



**Effects of open climate on innovation radicality in SMEs:
Relevance of hidden innovation**

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Effects of open climate on innovation radicality in SMEs: Relevance of hidden innovation

Abstract:

- *Purpose:* Open innovation is an issue that has aroused great interest in recent years. The need to create an environment that facilitates the creation of ideas is essential for the implementation of a series of changes in organizational practices and routines that lead to the launch of new products. However, due to the more behavioral nature and the lesser externalization of these changes introduced in the company's internal processes, how this process occurs has not been studied in depth. However, there are few empirical studies on the climate of open innovation in the field of small and medium-sized enterprises (SMEs). The objective of this study is to analyse the effect of an open innovation climate on both incremental and radical product innovation. Moreover, it specifically analyses the mediating role played by hidden innovation in this relationship.
- *Design/methodology/approach:* The methodology used in this study was based on a survey of 213 Spanish SMEs, subsequently applying the structural equation methodology to contrast the results.
- *Findings:* The results indicate that the open innovation climate offers significant competitive advantages to SMEs. First, the open innovation climate in SMEs favorably influences product innovation (both incremental and radical). Secondly, it is observed that hidden innovations are essential to obtain product innovations. Finally, evidence of the mediating effect of hidden innovation has been obtained.
- *Originality:* The main interest of this work is based on the importance of hidden innovation for the development of innovations. Our study shows how organizations must make a series of organizational changes prior to the implementation of more visible innovations materialized in products. For this task, the creation of a favorable climate for the

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3 *development of new ideas becomes a fundamental task. On the other hand, this study has*
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5 *focused on SMEs, which tend to have fewer means for the development of the right*
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7 *conditions for innovation and are often more neglected by scientific research.*
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- 10 • *Research limitations/implications:* Although the literature often focuses on visible
11 innovation, materialized in product development, this study once again demonstrates the
12 importance of other types of innovations that are necessary to launch new products. This is
13 especially relevant for SMEs that, with limited resources, must be creative enough to
14 involve their personnel in introducing changes that will lead to new products. This paper
15 attempts to strengthen the previous literature on hidden innovation by contributing to the
16 understanding of how SMEs improve their innovative processes. However, the study has
17 the limitations inherent to cross-sectional studies.
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19 • *Practical implications:* Managers of companies involved in innovation processes should
20 pay more attention to creating conditions that facilitate the creation of new ideas or the
21 implementation of less visible but necessary practices to develop innovation.
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38 **Keywords:**

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40 SMEs, open innovation, innovation climate, product innovation, hidden innovation.
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45 **1. Introduction**

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47 When consumers require new products, and competition offers them more quickly,
48 small businesses must target their limited resources and routines to innovate and survive (Çakar
49 & Ertürk, 2010; Dibrell, Davis, & Craig, 2008; Madrid-Guijarro, García, & Van Auken, 2009).
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51 Literature recognizes the key role that innovation plays in the creation and maintenance of
52 sustainable competitive advantages because it provides flexibility in situations of constant
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3 change (Büschgens, Bausch, & Balkin, 2013; Camisón & Villar-López, 2014; Damanpour &
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5 Gopalakrishnan, 2001; Forés & Camisón, 2016).
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8 The threat of rapid technological advances, rising costs, and complex demand for small
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10 and medium enterprises is also accentuated by the need to innovate faster with limited resources
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12 (McNally, Akdeniz, & Calantone, 2011). In these circumstances, SMEs start from a situation
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14 of greater weakness due to the difficulty of generating new internal knowledge in their Research
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16 and Development (R&D) departments, causing them to resort to knowledge from external
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18 sources in search of more expertise (Cui & Wu, 2016; Schleimer & Faems, 2016). The resource-
19
20 based view (RBV) and knowledge-based view (KBV) propose that companies build
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22 collaborative networks with external partners in order to acquire new knowledge, skills, and
23
24 technologies (Popa, Soto-Acosta, & Martínez-Conesa, 2017). These relationships allow the
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26 company to access the required expertise, which the firm can internalize and utilize to develop
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28 new products (Oke, Prajogo, & Jayaram, 2013). The introduction of external partners in the
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30 innovation process is referred to by the term "open innovation", coined by Chesbrough (2003).
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32 It describes the entrance and exit of company knowledge to accelerate market opportunities and
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34 create value (Ham, Choi, & Lee, 2017; Lee, Gwangman, & Jinwoo, 2010; Remneland-
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36 Wikhamn & Wikhamn, 2011). The origin of the term lies in the opposing meaning of closed
37
38 innovation, which occurs when all of a company's innovations are produced through internal
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40 R&D efforts (Chesbrough, 2003). Thus, open innovation is a relatively new paradigm referring
41
42 to the idea that knowledge management that flows across organizational boundaries can
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44 stimulate both internal innovation and the external use of innovation (Dong, McCarthy, &
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46 Schoenmakers, 2017; Passarelli et al., 2021).
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54 Despite the great interest aroused by the issue of open innovation, most studies have
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56 focused on large companies, where the concept of open innovation first started. It has been less
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58 often analyzed in SMEs (Ham *et al.*, 2017; Henttonen & Lehtimäki, 2017) because these
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3 companies have more difficult access to external resources and fewer technological assets they
4
5 can exchange (Lee *et al.*, 2010; Madrid-Guijarro *et al.*, 2009). These limitations extend to the
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7 absence of human capital, financial resources, and knowledge (Iturrioz, Aragón, & Narvaiza,
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9 2015; Ham *et al.*, 2017; Nieto & Santamaria, 2010; Parida, Westerberg, & Frishammar, 2012).
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11 Therefore, given these limitations, SMEs must articulate more agile practices that allow them
12
13 to benefit from interaction with a greater number of external agents, giving rise to new
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15 knowledge that can be applied to new products from the perspective of open innovation
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17 (Chesbrough & Schwartz, 2007; de Jong & Flowers, 2018; Greco, Grimaldi, & Cricelli, 2016).
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21 Taking into account the role of innovation in the field of SMEs, several studies have
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23 focused on the analysis of the factors that can be decisive in the innovation process (Damanpour
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25 & Gopalakrishnan, 1998; Dembla, Palvia, & Krishnan, 2007; Igarria, Zinatelli, & Cavaye,
26
27 1998; Sadowski, Maitland, & van Dongen, 2002). One of the variables that is closely related to
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29 the innovation process is organizational climate (Kmieciak, Michna, & Meczynska, 2012; Oke
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31 *et al.*, 2013; Popa *et al.*, 2017). Organizational climate can condition the behavior of employees
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33 in relation to the innovation process because it encourages them to change their predisposition
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35 towards innovation and get involved in its development (Patterson *et al.*, 2005). However,
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37 despite its importance, empirical research on the organizational climate and innovation in SMEs
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39 is quite limited.
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45 This paper aims to cover some of the gaps detected in the literature. First, we analyze
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47 whether the existence of an organizational climate favorable to open innovation has a positive
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49 effect on the innovation of a company, specifically on product innovation. This represents a
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51 breakthrough in research since previous studies on open innovation mainly examine how this
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53 strategy affects a firm's performance (Schroll & Mild, 2012; West & Bogers, 2014). Second,
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55 product innovations require a series of previously implemented internal changes in a company's
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57 organization. This hidden innovation has been less often studied than other forms of innovation,
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3 such as product innovation or process innovation (Murphy, Huggins, & Thompson, 2016; Wang
4 & Chen, 2020). To cover this gap, this study analyzes the relationship between hidden
5 innovation and product innovation. Third, open innovation in SMEs is studied. This is another
6 important contribution since, although in recent years open innovation has received attention
7 from both academics and professionals, research has focused mainly on large companies
8 (Chesbrough & Schwartz 2007; Dong & Netten, 2017; Remneland-Wikhamn & Wikhamn,
9 2011). However, according to the Organization for Economic Cooperation and Development
10 (OECD) (2019), SMEs represent 99 percent of all companies, generate more than 50 percent of
11 the added value, employ two out of every three people throughout the world, and receive
12 significant economic and political incentives. Nevertheless, these organizations have received
13 little attention in the scientific literature related to innovation (Forsman, 2011; Lima & da Silva
14 Müller, 2017; Popa *et al.*, 2017).

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17 To achieve these objectives, this study is structured as follows. First, the importance of
18 innovation and SMEs is highlighted, as well as the value of an innovative climate. Next, the
19 relationship between an open innovation climate and product innovation in SMEs is analyzed,
20 the possible impact of hidden innovation on product innovation is studied, and the link between
21 a climate of open innovation and hidden innovation is indicated, proposing the corresponding
22 research hypotheses. Subsequently, the methodology is detailed and the results of the empirical
23 study conducted on 213 Spanish SMEs are presented and discussed. Finally, some practical
24 implications are enumerated.

