MEASURING MARKET SENSING CAPABILITIES FOR NEW PRODUCT DEVELOPMENT SUCCESS

Purpose

The purpose of this paper is to conceptualize and operationalize the concept of sensing capabilities and analyse its relationship with new product development (NPD) success and organic organizational structures. To our knowledge, past measures of market sensing capabilities have never included opportunity interpretation, through business experience and organizational articulation, as part of the concept.

Design/methodology/approach

Based on a sample of over 180 SMEs, market sensing capabilities constructs and their relationships were tested through academics' and managers' perceptions. The measure was tested using confirmatory factor analysis.

Findings

Findings reveal theoretically sound constructs based on four underlying sensing capabilities components: analytical processes, customer relationship, business experience, and organizational articulation. Results demonstrate reliability, convergent, discriminant, and nomological validity. All four dimensions are positively associated with new product development success and are more likely to appear in organic organizational structures.

Originality/value

Existing sensing capabilities measures are focused on environmental scanning, and the essence of the concept is not fully expressed by the traditional measures of analytical processes and customer relationship. Our new measure includes opportunity interpretation through business experience and organizational articulation.

Practical implications

The resulting instrument provides managers with a valuable tool to measure firms' abilities to address environmental uncertainty. By using this instrument, managers can assess internal organizational structures and resources allocated to sensing capabilities. By developing sensing capabilities, managers might ultimately influence their new product development strategy. Findings also reveal that sensing capabilities are positively and significantly associated with organic organizational structures.

"Entrepreneurship is about sensing and understanding opportunities"
(Teece, 2007: 1346)
"If opportunity does not knock build a door"
(Milton Berlinger)

1. Introduction

Market opportunity sensing is a fundamental capability of market-driven organizations (Morgan, *et al*., 2009). A market sensing capability can be defined as the firm's ability to learn about customers, competitors, intermediaries and the market context in which it operates (Day, 1994). In a context of uncertainty and dynamism in competitive environments the demand for sensing capabilities increases due to global competition, information overload, technology changes, and high innovation rates (Barrales-Molina, *et al*., 2014). To address environmental uncertainties, firms must be open to change, look for a wider range of solutions and decision-making styles, and embrace outside views (Asseraf, *et al*., 2019; Lages, 2016). In today's dynamic world, managers must be able to develop unique capabilities for sensing market opportunities in the decision making context, and to determine when an opportunity has been identified (Eckhardt and Shane, 2003).

Sensing capabilities also require the ability to search and explore new domains (Hodgkinson and Healey, 2011). This makes it possible to reach different markets and build relationships with customers that the firm does not yet have (Danneels, 2008). Firms should have a basis for successful innovations and value added strategies to sustain competitive advantage (Harmsen and Jensen, 2004). Furthermore, sensing capabilities are found to be important for reducing production and acquisition costs (Hult, 1998), and linked with firms' revenue, and margin and profit growth (Morgan, et al., 2009).

The theoretical and managerial relevance of sensing capabilities is related to the sustainability of competitive advantage in changing environments (Teece *et al.*, 1997; Zahra, *et al.*, 2006; Eisenhardt and Martin, 2000), forming the basis of the dynamic capabilities framework (Teece, 2007). Research on dynamic capabilities has evolved from identifiable, specific, and stable patterns of collective routines (e.g. Eisenhardt and Martin, 2000; Zollo and Winter, 2002) to a more complex approach based on microfoundations (e.g. Teece, 2007; Dixon, *et al.*, 2010; Hodgkinson and Healy, 2011). As such, a new perspective for the causes of sustainable performance implies a more complex approach, more consistent with rapidly changing global business environments, which requires that firms develop heterogeneous capabilities (Drnevich and Kriauciunas, 2011; Teece, 2007).

The importance of sensing capabilities is reflected in several attempts to operationalize the concept. In the context of the framework advanced by Teece (2007), several measures are proposed for sensing, seizing, and reconfiguring capabilities (e.g. Pavlou and El Sawy, 2011; Wilden, *et al*., 2013; Janssen, *et al.*, 2016). These measures focus on the assessment of the firm's sensing capabilities including items related to environmental scanning processes, such as gathering market and business information, observing and adopting the best practices, or identifying customer needs. The word "scanning" is used by Danneels (2008) with regard to measurement. It includes aspects such as attending scientific or professional conferences or frequently participating in trade shows. This measure is further extended by Wilden, *et al*. (2013) incorporating items of the measure proposed by Jantunen (2005) regarding the knowledge acquisition dimension.

Despite the relevance of these scales in the operationalization of the construct of dynamic capabilities, we posit that the essence of sensing capabilities is not fully reflected. Sensing capabilities goes beyond environmental scanning. The measure alertness (Tang, *et*

al., 2012) addresses the individual's ability to identify opportunities, framing it in the context of the entrepreneur, not the organization. As suggested by Rastkhiz, *et al.* (2019) it should be placed within the scope of a multi-expert decision-making process, or collective mind (Ettlie and Pavlou, 2006). In this vein, we argue that market sensing should reflect its true essence.

This study revisits the concept, role, and key components to develop and empirically test a new sensing capabilities measure that incorporates the essence of the construct. Accordingly both researchers and practitioners might better assess and thereby tackle this construct more efficiently. Furthermore, by doing so, they can improve NPD success and amplify this source of competitive advantage (Ettlie and Pavlou, 2006). NPD success depends on firms' abilities to scan the environment to transfer new market knowledge into the organizational processes (Dosi, et al., 2008).

The articulation could be related to cooperation between marketing and sales and NPD project managers (Ernst, *et al*. 2010), to link marketing resources to sensing capabilities (Kozlenkova, *et al*., 2013), to develop NPD inter-firm partnerships (Day, 1994; Ettlie and Pavlou, 2006), or to incorporate past NPD experience (Marsh and Stock, 2003).

This article aims to propose a market sensing capabilities measure using to scale development procedures. Instead of treating this measure as a unidimensional construct, various measurement units for each of the four dimensions are presented. The measurement properties of the market sensing capabilities measure were assessed using a confirmatory factor analysis approach and a multi-industry sample from a European Union country (Portugal). Considering the need for SMEs to adapt their organisational structure to integrate the proposed dimensions of scale and simultaneously improve their performance in the development of new products, this article also aims to explore the relationship between the

four dimensions of scale and the pursuit of an organic organisational structure and performance in the development of new products.

2. Sensing Capabilities: concept, role, and key components

We posit that the essence of sensing capabilities is not fully captured in existing measures, which are more focused on scanning activities. However, based on the essence of the concept, we argue that sensing capabilities are also related to processes occurring inside firms' borders, such as opportunity interpretation through business experience and organizational articulation. We build on reported research to lay three theoretical assumptions: concept, role, and key components.

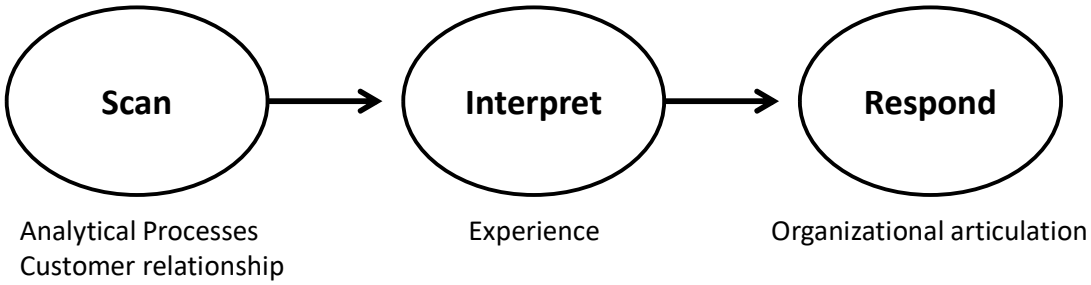
To integrate the essence, the *concept* should be clarified. One critical concept is opportunity recognition. Opportunity recognition is concerned with the formation of subjective beliefs that an opportunity exists (Shepherd, *et al.*, 2007). This means that opportunity recognition is an element of the larger opportunity exploration-recognition-exploitation process (Gregoire, *et al*., 2010). Sensing capabilities goes further, consisting of the organizational ability to spot, interpret, and pursue opportunities (Pavlou and El Sawy, 2011). It is therefore not only about scanning and recognition of market opportunities. The definition also includes interpretation and mobilization of resources (Teece, 2009; Katkalo *et al*., 2010), meaning that sensing is a process that incorporates intuition, which is particularly important on more turbulent environments (Zacca, *et al.*, 2017). In sum, sensing new opportunities "is much a scanning, creation, learning and interpretative activity" (Teece, 2007, p. 1322).

The *role* of sensing capabilities within the organization should also be specified. It is not clear in the literature whether roles are a precedent of dynamic capabilities (Inan and Bititci, 2015) or a part of them. The latter enjoys more consensus in the literature (Pavlou and El Sawy, 2011; Wilden *et al.*, 2013). More specifically, Teece (2007) considers sensing capabilities to be the organizational and managerial processes that underlie dynamic capabilities.

