financial performance. Gnyawali and Park (2009) argue that SMEs face even greater challenges when pursuing innovation and the development of new technologies, which is why co-opetition can contribute to their ability to innovate. They also affirm that SMEs can collaborate with either direct competitors, indirect competitors or collaborators that may become competitors over time (Gnyawali & Park, 2009). In order to identify competitors to collaborate with, SMEs can make use of competitive analysis, which refers to the “process by which a company attempts to define and understand its industry, identify its competitors, determine the strengths and weaknesses of its rivals, and anticipate their moves” (Zahra & Chaples, 1993, p. 8). To conclude, collaboration with competitors has three main advantages compared to other types of partners. First, since they operate in the same market, competitors have resources and capabilities that are relevant to each other, second, they face the

same challenges and, thus, it makes sense for them to join forces to overcome these constraints, and third, together they can create common technologies due to the similarity of their products and the pooling of the resources (Gnyawali & Park, 2009).

Ragatz et al. (1997) argue that, in today’s competitive environment, suppliers became a very important resource for firms and integrating them effectively in the innovation process will result in improved competitive advantage. According to Ragatz et al. (2002), the involvement of suppliers could take different forms, ranging from consultation on design ideas to giving them full responsibility for the design of components, systems, processes and services. Furthermore, integrating suppliers in the innovation process to complement internal capabilities will likely lead to reduced time to market, costs, quality issues and improved design effort (Ragatz et al., 1997). Rodríguez-Ferradas and Alfaro-Tanco (2016) found that collaborating with suppliers is a suitable way for SMEs to develop new products. To conclude, by collaborating with suppliers, SMEs can respond to their lack of resources and deliver their products faster to the market at a lower cost.

As it was previously presented, collaborating with customers can increase the ability of a company to innovate and create value, since it allows the firm to better understand customers’ needs and expectations and to improve product designs accordingly (Nonaka & Konno, 1998; Dyer & Singh, 1998). Raasch (2011) argues that the main question for firms is how user integration impacts revenues, costs and ultimately profits and suggests that it affects profits in two ways. First, the ‘marketing effect’ consists of word-of-mouth as a result of having a network of community members through which a firm can communicate; “the larger and more active the community, the stronger the word-of-mouth effects it can engender” (Raasch, 2011, p. 26). The second way is the ‘innovation effect’, and refers to the increased value that results from the improvement of the firm’s offering due to customers’ ideas and solutions. SMEs could highly benefit from both these effects: the ‘marketing effect’ could increase the reach and popularity of the firm and lead to growth and higher market share, whereas the ‘innovation effect’ could lead to higher revenues and demand. Finally, Zaborek and Mazur (2015) found a positive relation between customer involvement and innovativeness in SMEs. To conclude, involving customers in the innovation process for SMEs will contribute to increase the firm’s reach and market share, as well as revenues and demand, to eventually improve innovativeness.

Universities and research centers are relevant sources of inventive and pre-industrial knowledge for SMEs (Brunswick & Vanhaverbeke, 2015). Hendry et al. (2000) identified three key reasons for SMEs to collaborate with universities and research centers: “informal engagement with experts with relevant scientific and engineering knowledge, recruitment of scientific and engineering personnel, and collaborative research on both product and process improvements” (p. 68). Janeiro et al. (2013) argue that collaborating with universities and research centers is particularly valuable when radical innovation is desired, since this type of innovation requires new knowledge that usually comes from fundamental research undertaken by these institutions. Harryson et al (2008) identified different learning barriers for the collaboration between firms and universities, such as cultural differences, the long-term orientation of academic research versus the focus on short- and medium-term exploitation-oriented research by companies and incompatible reward systems focused on publishing versus protecting results. Hendry et al. (2000) propose the use of intermediaries to overcome these barriers. To conclude, SMEs could benefit from the collaboration with universities and research centers if they want to obtain scientific and engineering knowledge to improve

their products and processes, if they want to recruit scientific and engineering personnel or if they are aiming at radical innovation. Furthermore, they can involve intermediaries in the collaboration in order to overcome the barriers that arise with this type of collaboration.

Parida et al. (2012) suggest that, if the focus of the SME is incremental innovation, the firm should collaborate with competitors in order to share development costs and sharing information. If, on the other hand, the firm is aiming at radical innovation, vertical collaboration with suppliers or customers is advised (Parida et al., 2012), as well as tapping into knowledge from universities and research centers (Janeiro et al., 2013).

Furthermore, Parida et al. (2012) argue that SMEs should collaborate with other small firms due to the risks of partnering with competitors, findings also supported by Gnyawali and Park (2009). Lee et al. (2010) also advise SMEs to collaborate with other SMEs, universities or research centers, as strong ties with larger firms could limit opportunities.

5. PROCESS MODEL

The process model to guide SMEs' managers in the open innovation process will be developed based on the findings of Chapter 4. The model will include six steps, represented in Figure 1 – Open Innovation Process Model for SMEs.

First, the model will identify whether there is a need for open innovation by outlining all the possible motives for open innovation ('why' should I invest in open innovation?), followed by the evaluation of antecedents of open innovation to verify whether there are the right conditions in place for open innovation to be successful ('when' should I invest in open innovation?). The next step in the process is for SMEs to choose 'what' type of open innovation is most appropriate, so either inbound, outbound or coupled open innovation. After deciding on a type of open innovation, it will be evaluated in which phase of the innovation process open innovation will take place, namely the exploration or exploitation phase ('where' in the innovation process should I implement open innovation?). Once these two decisions are made, the SME will now know which category of methods is the most appropriate, namely 'revealing', 'selling', 'sourcing', 'acquiring', 'pooling' or 'jointly commercializing'. At this moment, a firm has to decide which method to adopt following advantages and disadvantages of each method and findings discovered in literature ('how' should I implement open innovation?). Once this choice is made, the last decision to take is the partner to collaborate with ('with whom' should I collaborate?). The flowchart presented in Appendix 1 – Flowchart of Open Innovation Process Model for SMEs shows each activity, decision and possibility of the provided process model. Managers of SMEs can follow this flowchart when making the decisions presented in Figure 1 in order to find the trajectory that best fits their needs and situation.