25 26 27 **2. Theoretical Background and Hypotheses Development**

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29 While some academics have traditionally defended the need for R&D departments with
30 sufficient capacity to develop large innovative projects that involve excessive risks and costs,
31 reality has shown that smaller companies can also be innovative and develop new products if

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3 they are able to open up to external knowledge with an open innovation approach (Chesbrough,
4 2003). This new theoretical perspective suggests the need for companies to open their doors
5
6 abroad, thereby increasing external collaboration and their capacity to absorb new knowledge
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8 to apply to their innovative projects (Cohen & Levinthal, 1990).
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12 In this paper, we delve into the internal environment necessary to promote this type of
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14 openness to the exterior. Specifically, we analyze whether an open innovation climate is
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16 sufficient to introduce organizational changes that, in turn, help develop product innovations in
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18 small businesses.
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23 24 2.1. Innovation in SMEs 25

26 Since Schumpeter's early work (1934), innovation has been recognized as a key element
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28 of competition and dynamic market efficiency (Atalay, Anafarta, & Sarvan, 2013; Dibrell *et*
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30 *al.*, 2008; Frans & Meulenger, 2004; Keupp, Palmié, & Gassmann, 2012; Reichstein & Salter,
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32 2006). Innovation is a means of facilitating a company's response to external changes,
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34 competitive pressures, variations in customer demand, and the constant petition for new and
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36 better products and services (Jansen, Van Den Bosch, & Volberd, 2006; Prajogo & Ahmed,
37
38 2006). However, according to the OECD (2018), innovation could be understood as “a new or
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40 improved product or business process (or combination thereof) that differs significantly from
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42 the firm's previous products or business processes and that has been introduced on the market
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44 or brought into use by the firm”. However, the concept of innovation has also been conditioned
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46 by the type of innovation developed. For example, Damanpour (1991) differentiates between
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48 technological innovation and administrative innovation. While technological innovation is
49
50 related to products, services, and production process technology, administrative innovation
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52 involves organizational structure and administrative processes. We will focus especially on
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54 product innovation that enables SMEs to conduct innovative processes by mobilizing many
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3 different types of resources and competences which are often owned by several partners
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5 (Dhanasai & Parkhe, 2006).
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8 According to the existing literature in this area, innovation is viewed as a practice that
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10 generates sustainable competitive advantages by allowing companies to improve their
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12 capabilities and performance (Hilman & Kaliappen, 2015; Kafetzopoulos & Psomas, 2015;
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14 Wang, 2014, Chatzoglou and Chatzoudes, 2017). Moreover, numerous studies show that
15
16 innovation improves the potential for growth in the organization in areas of sales and
17
18 employment, among others (Hagen, Denicolai, & Zucchella, 2014; Louart & Ducroquet, 2012;
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20 Rask, 2014). It contributes to the efficiency of the management of change (Hagen *et al.*, 2014;
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22 Onetti, Zucchella, Jones, & McDougall-Covin, 2012), enhances internationalization (Dai,
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24 Maksimov, Gilbert, & Fernhaber, 2014), and increases business performance (Artz, Norman,
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26 Hatfield, & Cardinal, 2010; Hagen *et al.*, 2014; Kunttu & Torkkeli, 2015). The interest in
27
28 innovation as a precursor to competitive advantages has promoted studies that define the most
29
30 interesting scenarios to allow each type of company to develop innovative processes more
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32 effectively. One of the most consolidated alternatives has been that the innovation capacity of
33
34 a company often depends on the R&D activities it carries out. This is a linear model that
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36 emphasizes scientific and technological knowledge and perceives formal efforts in R&D as an
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38 indicator of the degree of innovation in a company (greater R&D expenditure indicating greater
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40 innovation orientation) (Bhaskaran, 2006; Kirner, Kinkel, & Jaeger, 2009). However, research
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42 on innovation shows that, on average, smaller companies tend to innovate significantly less
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44 than similar larger companies (Bodlaj & Čater, 2019).
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51 Therefore, a part of the literature suggests that this model is not valid for SMEs since
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53 the number of patents or the amount of R&D spending are not suitable indicators for these types
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55 of companies, which generally have limited resources and capabilities and cannot conduct in-
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57 house research (Bhaskaran, 2006; Frans & Meulenber, 2004; Lima & da Silva Müller, 2017).
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3 It is currently assumed that innovation is not necessarily the result of formal R&D, and that
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5 SMEs do not have the capacity to innovate in isolation (Dahlander & Gann, 2010). This
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7 capacity depends on the daily development of a company's commercial activity and the
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9 collaboration with its customers and suppliers and is based on off-the-shelf technologies (Frans
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11 & Meulenberg, 2004; Hirsch-Kreinsen, 2008). That is, SMEs can innovate by adopting an open
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13 innovation model that allows them to reduce costs, accelerate innovation efforts, and ensure
14
15 better returns on investments in innovation (Perkins, 2012; Khan et al., 2021).
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20 The question that remains to be resolved is how SMEs can acquire this external
21
22 knowledge. Prior literature seems to suggest that it is not a simple matter, but that there should
23
24 be a continuing effort to foster an external orientation (Tian et al., 2021). This requires changing
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26 the values and practices of the organization to redirect them towards an orientation of open
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28 innovation.
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33 2.2. Open Innovation Climate and Product Innovation

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35 Product innovation is a new or improved good or service that has been introduced in the
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37 market and that differs significantly from a firm's previous goods or services (OECD, 2018).
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39 These innovations are the most often studied due to their direct participation in the company's
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41 results, (Mansury & Love, 2008; Prajogo, 2006; Roper & Love, 2002).
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46 The starting point for an innovation is that it must be significantly different from the
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48 products or services that the company previously produced or performed. However, certain
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50 subjectivity is introduced into the concept if the degree of innovation is not explained. In this
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52 case, literature frequently differentiates between incremental or radical innovation. Incremental
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54 innovation involves small changes in existing products, requires less time to carry out, and
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56 requires small technological improvements (Brown & Eisenhardt, 1995; Forés & Camisón,
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58 2016; Lennerts, Schulze, & Tomczak, 2020). Radical innovation implies important changes and
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3 novelty in the products developed. It requires great research efforts and represents a greater risk
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5 for the company due to the higher costs involved and the uncertainty of success (Brown &
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7 Eisenhardt, 1995; Flor, Cooper, & Oltra, 2018; Xie, Wanga, & Zeng, 2018).
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10 As previously noted, product innovation is of great importance to the profitability and
11
12 competitiveness of an organization since developing a new product successfully can generate a
13
14 sustainable competitive advantage and can even become a key to the overall success of a firm
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16 (Thomas, 2013). However, at present, it is very complicated for product innovation to be
17
18 successful due to the rapid changes that occur in both technology and consumer taste, making
19
20 product life cycles increasingly shorter (Menon, Chowdhury. & Lukas, 2002; Remneland-
21
22 Wikhamn & Wikhamn, 2011). Under these circumstances, firms try to introduce new products
23
24 faster (McNally *et al.*, 2011), for which they require more knowledge. Companies have to go
25
26 beyond their internal knowledge and must resort to external sources of knowledge (Ardito &
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28 Petruzzelli, 2017). In fact, it is unlikely that all the knowledge needed to innovate can originate
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30 within an organization (Enkel, Gassmann, & Chesbrough, 2009; Naranjo-Valencia, 2010). This
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32 is especially the case of SMEs, which have fewer resources and capabilities than large
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34 companies (Bhaskaran, 2006; Hewitt-Dundas, 2006; Nieto & Santamaria, 2010) and depend
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36 almost exclusively on external resources to meet complex demands (Cui & Wu, 2016; Wagner,
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38 2010; Greitzer, Pertuze, Calder, & Lucas, 2010; Schleimer & Faems, 2016). Therefore, more
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40 and more SMEs turn to open innovation to achieve product innovation and improve their
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42 competitive advantage (Ardito & Petruzzelli, 2017; Chesbrough, 2003; Dahlander & Gann,
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44 2010; Popa *et al.*, 2017; Saebi & Foss, 2015). It is necessary to focus on the organizational
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46 practices required to guarantee success in any innovation process, even more so if the need to
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48 introduce new knowledge from abroad is suggested. One of the keys to achieving successful
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50 results pointed out by some authors is the existence of an organizational climate that supports
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52 innovation. In fact, organizational climate has been pointed to as a necessary antecedent to
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3 product innovation (Baer & Frese, 2003; Chen & Huang, 2009; Gumusluoğlu & Ilsev, 2009;
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5 Somech & Drach-Zahavy, 2013).