Accepting this assumption, roles are important enablers of firms' evolutionary mechanisms (Janssen, *et al.*, 2016), of innovation performance and long-term competitiveness (Jantunen, 2005; Bruni and Verona, 2009; Barrales-Molina, *et al.*, 2014), of the ability to reconfigure operational or ordinary capabilities (Danneels, 2008; Drnevich and Kriauciunas, 2011; Pavlou and El Sawy, 2011; Laaksonen and Peltoniemi, 2018), and of competitive advantage (Harmsen and Jensen, 2004; Perry, *et al.*, 2011). This is consistent with the indirect effect of dynamic capabilities on firm performance (Laaksonen and Peltoniemi, 2018). In the field of SMEs, management competences influence performances indirectly with the mediating role of entrepreneurial orientation and willingness to change (Zacca and Dayan, 2018).

The decomposition of sensing capabilities is especially important to bring new insights on this matter (Singh, 2001) and must be established considering organizational capabilities in order to build the link to action (Harmsen and Jensen, 2004). The *key components* of sensing capabilities are presented in Figure 1.

FIGURE 1:
KEY COMPONENTS OF SENSING CAPABILITIES



Key components of sensing capabilities include several routines. First, the firm must be able to perform an environmental *scanning*. Two major streams of literature can be identified addressing this topic. One asserts that the firm must possess capabilities to develop a systematic scanning mechanism to track and interpret market trends, based on analytical processes and organizational articulation (Teece, 2007; Schreyögg and Kliesch-Eberl, 2007; Laamanen and Wallin, 2009). The other is based on managerial cognition factors that complement processes analysis through individually accumulated knowledge and experience, relational capabilities (Shane and Venkataraman, 2000; Hodgkinson and Healy, 2011; Tumasjan and Braun, 2012), and managerial intuition (Zacca, *et al*., 2017).

Scanning activities are related to search activities in the business ecosystem (Teece, 2007), to the generation of market intelligence (Pavlou & El Sawy, 2011), and to the allocation of resources, processes, and employees to scan the environment (Wilden *et al*., 2013). Being close to the customer also facilitates detailed comprehension of customer needs and frustrations (Teece, 2007). For this reason customer relationship is also an important task for scanning activities (Danneels, 2008; Zahra *et al*., 2006). Accordingly, scanning is about an orchestration between analytical reasoning and relationship capabilities (Wood and McKinley, 2010).

Second, the scanning results should be evaluated through mechanisms of *interpretation* (Eckhardt and Shane, 2003), avoiding situations in which attention is diverted by all the opportunities that a successful scanning activity might reveal (Teece, 2007). Recognizing the potential profit of an opportunity depends on the possession of the experience necessary to identify it (Groysberg and Lee, 2009) and on the cognitive ability to value it (Shane and Venkataraman, 2000; Zott and Huy, 2012). As such, interpretation plays a key role in filtering and aligning the opportunities to be explored in the context of the organizational vision (Wood and McKinley, 2010). Interpreting the glimpsed opportunities means that managers and entrepreneurs should evaluate new developments and identify which technology and which market segment to target (Teece, 2007). Opportunity evaluation is considered "a multi-expert decision-making process in which main decision makers of the firm or key entrepreneurial team members who are responsible for the business engage in evaluation" (Adel Rastkhiz, *et al*., 2019). Through this process the dissemination of market intelligence should occur (Kogut and Zander, 1996; Pavlou and El Sawy, 2011).

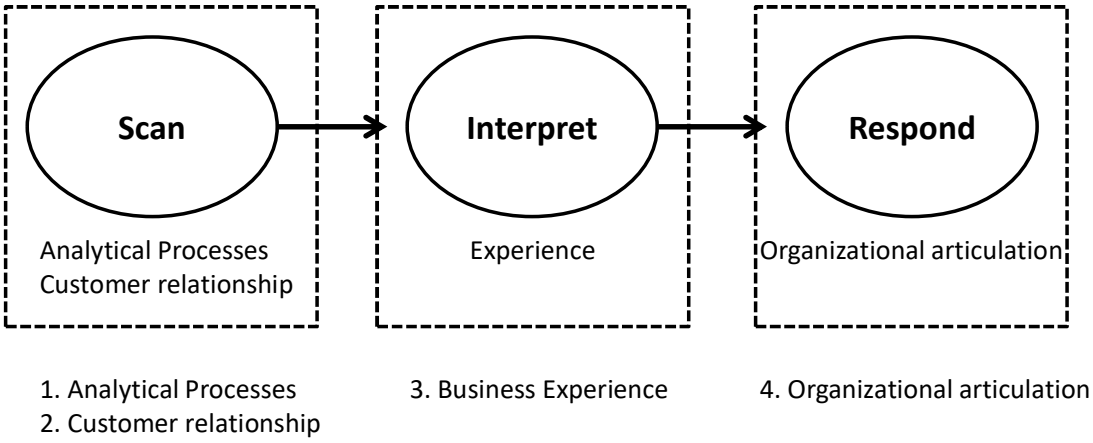
Third, *responding* to market opportunities is related to mobilizing resources (Teece, 2007) and initiating plans to capitalize on market intelligence (Pavlou and El Sawy, 2011). These plans promote the development of cross functional business processes, leading to superior customer value (Fang and Zou, 2009). Organizational articulation can be completed by embedding this new market knowledge in business processes designed by middle management (Teece, 2007).

3. The Four Dimensions of Sensing Capabilities

Literature about sensing capabilities addresses the need for the integration of three key components, as discussed above. First, the existence of formal analytical processes allowing a systematic approach to market research (Teece, 2007; Schreyögg and Kliesch-Eberl, 2007; Laamanen and Wallin, 2009), market knowledge as a driving force to achieve high level of market response (Barrales-Molina, *et al*., 2014), and customer relationship to obtain first hand market intelligence (Danneels, 2008; Pavlou and El Sawy, 2011). The outcomes of these processes must flow toward the firm's decision makers. They must interpret (Teece, 2007) and respond through organizational articulation practices (Narver and Slater, 1990; Allred, *et al*., 2011). Second, sensing capabilities also depend on managerial experience in opportunity recognition and the subjacent means-end relationship (Shane and Venkataraman, 2000; Welpe, *et al.*, 2012), representing a subjective perception of environmental change (Teece, 2007).

The differences in opportunity sensing depend on the management team to respond in conformity (Baron, 2004; Tumasjanand and Braun, 2012). To do so, managers must interpret which opportunities are aligned with firms' visions as a basis to launch new ventures (Hoskisson, *et al*., 2011; Rasmussen, *et al*., 2011). While integrating these topics, our measure combine scanning, interpretation, and responsiveness as key components of sensing capabilities. As such, our measure comprises the perspective of organizational systems to obtain and translate the market information into organizational learning, but also includes the human experiential and relational factor. Our measure is thus composed of four dimensions supporting sensing capabilities: (1) analytical processes, (2) customer relationships, (3) business experience, and (4) organizational articulation, (as presented in Figure 2). Next, these four constructs are explained in detail.

FIGURE 2:
THE LINK BETWEEN KEY COMPONENTS OF SENSING CAPABILITIES AND MEASURE DIMENSIONS



4.1. Analytical processes

Sensing capabilities are related to the existence of analytical processes that result in a methodical scanning of changes in environmental opportunities. Firms that do not build these kinds of processes are less prepared to assess their market and spot opportunities (Teece, 2007). Analytical processes follow theoretical development of dynamic capabilities that lead to a general agreement that they can be considered as organizational routines or processes (Eisenhardt and Martin, 2000). By continuously scanning environmental change, the monitoring function of analytical processes is fundamental to the adoption of corrective actions (Schreyögg and Kliesch-Eberl, 2007). Market orientation also integrates the essence of mechanisms of generation and dissemination of market intelligence (Kohli and Jaworski, 1990), considering a sequence of processes and routines with the goal of monitoring customers' needs and wants. By assuring the environmental comprehension, managers are

more able to identify real and potential failures and take the appropriate responses (Shane and Venkataraman, 2000). As the skills to do so are not equally distributed throughout the organization, it is suggested that analytical processes should be embedded within the organization (Teece, 2007).

The literature related to analytical processes to identify opportunities considers several mechanisms and systems, such as in-house market research, formal and informal contacts with stakeholders (Vorhies, *et al.*, 2005; Teece, 2007), customer and prospects tracking (Harmsen and Jensen, 2004), and detection of changes in their preferences (Jaworski and Kohli, 1993). According to the degree of market uncertainty, traditional approaches for new product development like Stage-Gate can be combined with more agile solutions, especially when exists a greater need for experimentation (Cooper and Sommer, 2016). As such, the hybrid Agile-Stage-Gate approach allows to rapidly creating prototypes that can be market tested for feedback, in a trial and error solution more suited when there is much uncertainty (Cooper, 2016). The construct presented below has eight items and assesses the strength of analytical processes for sensing capabilities in relation to competitors.

