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► To cite this version:

Elodie Pillon, Mourad Messaadia, Anne Louis, Thomas Loilier. Strategic and organizational determinants for open innovation practices in SMEs : a conceptual framework. WOIC 2019, University of California, Berkeley, Dec 2019, Rome (Virtual), Italy. hal-04093824

HAL Id: hal-04093824

<https://hal.science/hal-04093824>

Submitted on 10 May 2023

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Strategic and organizational determinants for open innovation practices in SMEs : a conceptual framework.

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Abstract – The objective of our study is to contribute to the understanding of the OI adoption in the context of SMEs by exploring the specific strategic and organizational characteristics of this type of enterprise, and identify the determinants that enable them to adopt OI practices. Through a rigorous literature review of 98 articles and books, we identified 22 organizational characteristics, 3 strategic characteristics and 12 OI practices. These determinants have been grouped according to four of the five levels of analysis recommended by Bogers et al (2017). Based on the results obtained, we proposed a conceptual model for the OI adoption in SMEs that links strategic and organizational characteristics to practices. For academics, the results will contribute to have a better understanding of factors that influence OI adoption in the specific context of SMEs. The proposed conceptual framework will also provide a basis for future researches. For managers, these results will help them to take better account of organizational and strategic characteristics in order to develop the openness of SMEs.

Keywords – open innovation, SME, practices, organizational and strategic characteristics.

1. Introduction

Since few years, research has focused on open innovation (OI) and small and medium enterprise (SME) (Usman, Roijakkers, Vanhaverbeke, & Frattini, 2018), attempting to identify the characteristics and determinants of this approach in the specific context of SMEs (Bigliardi & Galati, 2016; Brunswicker & Vanhaverbeke, 2015; Parida, Westerberg, & Frishammar, 2012; Spithoven, Vanhaverbeke, & Roijakkers, 2013; Usman et al., 2018). Despite this interest, this field of research remains limited and some studies show contradictory results. While some studies consider that OI allows SMEs to cope with resource constraints (time, money, etc.) and skills gaps (Bougrain & Haudeville, 2002; Dahlander & Gann, 2010; Lee, Park, Yoon, & Park, 2010; Rahman & Ramos, 2010; Verbano, Crema, & Venturini, 2015; Wyncarczyk, Piperopoulos, & McAdam, 2013) another part of the literature has also highlighted its disadvantages such as more complex innovation processes leading to higher managerial costs, the "not invented here" syndrome, undesirable spillovers and other effects that reduce companies' competitive advantage (Ahn, Minshall, & Mortara, 2018; Cheng & Shiu, 2017; Enkel, Gassmann, & Chesbrough, 2009; Lazzarotti & Manzini, 2009; Van de Vrande, De Jong, Vanhaverbeke, & De Rochemont, 2009; West & Gallagher, 2006).

A previous study (Pillon & Loilier, 2019) on the diffusion of OI practices in four different countries represented by Germany, Great-britain, Italy and Korea showed that contextual effect alone is not enough to explain the diversity of OI adoption processes. While this diversity results from the cultural aspect of the environment, other characteristics also seem to impact it. Recognizing both the benefits and costs of OI, the literature suggests that the optimal degree of openness for a given firm would thus result from a balance between the positive and negative effects of OI in a given context characterized by internal and external factors (Reed, Storrud-Barnes, & Jessup, 2012; Sandulli, Fernandez-Menendez, Rodriguez-Duarte, & Lopez-Sanchez, 2012; West & Gallagher, 2006). The approach chosen by companies should depend on its consistency with strategic, organizational and managerial contexts (Lazzarotti & Manzini, 2009).

To better understand the OI adoption by SMEs, it seems to be interested to explore specific SMEs' strategic and organizational characteristics and to identify the determinants that enable SMEs to adopt this approach. In this way, our research question is what are the main strategic and organizational determinants of OI in SMEs? Our answers will provide a twofold contribution. From a theoretical point

of view, the results will contribute to have a better understanding of the factors that influence the OI adoption specific context of SMEs. The proposed conceptual framework will also provide a basis for future researches. From a managerial point of view, these results could help SMEs' manager to define strengths and weaknesses in OI and identify the appropriate OI practices to be implemented according to SME's characteristics.

2. Levels of determinants of OI.

Various studies have examined the determinants and processes of OI in SMEs. Most of them have shown that a multitude of factors at different analysis levels affect the OI adoption in SMEs (Bigliardi & Galati, 2016; Dries, Pascucci, Török, & Tóth, 2014; Dufour & Son, 2015; Manzini, Lazzarotti, & Pellegrini, 2017). Current research on OI approaches the firm as a unit of analysis, although it is increasingly recognized that to obtain a more detailed understanding of the OI adoption or practices, other levels of analysis must also be considered (Bogers & West, 2014; Bogers et al., 2017). Based on the analysis units of Chesbrough and Bogers (2014), Bogers et al. (2017) introduce five levels of analysis.

2.1. Intra-organizational level.

The OI strategies deployed depend heavily on the individuals responsible for implementing them (Bogers et al., 2017; Comacchio, Bonesso, & Pizzi, 2012). Employees are generally confronted with a number of challenges that companies must face in order for OI to be profitable (Salter, Criscuolo, & Ter Wal, 2014). These challenges may relate to how to manage the "not invented here" syndrome (Burcharth, Knudsen, & Søndergaard, 2014), how R&D employees should spend their time on innovation within and/or outside the company (Dahlander, Mahony, & Gann, 2016) or how all employees can contribute to innovation (Bogers & Horst, 2014).