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7 Organizational climate, in general, refers to the shared perceptions of employees about
8
9 the company's policies, practices, and procedures, and the subsequent behavior and interaction
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11 patterns that support some shared ideas within the organization (Patterson *et al.*, 2005). More
12
13 specifically, Baer and Frese (2003) consider that an innovative climate encompasses those
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15 formal and informal organizational practices and procedures that guide and support a proactive
16
17 and persistent approach to innovation.
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21 For the proper implementation of open innovation, an organizational climate that
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23 supports this orientation is also necessary (Remneland-Wikhamn & Wikhamn, 2011; van der
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25 Meer, 2007). This is because certain dynamic capacities that facilitate the ability to integrate
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27 the existing knowledge within the firm with new knowledge coming from abroad must be
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29 developed among employees (Teece, 2007). Under this premise, some authors, such as
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31 Patterson *et al.* (2005), have pointed out the dimensions necessary to generate an environment
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33 of open innovation in a company: flexibility (focus on change); innovation (support for new
34
35 ideas); external approach (taking responsibility for the needs of customers and the market in
36
37 general); and reflexivity (review strategies and processes to adapt to the environment).
38
39 Similarly, Remneland-Wikhamn & Wikhamn (2011) establish three factors to measure a
40
41 company's open innovation climate: innovation and flexibility, external focus, and reflexivity.
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47 This innovative climate must facilitate creativity and change, improve the independence
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49 of employees in the search for new ideas, and facilitate cooperation and personal development
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51 (Baer & Frese, 2003; Popa *et al.*, 2017). In addition, if the climate eases resources, it allows an
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53 adequate allocation of time for the execution of tasks, tolerates risk, and supports personal
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55 growth, which will contribute decisively to the development of new products (Martín-de Castro,
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57 Delgado-Verde, Navas-López, & Cruz-González, 2013; Menzel, Aaltio, & Ulijn, 2007). Given
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3 that when introducing new products a certain degree of failure is inevitable, the existence of an
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5 innovative climate that favors autonomy and freedom makes employees feel safe when taking
6
7 risks. They dare to propose new ideas and talk openly about problems (Oke *et al.*, 2013).
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10 Finally, uncertainty, insecurity, and resistance to change are often associated with less
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12 innovation (Shane, 1995; Shanker, Bhanugopan, van der Heijden, & Farrell, 2017).
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15 In relation to a climate of open innovation, literature has studied how companies can
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17 depend on and take advantage of the innovative nature of their partners in the supply chain to
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19 increase their innovation results. Firms, especially SMEs, can rely on the experience of their
20
21 suppliers and customers to reduce some typical problems of product innovation such as the
22
23 failure to develop new products and the time needed to complete marketing tasks. With this
24
25 external knowledge, SMEs can supply their limited capacity for innovation and share the risks
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27 associated with product innovation (Azadegan & Doole, 2010; Oke *et al.*, 2013; Wagner, 2010).
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29 This is even more important in the case of radical innovation, which requires new knowledge
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31 to generate substantially new products.
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35 Some studies provide evidence that there is a positive relationship between a climate of
36
37 organizational innovation and product innovation (Shanker *et al.*, 2017; Yuan & Woodman,
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39 2010). In the field of SMEs, Kmiecik *et al.* (2012) found that an innovative climate facilitates
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41 the activity of innovation, and Popa *et al.* (2017) showed that an innovative environment has a
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43 positive effect on open innovation.
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47 Therefore, if SMEs have an open innovation climate, theoretically, they can generate
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49 new ideas to develop new products that meet customer's new demands more easily. This
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51 climate is necessary for radical innovation but also for new incremental products since a simple
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53 change in design, presentation, or internal performance may depend on external suggestions
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55 offered by the company's suppliers. Given the above arguments, the following research
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57 hypothesis is proposed:
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3 *H₁: An open innovation climate positively influences product innovation in SMEs.*

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6 *H_{1a}: An open innovation climate positively influences incremental innovation in SMEs.*

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8 *H_{1b}: An open innovation climate positively influences radical innovation in SMEs*

9 10 11 12 Hidden Innovation and Product Innovation

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14 Research has focused on traditional types of innovation based on their nature, while
15 other forms, such as hidden innovation, have received much less attention (Murphy et al., 2016).
16
17 Hidden innovation is intangible in character and is considered to be crucial for a firm's
18 performance. This is because it may improve productivity and profits, thereby increasing a
19 company's competitive advantage (Alegre & Chiva, 2008). Although some studies have
20 analyzed the role of hidden innovation as an intermediate variable to developing the use of
21 technology, the analysis of its direct effect has not been sufficiently explored (Wang & Chen,
22 2020). Hidden innovation is innovation that is not measured using traditional innovative
23 indicators, such as the number of patents or R&D spending (Miles & Green, 2008).
24
25 Organizational innovation could be one of the main elements of hidden innovation. A broad
26 definition of organizational innovation indicates that it is the implementation of a new method
27 of organization applied to business practices, the workplace, or a firm's external relationships
28 with other firms or public institutions (Schumpeter, 1934). Therefore, it implies changes in
29 organizational structure and processes as a result of the introduction of new practices
30 (Armbruster, Bikfalvi, Kinkel, & Lay, 2008; Christian et al., 2015; Wang & Chen, 2020). These
31 changes remain unmeasured by traditional indicators but imply important steps towards
32 generating new products. Thus, hidden innovation could be identified with the concept of
33 administrative innovation proposed by Damanpour (1991).
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56 Although hidden innovations receive relatively little coverage in the literature (Murphy
57 et al., 2016), their importance stems from the belief that technological innovation is not enough
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3 to explain a company's innovation (Geldes, Heredia, Felzensztein, & Mora, 2017). Although
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5 product innovation allows the organization to gain a competitive advantage in the markets, to
6
7 achieve this objective, the firm needs to adopt a set of measures in its organization (Miller,
8
9 2001). Companies with more flexible organizational structures achieve greater product
10
11 innovation than companies with hierarchical organizational structures because they adapt better
12
13 and faster to changes. The decentralization typical of firms with organic organizational
14
15 structures favors employee creativity and open communication (Damanpour, 1991; Baum &
16
17 Wally, 2003). This enhances hidden innovation, which, in turn, encourages a company's
18
19 adaptation to technical changes (Gallego, Rubalcaba, & Hipp, 2013). In this aspect, SMEs can
20
21 benefit from being less bureaucratic and rigid than larger enterprises and can therefore react
22
23 quicker in the face of market demands (Parida *et al.*, 2012).
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29 In fact, product innovation is the result of a company's innovative capacity. To achieve
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31 this capacity, SMEs need to have made prior changes, among which is included improvements
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33 in management (through hidden innovation). These developments can favor learning and
34
35 knowledge sharing, both internally and externally (Gallego *et al.*, 2013; OECD, 2018), and this
36
37 organizational learning process can lead to product innovation (Keskin, 2006; Jiménez-Jiménez
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39 & Sanz-Valle, 2011). According to Evangelista and Vezzani (2010), the joint application of
40
41 hidden and product innovation is more effective than their individual application.
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46 Therefore, hidden innovation can be a necessary antecedent to product innovation.
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48 However, the causal relationship between hidden innovation and product innovation is not clear
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50 in the literature (Wang & Chen, 2020). While some researchers find a positive impact of hidden
51
52 innovation on product innovation (Ballot, Fakhfakh, Galia, & Salter, 2015; Camisón & Villar-
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54 López, 2014; Wang & Chen, 2020), others consider that hidden innovation does not have a
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56 significant impact on product innovation, or that it could even be counterproductive (Hervas-
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58 Oliver & Sempere-Ripoll, 2015; Mariano & Casey, 2015). Among the first, authors such as
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3 Gallego *et al.* (2013) highlight the importance of hidden innovation in small firms and find that
4
5 in these companies, organizational innovation increases the propensity to introduce
6
7 technological innovation. In addition, the results of their study show that small firms
8
9 complement organizational innovation with an intensive use of external knowledge.
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12 To our knowledge, there are no works that link this type of hidden innovation with the
13
14 degree of radicalism in SMEs. The perception is that for incremental and radical innovation,
15
16 hidden innovation is necessary, although it is true that radical innovation may require more
17
18 intense changes for the generation of substantially different products. In any case, when
19
20 developing any type of product innovation, it is essential to make changes in the administration
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22 of the company as well as in the processes that provide coverage to the rest of the innovative
23
24 activities. Taking these arguments into account, the following research hypothesis is proposed:
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28 *H₂: Hidden innovation positively influences product innovation in SMEs.*
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31 *H_{2a}: Hidden innovation positively influences incremental innovation in SMEs.*
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34 *H_{2b}: Hidden innovation positively influences radical innovation in SMEs.*
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37 2.3. Open Innovation Climate and Hidden Innovation

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39 Although traditionally hidden innovation has not been studied in depth, mainly due to
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41 problems in measuring it, this does not mean that it is less important than other types of
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43 innovation. In fact, hidden innovation may be more relevant to SME performance and
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45 innovation processes than traditional product innovation measures point out (Miles & Green,
46
47 2008; Wang & Chen, 2020). Hidden innovation is usually the result of the absorption of existing
48
49 ideas and depends less on the generation of new ideas. This form of innovation has been called
50
51 “innovation without research” (Murphy *et al.*, 2016; NESTA, 2007), and it can be of great value
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53 for SMEs because their capacity for innovation is restricted by limited resources (Ham *et al.*,
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55 2017; Nieto & Santamaria, 2010; Parida *et al.*, 2012).
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3 This characteristic of hidden innovation is clearly related to an open innovation climate
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5 since such a climate favors the absorptive capacity of a firm (Chesbrough, 2003; Spithoven,
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7 Clarysse, & Knockaert, 2010). Absorptive capacity is an ability to explore, judge, and
8
9 incorporate external knowledge. It is essential to understanding the possibilities and restrictions
10
11 of external knowledge in relation to a company's own resources (Cohen & Levinthal, 1990).
12
13 On the other hand, an open innovation climate allows companies to deal with the so-called “not
14
15 invented here” syndrome (Remneland-Wikhamn & Wikhamn, 2011), which occurs when
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17 organizations develop a culture of scepticism, contempt, and resistance towards ideas that come
18
19 from abroad (Katz & Allen, 1982), making the integration of external knowledge in the
20
21 innovation process difficult (Chesbrough, 2003; Dahlander & Gann, 2010). This syndrome is
22
23 especially dangerous in SMEs because it complicates the acquisition of knowledge from the
24
25 exterior, which prevents the exploration of new forms of organizational structures or new
26
27 organizational practices (Remneland-Wikhamn & Wikhamn, 2011). Employee resistance and
28
29 lack of internal commitment have been identified as important barriers to adopting innovative
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31 practices for SMEs (Chesbrough & Crowther, 2006; Van de Vrande, De Jong, Vanhaverbeke,
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33 & De Rochemont, 2009).
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40 Previous literature suggests that an innovative climate facilitates SME innovativeness
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42 (Kmieciak *et al.*, 2012). The existence of an innovative climate favors innovation in the
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44 organizational structure and management systems of SMEs (Hsu & Fang, 2009) and allows
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46 them to explore, internalize, and exploit external knowledge to improve their innovative
47
48 capability (Popa *et al.*, 2017). Firms that present a work environment in which employees
49
50 participate in the processes of change feel safe to take risks, propose new ideas, openly discuss
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52 problems, and show a proactive approach to work. In addition, they are more likely to
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54 implement non-technological innovation effectively (Baer & Frese, 2003; Caroline & Thuc,
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56 2010; Oke *et al.*, 2013). This environment can be achieved if companies have an open
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3 innovation climate. Likewise, this climate favors the external acquisition of knowledge and the
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5 involvement of stakeholders, enabling the creation of collaborative networks between SMEs
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7 and external partners, which is essential to developing innovative capacity in SMEs
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9 (Brunswick & Wim Vanhaverbeke, 2015; Popa *et al.*, 2017). In view of these explanations,
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11 the following research hypothesis is proposed:
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14 *H₃: An open innovation climate positively influences hidden innovation in SMEs*

15
16 Figure 1 shows the conceptual model that summarizes the three hypotheses.