The aim of this process model is to help SMEs to make informative decisions on the implementation of open innovation.

Considering the concept of equifinality presented in Chapter 2, which states that in an open system the same outcome can be reached in different ways, the proposed process model will not provide exclusive choices, but will instead present advantages and disadvantages of each choice, so that each manager can evaluate the situation of his SME and, based on that, make an informative choice.

Each step of the process model presented in Figure 1 will now be discussed and the findings from literature concerning each step will be summarized. Firms are advised to apply these instructions while following the Flowchart of Open Innovation Process Model for SMEs presented in Appendix 1.

The first step consists of evaluating whether there is a need for open innovation for the specific SME. In order to do so, the firm should identify one of the following needs:

- Gaining control over activities and process organization
- Obtaining clear focus on firm's competencies and activities
- Improving innovation process and innovativeness
- Gaining new knowledge and expertise
- Decreasing costs, increasing efficiency and profitability
- Counterbalancing lack of capacity
- Keeping up with current market developments and increasing growth and/or market share

If the SME has identified a need for open innovation, the next step is for them to analyze whether they have the right antecedents for open innovation to be successful. Antecedents have been divided in 'prerequisites' (conditions that must be present in order for open innovation to be successful) and 'drivers' (conditions that improve the chances of success of open innovation but are not necessarily required). In the following, the prerequisites that a company, specifically an SME, should meet in order to successfully implement open innovation are summarized:

- The firm is able to provide a team of people that is committed to the cause, motivated and diverse in term of gender, age and education
- The firm is able to provide human resources, time, equipment and budget to the open innovation process
- The firm has an open culture, where networking and knowledge sharing is encouraged

If these three prerequisites are not present, the firm should wait to implement open innovation until these factors are in place. Once these prerequisites are met, the firm should improve other factors ('drivers') in order to increase the chances of a successful implementation:

- The firm should implement a well-structured governance system where tasks are clearly distributed and objectives are well-defined
- The firm should involve facilitators in the open innovation process

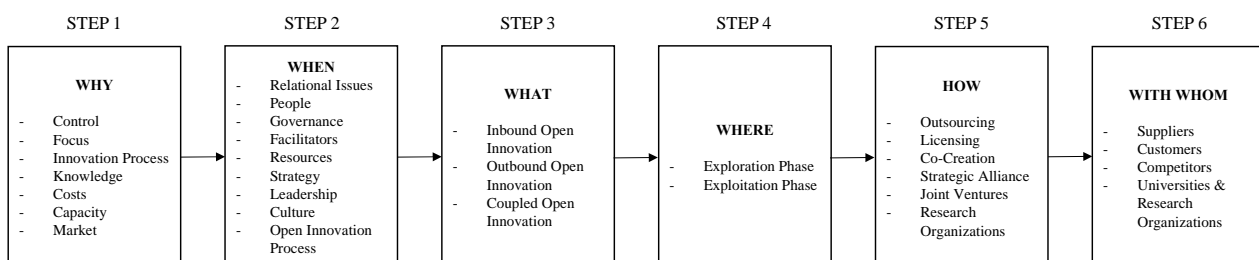


Figure 1 – Open Innovation Process Model for SMEs

- The firm should build an open innovation strategy that matches its strategy
- The firm should appoint a strong leader to guide the open innovation process
- The firm should understand the open innovation process
- The firm should select a partner that is compatible and build a relationship based on trust

The next step in the open innovation process (step 3) is the decision of what type of open innovation to implement, namely inbound, outbound or coupled.

- Inbound open innovation consists of acquiring external knowledge to contribute to innovation activities and is beneficial for firms that want to support innovation efforts and gain ideas and resources to exploit innovative opportunities. Since inbound open innovation could lead to 'over-search' and, thus, become time consuming and expensive, it is advised to implement this type of open innovation carefully. The following drivers of open innovation could contribute to limit this disadvantage: a well-structured governance system, the involvement of facilitators and building a clear open innovation strategy.
- Outbound open innovation is beneficial for a firm that owns internal knowledge or technologies and is searching for external organizations to commercialize it. Outbound open innovation will lead to earning revenues either with licensing or by performing another company's activity.
- Coupled open innovation is a good fit for firms that want to exploit internal knowledge or technologies while acquiring external knowledge at the same time. This type of open innovation allows a company to leverage internal innovations and knowledge while improving innovation performance, and it could lead to significant financial and strategic benefits.

After choosing which type of open innovation to implement, the firm needs to identify in which phase of the innovation process open innovation should be applied, either in the exploration phase or in the exploitation phase.

- The exploration phase should be chosen if the firm wants to carry out R&D activities to develop an innovation
- The exploitation phase should be chosen if the firm wants to commercialize an already existing innovation

Step 5 consists of identifying which open innovation method to implement. Depending on the results of step 3 and 4, the firm will now know from which category they should choose the method ('revealing', 'selling', 'sourcing', 'acquiring', 'pooling' or 'jointly commercializing'). The Flowchart of Open Innovation Process Model for SMEs in Appendix 1 shows which methods are available for each category. Each method will now be discussed.