To advance the understanding of OI, Bogers et al. (2017) suggest that research should focus on understanding the factors that motivate employees and R&D managers to adopt OI models. They also suggest to study how managers choose and manage the multiple outside-in opportunities and initiatives or reveal why individuals differ in their ability to contribute to the effective identification of external knowledge, its integration with internal knowledge and its use. Such approaches require the mobilization of sociocognitive theories of resistance to change (Ford, Ford, & D'Amelio, 2008) or learning theories.

2.2. Organizational level.

Organizational factors influence SMEs' ability to implement and manage OI (Gurău & Lasch, 2011; Naqshbandi, 2018), and companies need to develop specific organizational capacities to implement an OI approach (Salvador, Montagna, & Marcolin, 2013). The OI model suggests combining internal innovation with other sources of knowledge (Ramirez-Portilla, Cagno, & Brown, 2017). A company's internal R&D capacity appears to be a crucial component of the OI process (Wynarczyk et al., 2013) and the size of the department's technical staff is considered critical (Akinwale, 2018). Nevertheless, it seems preferable for a company to have a good R&D capacity and partially open its innovation process rather than to fully open its innovation process and have a too low innovation capacity (Verbano et al., 2015). The size of the company has also a significant impact on the OI adoption. In fact, there are significant differences in the adoption of OI practices between different size class (Van de Vrande et al., 2009), and OI strategies differ considerably between micro, small, medium and large firms (Dooley, Kenny, & Cronin, 2016; Rangus & Drnovsek, 2013). Finally, the culture of innovation also seems to play a role.

To contribute to a better understanding of how the various approaches to OI lead to various processes, future research should focus on the possible existence of organizational characteristics that would determine the success of an OI approach in this environment (Bogers et al., 2017).

2.3. Inter-organizational level.

To be effective, OI requires various types of interactions and knowledge flows between different organizations. So, OI describes new dynamic network structures resulting from dynamic interactions between a diverse set of organizations during the innovation process (Dhanaraj & Parkhe, 2006). For a

company and in particular an SME, the network is a major element in an OI process. However, this network must meet different conditions to be effective, in particular that of the complementarity of the actors. This complementarity can be technological, capacity or product knowledge (H.-C. Huang, Lai, & Huang, 2015).

The opening up to nearby external innovation resources seems to be linked to a lack of time and the need to make rapid use of new knowledge. It should be noted that this enthusiasm for openness must nevertheless be tempered by an understanding of the costs and risks it generates. As it appears that there is a tipping points after which openness (in terms of depth and scope) can negatively affect the company's innovative performance, external sources must be managed so that research efforts are not dispersed over too many research channels (Laursen & Salter, 2006).

2.4. Extra-organizational level.

The effectiveness of OI also depends of the active participation of external stakeholders either as contributors to the creation of new knowledge or as receptors of knowledge used to generate innovations. One of the largest sources of OI on which companies rely is undoubtedly the knowledge of users or customers (Laursen & Salter, 2006; Piller & West, 2014). The opening of the innovation process to external stakeholders can be supported by digitisation. The ubiquity of information and communication technologies and global supply makes it possible to develop platforms that promote connectivity and integration between various actors (Chesbrough & Bogers, 2014). This is the case, for example, with crowdsourcing (Seidel, Langner, & Sims, 2017).

Possible differences between stakeholders may lead to heterogeneous factors that may or may not contribute to the OI adoption. When the knowledge is related to the preferences/needs of customers/users, or to a context that requires experts to contribute to the definition of the problem and the contribution of knowledge to the solutions, the integration of external actors is relevant. On the other hand, their importance decreases in situations where knowledge is tacit and its development is linked to the contextual aspects of an organization. The study of the relationships between different types of extra-organizational individuals and different types of knowledge creation and innovation processes would advance the understanding of OI and its effectiveness (Bogers et al., 2017).

2.5. Sectoral level.

OI does not have the same effect in all situations, and at analysis levels higher than those of the company, OI is considered in a wide variety of contexts beyond the innovation capacity and profitability of companies. Technological turbulence, the presence of intermediaries, the dynamism of the environment and the role of governments in promoting OI (Brunswick & Vanhaverbeke, 2015; Martinez-conesa, Soto-acosta, & Carayannis, 2017; Popa, Soto-Acosta, & Martinez-Conesa, 2017; Wynarczyk et al., 2013) are elements involved in the implementation of OI. The sector of activity is also one of the elements that impacts the OI adoption (Bigliardi & Galati, 2016; Presenza, Abbate, Meleddu, & Cesaroni, 2016).