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19 INSERT FIGURE 1 AROUND HERE
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24 **3. Methodology**

25 26 3.1. Sample

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28 The population of this study is composed of 1,053 SMEs from different sectors located
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30 in south-eastern Spain. The information was collected through a survey based on a web page
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32 designed for this purpose, with a follow-up telephone interview by a company specialized in
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34 market research.
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38 The unit of analysis was set in the company, because the variables studied responded to
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40 organizational processes. In addition, we considered it appropriate to contact and collect the
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42 information directly from the CEO of the SMEs, since in these types of companies they had a
43
44 real vision of the processes studied in this paper.
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48 For the appropriate contrast of the proposed model, it was considered pertinent to arrive
49
50 to a sample of at least 200 questionnaires, which would allow us to model the hypotheses with
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52 sufficient information. After making initial contact via email with the population of the
53
54 companies to inform them about the objectives of the study and encourage them to answer the
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56 online survey, the company specialized in market studies proceeded to contact the CEOs of the
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58 companies directly to reach the target sample. Finally, 213 validly completed questionnaires
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3 were obtained, which represents a response rate of 20.23 percent of the population; higher than
4
5 the expected response rates in this type of study (Riva, Torcal, & Morales, 2010). Table 1 shows
6
7 the main characteristics of the companies that are part of the sample.
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10 INSERT TABLE 1 AROUND HERE
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12 3.2. Measures 13

14 A five-point Likert scale was used to measure the variables of the model (1 = "strongly
15 disagree" and 5 = "strongly agree"). Each of the variables was modelled as a reflective
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17 construct.
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21 *Open innovation climate* is a second-order construct that has been measured using a
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23 scale developed by Remneland-Wikhamn & Wikhamn (2011) which has three constructs:
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25 flexibility (six items), external approach (six items) and reflexivity (five items). These three
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27 scales refer to the facility that the company has to introduce changes, to the external orientation
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29 of the company, and to the ability to discuss and interpret the changes that support the
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31 innovation process.
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35 *Hidden innovation* has been measured with four indicators based on the work by
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37 Murphy *et al.* (2016). The scale focuses on the implementation of new ways of managing
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39 resources, increasing the capacity to implement new processes, improving the interpretation of
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41 new external knowledge, or the introduction of a culture that supports the emergence of new
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43 ideas.
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47 *Incremental innovation* and *radical innovation* have been measured using the scales of
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49 Jansen *et al.* (2006), which allow the simultaneous measurement of the effect of both types of
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51 product innovation. Each scale has six indicators that configure two reflective constructs. Items
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53 appear in the Appendix.
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55 3.3. Analysis 56 57 58 59 60

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3 The data were analyzed through structural equation models (SEM) with the Partial Least
4 Squares (PLS) approach using the Smart PLS 3.2.6 statistical program (Ringle, Sarstedt,
5 Schlittgen, & Taylor, 2013). This approach has been utilized because it works with composite
6 constructs (Henseler, 2017). The composite model understands that the construct is composed
7 of indicators or elements as a linear combination. The relationships between indicators and the
8 construct are not cause and effect. PLS-SEM always uses the modeling of variables as
9 compounds. In addition, PLS does not require normal data, unlike other techniques based on
10 covariance.

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22 Prior to performing the structural analysis that permits the contrast of the hypotheses, it
23 is necessary to analyze the measurement model. First, the reliability of the measurement scales
24 was verified with the Cronbach alpha coefficient, obtaining a value greater than 0.7 in all cases,
25 considered adequate by the literature (Nunnally, 1978). An examination of the average variance
26 extracted (AVE) revealed that all constructs exceeded the cut-off of 0.50 set by the literature
27 (Fornell & Larcker, 1981). On the other hand, the value of R^2 for endogenous constructs
28 exceeds the recommended minimum value of 0.1, which shows that the model developed is
29 suitable for hypothesis testing (Table 2). Next, the discriminant validity of the measures was
30 evaluated. As Fornell and Larcker (1981) suggested, the AVE for each construction should be
31 greater than the correlations of the latent factors squared between pairs of constructs (Table 2).
32 In addition, discriminant validity has also been proven using a more demanding method known
33 as the Heterotrait-Monotrait (HTMT) ratio, whose values must be less than 0.9 (Henseler,
34 Ringle, & Sarstedt, 2015).

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INSERT TABLE 2 AROUND HERE

Consequently, all the variables showed satisfactory discriminant validity. In summary,
our model has adequate convergent validity, reliability, and discriminant validity.

4. Results and Discussion

The hypothesis contrast results of the structural model are shown in Table 3. This table shows the values of the standardized regression coefficients and their significance from the Bootstrap technique with 5,000 subsamples.

First, the results of the model demonstrate that the exogenous variables considerably explain the endogenous variables. The R^2 shown in Table 2 indicates values of 0.499 for hidden innovation, 0.533 for incremental innovation, and 0.501 for radical innovation. The results of the blindfolding test generate values greater than 0 in the exogenous constructs for the Q^2 Stone-Geisser indicator.

On the other hand, Table 3 shows the f^2 statistic size effects that identify significant impact on the constructs explained, although the values of hidden innovation on incremental and radical innovation are less intense (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

INSERT TABLE 3 AROUND HERE

In relation to the results of the model, H_1 regarding the positive effect of an open innovation climate on product innovation is supported. For both incremental innovation (H_{1a} : $\beta = 0.473$; $p < 0.001$) and radical innovation (H_{1b} : $\beta = 0.400$; $p < 0.001$), a positive and significant relationship is observed. These results coincide with those obtained in previous research (Kmieciak *et al.*, 2012; Popa *et al.*, 2017). In this case, a climate of openness will allow incremental innovation because the modification of existing products is often derived from suggestions made by customers and external knowledge that is incorporated into the company. In addition, if the organization seeks to develop radical innovation, an open innovative climate allows a company to be open to new ideas, discuss current procedures, and introduce new knowledge into the company.

The second hypothesis analyzes whether hidden innovation facilitates the development of product innovation. The results observed for incremental innovation (H_{2a} : $\beta = 0.311$; p

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3 <0.001) and for radical innovation (H_{2b} : $\beta = 0.353$; $p < 0.001$) confirm this hypothesis. This is
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5 consistent with the results found by previous studies (Ballot *et al.*, 2015; Camisón & Villar-
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7 López, 2014; Evangelista & Vezzani, 2010; Jiménez Jiménez & Sanz-Valle, 2011; Wang &
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9 Chen, 2020) that show evidence of the relationship between administrative and technological
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11 innovation and emphasizes the idea that it is necessary for changes to occur in an organizational
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13 system to favor changes in products.
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17 The last hypothesis studies whether an open innovation climate favorably influences
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19 hidden innovation. The results in Table 3 show that the effect is positive and significant (H_3 : β
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21 = 0.679, $p < 0.001$). Therefore, it is confirmed that a climate more open to innovation encourages
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23 changes within a company, and that those firms with an open innovation climate can make
24
25 changes in their organizational structures and processes more easily.
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29 Finally, it should be noted that an indirect effect of an open innovation climate on
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31 incremental innovation ($\beta = 0.211$, $p < 0.001$) and radical innovation ($\beta = 0.239$, $p < 0.001$)
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33 through hidden innovation has been observed. These results help to understand that an open
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35 innovation climate facilitates new product development by favoring the internal changes in a
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37 company that are necessary to achieve product innovation. Therefore, globally speaking, the
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39 relationships and influences raised in the research model are confirmed. Figure 2 shows the
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41 result of the hypothesis contrast.
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45 INSERT FIGURE 2 AROUND HERE
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49 5. Conclusion