- Out-licensing an innovation means giving the right to use an own technology to another firm. Out-licensing can prevent competitors from developing the same technology and allows the company to gain a steady stream of royalties instead of having the technology compete against big competitors. SMEs can benefit from out-licensing if they have a technology that they cannot commercialize due to lack of complementary or downstream assets.
- Outsourcing-in refers to the process of performing an activity for another firm. SMEs can outsource-in if they have technologies, knowledge or capabilities that they do not fully exploit and want to increase revenue as well as reach.

- In-licensing consists in buying or gaining the rights to use knowledge or technologies of another firm and it offers a quick way to obtain access to a technology at a lower cost than developing it internally. SMEs should adopt in-licensing if they need access to a specific technology that would be expensive to develop internally or that is not central to the firm's competitive advantage. Furthermore, with in-licensing SMEs could gain important knowledge over time and develop their own technology.
- Outsourcing refers to giving up control of an activity to another firm in order to gain access to another company's expertise. Outsourcing allows a firm to focus on its core business by outsourcing secondary activities and it leads to saved time, costs and effort. In order to decide whether to outsource or not, SMEs should look at their core strengths and evaluate whether a service could be performed better by another firm.
- Co-creation concerns the collaboration with customers to develop a product or service. Other than helping SMEs to develop new products or services, co-creation can also help SMEs to improve their current offering based on customers' needs and wants.
- Strategic alliances allow companies to leverage core competences, penetrate new markets and protect old ones and gain new strategic capabilities. SMEs can use strategic alliances to learn from partners and exploit an opportunity to which they might want to commit more fully in the future.
- Joint venture refers to a specific type of strategic alliances where two firms pool their resources into an organization and it allows firms to overcome R&D costs barriers and to eliminate duplication of effort. Nevertheless, joint ventures entail a significant investment for the firm.
- Cross licensing, providing access to your technology in exchange for access to another firm's technology, allows a firm to save on development costs and could shorten the time to market (if the acquired technology is complementary to an internal technology). Cross licensing could be beneficial for SMEs that own a technology but still require another technology that has either high development costs or that it is not central to the firm's business.
- Collective research organizations represent a longer commitment compared to most of the other methods and allow a firm to leverage and build upon existing competences while learning from the other partners.

Following the literature, SMEs are advised to first implement methods that are rather easier to implement and less costly, namely outsourcing, co-creation and research organizations. After a successful implementation of these methods, licensing, strategic alliances and joint ventures can be applied. These last three methods, in fact, are more difficult to implement and require a significant financial investment.

The last step requires the firm to find and select a partner for the collaboration. In order to identify potential partners, SMEs can use different methods (expert opinions, human relationships, e-mail requests, online communities, stakeholder analysis and a patent-based approach). As mentioned before, SMEs are advised to include intermediaries in the partner search, as they often do not possess the necessary resources to successfully search for partners on their own. The Flowchart of Open Innovation Process Model for SMEs in Appendix 1 shows which partner possibilities are available for each method. Each partner possibility will now be discussed.

- Competitors collaborations allow SMEs to create economies of scale, mitigate risk and leverage resources

together in order to better compete with large competitors. Collaborating with competitors, either direct, indirect or potential future competitors, could be beneficial for SMEs since both parties have resources that are relevant to each other, face the same challenges and create similar products, which makes the collaboration easier and allows the partners to create common technologies. In order to identify competitors with whom to collaborate, SMEs can carry out a competitive analysis.

- Suppliers collaborations could compliment internal capabilities in order to reduce the time to market, costs, quality issues and improve design effort.
- Customers involvement in the innovation process could increase the SME's reach and market share as well as revenue and demand, to eventually lead to improved innovativeness.
- Universities and Research Centers collaborations can be beneficial for SMEs if they want to obtain scientific and engineering knowledge to improve their products and processes, if they want to recruit scientific and engineering personnel or if they are aiming at radical innovation. In order for the collaboration to be successful, the involvement of facilitators is advised.

When selecting a partner for open innovation, SMEs should look for companies that have compatible goals and styles and with resources that can be effectively integrated into a strategy that creates value. SMEs are advised to collaborate with competitors if their focus is incremental innovation, whereas they should collaborate with suppliers, customers, universities and research centers if they are aiming at radical innovation. Furthermore, when collaborating with other firms, SMEs should choose partnering with other small and medium firms, as strong ties with larger firms could limit opportunities.

6. DISCUSSION AND CONCLUSION

The purpose of this paper was to analyze how SMEs can implement open innovation to improve organizational performance. Studies by Oke et al. (2007) and Rosenbusch et al. (2011) identified a positive relationship between innovation and organizational performance for SMEs; hence, improving innovativeness would lead to an improvement in organizational performance. Furthermore, Ebersberger et al. (2012) found that open innovation has a strong impact on innovation performance. SMEs should, therefore, invest in open innovation to improve organizational performance. Nevertheless, open innovation does not fit to every company and every situation, hence a process model to help SMEs' managers to decide if and how to implement open innovation is necessary.

The developed process model (Figure 1) consists of six steps that were found to be crucial in the implementation of open innovation. If the SME identifies a need for open innovation and if the right conditions are in place, the firm is advised to invest in open innovation. Thereafter, the SME evaluates which type of open innovation best fits the firm and the specific situation and which method and partner are most appropriate.

The process model was developed based on the concept of equifinality, stating that in an open system the same outcome can be reached in different ways. Therefore, the model does not provide exclusive choices, but instead provides advantages and disadvantages of each choice. Managers of SMEs will be able to use the process model to make informative choices in each step of the model in order to successfully apply open innovation to improve organizational performance.