3. OI in SMEs as a research subject.

The OI paradigm was initially based on large high-tech companies (Chesbrough, 2006a) before expanding to other sectors of activity (Dahlander & Gann, 2010). In recent years, research on OI in SMEs has grown rapidly (Lee et al., 2010; Van de Vrande et al., 2009), demonstrating that in terms of resources, skills, business strategy, etc., SMEs represent unique contexts (Van de Vrande et al., 2009; Vanhaverbeke, Vermeersch, & De Zutter, 2012). The size of the SME, its organizational stage, its ability to develop partnerships and its ability to identify partners with complementary resources influence the SME's ability to implement an OI approach (Gurău & Lasch, 2011; Lichtenthaler, 2008). In general, the main difficulties encountered in the field of innovation by SMEs come mainly from their small size and their limited number of resources (Freel, 2000; Narula, 2002; Teece, 1986). Due to their specificities and distinct characteristics, SMEs require different approaches than those used for large companies (Ahn, Mortara, & Minshall, 2013; Vanhaverbeke et al., 2012). Even if OI adoption is one of the most studied topic (Usman et al., 2018), OI determinants in SMEs are not fully understand. According to its

rich concept, OI can be implemented in different ways. Huizing (2011) explains that OI must be studied through three different dimensions : the content (classification of openness, the inbound and outbound activities and the effectiveness), the context (internal and external context characteristics) and the process (practices). OI adoption by SMEs could not be explained without explicitly taking into account the relations between adopted OI practices and strategical or organizational characteristics. Few studies explored the main OI determinants in SMEs to provide fully understanding, and according to our state of the art analysis, none of the studies currently offer an integrated conceptual framework for OI in the specific context of SME. Hence, through a literature review, our paper aims to fill these gaps by proposing a conceptual framework to identify strategic and organizational determinants for adopting OI practices in SMEs.

4. Methodology.

In order to have relevant evidence and rigorous method, we based our literature review process (Table 1) on the Tranfiel et al. (2003) and Scaringella and Radziwon (2018) approaches. The aim was to select and analyse relevant papers, which dealt at the same time with OI and SMEs themes. Tranfiel, Denyer and Smart's (2003) designed a review strategy with a number of stages designed to provide a systematic and explicit method for the review.

Steps	Objectives	Outcomes
Initial search	<ul style="list-style-type: none"> – Database selection. – Identification of the key search terms. 	<ul style="list-style-type: none"> – Database selection choice. – Preliminary list of search keywords.
Scoping studies	<ul style="list-style-type: none"> – Evaluation of the size of the literature. – Definition of the search criteria. 	<ul style="list-style-type: none"> – Search protocol with inclusion and exclusion criteria
Article search	<ul style="list-style-type: none"> – Identification of the main articles. 	<ul style="list-style-type: none"> – Articles with the best fit with the study
Article selection	<ul style="list-style-type: none"> – Creation of a Mendeley database containing all articles that meet the search protocol. 	<ul style="list-style-type: none"> – Articles for the literature review with all bibliometric information.
Reference backtracking	<ul style="list-style-type: none"> – Identification of all potentially missing papers from the bibliography section of articles issued from previously steps. – Reach saturation 	<ul style="list-style-type: none"> – Completed list of the articles with the best fit with the study.
Content analysis	<ul style="list-style-type: none"> – Identification of key terms, definitions, and theoretical frameworks. 	<ul style="list-style-type: none"> – Content information analysis. – Identification of the main strategic and organizational determinants of OI in SMEs. – Development of a framework that bridges the main determinants with the different levels of analysis

Table 1: Literature review process based on Scaringella and Radziwon (2018, p. 61)

4.1. Search protocol.

For the database selection, we use the free Google Scholar database. Compared to traditional databases such as Web of Science, Google Scholar extends the scope of coverage beyond a set of peer-reviewed journals, thus providing a more complete picture of available resources (Levine-Clark & Gil, 2009). We also identified the relevant concepts related to our subject. In addition to OI, the research also included other concepts related to OI, including the terms external innovation, outsourcing, outside-in, inside-out, coupled process, co-opetition, openness, inbound, and outbound. The goal behind this range of concepts is to take into account articles that have not been, explicitly, identified by the term of OI, but

still address some of its aspects. As our study is specific to the SME context, we have also used key words, such as small manufacturing, SME, Small and Medium-Sized Enterprises. These keywords were then concatenated into a research chain such as [(open innovation OR external innovation OR outsourcing OR outside-in OR inside-out OR coupled process OR co-opetition OR openness OR inbound OR outbound) AND (SME OR small sized OR medium sized OR small manufacturing)]. The data collection was initiated by searching articles listed on Google Scholar from January 2003 to March 2018 where OI practices were examined. To reduce the number of publications and select the most relevant articles, we only included in our literature review articles with titles and abstracts that fit with our inclusion and exclusion criteria (Table 2).

Defined criteria	Justification
<i>Inclusion criteria</i>	
Articles, books' chapter indexed in Google Scholar.	All major journals and other publications indexed in the Google Scholar database.
Theoretical, conceptual, empirical, qualitative, quantitative and conceptual methodologies, literature reviews.	The goal is to include as many relevant academic publications as possible.
<i>Exclusion criteria</i>	
Studies published before 2003.	The concept of OI was created in 2003. Studies prior 2003 are therefore not taken into account.
Other language than French or English.	The two languages most often used by the most relevant management databases. Also, due to language constraints, articles in other languages were not selected.
Conference papers, articles from business magazines, editorials or similar publications.	Only articles from scientific journals, books and book chapters were considered.
Studies on the role of the entrepreneur-manager.	The role of the entrepreneur in the innovation process of SMEs is a widely studied subject that we do not wish to address in this paper.
Other research area than management, business, and economics	Categories the most relevant for our study.

Table 2 : Inclusion and exclusion criteria.