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51 Open innovation is one of the most important sources of sustainable competitive
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53 advantages in SMEs (Çakar & Ertürk, 2010; Dibrell *et al.*, 2008) since it allows them to develop
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55 innovative, creative, and more efficient production processes despite having fewer resources
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57 and capacities than large companies (Nieto, Santamaria, & Fernandez, 2013; Parida *et al.*,
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3 2012). However, empirical research on open innovation in SMEs is still scarce. Therefore, we
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5 set out to explore how small businesses might be able to reach higher levels of innovation if
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7 they opt for greater openness to external knowledge. Based on the RBV and the KBV, this study
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9 has been proposed with the objective of analyzing the effect of an open innovation climate on
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11 product and hidden innovation in SMEs.
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15 Based on our regression results, we identify relevant implications for the scientific
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17 literature. First, there are positive effects of an open innovation climate on both incremental and
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19 radical product innovation. These results show the key role that an open innovation climate
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21 plays in the development of new products, and the need for SMEs to potentiate this type of
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23 climate in their organizations.
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27 Second, this study also obtains evidence that hidden innovation has a favorable impact
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29 on product innovation. This confirms the importance of hidden innovation to achieve
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31 technological innovation for small companies. Taking into account the limitations of small
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33 businesses, this highlights the importance of redirecting the greatest possible efforts towards
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35 the development of hidden innovation, as it appears to be an effective means to obtaining
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37 product innovation.
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41 Third, this study has also confirmed a positive effect of an open innovation climate on
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43 hidden innovation. This result indicates that those SMEs that have this type of climate will have
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45 a greater facility to introduce changes in their processes than those that are more resistant to
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47 change (Baer & Frese, 2003). Finally, it is important to highlight the finding of an indirect effect
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49 of an open innovation climate on product innovation (incremental and radical) through hidden
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51 innovation.
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55 Our paper contributes to the literature in a variety of ways. First, although there is
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57 literature on open innovation, it has focused mainly on large companies, and its results cannot
58
59 be generalized to small enterprises due to the effect of firm size on the effectiveness of
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2
3 innovation (Lee *et al.*, 2010). Moreover, most of the research on open innovation in SMEs has
4
5 been conceptual or qualitative, which cannot be generalized either (Parida *et al.*, 2012).
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7 Therefore, this study, in empirically analyzing the open innovation of SMEs, provides
8
9 important contributions for research and management. Second, our work helps to understand
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11 how small businesses can also be effective in developing innovations. This contributes to
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13 questioning the traditional thesis which argued that the size of a company does not always
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15 explain innovation (Damanpour, 1992). The results reveal that if small companies seek out
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17 external knowledge and bet on innovative efforts that are not always visible, they will end up
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19 obtaining both incremental and radical innovation. Specifically, our research shows that an
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21 innovative climate is an antecedent of both hidden innovation and product innovation in SMEs.
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23 Our arguments support the idea that the presence of an open climate of innovation, which
24
25 encourages the acceptance of new ideas, openness to new external knowledge, and fosters
26
27 flexibility in the organization, becomes an essential element to overcoming limitations and
28
29 boosting innovation. This study, therefore, also confirms that hidden innovation is essential to
30
31 driving more technological innovation in SMEs. This aspect is relevant since hidden innovation
32
33 has received less attention in the literature despite the presumed importance it has on final
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35 innovation. In fact, hidden innovation plays a crucial role in the innovation of products
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37 (incremental and radical) in SMEs because it introduces conditions, such as new ways of
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39 successfully managing resources or skills to integrate knowledge that comes from outside the
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41 organization, which are necessary to improve new product generation.
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49 The paper contributes to the identification of practical implications. One of the main
50
51 recommendations is that SME managers favor the creation of an open innovation climate.
52
53 Managers must be alert in order to quickly detect the need to make changes. They must be
54
55 proactive and willing to modify procedures. They must be agilely solving the problems that
56
57 arise and must look outside the company as well as inside, continuously seeking new market
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1
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3 opportunities and incorporating ideas and knowledge from outside the organization. Managers
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5 must generate a creative environment in SMEs which is open to the exterior and in which
6
7 current practices are questioned. This climate must serve as a stimulus to the implementation
8
9 of new ideas and to their transformation into innovation. On the other hand, taking into account
10
11 the importance of hidden innovation on product innovation, SME managers must invest in
12
13 organizational innovation. Managers must be aware that the type of organizational structure
14
15 that characterizes SMEs (more organic, decentralized and flexible than that of large companies)
16
17 benefits employee creativity and the exchange of knowledge both inside and outside the
18
19 company (Damanpour, 1991; Baum & Wally, 2003), which favors the development of hidden
20
21 innovation.
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26 From this study, it can be concluded that SMEs can be very innovative if they choose to
27
28 develop an open innovation climate that allows the permeability of external knowledge and its
29
30 application in a series of innovative activities that lead to the development of new products.
31
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33 Despite its contributions, this study also has a number of limitations. Among them, it
34
35 should be noted that a cross-sectional sample has been used, that the data used came from a
36
37 single informant, and that the use of subjective-type scales poses a risk regarding the quality of
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39 the data.
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42 Looking ahead and thinking about new research, it would be interesting to introduce
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44 variables related to knowledge management or environmental variables such as dynamism in
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46 the study, as well as contrasting them in longitudinal studies.
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References

- Alegre, J., & Chiva, R. (2008). Assessing the impact of organizational learning capability on product innovation performance: An empirical test. *Technovation*, 28 (6), 315-326.
- Ardito, L., & Petruzzelli, A.M. (2017). Breadth of external knowledge sourcing and product innovation: The moderating role of strategic human resource practices. *European Management Journal*, 35, 261-272.
- Armbruster, H., Bikfalvi, A., Kinkel, S., & Lay, G. (2008). Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys. *Technovation*, 28 (10), 644-665.
- Artz, K., Norman, P., Hatfield, D., & Cardinal, L. (2010). A longitudinal study of the impact of R&D, patents, and product innovation on firm performance. *Journal of Product Innovation Management*, (27) 5, 725-740.
- Atalay, M., Anafarta, N., & Sarvan, F. (2013). The relationship between innovation and firm performance: An empirical evidence from Turkish automotive supplier industry. *Procedia-Social and Behavioral Sciences*, 75, 226-235.
- Azadegan, A., & Dooley, K. J. (2010). Supplier innovativeness, organizational learning styles and manufacturers performance: An empirical assessment. *Journal of Operations Management*, 28 (6), 488-505.
- Baer, M., & Frese, M. (2003). Innovation is not enough: climates for initiative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behavior*, (24) 1, 45-68.
- Ballot, G., Fakhfakh, F., Galia, F., & Salter, A. (2015). The fateful triangle: Complementarities in performance between product, process and organizational innovation in France and the UK. *Research Policy*, 44 (1), 217-232.

- 1
2
3 Baum, J. R., & Wally, S. (2003). Strategic decision speed and firm performance. *Strategic*
4
5 *Management Journal*, 24 (11), 1107-1129.
6
7
8 Bhaskaran, S. (2006). Incremental innovation and business performance: Small and medium-
9
10 size food enterprises in a concentrated industry environment. *Journal of Small Business*
11
12 *Management*, 44 (1), 64-80.
13
14 Bodlaj, M., & Čater, B. (2019). The impact of environmental turbulence on the perceived
15
16 importance of innovation and innovativeness in SMEs. *Journal of Small Business*
17
18 *Management*, 57(sup2), 417-435.
19
20
21 Brown, S. L., & Eisenhardt, K. M. (1995). Product development: Past research, present
22
23 findings, and future directions. *Academy of Management Review*, 20 (2), 343-378.
24
25
26 Brunswicker, S., & Vanhaverbeke, W. (2015). Open Innovation in Small and Medium-Sized
27
28 Enterprises (SMEs): External Knowledge Sourcing Strategies and Internal
29
30 Organizational Facilitators. *Journal of Small Business Management*, 53 (4), 1241-1263.
31
32
33 Büschgens, T., Bausch, A., & Balkin, D. B. (2013). Organizing for radical innovation - A multi-
34
35 level behavioral approach. *The Journal of High Technology Management Research*,
36
37 (24) 2, 138-152.
38
39
40 Çakar, N. D., & Ertürk, A. (2010). Comparing innovation capability of small and medium-size
41
42 enterprises: examining the effects of organizational culture and empowerment. *Journal*
43
44 *of Small Business Management*, 48 (3), 325-359.
45
46
47 Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of
48
49 technological innovation capabilities and firm performance. *Journal of Business*
50
51 *Research*, 67 (1), 2891-2902.
52
53
54 Caroline, M., & Thuc, U. N. T. (2010). The link between non-technological innovations and
55
56 technological innovation. *European Journal of Innovation Management*, 13(3), 313-332.
57
58
59
60

- 1
2
3 Chatzoglou, P., & Chatzoudes, D. (2017). The role of innovation in building competitive
4 advantages: an empirical investigation. *European Journal of Innovation Management*,
5
6 21(1), 44-69.
7
8
9
- 10 Chen, C., & Huang, J. (2009). Strategic human resource practices and innovation performance
11 - The mediating role of knowledge management capacity. *Journal of Business Research*,
12
13 62 (1), 104-114.
14
15
16
- 17 Chesbrough, H. (2003). *Open innovation: the new imperative for creating and profiting from*
18
19 *technology*. Harvard Business School Press, Boston, MA.
20
- 21 Chesbrough, H. W., & Schwartz, K. (2007). Innovating business models with codevelopment
22
23 partnerships. *Research Technology Management*, 50 (1), 55-59.
24
25
- 26 Chesbrough, H., & Crowther, A. K (2006). Beyond high-tech: early adopters of open innovation
27
28 in other industries. *R&D Management*, 36 (3), 229-236.
29
- 30 Christian, L. B., Caroline, M., & Uyen, N.-T. T. (2015). The differentiated impacts of
31
32 organizational innovation practices on technological innovation persistence. *European*
33
34 *Journal of Innovation Management*, 18(1), 110-127.
35
36
- 37 Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning
38
39 and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
40
41
- 42 Cui, A.S., & Wu, F. (2016). Utilizing customer knowledge in innovation: antecedents and
43
44 impact of customer involvement on new product performance. *Journal of Academy of*
45
46 *Marketing Science*, 44 (4), 516-538.
47
48
- 49 Dahlander, L., & Gann, D. M. (2010). How open is innovation?" *Research Policy*, 39 (6), 699-
50
51 709.
52
- 53 Dai, L., Maksimov, V., Gilbert, B. A., & Fernhaber, S.A. (2014). Entrepreneurial orientation
54
55 and international scope: The differential roles of innovativeness, proactiveness, and
56
57 risk-taking. *Journal of Business Venturing*, (29) 4, 511-524
58
59
60