6.1 Implications

6.1.1 Theoretical Implications

This research has studied how open innovation can be implemented successfully in SMEs. Even though literature exists regarding each dimension that was found to be crucial for a successful implementation, a complete framework that integrates different dimensions was not available, especially with a focus on SMEs. Due to this gap, the comparison of empirical findings was found to be difficult. This research fills the aforementioned gap by incorporating different aspects of the open innovation process in one single framework focused on SMEs. Building on existing literature in the field of open innovation, this research proposed a process model that critically integrated the growing literature on open innovation and open innovation in the context of SMEs.

A new classification of open innovation was proposed, since literature was fragmented regarding what types of open innovation are available. Different classifications were provided by authors, but none of these was exhaustive. The new proposed classification contributes by integrating two dimensions and different perspectives by many authors. One dimension refers to the direction of the flows of information, thus the 'inbound' versus 'outbound' classification by Chesbrough (2003) and the 'coupled' approach by Enkel et al. (2009) were incorporated. The second dimension relates to the stage of the innovation process where open innovation would take place and the work of March (1991, 1995) was used, differentiating between the exploration phase (R&D) and exploitation phase (commercialization). Furthermore, the work of Dahlander and Gann (2010) was taken as an inspiration for the new proposed classification. Following the new proposed classification, it was possible to categorize easily different open innovation methods. Therefore, this research also provides a new classification of different methods of open innovation based on existing literature. The paper also provides a categorization of partner possibilities depending on the methods. Neither the classification of open innovation methods nor the categorization of partners was available in literature; it represents, therefore, an important contribution to existing literature on the topic.

6.1.2 Practical Implications

The integration of the different dimensions led to the development of a process model. Managers of SMEs can apply and follow the process model to successfully implement open innovation. First of all, open innovation should not always be implemented, but the SMEs' managers should evaluate whether the firm has a need for an open approach and if the right conditions for successful open innovation are in place. In fact, it was found that open innovation does not fit to every company or situation. Managers are advised to analyze their motives for open innovation to decide whether they have a need for an open approach. Moreover, SMEs should assess whether prerequisites of open innovation are in place and if they are able to implement open innovation drivers in order to improve chances of successful implementation.

Furthermore, it is recommended for managers to carefully evaluate which type, method and partner best fits their situation, as each decision has different advantages and disadvantages. It was found that outsourcing, co-creation and research organizations should be implemented first, as they are rather easier and less costly, and licensing, strategic alliances and joint ventures should be applied at a later stage, once the other methods are successfully used. Moreover, SMEs are advised to collaborate with competitors (preferably other SMEs rather than larger competitors) if their focus is incremental innovation, whereas they should collaborate with suppliers (other SMEs),

customers, universities and research centers if their purpose is radical innovation.

6.2 Limitations and Further Research

Similar to other papers, this research has limitations that provide directions for further research. Six main limitations were identified.

First, the proposed process model was developed based on existing literature, but it has not been tested on SMEs to evaluate its applicability and success due to time constraints. It is assumed that, since the model is based on existing research, it is applicable and successful. In order for the model to be both applicable and successful, long-term outcomes and results of the open innovation decisions have to be taken into account. Future research should test the process model on actual SMEs in order to ensure the applicability and validity of the tool.

Second, the paper did not focus on a specific country or continent, as literature on specific countries was not complete and exhaustive. It can be argued that SMEs in different countries might have different motives, barriers, methods or partner possibilities. Moreover, different cultures might approach, implement and react to open innovation differently. The studies of Tödting et al. (2011) found that certain regional culture characteristics affect open innovation differently, which could entail that the developed process model is suitable for some cultures more than others. Therefore, testing the process model on SMEs in a specific country could contribute to ensure the applicability of the model in different nations with different cultures.

Another limitation that was identified is the possibility that the provided list of method and partners is not complete and does not cover all the possible options that SMEs have. For example, Lee et al. (2010) also include networking and funding as open innovation methods, but exclude research organizations and co-creation, whereas Ahn et al. (2015) comprise M&A and open sourcing, but neglect outsourcing. A choice had to be made on the selection of method and partner possibilities which was based on the conceptualization of open innovation provided, but there is the possibility that the selected list is not complete and exhaustive. Therefore, future research should study all the open innovation possibilities that are available to SMEs to ensure the full coverage of the process model.

Fourth, the differentiation between exploitation and exploration was presented and included in the paper, but how open innovation changes depending on the phase of the innovation process has not been extensively studied. Hence, an in-depth evaluation of the changes that open innovation would encounter depending on the phase of the innovation process is necessary. Furthermore, future studies should investigate how open innovation specifically in the exploration or exploitation phase affects innovation performance and organizational performance, and whether the effects of open innovation in the exploration phase on innovation performance, organizational performance and other important variables (e.g. profitability) are stronger or weaker than in the exploitation phase.

The fifth limitation relates to how partners were categorized for each open innovation method. In order to identify which partner possibility was available for each method, literature on open innovation, open innovation methods and partners was reviewed. If there was no literature available that combined an open innovation method with a partner, it was assumed that the combination was not possible. Researching in-depth each method and partner possibility would be useful to ensure the complete validity of the process model. Furthermore, it would be interesting as well as beneficial for the model to study how each

combination of method and partner affect open innovation performance, innovativeness and organizational performance.

Finally, the research and the process model did not take into account the possibility to combine different ways of open innovation. SMEs can, in fact, use multiple types, methods or partner of open innovation at the same time. Further research on how different types, methods or partners can be combined and what the effects would be on SMEs is therefore necessary.

Furthermore, it can also be argued that future research could contribute in extending the process model and, thus, include other activities or decisions in the flowchart presented in Appendix 1.

First of all, as it was often mentioned in this paper, intellectual property rights and protection are a very relevant issue for open innovation. SMEs should therefore evaluate whether their technology should be legally protected, whether they should disclose their intellectual properties to external parties and they should also understand how to treat the external knowledge gained through open innovation. Hence, intellectual property rights and how to handle this issue for each specific method and partner could be a potential addition to the proposed process model.