To add any missing publications and ensure that we covered the entire bibliography, we conducted the same keyword search in the bibliographies of the identified articles and reviewed their titles and abstracts according to the same inclusion and exclusion criteria as stated above.

4.2. Data analysis.

After completing the list of 91 articles and 7 books with the best fit with our study, we conducted the content analysis. We reviewed all this publications to identified key terms, definitions, and theoretical frameworks related to strategic and organizational determinants of OI in SMEs. For the purposes of our study, we conceived a Microsoft Excel database containing, for each publication, its references (author, title, year, academic journal or editor) and its most relevant citations related to determinants of OI in SMEs. Assuming that there is extreme heterogeneity between SMEs and that traditional typologies based on quantitative criteria have limitations (Julien, 1990), our literature review allowed to identify 22 characteristics that influence the adoption of OI practices in SMEs. These different identified

determinants were then classified according to the different levels of analysis. We specify that the intra-organizational level of analysis is relatively well documented in the literature and that the future directions envisaged involve broader fields than innovation management. For these reasons, we have chosen not to use this analysis level.

5. Characteristics of OI in SMEs.

The content analysis shows that specific strategic and organizational determinants are correlated with different OI practices. In the next section, we will give an overview of these determinants issued from our literature review and we will explore all the practices identified through this literature review. To finish, we will propose our conceptual framework that bridges the context (strategic and organizational characteristics) and the process (OI practices) dimension within the meaning of Huizing (2011).

5.1. Organizational characteristics.

This section presents the main characteristics of SMEs, and more specifically the main factors that are most relevant concerning the OI in the SME context. Figure 1 summarizes all these determinants identified by different levels of analysis. Other factors distinguishing SMEs and not relevant for the opening of their innovation processes will not be presented.

One of the main characteristics of the SME is undoubtedly its small size (Andries & Faems, 2013; Brunswicker & Van de Vrande, 2014; Brunswicker & Vanhaverbeke, 2011; Chesbrough & Vanhaverbeke, 2018; Gassmann, Enkel, & Chesbrough, 2010; Gnyawali & Park, 2009; González-Benito, Muñoz-Gallego, & García-Zamora, 2016; Hossain & Kauranen, 2016; Narula, 2004; Sağ, Sezen, & Güzel, 2016; Theyel, 2013; Usman et al., 2018; Van de Vrande et al., 2009; Verbano et al., 2015; Vrgovic, Vidicki, Glassman, & Walton, 2012) which can be both a strength and a weakness. Indeed, the limits of SMEs are generally linked to insufficient resources, whether human, financial or IT (Bianchi, Campodall'Orto, Frattini, & Vercesi, 2010; Bigliardi & Galati, 2018; Gassmann, 2006; Gellynck & Kühne, 2010; Gnyawali & Park, 2009; Lee et al., 2010; Rahman & Ramos, 2010; Sağ et al., 2016; Stanisławski & Lisowska, 2015; West & Gallagher, 2006; Wynarczyk et al., 2013; Xiaobao, Wei, & Yuzhen, 2013). To address these challenges, SMEs are therefore turning to OI models and collaborating with other firms (Brunswicker & Vanhaverbeke, 2015; Chesbrough, 2006c; Chiaroni, Chiesa, & Frattini, 2010; Edwards, Delbridge, & Munday, 2005; F. Huang & Rice, 2009; Presenza et al., 2016; Sağ et al., 2016; Teirlinck & Spithoven, 2013; West & Gallagher, 2006). With limited financial resources, SMEs may face difficulties in financing OI activities (Bigliardi & Galati, 2016; Gellynck & Kühne, 2010; Vanhaverbeke et al., 2012; Xiaobao et al., 2013) and foster those that require few or no money (Chesbrough & Vanhaverbeke, 2018; Dahlander & Gann, 2010; Sağ et al., 2016; Van de Vrande et al., 2009; Wynarczyk et al., 2013).

The relatively small number of employees gives to the SME an informal character that favours process adjustment and a rapid reaction to change (Brunswicker & Vanhaverbeke, 2015; Dodgson, 2000; Dufour & Son, 2015; Lee et al., 2010; Van de Vrande et al., 2009). This adaptability is an advantage in accelerating the innovation process, in particular with regard to absorptive capacity. Improving absorption capacity leads to a greater propensity to engage in both research cooperation and outsourcing of R&D. However, the R&D capacity (Chesbrough & Crowther, 2006; Manzini et al., 2017; Marangos & Warren, 2017; Narula, 2004; van Hemert, Nijkamp, & Masurel, 2013; Yoon, Shin, & Lee, 2016; Zeng, Xie, & Tam, 2010) and the proportion of employees dedicated to it (Akinwale, 2018) have a positive and significant correlation with SME performance (Andries & Faems, 2013; Lee et al., 2010; Weil, de Charentenay, & Sanz, 2010). SME policies are also specific (Dufour & Son, 2015). The decision-making process is generally centralized at the manager level (Torres, 2000), who is responsible for many aspects of the company and most management system decisions (Dufour & Son, 2015; Zahra & Filatotchev, 2004). But the changes generated by his decisions can bring more managerial complexity (Bianchi, Cavaliere, Chiaroni, Frattini, & Chiesa, 2011; Dodgson, Gann, & Salter, 2006; Dufour & Son, 2015; Enkel et al., 2009; Freel & Robson, 2017; Hossain, 2015; Knudsen & Mortensen, 2011; Laursen & Salter, 2014; Parida et al., 2012; Pénin, Hussler, & Burger-Helmchen, 2011; Popa et al., 2017; Savitskaya, Salmi, & Torkkeli, 2010; Vanhaverbeke, van de Vrande, & Chesbrough, 2008; Verbano et al., 2015; Weil et al., 2010; West & Gallagher, 2006; Wynarczyk et al., 2013; Xiaobao et al., 2013). In