4.2. *Customer relationships*

Sensing opportunities requires the firm to maintain close relationships with customers (Teece, 2007). Being close to customers is important for monitoring market demands and for translating them into organizational responses (Harmsen and Jensen, 2004). The adaptation of organizational activities also depends on the relational perspective established by the firm and its individuals (Rothaermel and Hess, 2007; Zahra *et al.*, 2006; Hodgkinson and Healy, 2011). Customer relationship management is a mechanism that helps to achieve superior competitive advantage (Barrales-Molina, *et al.*, 2014). Wang, *et al.* (2015) underpinned

relational capabilities (including innovation and information) as a critical enabler of firm capabilities. They enhance collaboration, which is independent of the level of market turbulence (Wang *et al.,* 2015). The concretization of this dimension is related to organizational culture toward customers and to listening to the market (Zahra *et al.,* 2006). In fact, market sensing can be more fine-tuned about customers' needs and wants than proposals made by competitors (Danneels, 2008).

As capabilities "usually evolve over time in the context of complex and partly implicit experiences, organizations often lack a well-articulated understanding of their own capabilities" (Schreyögg and Kliesch-Eberl, 2007:928). Opportunity recognition depends partially on managerial experience and organizational knowledge and learning capabilities (Teece, 2007; Dosi, *et al.*, 2008). This construct is inspired by the work of Parasuraman, *et al*. (1988) and seeks to capture employees' behaviour regarding customer assistance, responsiveness to customer's needs, and relationship with customers.

4.3. *Business Experience*

As mentioned above, the interpretation encompasses customer relationships and the ability to filter the options detected through analytical processes. This is the field of subjective perception and creativity of the management team (Kor, *et al.*, 2007). Recent studies underscore the complementary importance of managers' experience in the interpretation of the information produced by the analytical processes. It has been argued that analytical processes dim the comprehension of market trends, diminishing true sensing, and losing several important managerial capabilities such as intuition and emotion (Hodgkinson and Healy, 2011). Differences in strategic change are linked to differences in managerial cognition (Zott and Huy, 2012). Experience is a key issue to explore new markets, a part of

the essence of dynamic capabilities (Groysberg and Lee, 2009). Business learning and managers' past experience develop in a co-evolution perspective (Zollo and Winter, 2002; Dixon, *et al*., 2010), and failure recognition plays an important role in experience accumulation (Mitchell, *et al*., 2008). A higher level of business experience allows companies to combine "emotion to update mental representations and (…) skilled utilization of intuitive processes to synthesize information and form expert judgments" (Hodgkinson and Healy, 2011, p.1502).

Different managers can thus interpret or exploit the same market opportunities differently. In their mental equation they evaluate several outcomes of exploiting market opportunities, based on their caracteristics (Shane and Venkataraman, 2000). However, Welpe, *et al*. (2012) argue that subjective evaluations are more important than market opportunities' caracteristics, as "innovative activities in organizations occur through managers' subjective sensing of processes that need to be initiated to then search, learn, establish, and implement this creativity" (Lin, *et al*., 2016, p. 866).

Another perspective that reinforces the importance of the managerial experience emerges from the entrepreneurship literature, suggesting that opportunity recognition needs the development of specific capabilities such as experience in the industry (Rasmussen, *et al*., 2011). This component of sensing capability is important because the exclusive use of analytical processes can lead to competitive parity. Since these systems are sought by several firms, in the limit all competitors are aware of the same market opportunities. Decision making can thus produce similar strategies between rival firms (Porter, 1996). After opportunity detection by analytical processes, entrepreneurs and managers must determine how to interpret new events and developments (Teece, 2007). The quality of this decision

depends on the use of a mixture of analytical and intuitive styles (Hodgkinson and Healy, 2011). This construct is inspired by the work of Morgan, *et al*. (2004), who consider that sensing capabilities must include firms' accumulated experience. It captures the experiential evolution recognizing that market, client, and business wisdom lead to better sense when reading environmental scanning information.

4.4. Organizational articulation

The effectiveness of analytical processes and learning through customer relationship depends on the existence of organizational articulations. Asset orchestration and sensing capabilities are closely related managerial functions (Helfat and Martin, 2014). They make it possible to absorb knowledge and create a bridge between external opportunities and internal operationalization (Teece, 2007; Pavlou and El Sawy, 2011; Pinheiro et al., 2021). There are two key underpinnings: interpretation and knowledge absorption. First, this articulation assures a "filter so that attention is not diverted to every opportunity and threat that 'successful' search reveals" (Teece, 2007, p. 1326) and is an essential requisite to accurately change operational capabilities (Cepeda and Vera, 2007). A key assumption in marketing dynamic capabilities is the ability to absorb market knowledge and facilitate its integration into the organization (Barrales-Molina, *et al*., 2014), and application to commercial ends (Cohen and Levinthal, 1990). Zahra and George (2002) consider absorptive capacity as a set of abilities to manage knowledge. Marketing resources and capabilities have the potential to reach new market opportunities and disseminate knowledge through the organization (Kozlenkova, *et al*., 2014).

Several aspects such as established organizational structures, cultures that negatively affect inter-firm collaboration, and the unavailability of other organizational enablers (Allred, *et al*., 2011) constitute a holistic approach for structuring sensing capabilities across the organization and entrepreneurial teams (Lim, *et al*., 2012). Key barriers to the organizational articulation could also be inefficient coordination and integration of capabilities and entrenched learning processes that create rigidities (Sirmon, *et al*., 2007). In a healthy organizational articulation, managerial decisions must gather and leverage capabilities, establish a climate of strong collaboration, and focus the organization on a common vision (Sirmon *et al*., 2007). This leads to the need of more organic organizational structures that allow firms to implement "management practices among functional departments for the generation and sharing of market intelligence on current and future demands and customer needs" (Wong ang Tong, 2012, p. 102). Furthermore, a positive organizational climate and culture are at the core of sensing capabilities (Dyer, *et al.*, 2008). This context promotes the articulation between entrepreneurial team members, especially the adoption of behaviours that increase the probability of generating new ideas (Dyer, *et al.*, 2008).

Learning also plays an important role in sensing capabilities (Gavetti, 2005; Rothaemel and Hess, 2007; Laamanen and Wallin, 2009), from several perspectives: first, in resource management in dynamic environments it promotes improvement (Sirmon *et al.,* 2007); second, in organizational transformation processes it is important for deployment and environmental search (Dixon, *et al.,* 2010); and finally, for modifying operating routines, since it is based on systematic methods (Zollo and Winter, 2002).

Our study adapts the organizational learning construct from the work of Hult, *et al.* (2003), considering that previous conditions must be joined in an organizational articulation

that reinforces team spirit, the existence of a commonality of purpose, a total agreement regarding the organizational vision, the comprehension of how each one's work fits into the value chain of the organization, and the recognition of the importance of learning as a key to improvement. Our construct comprises 10 items.

4. Hypotheses development and research model

4.1. Sensing Capabilities Dimensions and NPD Success

The new product development construct relies on Vorhies and Morgan's (2005) work, and measures "the processes by which firms develop and manage product and service offerings" (p. 82). NPD success "involves the transformation of innovative ideas into products" (Wong and Tong, 2012, p. 101), and can be defined as the relative success rate on revenue and margin growth resulting from new products (Atuahene-Gima *et al*., 2005).

New product development success includes knowledge resulting from the identification of customers expressed and latent needs (Tsai, *et al.*, 2008). Accurate reading of market trends and necessities ensures that the firm is able to respond with concrete products (Harmsen and Jensen, 2004). Sensing capabilities play an important role in the identification of those needs, providing fundamental information for new product development success. By focusing on this capability the firm is thus able to create more value for the customer through its offering (Drnevich and Kriauciunas, 2010). The way that value is created in new product development is an object of scholarly debate. Some consider that it results from a dynamic, intentional, and complex process (Eisenhardt and Martin, 2000; Helfat and Peteraf, 2009; Schreyögg and Kliesch-Eberl, 2007) in which firms apply experience resulting from previous product development projects (Marsh and Stock, 2003).

Others argue that the knowledge source can also be external – acquired through dynamic partnership capabilities that arise from the co-existence of absorptive and coordination capabilities and a collective mind (Ettlie and Pavlou, 2006; Rothaermel and Hess, 2007).