Secondly, the proposed model provides a list of conditions under which open innovation should be implemented in SMEs, which consist of motives and antecedents of open innovation. Nevertheless, only a few examples are provided for both the motives and antecedents. A useful addition to the model would be the development of an in-depth conceptualization of the different motives to adopt open innovation in SMEs and a maturity model to evaluate where the firm stands regarding the different antecedents of open innovation for SMEs. This addition would make it easier for SMEs' managers to analyze whether they have a need for open innovation and whether the right antecedents are in place to implement open innovation successfully.

Another possible addition to the developed process model could be the implementation of incentive strategies to motivate partners. Vergés Suárez (2014) argues that it is important and often becomes a challenge for firms to develop incentives in order to motivate external partners to collaborate with them. Therefore, an additional step in the process model could be the development of an incentive strategy to motivate partners based on the method and the partner chosen.

Even though the issue of partner identification was introduced in the paper, it was not integrated as one step in the process model, since existing literature did not provide extensive information on partner identification for each type of partner or method. It could be interesting to add an additional step before the partner selection dedicated to the identification of potential open innovation partners for each method and partner type. Different ways and methods to identify potential partners could be available depending on the method and partner chosen.

Finally, another important addition to the process model would be the implementation of an assessment and control strategy to ensure the success of the open innovation process. Both short-term and long-term objectives as well as measures should be set and evaluated during the implementation of open innovation. Moreover, Enkel et al. (2011) argue that continuous improvement in open innovation is required and they developed an open innovation maturity framework to measure and benchmark open innovation. Integrating such a framework in the proposed process model could be an interesting addition in order to ensure continuous improvement of the process of open innovation. Nevertheless, the framework should be adapted to

SMEs as the original framework was developed based on larger companies.

7. ACKNOWLEDGEMENTS

First of all, I would like to thank my supervisor, Dr. Matthias de Visser, for the great supervision while writing my bachelor thesis, his continuous support and valuable feedback. Furthermore, I would like to thank all of the students in my bachelor thesis circle for their feedback throughout the whole process of writing my thesis, their insights and the extended discussions were highly appreciated. Lastly, I would like to thank my parents for their continuous support during my studies and without whom I would have never been able to attain this degree.

8. REFERENCES

- Aguilar-Saven, R. S. (2004). Business process modelling: Review and framework. *International Journal of production economics*, 90(2), 129-149.
- Ahlstrom, D. (2010). Innovation and growth: How business contributes to society. *The Academy of Management Perspectives*, 24(3), 11-24.
- Ahn, J. M., Minshall, T., & Mortara, L. (2015). Open innovation: a new classification and its impact on firm performance in innovative SMEs.
- Anderson, P. and Tushman, M.L. (1990). Technological discontinuities and dominant designs: A cyclical model of technological change. *Administrative Science Quarterly*, 35, 4, 604-633.
- Andrew C. Inkpen, Steven C. Currall, (2004) The Coevolution of Trust, Control, and Learning in Joint Ventures. *Organization Science* 15(5):586-599.
- Apple - Partners. (2017). Retrieved May 27, 2017, from <https://www.apple.com/business/partners/>
- Arya, A., & Mittendorf, B. (2006). Enhancing vertical efficiency through horizontal licensing. *Journal of Regulatory Economics*, 29(3), 333-342.
- Barajas, A., Huergo, E., & Moreno, L. (2012). The impact of international research joint ventures on SMEs performance.
- Barnes & Noble. (2017). B&N Cafe. Retrieved May 27, 2017, from <http://www.barnesandnoble.com/h/cafe>
- Bigliardi, B., & Galati, F. (2016). Which factors hinder the adoption of open innovation in SMEs?. *Technology Analysis & Strategic Management*, 28(8), 869-885.
- Bogers, M., Bekkers, R., & Granstrand, O. (2012). Intellectual property and licensing strategies in open collaborative innovation.
- Brunswicker, S., & Ehrenmann, F. (2013). Managing open innovation in SMEs: A good practice example of a German software firm. *International Journal of Industrial Engineering and Management*, 4(1), 33-41.
- Brunswicker, S., & Vanhaverbeke, W. (2011). Beyond Open Innovation in Large Enterprises: How Do Small and Medium-Sized Enterprises (SMEs) Open Up to External Innovation Sources?
- Brunswicker, S., & Vanhaverbeke, W. (2015). Open innovation in small and medium-sized enterprises (SMEs): External knowledge sourcing strategies and internal organizational facilitators. *Journal of Small Business Management*, 53(4), 1241-1263.
- Chen, M. J. (1996). Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of management review*, 21(1), 100-134.
- Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press, Boston, MA.
- Chesbrough, H., & Crowther, A.K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R&D Management* 36 (3), 229-236.
- Chesbrough, H., Vanhaverbeke, W., & West, J., (2006). *Open Innovation: Researching a New Paradigm*. Oxford University Press, London.
- Choi, B., Lee, J. N., & Ham, J. (2016). Assessing the Impact of Open and Closed Knowledge Sourcing Approach on Innovation in Small and Medium Enterprises. *Procedia Computer Science*, 91, 314-323.
- Chung, S. A., & Kim, G. M. (2003). Performance effects of partnership between manufacturers and suppliers for new product development: the supplier's standpoint. *Research Policy*, 32(4), 587-603
- Cicchetti, D., & Rogosch, F. A. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology*, 8, 597-600.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.
- Dahan, E., & Hauser, J. R. (2002). The virtual customer. *Journal of Product Innovation Management*, 19(5), 332-353.
- Dahlander, L. & Gann, D. (2007). How Open is Innovation? *DRUID Summer Conference paper*.
- De Propriis, L. (2002) Types of innovation and inter-firm co-operation, *Entrepreneurship & Regional Development*, 14:4, 337-353
- De Toni, A., & Nassimbeni, G. (2003). Small and medium district enterprises and the new product development challenge: evidence from Italian eyewear district. *International Journal of Operations & Production Management*, 23(6), 678-697.
- Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management science*, 32(11), 1422-1433.
- Durst, S., & Stähle, P. (2013). Success Factors of Open Innovation-A Literature Review. *International Journal of Business Research and Management*, 4(4), 111-131.
- Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of management review*, 23(4), 660-679.
- Ebersberger, B., Bloch, C., Herstad, S. J., & Van De Velde, E. L. S. (2012). Open innovation practices and their effect on innovation performance. *International Journal of Innovation and Technology Management*, 9(06), 1250040.
- Elmuti, D., Abebe, M., & Nicolosi, M. (2005). An overview of strategic alliances between universities and corporations. *Journal of workplace Learning*, 17(1/2), 115-129.
- Engardio, P., Einhorn, B., Kripalani, M., Reinhardt, A., Nussbaum, B., & Burrows, P. (2005). Outsourcing innovation. *BusinessWeek Online*.