most cases, the lack of time devoted to strategic decision-making leads the manager to maintain a short-term vision of his company's strategy. This lack of time can be exacerbated by administrative burdens related to collaborations or grants (Van de Vrande et al., 2009; Yoon et al., 2016), or by time-consuming daily tasks that are necessary to ensure the company's sustainability (Igartua, Garrigos, & Hervás-Oliver, 2010; Knudsen & Mortensen, 2011; Savitskaya et al., 2010; Van de Vrande et al., 2009; Verbano et al., 2015).

Innovation potential being an essential element in this approach (Brunswick & Vanhaverbeke, 2011; Krause & Schutte, 2016; Pustovrh, Jaklič, Martin, & Raškovič, 2017; Stanisławski & Lisowska, 2015; van Hemert et al., 2013; Verbano et al., 2015; Xiaobao et al., 2013), SMEs generally rely on their own initiatives when seeking new methods of innovation (Chesbrough, 2006b; Chesbrough & Crowther, 2006; Manzini et al., 2017; Usman et al., 2018; Van de Vrande et al., 2009; van Hemert et al., 2013; West & Gallagher, 2006). These companies generally have strong operational expertise (Bianchi et al., 2010; Christensen, Olesen, & Kjaer, 2005; Rahman & Ramos, 2010), and are sometimes faced with a loss of know-how (Enkel et al., 2009; Enkel, Kausch, & Gassmann, 2005; Lee et al., 2010; Teirlinck & Spithoven, 2013; Xiaobao et al., 2013). As knowledge is increasingly disseminated (Bogers, Chesbrough, & Moedas, 2018; Chesbrough, 2006b; Chesbrough & Vanhaverbeke, 2018; Gassmann, 2006; West & Gallagher, 2006), information monitoring capacity plays a significant role in an OI approach (Chesbrough & Crowther, 2006; F. Huang & Rice, 2009; Sağ et al., 2016; Van de Vrande et al., 2009; Verbano et al., 2015; Xiaobao et al., 2013) because it allows to identify the knowledge to be assimilated and the potential partnerships to be realized.

Whether hierarchical, functional or spatial, the notion of proximity is considered central in SMEs (Torres, 2002). Thus, SMEs attach importance to territorial proximity (Bjerke & Johansson, 2015; Idrissia, Amaraa, & Landrya, 2012; Loilier & Tellier, 2011; Oughton, Mortara, & Minshall, 2013; Rahman & Ramos, 2010). In this sense, the geographical territory plays a significant role in SMEs' OI approaches (Oughton et al., 2013). Partners also play an essential role in the effectiveness of innovation approaches, particularly in terms of trust level (Chesbrough, 2006b; Gardet & Fraiha, 2012; Gellynck & Kühne, 2010; Gronum, Verreynne, & Kastele, 2012; Hossain, 2015; Pullen, Weerd-nederhof, Groen, & Fisscher, 2012; Vrgovic et al., 2012) heterogeneity and complementarities (Bianchi et al., 2011; Bogers & West, 2012; Gronum et al., 2012; Manzini et al., 2017; Pullen et al., 2012; Teirlinck & Spithoven, 2013; Van de Vrande et al., 2009; Verbano et al., 2015). This proximity is also evident at the user level, as SMEs seek to integrate users to improve their innovation process (Bogers & West, 2012; Bogers et al., 2017; Christensen et al., 2005; Gassmann, 2006; Gassmann et al., 2010; Loilier & Tellier, 2011; Theyel, 2013; Van de Vrande et al., 2009; Weil et al., 2010; Wyncarczyk et al., 2013). Nevertheless, an excessive dependence on the customer reduces the company's performance in terms of innovation (Elmqvist, Fredberg, & Ollila, 2009; Enkel et al., 2005; Van de Vrande et al., 2009; Verbano et al., 2015).

Finally, according to the activity sector which they belong, SMEs do not adopt the same OI approaches (Bianchi et al., 2011; Bigliardi & Galati, 2016; Brunswick & Vanhaverbeke, 2011, 2015; Chesbrough, 2006c, 2006b; Chesbrough & Vanhaverbeke, 2018; Dries et al., 2014; Gassmann, 2006; Gassmann et al., 2010; Oakey, 2013; Saguy & Sirotinskaya, 2014; Van de Vrande et al., 2009; West & Gallagher, 2006).