The successful development of new products, involving significant costs and risks, and nearly 50% of the new products that are introduced each year fail (Sivadas and Dwyer, 2000). To improve this rate, a close articulation between marketing and NPD is a key success factor (Wong and Tong, 2012). The constant contact with customer needs held by marketing department is essential to deliver information to the relevant parties (Voss and Voss, 2000). More specifically, Cooper and Kleinschmidt (2003) alerts to the key role of the predevelopment activities, such as preliminary market assessment, detailed market study, customer field trials or tests (Cooper and Kleinschmidt, 1995), where market sensing capabilities can be linked with superior product success rates (Morgan et al., 2009). The literature indicates several reasons for which market sensing capabilities contribute to NPD success. First, they allow a firm to identify underserved segments or unsatisfied customers and channel requirements (Slater and Narver, 2000). Second, strong market sensing capabilities are found to be linked with the identification of the least price sensitive customers and prospects, enabling practicing higher prices (Morgan et al., 2009), or to increase non-price value to customers (Slater and Narver, 2000). Third, opportunity recognition can be enhanced by exploring customer requirements (Morgan, *et al*., 2005). Fourth, market sensing capabilities provide information for a better match between resource investment and customer needs, contributing to reduce NPD and operational costs (Morgan et al., 2009). Finally, market sensing capabilities allow learning about competitor actions and reactions (Morgan et al., 2009). Within this context, the development of sensing capabilities plays a key role in the success of NPD. As such we hypothesize:

H1a. The development of analytical processes for sensing capabilities positively relates to NPD success

H1b. The development of customer relationships for sensing capabilities positively relates to NPD success

H1c. Business experience for sensing capabilities positively relates to NPD success

H1d. The organizational articulation for sensing capabilities positively relates to NPD success

4.2. Sensing Capabilities Dimensions and organic organizational structure

The "organic organizational structure" (Wilden et al, 2013) is associated with interdepartmental connectedness of market orientation literature (Jaworski and Kohli, 1993), and assesses the ease of communication between different departments. There is theoretical evidence for the existence of more sensing capabilities in organic organizational structures. Taking into consideration that the decision maker's distance from action reduces the ability to interpret market information (Gavetti, 2005), organic organizational structures are more likely to be close to the client (Harmsen and Jensen, 2004; Laamanen and Wallin, 2009). The involvement of top management and the existence of a supportive organizational structure that articulates knowledge and customer relationships are critical (Ernst, *et al.*, 2010; Sethi, *et al.*, 2012).

Organic organizational structures promote intra-firm communication (Macher and Mowery, 2009) that allows people in the organization to be close to the market. The communication is more agile and the effect of interdepartmental barriers becomes weaker.

Simultaneously, business experience articulation can be stimulated though the existence of more direct communication resulting even from informal ways (Krasnikov and Jayachandran, 2008). It is therefore expected that in order to better sense the market, an organic organizational structure will be useful (Jaworski and Kohli, 1993). Another important feature resulting from a flatter structure is the use of subjective information, which can be better captured by experienced managers (Krasnikov and Jayachandran, 2008). This perspective emphasizes that in organic organizational structures (i) the information resulting from market scanning can be more rapidly articulated and embedded in the organization, and (ii) the organization is more able to be close to the customer and to "read" more accurately the signs coming from the market. Both perspectives benefit from bureaucracy reduction and increased collaboration between departments, features expected to result from a flatter organizational structure.

H2a. The development of analytical processes for sensing capabilities positively relates to an organic organizational structure

H2b. The development of customer relationships for sensing capabilities positively relates to an organic organizational structure

H2c. Business experience for sensing capabilities positively relates to an organic organizational structure

H2d. The organizational articulation for sensing capabilities positively relates to an organic organizational structure

Figure 3 provides a graphic representation of the research model.

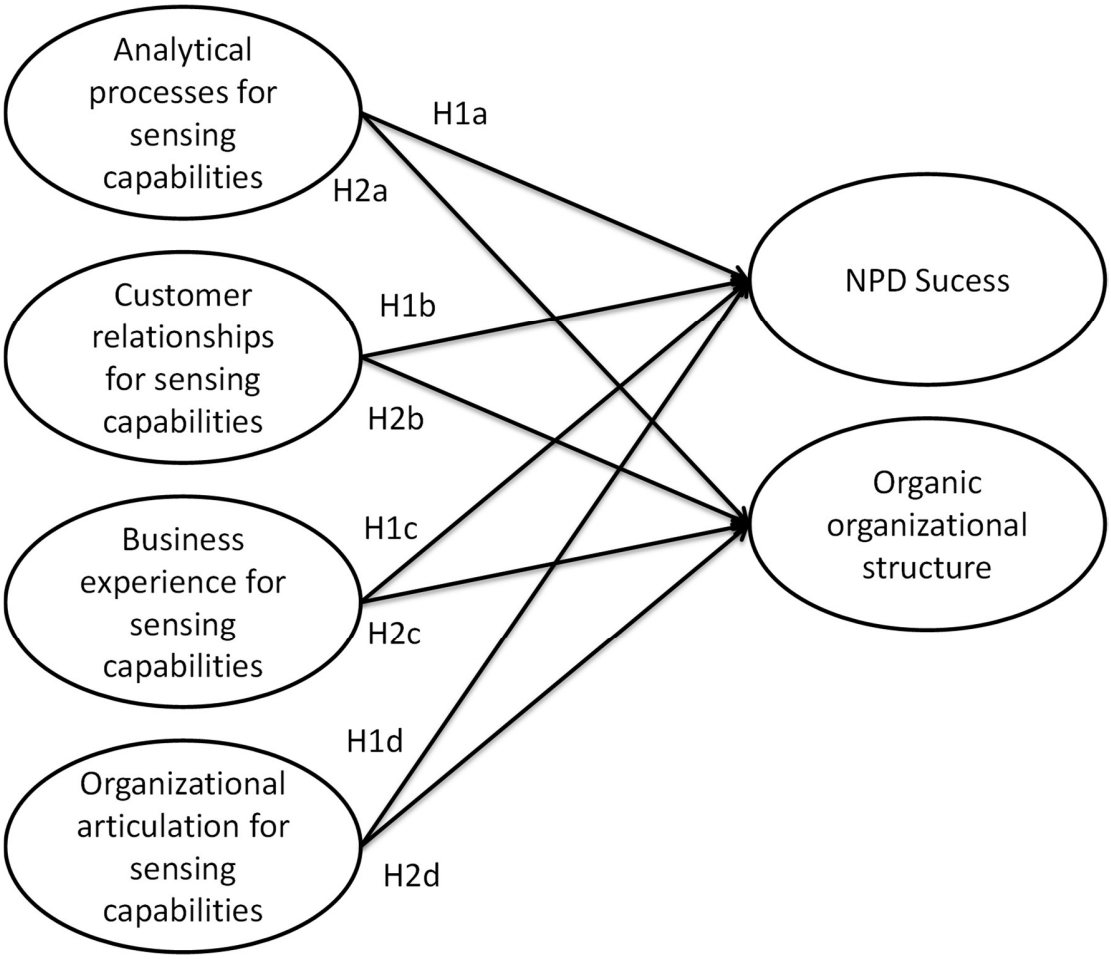


Figure 3. Research model

5. Method

5.1. The research setting

The research setting is the country of Portugal, a member of the European Union (EU), which is the second largest economy in the world in nominal terms, after the United States. As with many EU countries, Portugal's economic growth depends heavily on its entrepreneurial activity. Since entering the EU in 1986, the country's entrepreneurial activity has boomed. The most recent data on entrepreneurial behaviour and attitudes (GEM, 2020) show that in 2019, Portugal matched or surpassed the global average in indicators related with sensing

capabilities, such as Perceived Opportunities Rate (Portugal 53.52% and global average 53.65%) or Perceived Capabilities Rate (Portugal 61.43% and global average 58.27%).

This paper targets small and medium-sized enterprises (SMEs), for several reasons. First, in Europe, for example, SMEs are estimated to make up 99% of all businesses (Eurostat, 2015). Second, SMEs play an important role in many economies (Inan and Bititci, 2015; Zou and Stan, 1998). Third, SMEs are generally considered to be less adapted to compete on price when compared to large firms, having to explore their strengths by other means (Lages and Montgomery, 2004). While large companies have vast resources to conduct market research and systematically scan opportunities globally, SMEs struggle to do the same. Furthermore, it is essential to conduct research that enables SMEs to focus on sensing activities to improve new product development performance. The key issue goes beyond environmental scanning. These firms must be able to access and interpret market knowledge, changing internal resources and processes to rapidly react to opportunities identified, thereby leveraging on their lighter structure (Lages and Montgomery, 2004).

5.2. Survey instrument development

This study follows Churchill's (1979) traditional approach to scale development. The first step consisted on building on the existing literature in the field of sensing capabilities. Then, to assure reliability and reduce measurement error we adopted multi-item scales of the conceptual framework rather than single-item scales. As such, we operationalized the four sensing capabilities dimensions identified in the literature review (1. Analytical Processes; 2. Customer relationship; 3. Business experience; and 4. Organizational articulation). To measure analytical processes we adapted from Vorhies, et al. (2005) and Jaworski and Kohli (1993) scales. Customer relationship was measured by adopting the scale from Parasuraman, et al. (1988). Business experience measure was adopted from an adaptation of Morgan, et al. (2004). Finally, organizational articulation was adapted from Hult, et al. (2003). The scale

items are presented in Table 1 and Table 2. A preliminary survey was developed and evaluated by two academic judges, one with knowledge of the method employed in this study and another with business knowledge. They assessed the final survey instrument's content and face validity. After revisions, we used a pre-test sample of five firms in order to test the comprehension of the questionnaire. In order to avoid translation errors, the items were back-translated into English by a different researcher (cf. Douglas and Craig, 1983). Respondents were asked to assess all the items using a 5-point Likert scale (ranging from "1- Much worse than competitors" to "5- Much better than competitors"), while taking into consideration the competitive position of their firm in relation to their competitors. The anchor based on competitors' relative position is in line with the sensing capabilities concept.