- 1
2
3 Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants
4 and moderators. *Academy of Management Journal*, 34, 555-590.
5
6
7 Damanpour, F. (1992). Organizational size and innovation. *Organization Studies*, 13 (3), 375-
8 402.
9
10
11 Damanpour, F., & Gopalakrishnan, S. (1998). Theories of organizational structure and
12 innovation adoption: the role of environmental change. *Journal of Engineering and*
13 *Technology Management*, 15 (1), 1-24.
14
15 Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and
16 process innovations in organizations. *Journal of Management Studies*, 38 (1), 45-65.
17
18 de Jong, J. P. J., & Flowers, S. (2018). Free in, free out? Outbound transfer of user innovations
19 in small UK firms. *Industrial Marketing Management*, 73, 21-30.
20
21 Dembla, P., Palvia, P., & Krishnan, B. (2007). Understanding the adoption of web-enabled
22 transaction processing by small businesses. *Journal of Electronic Commerce Research*,
23 8 (1), 1.
24
25 Dhanasai, C., & Parkhe, A. (2006). Orchestrating innovation networks. *The Academy of*
26 *Management Review*, 31 (3), 659-669.
27
28 Dibrell, C., Davis, P. S., & Craig, J. (2008). Fuelling innovation through information
29 technology in SMEs. *Journal of Small Business Management*, 46 (2), 203-218.
30
31 Dong, J. Q., McCarthy, K. J., & Schoenmakers, W. W. M. E. (2017). How central is too central?
32 Organizing interorganizational collaboration networks for breakthrough innovation.
33 *Journal of Product Innovation Management*, 34, 526-542
34
35 Dong, J.Q., & Netten, J. (2017). Information technology and external search in the open
36 innovation age: New findings from Germany. *Technological Forecasting & Social*
37 *Change*, 120 (1), 223-231.
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation:
4
5 Exploring the phenomenon. *R&D Management*, 39 (4), 311-316.
6
7
8 Evangelista, R., & Vezzani, A. (2010). The economic impact of technological and
9
10 organizational innovations. A firm-level analysis. *Research Policy*, 39 (10), 1253-1263.
11
12 Flor, M. L., Cooper, S. Y., & Oltra, M. J. (2018). External knowledge search, absorptive
13
14 capacity and radical innovation in high-technology firms. *European Management*
15
16 *Journal*, 36, 183-194.
17
18
19 Forés, B., & Camisón, C. (2016). Does incremental and radical innovation performance depend
20
21 on different types of knowledge accumulation capabilities and organizational size?
22
23 *Journal of Business Research*, 69 (2), 831-848.
24
25
26 Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable
27
28 variables and measurement error. *Journal of Marketing Research*, (XXVII) February,
29
30 39-50.
31
32
33 Forsman, H. (2011). Innovation capacity and innovation development in small enterprises.
34
35 *Research Policy*, 40, 739-750.
36
37
38 Frans, J. H. M. V., & Meulenbergh, M. T. G. (2004). Market orientation, innovativeness, product
39
40 innovation, and performance in small firms. *Journal of Small Business Management*, 42
41
42 (2), 134-154.
43
44
45 Gallego, J., L. Rubalcaba, L., & Hipp, C. (2013). Organizational innovation in small European
46
47 firms: A multidimensional approach. *International Small Business Journal*, 31 (5), 563-
48
49 579.
50
51
52 Gandia, R., & Gardet, E. (2017). Sources of Dependence and Strategies to Innovate: Evidence
53
54 from Video Game SMEs. *Journal of Small Business Management*,
55
56 <https://doi.org/10.1111/jsbm.12339>.
57
58
59
60

- 1
2
3 Geldes, C., Heredia, J., Felzensztein, C., & Mora, M. (2017). Proximity as determinant of
4
5 business cooperation for technological and non-technological innovations: a study of an
6
7 agribusiness cluster. *Journal of Business & Industrial Marketing*, 32 (1), 167-178.
8
9
10 Greco, M., Grimaldi, M., & Cricelli, L. (2016). An analysis of the open innovation effect on
11
12 firm performance. *European Management Journal*, 34,501-516.
13
14
15 Greitzer, E. M., Pertuze, J. A., Calder, E. S., & Lucas, W. A. (2010). Best practices for industry-
16
17 university collaboration. *MIT Sloan Management Review*, 51 (4), 83-90.
18
19
20 Gumusluoğlu, L., & Ilsev, A. (2009). Transformational Leadership and Organizational
21
22 Innovation: The Roles of Internal and External Support for Innovation. *Journal of*
23
24 *Product Innovation Management*, 26 (3), 264-277.
25
26
27 Hagen, B., Denicolai, S., & Zucchella, A. (2014). International entrepreneurship at the
28
29 crossroads between innovation and internationalization. *Journal of International*
30
31 *Entrepreneurship*, 12 (2), 111-114.
32
33
34 Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, G. V. (2014). Partial least squares
35
36 structural equation modeling (PLS-SEM) An emerging tool in business research.
37
38 *European Business Review*, 26 (2), 106-121.
39
40
41 Ham, J, Choi, B., & Lee, J. N. (2017). Open and closed knowledge sourcing. Their effect on
42
43 innovation performance in small and medium enterprises. *Industrial Management &*
44
45 *Data Systems*, 117, 1166-1184.
46
47
48 Henseler, J. (2017). Bridging Design & Behavioral Research With Variance-Based Structural
49
50 Equation Modeling. *Journal of Advertising*, 46 (1), 178-192.
51
52
53 Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant
54
55 validity in variance-based structural equation modeling. *Journal of the Academy of*
56
57 *Marketing Science*, 43 (1), 115-135.
58
59
60

- 1
2
3 Henttonen, K., & Lehtimäki, H. (2017). Open innovation in SMEs. Collaboration modes and
4
5 strategies for commercialization in technology-intensive companies in forestry industry.
6
7 *European Journal of Innovation Management*, 20 (2), 329-347.
8
9
10 Hervas-Oliver, J. L., & Sempere-Ripoll, F. (2015). Disentangling the influence of technological
11
12 process and product innovations. *Journal of Business Research*, 68 (1), 109–118.
13
14
15 Hewitt-Dundas, N. (2006). Resource and Capability Constraints to Innovation in Small and
16
17 Large Plants. *Small Business Economics*, 26 (3), 257-277.
18
19
20 Hilman, H., & Kaliappen, N. (2015). Innovation strategies and performance: are they truly
21
22 linked? *World Journal of Entrepreneurship, Management and Sustainable Development*,
23
24 11 (1), 48-63.
25
26
27 Hirsch-Kreinsen, H. (2008). Low-tech innovation. *Industry and Innovation*, 15 (1), 19-43.
28
29
30 Hsu, Y. A., & Fang, W. (2009). Intellectual capital and new product development performance:
31
32 The mediating role of organizational learning capability. *Technological Forecasting &*
33
34 *Social Change*, 76, 664-677.
35
36
37 Igbaria, M., Zinatelli, N., & Cavaye, A. (1998). Analysis of information technology success in
38
39 small firms in New Zealand. *International Journal of Information Management*, 18 (2),
40
41 103-119.
42
43
44 Iturrioz, C., Aragón, C., & Narvaiza, L. (2015). How to foster shared innovation within SMEs'
45
46 networks: Social capital and the role of intermediaries. *European Management Journal*,
47
48 33, 104-115.
49
50
51 Jansen, J. J. P., Van Den Bosch, F. A. J., & Volberd, H. W. (2006). Exploratory innovation,
52
53 exploitative innovation, and performance: Effects of organizational antecedents and
54
55 environmental moderators. *Management Science*, 52 (11), 1661-1674.
56
57
58 Jiménez Jiménez, D., & Sanz Valle, R. (2011). Innovation, organizational learning and
59
60 performance. *Journal of Business Research*, 64 (4), 408-417.