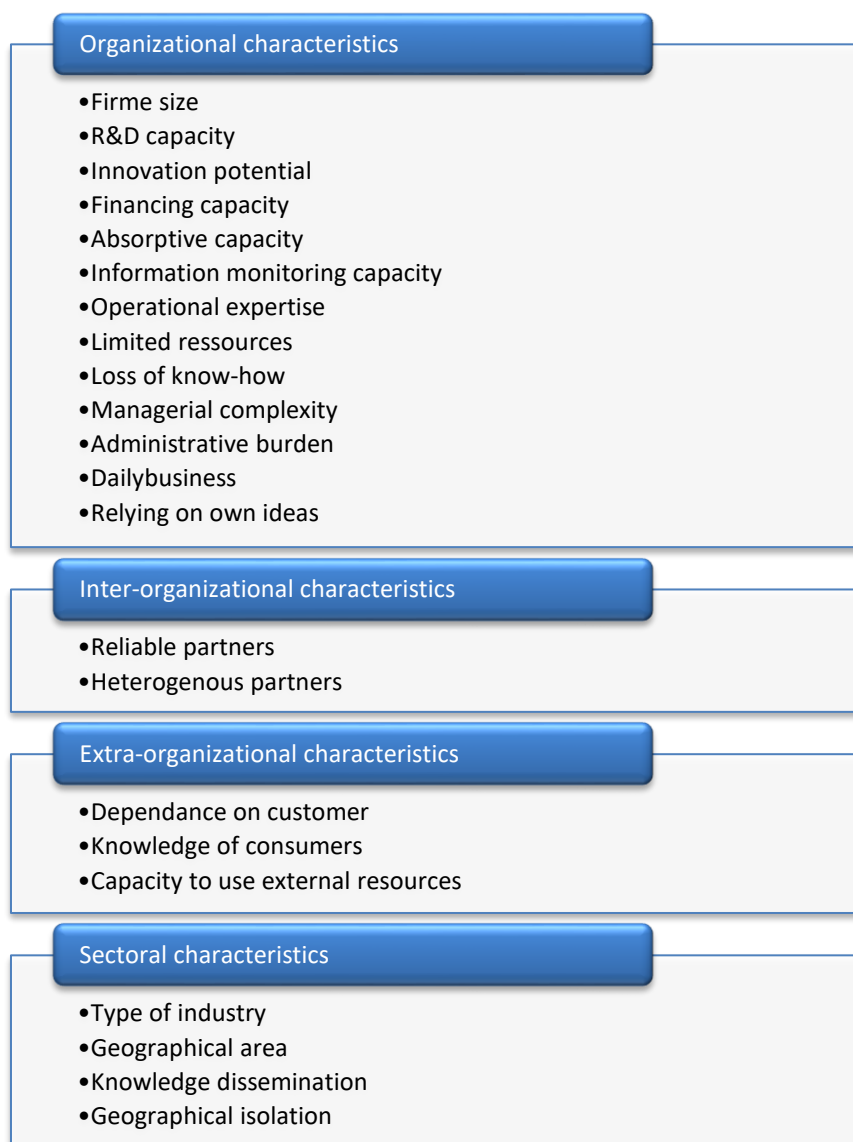


Figure 1 : Organizational determinants of OI in SME.

5.2. Strategic characteristics.

Absorption capacity is the company's ability to recognize the value of new external information, assimilate it and apply it for commercial purposes (Cohen & Levinthal, 1990). This capacity can be subdivided into two subsets (Zahra & George, 2002), one referring to the acquisition and assimilation of knowledge, and the other referring to the transformation and exploitation of knowledge. Exploitation is based on the mobilization of the company's core competencies on technological and marketing dimensions with the aim of renewing the different product lines by reusing existing knowledge (Chanal & Mothe, 2005). Exploration activities refer to variation, experimentation, flexibility, innovation, play and discovery (March, 1991). They allow the development of new knowledge that was previously unknown (Levinthal & March, 1993). If the company seeks continuity, in particular by improving technologies and processes that are already under control, it is part of an operating logic. If the SME is looking for a break, it will be in a logic of exploration. Exploitation and exploration activities differ because an organization that adopts an exploration approach seeks to learn from its experiences, while an organization that develops an exploitation approach seeks to carry out activities that mobilize existing knowledge (March, 1991). The conduct of exploration and exploitation activities is a necessary condition for successful OI approach (Loilier & Tellier, 2011). Nevertheless, these simultaneous activities represent one of the major constraints for SMEs (Zhang & Chen, 2014).

5.3. *OI practices*

OI strategies allows to explore remote topics from the firm's core competence and thus produce complex innovations that would not have emerged if they had been developed individually (Almirall & Casadesus-Masanell, 2010). To meet such strategic needs, companies develop various practices that can take several legal forms such as the direct sale of licenses and patents or partnerships within cooperation networks. A review of the literature reveals at least 12 types of practices (Table 3) related to an opening strategy.