TABLE 1
THE SCALE- CONSTRUCTS, ITEMS, AND RELIABILITIES

In comparison to your competitors, how would you describe:

AnaPrc–Analytical Processes (α= 0.88; $\rho_{vc(n)}$ = 0.57; ρ= 0.91)

Adapted from Vorhies, et al. (2005) and Jaworski and Kohli (1993)

V1 In-house market research

V2 Detecting changes in our customers' product preferences

V3 Contacting with or survey those who can influence our end users' purchases (e.g., retailers, distributors)

V4 Collecting industry information through informal means (e.g., lunch with industry friends, talks with trade partners)

V5 Gathering information about customers and competitors

V6 Identifying prospective customers

V7 Using market research skills to develop effective marketing programs

V8 Tracking customer wants and needs

CusRel – Customer Relationships (α= 0.87; $\rho_{vc(n)}$ = 0.66; ρ= 0.89)

Adapted from Parasuraman, et al. (1988)

V09 Employees' behaviors

V10 Relationships with customers

V11 Customers' assistance

V12 Responsiveness to customer needs

BusExp –Business Experience (α= 0.87; $\rho_{vc(n)}$ = 0.75; ρ= 0.90)

Adapted from Morgan, et al. (2004)

V13 Knowledge of the market

V14 Knowledge about customers

V15 Industry experience

OrgArt - Organizational Articulation (α= 0.94; $\rho_{vc(n)}$= 0.66; ρ= 0.95)

Adapted from Hult, et al. (2003)

V16 Team spirit pervades the ranks in the organization

V17 There is a commonality of purpose in the organization

V18 There is total agreement regarding the organizational vision

V19 There is a commitment to sharing the organizational vision with each other

V20 There is a good sense of inter-connectedness of all parts of the organization

V21 There is an understanding of how work fits into the value chain of the organization

V22 There is an understanding of where all the activities fit in the organization

V23 There is an agreement that the ability to learn is the key to improvement

V24 Basic values of the organization include learning as a key to improvement

V25 There are specific mechanisms for sharing lessons learned in the organization

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The scale format for the 25 measures is anchored by:
1 = Much worse than competitors and 5 = Much better than competitors

TABLE 2
ITEMS EXCLUDED FROM THE SCALE
AFTER CONFIRMATORY FACTOR ANALYSIS

… Please indicate in relation to your competitors, how you would describe:

- Management of complaints (1)
- Efficiency in solving customers' problems (1)
- Making full use of marketing research information (2)
- Market information analysis (2)
- Experience in new product development (3)
- Experience from past performance (3)
- There is an agreement that cross-functional teamwork is the common way of working in our organization (4)
- There is an understanding that all activities in the organization are clearly defined (4)
- Sense that employee learning is an investment not an expense (4)
- Auditing unsuccessful organizational endeavours and communicate the lessons learned(4)
- Formal routines exist to uncover faulty assumptions about the organization(4)
- Meetings with customers to find out what products or services they will need in the future (5)
- Direct interaction with customers to learn how to serve them better (5)
- Poll end users at least once a year to assess the products' and services' quality(5)
- Intelligence on our competitors is generated independently by several departments (5)
- Fast detection of fundamental shifts in our industry (e.g., competition, technology, regulation) (5)
- Periodic review of the likely effect of changes in our business environment (e.g., regulation) on customers (5)

1) Parasuraman, Zeithaml, and Berry (1988)
2) Vorhies and Morgan (2005)
3) Morgan, Kaleka, and Katsikeas (2004).
4) Hult, Snow, and Kandemir (2003)
5) Jaworski and Kohli (1993)

5.3. Data collection, assessment of non-response bias, and data profile

Similar to earlier research on dynamic capabilities (e.g. Kale and Singh, 2007; Kusunoki, *et al.*, 1998; Song, *et al.*, 2005) our study is based on an inter-industry sample of firms selected from a commercial list of Portuguese firms performing their activity in the country mainland. The inclusion criteria were: (i) to have less than 250 persons employed; (ii) the annual turnover should be inferior to EUR 50 million; and, (iii) the balance sheet total of no more

than EUR 43 million. The final data collection was conducted with a questionnaire, applied through in-depth interviews. In line with Cavusgil and Zou's (1994) research, we also "believed that the data collected through in-depth personal interviews were more comprehensive, accurate, and reliable than what would have been possible through a mail survey" (p.6). Questionnaires were filled out by directors of Portuguese firms who agreed to participate in this study. We assured confidentiality and promised a final summary to ensure a higher rate of return. As suggested by Laaksonen and Peltoniemi (2018) and Danneels (2008), we selected general or marketing directors because they should be knowledgeable of the overall firm strategy, marketing, organizational decisions, and performance compared to direct competitors. Of the 207 questionnaires filled out, a final sample of 187 respondents was obtained.

Non-response bias was tested by assessing the differences between early and late respondents of filled-in questionnaires with regard to the means of all the variables (Armstrong and Overton 1977). No significant differences between the two groups of questionnaires were found, suggesting that response bias was not a significant problem in the study. The data profile is presented in table 3.

TABLE 3
DATA PROFILE

Firm size	**Average business experience**
82.8% less than 50 employees	5.2% less than one year
18.2% between 50 and 250 employees	9.8% between one and five years
	20.5% between five and 10 years
Sector	30.5% between 10 and 20 years
36.0% services	34% more than 20 years
31.1% commerce	

32.9% manufacturing	

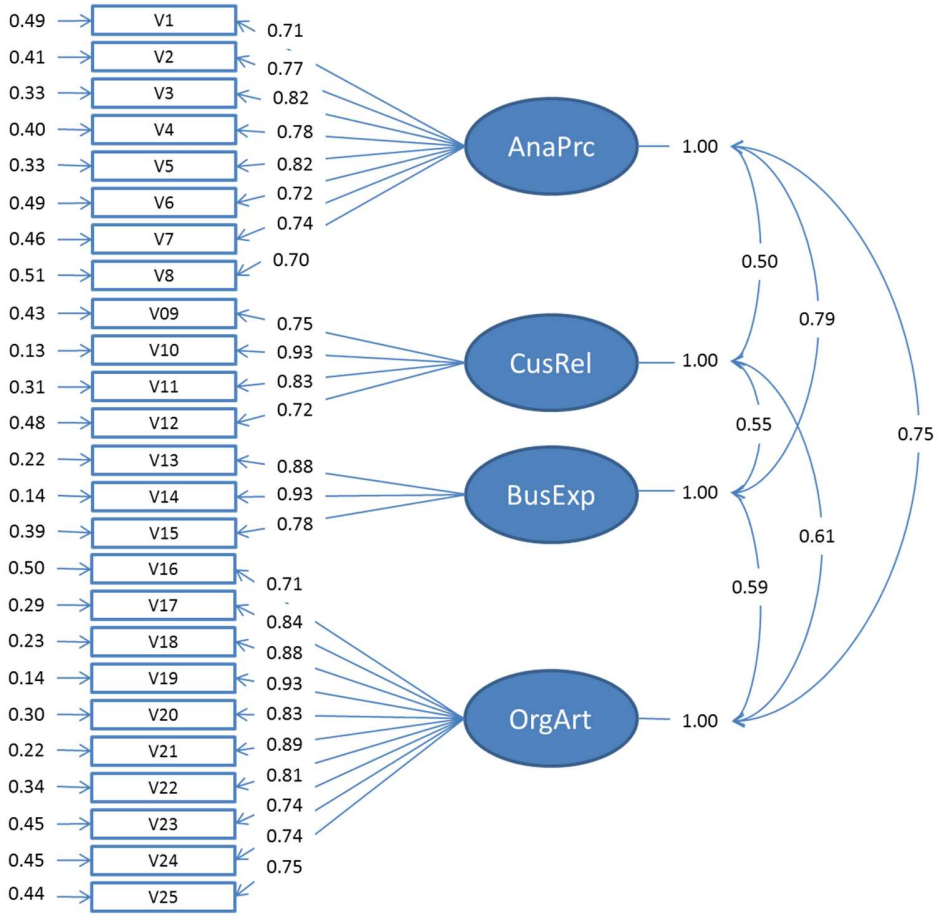
6. Results

6.1. Measurement analysis

After exploratory factor analysis (EFA), the items were subjected to confirmatory factor analysis (CFA) using full-information maximum likelihood (FIML) estimation procedures in LISREL 8.8. (Jöreskog and Sörbom, 1993). In this model each item is restricted to load on its pre-specified factor, with the four first-order factors allowed to correlate freely. After CFA purification, the initial list of 43 items was reduced to a final list of 25 items. The full listing of the 25 final items and their scale reliabilities is included in Table 2 (see also Table 3 for excluded items).

The chi-square for this model is significant (χ^2=1097.79, 269 df, p<.00). Since the chi-square statistic is sensitive to sample size, we also assessed additional fit indices: the Normed Fit Index (NFI), the Comparative Fit Index (CFI), the Incremental Fit Index (IFI), and the Non-Normed Fit Index (NNFI). The NFI, CFI, IFI, and NNFI of this model are .91, .93, .93, and .92, respectively. Figure 4 provides an overview of the standardized estimates of each item on its intended construct.