- Enkel, E., Bell, J., & Hogenkamp, H. (2011). Open innovation maturity framework. *International Journal of Innovation Management*, 15(06), 1161-1189.
- Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, 39(4), 311-316.
- Etgar, M. (2008). A descriptive model of the consumer co-production process. *Journal of the academy of marketing science*, 36(1), 97-108.
- Ettlie, J. E. (1983). Organizational policy and innovation among suppliers to the food processing sector. *Academy of Management journal*, 26(1), 27-44.
- Famuyiwa, O., Monplaisir, L., & Nepal, B. (2008). An integrated fuzzy-goal-programming-based framework for selecting suppliers in strategic alliance formation. *International Journal of Production Economics*, 113(2), 862-875.
- Ferradas, M. I. R. (2014). *Relevant factors in the implementation of open innovation practices: Application to the case of smes in the automotive sector* (Doctoral dissertation, Universidad de Navarra).
- Fershtman, C., & Kamien, M. I. (1992). Cross licensing of complementary technologies. *International Journal of Industrial Organization*, 10(3), 329-348.
- Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R&D Management*, 36(3), 223-228.
- Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R&D Management*, 40(3), 213-221.
- Gnyawali, D. R., & Park, B. J. R. (2011). Co-opetition between giants: Collaboration with competitors for technological innovation. *Research Policy*, 40(5), 650-663.
- Grando, A., & Belvedere, V. (2006). District's manufacturing performances: A comparison among large, small-to-medium-sized and district enterprises. *International Journal of Production Economics*, 104(1), 85-99.
- Greer, C. R., & Lei, D. (2012). Collaborative innovation with customers: A review of the literature and suggestions for future research. *International Journal of Management Reviews*, 14(1), 63-84.
- Guertler, M. R., Haymerle, R., Endres, F., & Lindemann, U. (2015, December). Identifying Open Innovation partners: a case study in plant manufacturing. In *ISPIM Innovation Symposium* (p. 1). The International Society for Professional Innovation Management (ISPIM).
- Hagelin, T. (2003). Valuation of patent licenses. *Tex. Intell. Prop. LJ*, 12, 423.
- Hamel, G., Doz, Y. L., & Prahalad, C. K. (1989). Collaborate with your competitors and win. *Harvard business review*, 67(1), 133-139.
- Han, J. K., Kim, N., & Srivastava, R. K. (1998). Market orientation and organizational performance: is innovation a missing link?. *The Journal of marketing*, 30-45.
- Harryson, S., Klikaite, S., & Dudkowski, R. (2008). Flexibility in innovation through external learning: exploring two models for enhanced industry? university collaboration. *International Journal of Technology Management*, 41(1-2), 109-137.
- Hart, C. (2001). Doing a literature search. London: Sage.
- Hendry, C., Brown, J., & Defillippi, R. (2000). Understanding relationships between universities and SMEs in emerging high technology industries: The case of optoelectronics. *International Journal of Innovation Management*, 4(01), 51-75.
- Huizingh, E. K. (2011). Open innovation: State of the art and future perspectives. *Technovation*, 31(1), 2-9
- Janeiro, P., Proença, I., & da Conceição Gonçalves, V. (2013). Open innovation: Factors explaining universities as service firm innovation sources. *Journal of Business Research*, 66(10), 2017-2023.
- Jeon, J., Lee, C., & Park, Y. (2011). How to use patent information to search potential technology partners in open innovation.
- Johnson, S. A., & Houston, M. B. (2000). A Reramination of the Motives and Gains in Joint Ventures. *Journal of Financial and Quantitative Analysis*, 35(01), 67-85.
- Judge, W. Q., & Dooley, R. (2006). Strategic alliance outcomes: a transaction-cost economics perspective. *British Journal of Management*, 17(1), 23-37.
- Kamien, M. I., Muller, E., & Zang, I. (1992). Research joint ventures and R&D cartels. *The American Economic Review*, 1293-1306.
- Kellogg Company. (2012). Kellogg Company And Wilmar International Limited Announce China Joint Venture. Retrieved May 28, 2017, from <http://newsroom.kelloggcompany.com/2012-09-24-Kellogg-Company-And-Wilmar-International-Limited-Announce-China-Joint-Venture>
- Killen, C. P., & Kjaer, C. (2012). Understanding project interdependencies: The role of visual representation, culture and process. *International Journal of Project Management*, 30(5), 554-566.
- Kline, D. (2003). Sharing the corporate crown jewels. *MIT Sloan management review*, 44(3), 89.
- Kogut, B. (1988). Joint ventures: Theoretical and empirical perspectives. *Strategic management journal*, 9(4), 319-332.
- Kogut, B. (1989). The stability of joint ventures: Reciprocity and competitive rivalry. *The Journal of Industrial Economics*, 183-198.
- Köhler, F. (2011). Patent cross-licensing, the influence of IP interdependency and the moderating effect of firm size. *The Journal of Technology Transfer*, 36(4), 448-467.
- Kowalski, S. P., Director, I. T. T. I., & Concord, N. H. (2009, December). SMES, open innovation and IP management: Advancing global development. In *A presentation at the WIPO-Italy International Convention on Intellectual Property and Competitiveness of Micro, Small and Medium-Sized Enterprises (MSMEs), Rome, Italy*.
- Koza, M. P., & Lewin, A. Y. (1998). The co-evolution of strategic alliances. *Organization science*, 9(3), 255-264.