- 1
2
3 Kafetzopoulos, D., & Psomas, E. (2015). The impact of innovation capability on the
4 performance of manufacturing companies: The Greek case. *Journal of Manufacturing*
5 *Technology Management*, 26 (1), 104-130.
6
7
8
9
10 Katz, R., & Allen, T. J. (1982). Investigating the not invented here (NIH) syndrome: A look at
11 the performance, tenure, and communication patterns of 50 R&D project groups. *R&D*
12 *Management*, 12 (1), 7-20.
13
14
15
16
17 Keskin, H. (2006). Market orientation, learning orientation, and innovation capabilities in
18 SMEs. *European Journal of Innovation Management*, 9(4), 396-417.
19
20
21
22 Keupp, M. M., Palmié, M., & Gassmann, O. (2012). The strategic management of innovation:
23 A systematic review and paths for future research. *International Journal of Management*
24 *Reviews*, 14 (4), 367-390.
25
26
27
28
29 Khan, S. H., Majid, A., Yasir, M., & Javed, A. (2021). Social capital and business model
30 innovation in SMEs: do organizational learning capabilities and entrepreneurial
31 orientation really matter? *European Journal of Innovation Management*, 24(1), 191-212.
32
33
34
35
36 Kirner, E., Kinkel, S., & Jaeger, A. (2009). Innovation paths and the innovation performance
37 of low-technology firms – an empirical analysis of German industry. *Research Policy*,
38 38 (3), 447-458.
39
40
41
42
43 Kmiecik, R., Michna, A., & Meczynska, A. (2012). Innovativeness, empowerment and IT
44 capability: evidence from SMEs. *Industrial Management & Data Systems*, 112, 707-
45 728.
46
47
48
49
50 Kunttu, A., & Torkkeli, L. (2015). Service innovation and internationalization in SMEs:
51 Implications for growth and performance. *Management Revue*, 26 (2), 83-100.
52
53
54
55
56 Lee, S., Gwangma, P., & Jinwoo, P. (2010). Open innovation in SMEs - An intermediated
57 network model. *Research Policy*, 39, 290-300.
58
59
60

- 1
2
3 Lennerts, S., Schulze, A., & Tomczak, T. (2020). The asymmetric effects of exploitation and
4 exploration on radical and incremental innovation performance: An uneven affair.
5
6 European Management Journal, 38 (1), 121-134.
7
8
9
10 Lima, V.A., & da Silva Müller, F. (2017). Why do small businesses innovate? Relevant factors
11 of innovation in businesses participating in the Local Innovation Agents program in
12 Rondônia (Amazon, Brazil). *RAI Revista de Administração e Inovação*, 14, 290-300.
13
14
15
16 Louart, P., & Ducroquet, A. (2012). Small and Medium-sized Enterprises and their Attitudes
17 towards internationalization and Innovation. *International Business Research*, 5 (6), 14-
18
19 23.
20
21
22
23 Madrid-Guijarro, A, García, D., & Van Auken, H. (2009). Barriers to Innovation among
24 Spanish Manufacturing SMEs. *Journal of Small Business Management*, 47, 465-488.
25
26
27
28 Mansury, M. A., & Love, J. H. (2008). Innovation, productivity and growth in US business
29 services: A firm-level analysis. *Technovation*, 28 (1-2), 52-62.
30
31
32
33 Mariano, S., & Casey, A. (2015). Is organizational innovation always a good thing?
34
35 *Management Learning*, 46 (5), 530-545.
36
37
38 Martín-de Castro, G., Delgado-Verde, M., Navas-López, J. E., & Cruz-González, J. (2013). The
39 moderating role of innovation culture in the relationship between knowledge assets and
40 product innovation. *Technological Forecasting & Social Change*, 80 (2), 351-363.
41
42
43
44 McNally, R., Akdeniz, M., & Calantone, R. (2011). New product development processes and
45 new product profitability: Exploring the mediating role of speed to market and product
46 quality. *Journal of Product Innovation Management*, 28 (1), 63-77.
47
48
49
50
51 Menon, A., Chowdhury, J., & Lukas, B. (2002). Antecedents and outcomes of new product
52 development speed. An interdisciplinary conceptual framework. *Industrial Marketing*
53
54
55
56
57
58
59
60

- 1
2
3 Menzel, H., Aaltio, I., & Ulijn, J. (2007). On the way to creativity: engineers as intrapreneurs
4
5 in organizations. *Technovation*, 27, 732-743.
6
7 Miles I, & Green, L. (2008). *Hidden Innovation in the Creative Industries*. (NESTA, London)
8
9
10 Miller, W. L. (2001). Innovation for business growth. *Research Technology Management*, 44
11
12 (5), 26-41.
13
14 Murphy, L., Huggins, R., & Thompson, P. (2016). Social capital and innovation: A comparative
15
16 analysis of regional policies. *Environment and Planning C: Government and Policy*, 34
17
18 (6), 1025-1057.
19
20
21 Naranjo-Valencia, J. C., Sanz-Valle, R., & Jiménez-Jiménez, D. (2010). Organizational culture
22
23 as determinant of product innovation. *European Journal of Innovation Management*,
24
25 13(4), 466-480.
26
27
28 NESTA (2007). *Hidden Innovation: How innovation happens in six 'low innovation' sectors*.
29
30 London: NESTA.
31
32
33 Nieto, M. J., & Santamaria, L. (2010). Technological collaboration: Bridging the innovation
34
35 gap between small and large firms. *Journal of Small Business Management*, 48 (1), 44-
36
37 69.
38
39
40 Nieto, M. J., Santamaria, L., & Fernandez, Z. (2013). Understanding the Innovation Behavior
41
42 of Family Firms. *Journal of Small Business Management*, 53 (2), 382-399.
43
44
45 Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
46
47
48 OECD (2018). *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on*
49
50 *Innovation*. Paris: Paris/Eurostat, Luxembourg.
51
52
53 OECD (2019). *OECD SME and Entrepreneurship Outlook 2019*. OECD Publishing, Paris,
54
55
56 Oke, A., Prajogo, D. I., & Jayaram, J. (2013). Strengthening the innovation chain: the role of
57
58 internal innovation climate and strategic relationships with supply chain partners.
59
60 *Journal of Supply Chain Management*, 49 (4), 43-58.

- 1
2
3 Onetti, A., Zucchella, A., Jones, M. V., & McDougall-Covin, P. P. (2012). Internationalization,
4 innovation and entrepreneurship: business models for new technology-based firms.
5
6 *Journal of Management & Governance*, 16 (3), 337-368.
7
8
9
10 Parida, V., Westerberg, M., & Frishammar, J. (2012). Inbound Open Innovation Activities in
11 High-Tech SMEs: The Impact on Innovation Performance. *Journal of Small Business*
12 *Management*, 50(2), 283-309.
13
14
15
16
17 Passarelli, M., Landi, G. C., Cariola, A., & Sciarelli, M. (2021). Open innovation in the new
18 context of proof of concepts: evidence from Italy. *European Journal of Innovation*
19 *Management*, 24(3), 735-755.
20
21
22
23
24 Patterson, M. G., West, M. A., Shackleton, V. J., Dawson, J. F., Lawthom, R., Maitlis, S.,
25 Robinson, D. L., & Wallace, A. M. (2005). Validating the organizational climate
26 measure: Links to managerial practices, productivity and innovation. *Journal of*
27 *Organizational Behavior*, 26 (4), 379-408.
28
29
30
31
32
33 Perkins, C. (2012). CoDev 2012 unveils future direction for open innovation advancement.
34 *Visions*, 2, 34-36.
35
36
37
38 Popa, S., Soto-Acosta, P., & Martínez-Conesa, I. (2017). Antecedents, moderators, and
39 outcomes of innovation climate and open innovation: An empirical study in SMEs.
40 *Technological Forecasting & Social Change*, 118, 134-142.
41
42
43
44
45 Prajogo, D. I. (2006). The relationship between innovation and business performance –A
46 comparative study between manufacturing and service firms. *Knowledge and Process*
47 *Management*, 13 (3), 218-225.
48
49
50
51
52 Prajogo, D. I., & Ahmed, P.K. (2006). Relationships between innovation stimulus, innovation
53 capacity, and innovation performance. *R&D Management*, 36, 499-515.
54
55
56
57
58
59
60

- 1
2
3 Rask, M. (2014). Internationalization through business model innovation: In search of relevant
4 design dimensions and elements. *Journal of International Entrepreneurship*, 12 (2),
5 146-161.
6
7
8
9
10 Reichstein, T., & Salter, A. (2006). Investigating the sources of process innovation among UK
11 manufacturing firms. *Industrial and Corporate Change*, 15 (4), 653-682.
12
13
14 Remneland-Wikhamn, B., & Wikhamn, W. (2011). Open Innovation Climate Measure: The
15 Introduction of a Validated Scale. *Creativity and Innovation Management*, 20 (4), 284-
16 295.
17
18
19
20
21 Ringle, C. M., Sarstedt, M., Schlittgen, R., & Taylor, C. R. (2013). PLS path modeling and
22 evolutionary segmentation. *Journal of Business Research*, 66, 1318-1324.
23
24
25
26 Riva, C., Torcal, M., & Morales, L. (2010). Estrategias para aumentar la tasa de respuesta y los
27 resultados de la Encuesta Social Europea en España", *Revista Internacional de*
28 *Sociología*, 68 (3), 603-635.
29
30
31
32
33 Roper, S., & Love, J. H. (2002). Innovation and export performance: evidence from the UK and
34 German manufacturing plants. *Research Policy*, 31 (7), 1087-1102.
35
36
37
38 Sadowski, B. M., Maitland, C., & van Dongen, J. (2002). Strategic use of the Internet by small-
39 and medium-sized companies: an exploratory study. *Information economics and Policy*,
40 14 (1), 75-93.
41
42
43
44
45 Saebi, T., & Foss, N. J. (2015). Business models for open innovation: Matching heterogeneous
46 open innovation strategies with business model dimensions. *European Management*
47 *Journal*, 33 (3), 201-213.
48
49
50
51
52 Schleimer, S.C., & Faems, D. (2016). Connecting interfirm and intrafirm collaboration in NPD
53 Projects: does innovation context matter? *Journal of Product Innovation Management*,
54 33 (2), 154-165.
55
56
57
58
59
60