FIGURE 4:
CFA STANDARDIZED COEFFICIENTS



As Figure 4 shows, convergent validity is evidenced by large and significant standardized loadings (average loading size was .80). As shown in Table 1, coefficients alpha for the variables in the model are good (.87 or greater) and all four constructs present the desired levels of composite reliability (over .70) (cf. Bagozzi, 1980). The Fornell and Larcker (1981) test also indicates that the level of average variance extracted compares well to accepted levels in the field (e.g. Lusch and Brown, 1996; Johnson, 1999; Lages and Lages, 2004). Discriminant validity among the constructs is also revealed in the correlation estimates between any two constructs (Jöreskog and Sörbom, 1993). No correlation includes a value of 1 and none of the correlations is sufficiently high to jeopardize discriminant validity (Anderson and Gerbing, 1988). As such, all constructs demonstrate discriminant validity.

Overall, these results suggest unidimensionality, internal consistency, and adequate reliability for these measures.

6.2. Nomological validity and hypotheses testing

In order to test nomological validity we tested our measures with respect to other constructs to which, as previously stated, we hope our construct is theoretically related (cf. Churchill, 1995). To test the degree to which our construct behaves as a marketing sensing capabilities measure, we considered two previously identified related factors, designated as "organic organizational structure" $_{(ORGANIC)}$[1](α= .85) and "new product development success" $_{(NPDS)}$[2] (α= .96)., corresponding to the research hypotheses.

We found that there is a significant positive correlation between all sensing capabilities scale dimensions and new product development success, and that they are more likely to appear in organic organizational structures. Table 4 summarizes our results.

TABLE 4: CORRELATIONS AMONG CONSTRUCTS

	AnaPrc	CusRel	BusExp	OrgArt
ORGANIC	0.572**	0.464**	0.592**	0.653**
NPDS	0.671**	0.390**	0.403**	0.458**

** $p<0.01$

[1] Organic organizational structures was adapted from Jaworski and Kohli's (1993) work and was measured on a 5-point scale (1=Much worse than competitors; 5= Much better than competitors) in relation to the statements, "It is easy to talk with virtually anyone you need to, regardless of rank or position" and "Employees from different departments feel comfortable calling each other when the need arises".

[2]New product development success was adapted from Vorhies and Morgan's (2005) work and was measured on a 5-point scale (1=Much worse than competitors; 5= Much better than competitors) in relation to the statements, "Ability to develop new products/services"; "Developing new products/services to exploit RandD investment"; "Test marketing of new products/services"; "Successful launching of new products/services", and "Insuring that product/service development efforts are responsive to customer needs".

All the research hypotheses were supported given that all of the coefficients are positive and significant (at $p<.05$ or better) – a much greater proportion than would be anticipated by chance – we may conclude that sensing capabilities are associated with new product development success and that they occur more often in organic organizational structures, and as a result the nomological validity of the four proposed measures is supported (Cadogan, *et al.*, 1999; Cross and Chaffin, 1982).

7. Discussion

Based on the hypotheses testing, it is possible to observe that each of the four dimensions of market sensing capabilities has a varying level of influence on NPD success. Our results show that of the four dimensions, customer relationship exerted the least influence on NPD success when compared to those exerted by analytical process, business experience and organizational articulation. In the same vein, Ryals (2005) found that customer relationship approaches by focusing on "high-potential" clients, are more likely to attract fewer new customers. This finding suggests, to SMEs, that the most effective way to secure NPD success is to foster analytical processes, business experience and strengthen organizational articulation. This aligns with the hybrid solution for the stage gate or planed new product development approach, which must be combined with more agile solutions, especially in more uncertain contexts (Cooper, 2016; Cooper and Sommer, 2016; Dias et al., 2021). As one interviewee from a manufacturing firm referred "we develop new products by systematically evaluating the market and competitors. The opportunities identified are initially filtered out by senior managers".

The four dimensions evidence stronger but also distinct relationships with organic organizational structures. The customer relationship exerted the least influence, while

organizational articulation and analytical process showed a stronger influence. This finding suggests that SMEs must strengthen the internal mechanisms for organizational articulation and to invest in analytical process in order to obtain more organic organizational structures. One interviewee from a commercial firm affirmed that "An important step to keep up with market changes is to have a strong procurement department, which allows us to capitalise more quickly than our competitors in launching new products". Previous research identified the key role of cross-functional integration and knowledge management on new product development (Sherman *et al*., 2005). More recently, Gao and Bernard (2018) recognized that knowledge sharing speeds up and improves the quality of NPD. Our findings extend existing knowledge by providing a more comprehensive flow on this topic. The starting consists on the allocation of resources and processes to scan the environment as suggested by Wilden et al. (2013), which must be combined with customer relationship capabilities (Wood and McKinley, 2010). This assures the *scanning* activities, the first component of market sensing capabilities. Then, firms must be able to *interpret* that data and information, activity that is enhanced by accumulated business experience. At this level, cognition plays an important role as previously suggested by Zott and Huy (2012). Finally, organizational articulation is related with the third element - *respond to market opportunities* - meaning that the firm must transfer knowledge through a more organic structure to develop new products and deliver superior customer value. This sequence of elements and its relation to NPD success and organic organizational structures constitutes an important contribution of this study.

8. Conclusions

This study conceptualizes and operationalizes the concept of sensing capabilities. We articulated sensing capabilities drawing on existing theories and research by interpreting

dimensions covering the essence of the concept. Our review indicates that previous measures are not in line with the theoretical development defining the essence of sensing capabilities. Specifically, we present sensing capabilities as comprising four dimensions: analytical processes, customer relationship, business experience, and organizational articulation. By doing so, several contibutions can be identified.

First, we further developed existing sensing capabilites measures by including several dimensions. One important dimension is the role of managerial cognition (Kor *et al.*, 2007; Hodgkinson and Healy, 2011; Zott and Huy, 2012), experience (Zollo and Winter, 2002; Mitchel, *et al.*, 2008; Dixon, *et al.*, 2010), and factors for strategic change (Helfat and Martin, 2015). These dimensions tend to complement traditional approaches based on the discussion around processes and organizational routines, with new contributions of individual perspectives, based mostly on customer relations (Gavetti, 2005; Rothaermel and Hess, 2007; Hodgkinson and Healy, 2011). We integrate analytical processes and organizational articulation with business experience and relational capabilities into a common measurement instrument.

Second, sensing capabilities represent an organizational ability that can be structured and improved, providing firms with a tool to become aware of market opportunities and act accordingly. This provides the ability to reach and sustain competitive advantage in changing environments. By combiningseveral internal capabilities and processes in a single instrument, the sensing capabilities measure provides a framework to align marketing resources and NPD processes as suggested by Ernst *et al*. (2010). Furthermore, when it is combined with organic organizational structures, the measure provides a basis for the use of

sensing capabilities processes (Wilden, *et al.*, 2013). In so doing, it establishes the path to resource orchestration that enables sensing capabilities (Helfat and Martin, 2015).

Third, the nomological validation advances crucial relationships between sensing capabilities and new product development success, stablishing a link that is never easy (Wong and Tong, 2012). By measuring sensing capabilities managers are able to evaluate the contribution of opportunity recognition in early stages of new product development (Marsh and Stock, 2003). All dimensions correlate with new product development. Organic organizational structures were also found to have a close relationship with sensing capabilities, in all dimensions. This finding has interesting implications in fields such as new product development, entrepreneurship, and organization theory.

The measure considers not only the identification of opportunities but also the interpretation and mobilization of the organization to respond. As such, SMEs can take advantage of their lighter structure (Lages and Montgomery, 2004). Organic structures allow more agile processes for opportunity recognition exploration and exploitation (Gregoire *et al*., 2010). Furthermore, more informal structures enhance the ability to interpret (Rasmussen, *et al*. 2012, Teece, 2007) and establish a means-end relationship (Welpe *et al*., 2012).

Fourth, opportunity recognition plays an important role from both corporative (Hoskisson, *et al.*, 2011) and entrepreneurial perspectives (Singh, 2001; Mitchell, *et al.*, 2012; Tang, *et al.*, 2012). Recent research has brought important insights on how to define organizational structures, resources, and capabilities to develop corporate entrepreneurship (Hornsby, *et al.*, 2009; Ireland, *et al.*, 2009). Our research provides a deeper knowledge on this subject by defining how to measure the firm's awareness for opportunity recognition and

by enhancing the link between the managerial and organizational dimensions, as well the articulation that must be considered within the firm.