- Lakin, R., Capon, N., & Botten, N. (1996). BPR enabling software for the financial services industry. *Management services*, 40(3), 18-20.
- Laursen, K., & Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic management journal*, 27(2), 131-150.
- Laursen, K., Leone, M. I., & Torrisi, S. (2010). Technological exploration through licensing: New insights from the licensee's point of view. *Industrial and Corporate Change*, dtq034.
- Lee, S., G. Park, B. Yoon, & J. Park (2010). Open Innovation in SMEs—An Intermediated Network Model. *Research Policy* 39(2), 290– 300.
- Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic management journal*, 14(S2), 95-112.
- Liao, J., Welsch, H., & Stoica, M. (2003). Organizational absorptive capacity and responsiveness: an empirical investigation of growth-oriented SMEs. *Entrepreneurship Theory and practice*, 28(1), 63-85.
- Lichtenthaler, U. (2005). External commercialization of knowledge: Review and research agenda. *International Journal of Management Reviews*, 7(4), 231-255.
- Lichtenthaler, U. (2011). Open Innovation: Past Research, Current Debates, and Future Directions. *Academy of Management Perspectives*.
- Link, A. N., & Scott, J. T. (2005). Universities as partners in US research joint ventures. *Research Policy*, 34(3), 385-393.
- March, J. G. (1991), "Exploration and Exploitation in Organizational Learning," *Organization Science*, 2, 1, 71–87.
- March, J. G. (1995), "The Future, Disposable Organizations and the Rigidities of Imagination," *Organization*, 2, 3/4, 427–440.
- Miotti, L., & Sachwald, F. (2003). Co-operative R&D: why and with whom?: An integrated framework of analysis. *Research policy*, 32(8), 1481-1499.
- Miotti, L., & Sachwald, F. (2003). Co-operative R&D: why and with whom?: An integrated framework of analysis. *Research policy*, 32(8), 1481-1499.
- Nerkar, A. T. U. L. (2007). The folly of rewarding patents and expecting FDA approved drugs: Experience and innovation in the pharmaceutical industry. *Kenan-Flagler Business School, University of North Carolina at Chapel Hill*.
- Nonaka, I. and Konno, N. (1998). The concept of 'ba': building a foundation for knowledge creation. *California Management Review*, 40, pp. 40–54.
- Oke, A., Burke, G., & Myers, A. (2007). Innovation types and performance in growing UK SMEs. *International Journal of Operations & Production Management*, Vol. 27 Issue: 7, pp.735-753
- Ozkan, N. N. (2015). An Example of Open Innovation: P&G. *Procedia-Social and Behavioral Sciences*, 195, 1496-1502.
- Padilla-Meléndez, A., & Garrido-Moreno, A. (2012). Open innovation in universities: What motivates researchers to engage in knowledge transfer exchanges?. *International Journal of Entrepreneurial Behavior & Research*, 18(4), 417-439.
- Parida, V., Westerberg, M., & Frishammar, J. (2012). Inbound Open Innovation Activities in High-Tech SMEs: The Impact on Innovation Performance. *Journal of Small Business Management*, 50(2), 283-309.
- Parkhe, A. (1993). Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm cooperation. *Academy of management journal*, 36(4), 794-829.
- Pfanner, E. (2014). Google and Samsung Sign Broad Cross-Licensing Agreement. Retrieved May 28, 2017, from https://www.nytimes.com/2014/01/28/technology/google-and-samsung-sign-broad-cross-licensing-agreement.html?_r=0
- Piller, F. T., Ihl, C., & Vossen, A. (2010). A typology of customer co-creation in the innovation process.
- Porter, M. E., & Stern, S. (2001). Innovation: location matters. *MIT Sloan management review*, 42(4), 28.
- Prahalad, C. K., & Ramaswamy, V. (2004). Co-creating unique value with customers. *Strategy & leadership*, 32(3), 4-9.
- Prandelli, E., Swahney, M., & Verona, G. (2008). *Collaborating with customers to innovate: Conceiving and marketing products in the networking age*. Edward Elgar Publishing.
- Pukkala, T. (2015). Managing Customer Co-Creation: Empirical Evidence from Finnish High-Tech SMEs.
- Pun, H., & Heese, H. S. (2014). Outsourcing to suppliers with unknown capabilities. *European Journal of Operational Research*, 234(1), 108-118.
- Quinn, J. B. (1992). The intelligent enterprise a new paradigm. *The Executive*, 6(4), 48-63.
- Quinn, J. B. (2000). Outsourcing innovation: the new engine of growth. *Sloan management review*, 41(4), 13.
- Raasch, C. (2011). The sticks and carrots of integrating users into product development. *International journal of technology management*, 56(1), 21-39.
- Ragatz, G. L., Handfield, R. B., & Petersen, K. J. (2002). Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *Journal of business research*, 55(5), 389-400.
- Ragatz, G. L., Handfield, R. B., & Scannell, T. V. (1997). Success factors for integrating suppliers into new product development. *Journal of product innovation management*, 14(3), 190-202.
- Reid, A. (2004). Bigger doesn't mean better: offshoring for SMEs [outsourcing]. *Engineering Management*, 14(6), 25-25.
- Rodríguez-Ferradas, M. I., & Alfaro-Tanco, J. A. (2016). Open innovation in automotive SMEs suppliers: an opportunity for new product development /Innovación abierta en PYMES proveedoras de automoción: una oportunidad para el desarrollo de nuevo producto. *Universia Business Review*, (50), 142.
- Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the