- 1
2
3 Schroll, A., & Mild, A. (2012). A critical review of empirical research on open innovation
4 adoption", *Journal Für Betriebswirtschaft*, 62 (2), 85-118.
5
6
7 Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital,*
8
9
10
11
12
13 Shane, S. (1995). Uncertainty avoidance and the preference for innovation championing roles.
14
15 *Journal of International Business Studies*, first quarter, 47-68.
16
17 Shanker, R., Bhanugopan, R., van der Heijden, B. I. J. M., & Farrell, M (2017). Organizational
18
19 climate for innovation and organizational performance: The mediating effect of
20
21 innovative work behaviour. *Journal of Vocational Behavior*, 100, 67-77.
22
23
24 Somech, A., & Drach-Zahavy, A. (2013). Translating team creativity to innovation
25
26 implementation: The role of team composition and climate for innovation. *Journal of*
27
28
29 *Management*, 39 (3), 684-708.
30
31 Spithoven, A., Clarysse, B., & Knockaert, M. (2010). Building Absorptive Capacity to Organise
32
33 Inbound Open Innovation in Traditional Industries. *Technovation*, 30, 130-141.
34
35 Teece, D. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of
36
37 (Sustainable) Enterprise Performance. *Strategic Management Journal*, 28, 1319-1350.
38
39
40 Thomas, E. (2013). Supplier integration in new product development: Computer mediated
41
42 communication, knowledge exchange and buyer performance. *Industrial Marketing*
43
44
45 *Management*, 42, 890-899.
46
47 Tian, H., Dogbe, C. S. K., Pomegbe, W. W. K., Sarsah, S. A., & Otoo, C. O. A. (2021).
48
49 Organizational learning ambidexterity and openness, as determinants of SMEs'
50
51 innovation performance. *European Journal of Innovation Management*, 24(2), 414-438.
52
53
54 Van de Vrande, V., De Jong, J. P., Vanhaverbeke, W., & De Rochemont, M. (2009). Open
55
56 innovation in SMEs: trends, motives and management challenges. *Technovation*, 29 (6),
57
58
59 423-437.
60

- 1
2
3 van der Meer, H. (2007). Open Innovation - The Dutch Treat: Challenges in Thinking in
4
5 Business Models. *Creativity and Innovation Management*, 16, 192-202.
6
7
8 Wagner, S. M. (2010). Supplier traits for better customer firm innovation performance.
9
10 *Industrial Marketing Management*, 39, 1139-1149.
11
12 Wang, C. H. (2014). A longitudinal study of innovation competence and quality management
13
14 on firm performance. *Innovation*, 16 (3), 392-403.
15
16
17 Wang, F., & Chen, K. (2020). Do product imitation and innovation require different patterns of
18
19 organizational innovation? Evidence from Chinese firms. *Journal of Business Research*,
20
21 106, 60-74.
22
23
24 West, J., & Bogers, M. (2014). Leveraging external sources of innovation: a review of research
25
26 on open innovation. *Journal of Product Innovation Management*, 31 (4), 814-831.
27
28
29 Xie, X., Wang, L., & Zeng, S. (2018). Inter-organizational knowledge acquisition and firms'
30
31 radical innovation: A moderated mediation analysis. *Journal of Business Research*, 90,
32
33 295-306.
34
35
36 Yuan, F., & Woodman, R. W. (2010). Innovative behavior in the workplace: The role of
37
38 performance and image outcome expectations. *Academy of Management Journal*, 53
39
40 (2), 323-342.
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
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57
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Appendix: Measures

Open Innovation Climate: Innovation and flexibility

- IF1: New ideas are readily accepted here.
- IF2: This organization is quick to respond when changes need to be made.
- IF3: Management here are quick to spot the need to do things differently.
- IF4: This organization is very flexible; it can quickly change procedures to meet new conditions and solve new problems as they arise.
- IF5: Assistance in developing new ideas is readily available.
- IF6: People in this organization are always searching for new ways of looking at problems.

Open Innovation Climate: Outward focus

- OF1: This organization is quite inward looking; it does not concern itself with what is happening in the marketplace. (R)
- OF2: Ways of improving service to the customer are not given much thought. (R)
- OF3: Customer needs are not considered top priority here. (R)
- OF4: This company is slow to respond to the needs of the customer. (R)
- OF5: This organization is continually looking for new opportunities in the marketplace.
- OF6: This organization has difficulties to incorporate ideas coming from outside the organization. (R)

Open Innovation Climate: Reflexivity

- R1: In this organization, the way people work together is readily changed in order to improve performance.
- R2: The methods used by this organization to get the job done are often discussed.
- R3: There are regular discussions as to whether people in the organization are working effectively together.
- R4: In this organization, objectives are modified in light of changing circumstances.
- R5: In this organization, time is taken to review organizational objectives.

Indicators of hidden innovation

- H1: Within the last 12 months we have successfully introduced a new way of managing resources
- H2: We have successfully delivered worthwhile training for the implementation of new products, services or processes
- H3: We are good at understanding knowledge from outside the organisation
- H4: Our organisational culture is supportive of generating new ideas

Exploratory innovation

- ERI1: Our unit accepts demands that go beyond existing products and services.
- ERI2: We invent new products and services.
- ERI3: We experiment with new products and services in our local market.

- ERI4: We commercialize products and services that are completely new to our unit.
- ERI5: We frequently utilize new opportunities in new markets.
- ERI6: Our unit regularly uses new distribution channels.

Exploitative innovation

- EII1: We frequently refine the provision of existing products and services.
- EII2: We regularly implement small adaptations to existing products and services.
- EII3: We introduce improved, but existing products and services for our local market.
- EII4: We improve our provision's efficiency of products and services.
- EII5: We increase economies of scales in existing markets.
- EII6: Our unit expands services for existing clients.

Table 1: Characteristics of the Sample

Features	% of Companies
Sector of activity	1.83% Agrarian
	18.90% Industrial
	7.93% Construction
	71.34% Services
Size	33.1% less than 10 employees
	56.6% from 11 to 50 employees
	10.3% more than 50 employees
Age	13.8% less than 5 years
	27.7% between 6 -10 years
	21.5% between 11-20 years
	36.9% over 20 years

Table 2: Psychometric properties and matrix of correlations of constructs.

	<i>Statistical</i>				<i>Correlations</i>					
	α	CR	AVE	R^2	1	2	3	4	5	6
1. Flexibility	0.934	0.950	0.759	0.862	0.871	0.796	0.881	0.723	0.685	0.740
2. External focus	0.951	0.964	0.816	0.838	0.747	0.903	0.817	0.695	0.723	0.645
3. Reflectivity	0.887	0.918	0.692	0.829	0.805	0.751	0.832	0.739	0.704	0.693
4. Hidden Innovation	0.930	0.962	0.863	0.499	0.656	0.640	0.657	0.929	0.706	0.718
5. Incremental Inv. Prod.	0.914	0.936	0.711	0.533	0.629	0.671	0.633	0.643	0.843	0.812
5. Radical Inv. Prod.	0.894	0.933	0.699	0.501	0.653	0.583	0.601	0.646	0.719	0.836

Note: AVE = average extracted variance; CR = composite reliability; α = Cronbach Alpha; R^2 = Statistic R corrected.

The diagonal of the covariance matrix (in bold) collects the square root of the extracted average variance. The values below the diagonal are correlations between the constructs and the values above the diagonal are the values of the ratio Heterotrait-Monotrait (HTMT).

Table 3: Results of the structural model for the contrast of the hypotheses.

<i>Hip.</i>	<i>Model relationships</i>	Path value	St-Dev	T-Value	<i>F</i> ²
H _{1a}	Open innovation climate → incremental innovation	0.473***	0.075	6.311	0.256
H _{1b}	Open innovation climate → radical innovation	0.400***	0.085	4.726	0.179
H _{2a}	Hidden innovation → incremental innovation	0.311***	0.079	3.925	0.105
H _{2b}	Hidden innovation → radical innovation	0.353***	0.095	3.730	0.132
H ₃	Open innovation climate → hidden innovation	0.679***	0.044	15.489	0.945
<i>Second order relationships</i>					
	Open innovation climate → Flexibility	0.738***	0.041	17.853	
	Open innovation climate → External focus	0.944***	0.009	106.824	
	Open innovation climate → Reflexivity	0.916***	0.014	65.838	
<i>Indirect effects</i>					
	Open innovation climate → incremental innovation	0.211***	0.061	3.450	
	Open innovation climate → radical innovation	0.239***	0.072	3.343	

Figure 1: Relationship model and interaction flow between model components.

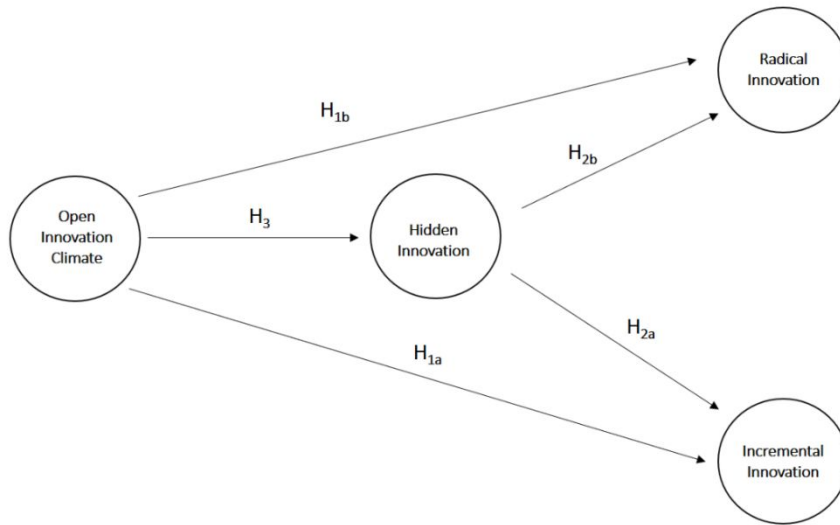


Figure 2: Result of hypothesis contrast