Fifth, we address several calls for dynamic capabilities construct development and measurement (Jeffrey and Mowery, 2009; Katkalo, *et al.*, 2010; Pavlou and El Sawy, 2011) by developing and validating a theoretically justified measure for sensing capabilities. We extend knowledge on dynamic capabilities, an "elusive" concept (Pavlou and El Sawy, 2011; Wilden, *et al.*, 2013), in which there is a lack of "sufficient empirical testing of the contributions" (Drnevich and Kriauciunas, 2011, p. 255-6). A tool to measure sensing capabilities allows both researchers and praticioners to evaluate the dimensions that contribute to the firm's abilitity to identify, absorb, and integrate market knowledge in business processes, which are key assumptions for dynamic capabilities (Zollo and Winter, 2002). Firms can improve innovation management and strategic change (Bruni and Verona, 2009), which is consistent with the renewal nature of dynamic capabilities (Barrales-Molina, *et al.*, 2014). Sensing capabilities also help to define more precisely which ordinary capabilities should be changed by dynamic capabilities (Laaksonen and Peltoniemi, 2018).

This measure also has managerial implications. Opportunity recognition and organizational structures are areas in which managers have the responsibility to guide firm strategy and growth. An integrative managerial perspective of the four dimensions suggests the development of a more organic organizational structure. This will promote the analytical processes of marketing sensing and fundamental connections that must be established in order to articulate learning and knowledge inside the firm,making it possible to monitor customer relationhips and market evolution. Moreover, the sensing capabilities measure

gives some guidance on how to better pursue a more focused business strategy and improve the likelihood of new product development success.

The scale may be used by managers and public policy makers for self-assessment and benchmarking purposes. The construction of an organic structure can go through the adequacy of the four dimensions. This includes the allocation of resources to the areas of sensing and defining policies that formalize the various dimensions; for example, the level of analytical mechanisms and customer relationships may encourage employees through rewards system. In a pandemic context, the policy-making approach of digital transformation can benefit from the incoporation of sensing mechanisms allowing to create resilient firms and more aware of the contextual tendencies. Simoultaneously, society can benefit from more competitive business ecosystems, well prepared to identify and respond to societal trends and problems. In the organizational articulation it will be important to foster policies related to the willingness to collaborate cross-functionally within the firm to respond effectively to the opportunities detected and interpreted. Policy making can increase this capability by enhancing the firms' collaborative mechanisms and by promoting inter-firm knowledge exchange, stimulating the creation or development of innovative clusters.

This study also points to avenues for future research. First, sensing capabilities represent a first moment of the microfoundations of dynamic capabilities. According to Teece (2007), seizing and operationalizing capabilities follow. The development of equivalent measures for these constructs would be an essential further step for future research. With the development of a measure of market sensing capabilities and its implications for NPD and organisational structure, a research field is opened for marketing, innovation and strategy research by understanding how sensing capabilities directly affect other organisational

capabilities and indirectly affect business performance and innovation as dependent variables.

References

Adner, R. and Helfat, C.E. (2003), "Corporate effects and dynamic managerial capabilities". *Strategic Management Journal*, Vol. 24 No. 10, pp. 1011-1025.

Allred, C.R., Fawcett, S.E., Wallin, C., and Magnan, G.M. (2011), "A Dynamic Collaboration Capability as a Source of Competitive Advantage". *Decision Sciences*. Vol. 42 No. 1, pp. 129-161.

Anderson J.C. and Gerbing D.W. (1988), "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach". *Psychological Bulletin*. Vol. 103, pp. 411-23.

Armstrong J.S. and Overton T.S. (1977), "Estimating Nonresponse Bias in Mail Surveys". *Journal of Marketing Research*. Vol. 16, pp. 396-400.

Asseraf, Y., Lages, L. F., and Shoham, A. (2019), "Assessing the drivers and impact of international marketing agility". *International Marketing Review*, Vol. 36, No. 2, pp. 289-315.

Atuahene-Gima, K., Slater, S.F. and Olson, E.M. (2005), "The contingent value of responsive and proactive market orientations for new product program performance", *Journal of Product Innovation Management*, 22(6), 464-82.

Augier, M. and Teece, D.J. (2009), "Dynamic capabilities and the role of managers in business strategy and economic performance". *Organization Science*, Vol. 20, pp. 410–21.

Bagozzi R.P. (1980), *Causal Models in Marketing*. New York: John Wiley.

Baron, R.A. (2004), "Opportunity recognition: insights from a cognitive perspective". In: Butler, J.E. (Ed.), *Opportunity Identification and Entrepreneurial Behavior*. Information Age Publishing, Greenwich, pp. 47–73.

Barrales-Molina, V., Martínez-López, F. J., and Gázquez-Abad, J. C. (2014), "Dynamic marketing capabilities: Toward an integrative framework". *International Journal of Management Reviews*, Vol. 16, No. 4, pp. 397-416.

Bruni, D.S. and Verona, G. (2009), "Dynamic marketing capabilities in Science-based firms: An exploratory investigation of the pharmaceutical industry". *British Journal of Management*, Vol. 20, pp. S101-S117.

Cadogan, J.W., Diamantopoulos, A., and Mortanges, C.P. (1999), "A Measure of Export Market Orientation: Scale Development and Cross-Cultural Validation". *Journal of International Business Studies*. Vol. 30, No. 4, pp. 689-707.

Cavusgil, S.T. and Zou, S. (1994), "Marketing Strategy-Performance Relationship: An Investigation of the Empirical Link in Export Market Ventures". *Journal of Marketing*. Vol. 58, No. 1, pp. 1-21.

Cepeda, G. and Vera, D. (2007), "Dynamic capabilities and operational capabilities: A knowledge management perspective". *Journal of Business Research*. Vol. 60, No. 5, pp. 426–437.

Churchill, G.A. (1979), “A paradigm for developing better measures of marketing constructs”, *Journal of Marketing Research*, Vol. 26, pp. 64-73.

Churchill G.A. Jr. (1995), *Marketing Research: Methodological Foundations*. Chicago: The Dryden Press, 1995.

Cohen, W.M. and Levinthal, D.A. (1990), “Absorptive capacity: A new perspective on learning and innovation”. *Administrative Science Quarterly*, Vol. 35, No. 1, pp. 128-152.

Cooper, R. G. (2016). Agile–Stage-Gate Hybrids: The Next Stage for Product Development Blending Agile and Stage-Gate methods can provide flexibility, speed, and improved communication in new-product development. *Research-Technology Management*, Vol. 59, No. 1, pp. 21-29.

Cooper, R. G., & Kleinschmidt, E. J. (1995). “New product performance: keys to success, profitability & cycle time reduction”. *Journal of Marketing Management*, Vol. 11, No. 4, pp. 315-337.

Cooper, R. G., & Kleinschmidt, E. J. (2003). “What separates winners from losers?”. *Operations management: Critical perspectives on business and management*, Vol. 3, No. 3, pp. 273-295.

Cooper, R. G., & Sommer, A. F. (2016). “The Agile–Stage-Gate hybrid model: A promising new approach and a new research opportunity”. *Journal of Product Innovation Management*, Vol. 33, No. 5, pp. 513-526.

Cross E.M. & Chaffin W.W. (1982), “Use of the Binomial Theorem in Interpreting Results of Multiple Tests of Significance”. *Educational and Psychological Measurement*. Vol. 42, pp. 25-34.

Danneels, E. (2008), “Organizational antecedents of second-order competences”. *Strategic Management Journal*. Vol. 29, pp. 519-543.

Day G.S. (1994), “The capabilities of market-driven organizations”. *Journal of Marketing*. Vol. 58, pp. 37-52.

Dias, Á. L., Manuel, E. C., Dutschke, G., Pereira, R., & Pereira, L. (2021). Economic crisis effects on SME dynamic capabilities. *International Journal of Learning and Change*, Vol. 13, No.1, pp. 63-80.

Dixon, S.E., Meyer, A., Klaus, E., and Day, M. (2010), “Stages of Organizational Transformation in Transition Economies: A Dynamic Capabilities Approach”. *Journal of Management Studies*. Vol. 47, No.3, pp. 416-436.

Douglas S.P. and Craig C. S. (1983), *International Marketing Research*, 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall International Editions.

Dosi, G., Faillo, M., and Marengo, L. (2008), “Organizational Capabilities, Patterns of Knowledge Accumulation and Governance Structures in Business Firms: An Introduction”. *Organization Studies*. Vol. 29, No. 8-9, pp. 1165–1185.

Drnevich, P.L. and Kriauciunas, A.P. (2011), “Clarifying the conditions and limits of the contributions of ordinary and dynamic capabilities to relative firm performance”. *Strategic Management Journal*. Vol. 32, pp. 254–279.

Dyer, J.H., Gregersen, H.B., and Christensen, C. (2008), “Entrepreneur behaviors, opportunity recognition, and the origins of innovative ventures”. *Strategic Entrepreneurship Journal*, Vol. 2, No. 4, pp. 317-338.

Eckhardt, J.T. and Shane, S.A. (2003), "Opportunities and Entrepreneurship". *Journal of Management*. Vol. 29, No. 3, pp. 333–349.

Eisenhardt, K.M. and Martin, J.A. (2000), "Dynamic Capabilities: What are They?" *Strategic Management Journal*. Vol. 22, pp. 1105-1121.

Ernst, H., Hoyer, W.D., and Rübsaamen, C. (2010), "Sales, Marketing, and Research and Development Cooperation Across New Product Development Stages: Implications for Success". *Journal of Marketing*. Vol. 74, pp. 80–92.