- relationship between innovation and performance in SMEs. *Journal of business Venturing*, 26(4), 441-457.
- Rothwell, R., 1994. Towards the fifth-generation innovation process. *International Marketing Review* 11 (1), 7–31.
- Sahay, B. S. (2003). Supply chain collaboration: the key to value creation. *Work Study*, 52(2), 76-83
- Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, 4(1), 5-18.
- Schilling, M. (2006). *Strategic Management of Technological Innovation*. McGraw-Hill, Irwin.
- Schwab, S., Koch, J., Flachskampf, P., & Isenhardt, I. (2011, June). Strategic implementation of open innovation methods in small and medium-sized enterprises. In *Concurrent Enterprising (ICE), 2011 17th International Conference on* (pp. 1-8). IEEE
- Shepard, A. (1987). Licensing to enhance demand for new technologies. *The Rand journal of economics*, 360-368.
- Sikimic, U., Chiesa, V., Frattini, F., & Scalera, V. G. (2016). Investigating the Influence of Technology Inflows on Technology Outflows in Open Innovation Processes: A Longitudinal Analysis. *Journal of Product Innovation Management*, 33(6), 652-669.
- Solow, R. (1957) Technical change and the aggregate production function. *Review of Economics and Statistics*, 39, 312–320.
- Spithoven, A., Vanhaverbeke, W., & Roijackers, N. (2013). Open innovation practices in SMEs and large enterprises. *Small Business Economics*, 41(3), 537-562.
- Storey, D. J. (1994). Understanding the Small Business Sector.
- Sydow, J., & Windeler, A. (1998). Organizing and evaluating interfirm networks: A structurationist perspective on network processes and effectiveness. *Organization science*, 9(3), 265-284.
- Tether, B. S. (2002). Who co-operates for innovation, and why: an empirical analysis. *Research policy*, 31(6), 947-967.
- Todorova, G., & Durisin, B. (2007). Absorptive capacity: Valuing a reconceptualization. *Academy of Management* 32, no. 3: 774–786.
- Tödting, F., Prud'homme van Reine, P., & Dörhöfer, S. (2011). Open innovation and regional culture—findings from different industrial and regional settings. *European Planning Studies*, 19(11), 1885-1907.
- Trott, P., & Hartmann, D. A. P. (2009). Why 'open innovation' is old wine in new bottles. *International Journal of Innovation Management*, 13(04), 715-736.
- Tsai, W. (2002). Social structure of “coopetition” within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing. *Organization science*, 13(2), 179-190.
- Van de Vrande, V., De Jong, J. P., Vanhaverbeke, W., & De Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*, 29(6), 423-437.
- Van Gils, A., & Zwart, P. (2004). Knowledge Acquisition and Learning in Dutch and Belgian SMEs:: The Role of Strategic Alliances. *European Management Journal*, 22(6), 685-692.
- Vanhaverbeke, W., Vermeersch, I., & De Zutter, S. (2012). Open innovation in SMEs: How can small companies and start-ups benefit from open innovation strategies?.
- Varis, M., & Littunen, H. (2010). Types of innovation, sources of information and performance in entrepreneurial SMEs. *European Journal of Innovation Management*, Vol. 13 Iss 2 pp. 128 – 154
- Verbano, C., Crema, M., & Venturini, K. (2011). Integration and selectivity in open innovation: an empirical analysis in SMEs. *Globalization*, 90(5), 32.
- Vergés Suárez, M. (2014). *Identification and search for suitable Open Innovation partners* (Bachelor's thesis, Universitat Politècnica de Catalunya).
- Von Hippel, E. (2005). Democratizing innovation: The evolving phenomenon of user innovation. *Journal für Betriebswirtschaft*, 55(1), 63-78.
- Wolff, J. A., & Pett, T. L. (2006). Small-firm performance: modeling the role of product and process improvements. *Journal of Small Business Management*, 44(2), 268-284.
- Yoon, B., Shin, J., & Lee, S. (2016). Open Innovation Projects in SMEs as an Engine for Sustainable Growth. *Sustainability*, 8(2), 146.
- Zaborek, P., & Mazur, J. (2015). Does engaging customers support SMEs' innovation? A survey of Polish manufacturing and service companies. In *11th INTERNATIONAL CONFERENCE of ASECU “OPENNESS, INNOVATION, EFFICIENCY AND DEMOCRATIZATION AS PRECONDITIONS FOR ECONOMIC DEVELOPMENT”* (p. 315).
- Zahra, S. A., & Chaples, S. S. (1993). Blind spots in competitive analysis. *The Academy of Management Executive*, 7(2), 7-28.
- Zeng, S. X., Xie, X. M., & Tam, C. M. (2010). Relationship between cooperation networks and innovation performance of SMEs. *Technovation*, 30(3), 181-194.
- Zwass, V. (2010). Co-creation: Toward a taxonomy and an integrated research perspective. *International Journal of Electronic Commerce*, 15(1), 11-48.

9. APPENDIX

9.1 Appendix 1 – Flowchart of Open Innovation Process Model for SMEs