Practices	Definition	Main references
Licensing-in	Exploiting external knowledge to reduce time-to-market and find new ideas	(Burcharth et al., 2014; Chesbrough, 2003; Gassmann, 2006; Lee et al., 2010; Van de Vrande et al., 2009; Wynarczyk et al., 2013)
Network	Drawing on or collaborating with external network partners to support innovation processes.	(Lee et al., 2010; Van de Vrande et al., 2009; Wynarczyk et al., 2013)
Capital venture	Invest in promising venture companies to bring new ideas.	(Kim et al., 2008; Waites & Dies, 2006)
Crowdsourcing	Outsource an activity to a large number of anonymous actor.	(Howe, 2006; Pénin & Burger-Helmchen, 2012; Schenk & Guittard, 2016)
Know-how acquisition	Buy R&D services provided by external organizations	(Burcharth et al., 2014; Gassmann, 2006; Harland & Nienaber, 2014; Holzmann, Sailer, Galbraith, & Katzy, 2014; Wynarczyk et al., 2013)
Customer involvement	Accessing new ideas by involving customers in the R&D or design process.	(Burcharth et al., 2014; Gassmann, 2006; Van de Vrande et al., 2009; Von Hippel, 1986)
Co- R&D	Conducting R&D with external partners	(Burcharth et al., 2014; Chesbrough, 2006c; Gassmann, 2006; Harland & Nienaber, 2014; Holzmann et al., 2014; Lee et al., 2010; Montelisciani, Gabelloni, Tazzini, & Fantoni, 2014; Tennenhouse, 2004; Van de Vrande et al., 2009; Wynarczyk et al., 2013)
Research consortium	Pool resources and commit to perform services to achieve a contracted research project.	(Cassier & Dominique Foray, 2001; Jullien & Pénin, 2014)
M&A	Absorb corporate knowledge by building or redeeming an alliance strategy.	(Enkel et al., 2009; Gassmann & Enkel, 2004)
Open-source	Open an internal project to form a new market and test customers' response	(Chesbrough, 2004; Lerner & Tirole, 2005; Loilier & Tellier, 2004, 2011; Pénin, 2013; West & Gallagher, 2006)
Licensing-out	Licensing or selling unused technologies to maximize profit.	(Dong & Pourmohamadi, 2014; Gassmann, 2006; Lee et al., 2010; Lichtenthaler & Ernst, 2009; Van de Vrande et al., 2009; Wynarczyk et al., 2013)
Spin-off	Spin-off internal organizations to commercialize disruptive technologies	(Kirschbaum, 2005)

Table 3 : OI practices

5.4. Conceptual framework of OI in SMEs.

Both SMEs and the external environment have organizational characteristics that contribute to the adoption of an OI approach. The determinants of the external environment include sectoral characteristics, and those of the SME include organizational and strategic characteristics. The success of OI also depends on inter- and extra-organizational characteristics related to the SME's relationship to its external environment. It should be noted that much of the research (Bigliardi & Galati, 2018; Lee et al., 2010; Sağ et al., 2016; Van de Vrande et al., 2009; Verbano et al., 2015) demonstrates a reciprocal relationship between organizational determinants, strategic determinants or the implementation of OI practices. Indeed, SMEs develop different OI practices depending on the internal and external context of the company. OI practices are therefore not adopted in the same way by all companies and vary from one organization to another according to the different determinants identified by our conceptual framework. Figure 2 illustrates our proposed conceptual framework that clarifies how the different determinants are related to OI practices according the different level of analysis.

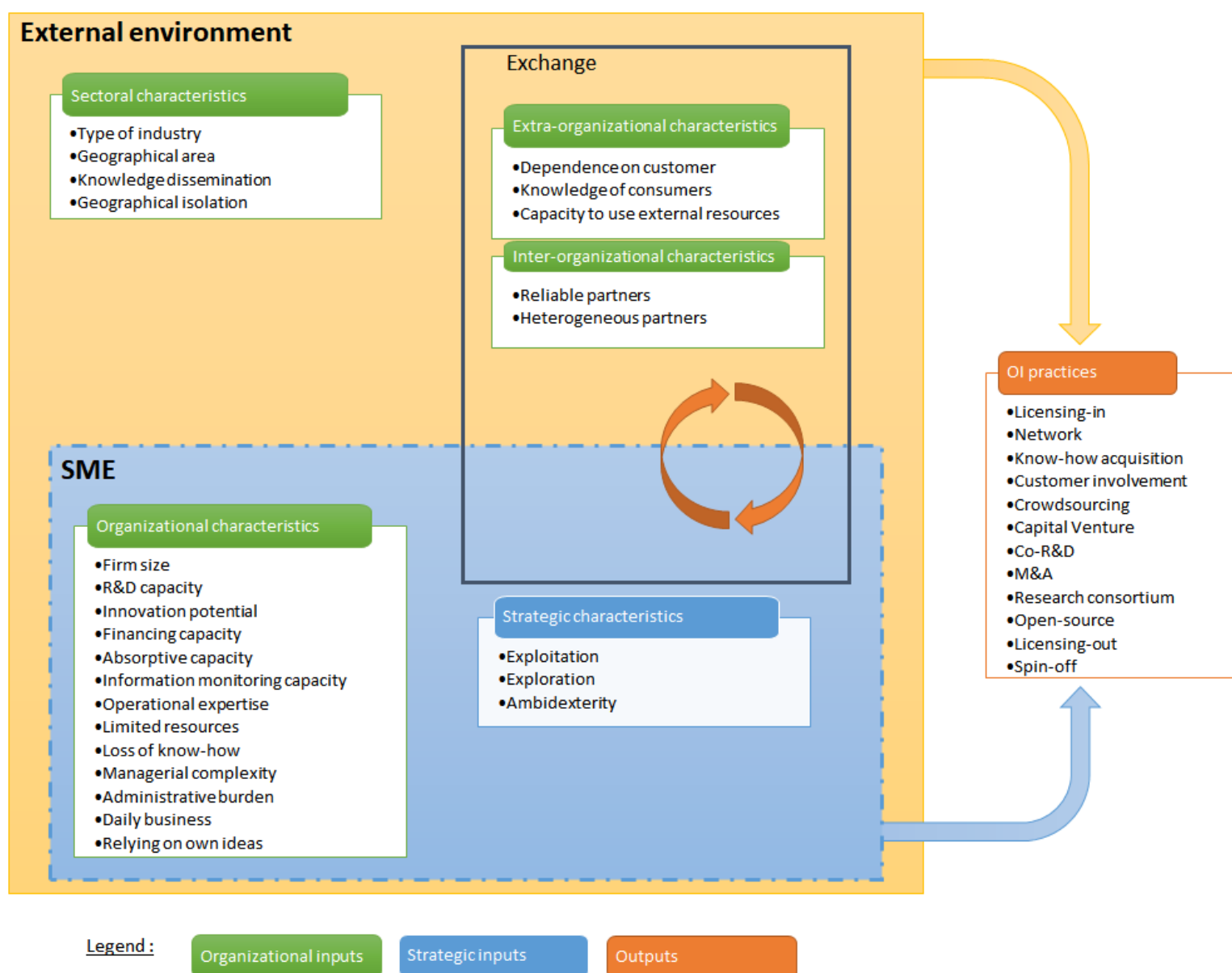


Figure 2: Conceptual framework of OI in SMEs.

6. Discussion and conclusion.

This last section is structured as follows. In the first paragraph, we remind the aim of our works and the used methodology. Then, some theoretical development and results are summarized. Also, theoretical and managerial contributions will be provided. To finish, we will mention the possible continuation of these researches with the introduction of our empirical test which is being carried out to validate our conceptual framework above proposed.

The objective of our study was to contribute to the understanding of the adoption of OI by SMEs by exploring the specific strategic and organizational characteristics of this type of enterprise in order to identify the determinants that enable them to adopt an OI approach. To reach this goal, we used a literature review process based on the Tranfiel et al. (2003) and Scaringella and Radziwon (2018) approaches designed with a number of stages that allow to provide a systematic and explicit method for the review. Through this rigorous literature review, we identified 22 organizational characteristics, 3 strategic characteristics and 12 OI practices. The determinants thus identified have been grouped according to the levels of analysis recommended by Bogers et al (2017), except for the intra-organizational level that we have chosen to exclude. Based on the results obtained, we proposed a conceptual model for the adoption of OI in SMEs that links strategic and organizational characteristics to practices.

The size, organizational stage, ability to develop partnerships and the ability to identify partners with complementary resources influence SMEs' ability to implement an OI approach (Gurău & Lasch, 2011; Lichtenthaler, 2008). SMEs generally have direct and informal relationships with the market to capture new ideas (Loilier & Tellier, 2011; Van de Vrande et al., 2009; Wynarczyk et al., 2013). In general, the main difficulties encountered in the field of innovation by SMEs come mainly from their small size and limited resources (Lee et al., 2010; Van de Vrande et al., 2009) or from a lack of skills (Bougrain & Haudeville, 2002; Dahlander & Gann, 2010; Lee et al., 2010; Rahman & Ramos, 2010; Wynarczyk et al., 2013). As a result, SMEs use different OI models depending on their size (Ahn et al., 2013; Vanhaverbeke et al., 2012). Due to greater absorptive capacity and stronger management skills, larger SMEs are more likely to benefit from OI than smaller ones. By implementing an OI approach, these larger SMEs are also more likely to generate radical innovations, while smaller SMEs tend to make essentially incremental innovations (Minguella-Rata, Fernández-Menéndez, & Fossas-Olalla, 2014). In the light of internal and external context of the companies, SMEs develop different OI practices. These practices are therefore not adopted in the same way by all companies and vary from one organization to another according to the strategic and organizational characteristics that we identified.

Due to the recent interest of research in OI in SMEs, gaps still remain in the knowledge of the determinants of the adoption of such an approach by these small structures. From a managerial point of view, these results will help SME managers to take better account of organizational and strategic characteristics in order to develop the openness of their company. Our conceptual model provides a basis to help define the company's strengths and weaknesses in terms of the organizational and strategic characteristics essential to the implementation of an OI approach. From a theoretical point of view, the adoption of OI by SMEs cannot be explained without explicitly taking into account the relationship between the OI practices adopted and the strategic or operational characteristics. To our knowledge, few studies have explored how the characteristics of SMEs influence the adoption of OI practices. Our study thus contributes to a better understanding of the relationships between the OI practices deployed and the strategic and operational characteristics of SMEs. It also provides an opportunity to review the work that has already been done on this subject.

Thus, our future research will have to focus on the validation of our conceptual framework. In our literature review, we found that the approach mainly used to study OI in the context of SMEs is the qualitative approach. Although this approach allows the development of new

theories through an in-depth understanding of a phenomenon, it does not allow the hypotheses thus established to be tested. To further contribute to the understanding of the relationships between the strategic and organizational characteristics of SMEs and their OI practices and to further develop our conceptual model, we recommend a quantitative approach. The use of such an approach would also make recommendations to the leaders of decision-makers. To achieve this goal, we conducted an empirical survey of Norman SMEs. All the strategic and organizational characteristics as well as OI practices were translated into a questionnaire. This study was conducted from July 2018 until March 2019 and included 92 SMEs from Normandy in the manufacturing and services sector. The analysis of the results through a factorial analyze is in progress. First results may be presented at the conference.

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