Ettlie, J.E. and Pavlou, P.A. (2006), "Technology-Based New Product development Partnerships". *Decision Sciences*. Vol. 37, No. 2, pp. 117-147.

Eurostat (2015), *Statistics on small and medium-sized enterprises*. https://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_small_and_medium-sized_enterprises (Access Date: April 06, 2019)

Fainshmidt, S., Wenger, L., Pezeshkan, A., and Mallon, M.R. (2018), "When do Dynamic Capabilities Lead to Competitive Advantage? The Importance of Strategic Fit". *Journal of Management Studies*.

Fang, E.E. and Zou, S. (2009), "Antecedents and consequences of marketing dynamic capabilities in international joint ventures". *Journal of International Business Studies*, Vol. 40, No. 5, pp. 742-761.

Fornell, C. and Larcker, D.F. (1981), "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error". *Journal of Marketing Research*. Vol. 18, No.1, pp. 39-50.

Gao, J., & Bernard, A. (2018). "An overview of knowledge sharing in new product development". *The International Journal of Advanced Manufacturing Technology*, *94*(5-8), 1545-1550.

Gavetti, G. (2005), "Cognition and Hierarchy: Rethinking the Microfoundations of Capabilities' Development". *Organization Science*. Vol. 16, No.6, pp. 599–617.

GEM (2020). Entrepreneurial Behaviour and Attitudes. Global Entrepreneurship Monitor. Available at https://www.gemconsortium.org/economy-profiles/portugal#pb [Accessed September 10, 2020]

Gregoire, D.A., Shepherd, D.A., and Schurer Lambert, L. (2010), "Measuring opportunity-recognition beliefs: Illustrating and validating an experimental approach". *Organizational Research Methods*, Vol. 13, No.1, pp. 114-145.

Groysberg, B. and Lee, L.E. (2009), "Hiring stars and their colleagues: Exploration and exploitation in professional service firms". *Organization science*, Vol. 20, No.4, pp. 740-758.

Harmsen, H. and Jensen, B. (2004), "Identifying the Determinants of Value Creation in the Market. A Competence-Based Approach". *Journal of Business Research*. Vol. 57, pp. 533–547.

Helfat, C.E. and Martin, J.A. (2015), "Dynamic managerial capabilities: Review and assessment of managerial impact on strategic change". *Journal of Management*, Vol. 41, No.5, pp. 1281-1312.

Helfat, C.E. and Peteraf, M.A. (2009), "Understanding Dynamic Capabilities: Process Along a Developmental Path". *Strategic Organization*. Vol. 7, No.1, pp. 91–102.

Hodgkinson, G.P. and Healy, M.P. (2011), "Psychological Foundations of Dynamic Capabilities: Reflexion and Reflection in Strategic Management". *Strategic Management Journal*. Vol. 32, pp. 1500-1516.

Hornsby, J., Kuratko, D., Shepherd, D., and Bott, J. (2009), "Managers' corporate entrepreneurial actions: examining perception and position". *Journal of Business Venturing*. Vol. 24, pp. 236–47.

Hoskisson, R.E., Covin, J., Volberda, H.W., and Johnson, R.A. (2011), "Revitalizing Entrepreneurship: The Search for New Research Opportunities". *Journal of Management Studies*. Vol. 48, No.6, pp. 1141-1168.

Hult, G., Snow, C., and Kandemir, D. (2003), "The Role of Entrepreneurship in Building Cultural Competitiveness in Different Organizational Types". *Journal of Management*. Vol. 29, No.3, pp. 401-426.

Inan, G.G. and Bititci, U.S. (2015), "Understanding organizational capabilities and dynamic capabilities in the context of micro enterprises: a research agenda". *Procedia-Social and Behavioral Sciences*, No.210, pp. 310-319.

Ireland, R., Covin, J., and Kuratko, D. (2009, "Conceptualizing corporate entrepreneurship strategy". *Entrepreneurship Theory and Practice*. Vol. 33, pp. 19–46.

Janssen, M.J., Castaldi, C., and Alexiev, A. (2016), "Dynamic capabilities for service innovation: conceptualization and measurement". *R&D Management*, Vol. 46, No.4, pp. 797-811.

Jantunen, A. (2005), "Knowledge-processing capabilities and innovative performance: an empirical study". *European Journal of Innovation Management*, Vol. 8, No.3, pp. 336-349.

Jaworski, B. and Kohli, A. (1993), "Market Orientation: Antecedents and Consequences". *Journal of Marketing*. Vol. 57, pp. 53-70.

Jeffrey T.M. and Mowery, D.C. (2009), "Measuring Dynamic Capabilities: Practices and Performance in Semiconductor Manufacturing". *British Journal of Management*. Vol. 20, No.1, pp. 41–62.

Johnson J.L. (1999), "Strategic Integration in Industrial Distribution Channels: Managing the Interfirm Relationship as a Strategic Asset". *Journal of the Academy of Marketing Science*. Vol. 27, No.1, pp. 4-18.

Jöreskog, K.G. and Sörbom, D. (1993). *Lisrel 8: Structured equation modeling with the Simplis command language*. Scientific Software International.

Kale, P. and Singh, H. (2007), "Building Firm Capabilities through Learning: the Role of the Alliance Learning Process in Alliance Capability and Firm-Level Alliance Success". *Strategic Management Journal*. Vol. 28, No.10, pp. 981–1000.

Katkalo, V.S., Pitelis, C.N., and Teece, D.J. (2010), "Introduction: On the nature and scope of dynamic capabilities". *Industrial and Corporate Change*, Vol. 19, No.4, pp. 1175-1186.

Kogut, B. and Zander, U. (1996), "What firms do? Coordination, identity, and learning". *Organization science*, Vol. 7, No. 5, pp. 502-518.

Kohli A.K. and Jaworski B. (1990), "Market Orientation: The Construct, Research Propositions and Managerial Implications". *Journal of Marketing*. Vol. 54, No.1, pp. 1-18.

Kor, Y.Y., Mahoney, J.T., and Michael, S. (2007), "Resources, capabilities, and entrepreneurial perceptions". *Journal of Management Studies*, Vol. 44, No.7, pp. 1185–1210.

Kozlenkova, I.V., Samaha, S.A., and Palmatier, R.W. (2014), "Resource-based theory in marketing". *Journal of the Academy of Marketing Science*, Vol. 42, No.1, pp. 1-21.

Krasnikov, A. and Jayachandran, S. (2008), "The Relative Impact of Marketing, Research-and-Development, and Operations Capabilities on Firm Performance". *Journal of Marketing.* Vol. 72, pp. 1–11.

Kusunoki, K., Nonaka, I., and Nagata,A. (1998), "Organizational Capabilities in Product Development of Japanese Firms: A Conceptual Framework and Empirical Findings". *Organization Science*. Vol. 9, No.6, pp. 699-718.

Laaksonen, O. and Peltoniemi, M. (2018), "The essence of dynamic capabilities and their measurement". *International Journal of Management Reviews*, Vol. 20, No.2, pp. 184-205.

Laamanen, T. and Wallin, J. (2009), "Cognitive Dynamics of Capability Development Paths". *Journal of Management Studies*. 46 (6). 950-981.

Lages, L. F. (2016), "VCW-Value Creation Wheel: Innovation, technology, business, and society", *Journal of Business Research*, 69(11), 4849-4855.

Lages, L. F. and Lages, C. R. (2004), "The STEP Scale: A Measure of Short-Term Export Performance Improvement". *Journal of International Marketing*. 36-56.

Lages, L. F. and Montgomery, D. B. (2004), "Export performance as an antecedent of export commitment and marketing strategy adaptation: Evidence from small and medium-sized exporters". *European Journal of Marketing*, 38(9/10), 1186-1214.

Lim, J.Y., Busenitz L.W., and Chidambaram, L. (2013), "New Venture Teams and the Quality of Business Opportunities Identified: Faultlines between Subgroups of Founders and Investors". *Entrepreneurship Theory and Practice*. 37(1). 47-67.

Lin, H. F., Su, J. Q., and Higgins, A. (2016), "How dynamic capabilities affect adoption of management innovations". *Journal of Business Research*, 69(2), 862-876.

Lusch R.F. & Brown, J.R. (1996), "Interdependency, Contracting, and Relational Behavior in Marketing Channels". *Journal of Marketing*. 60. 19-38.

Marsh, S.J. and Stock, G.N. (2003), "Building Dynamic Capabilities in New Product Development through Intertemporal Integration". *Journal of Product Innovation Management*. 20. 136-148.

Mitchell, R. K., Mitchell, J. R., and Smith, J. B. (2008), "Inside opportunity formation: Enterprise failure, cognition, and the creation of opportunities". *Strategic Entrepreneurship Journal*, 2(3), 225-242.

Morgan, N. A., Anderson, E. W., & Mittal, V. (2005). "Understanding firms' customer satisfaction information usage". *Journal of Marketing*, 69(3), 131-151.

Morgan, N.A., Kaleka, A., and Katsikeas, C.S. (2004), "Antecedents of Export Venture Performance: A Theoretical Model and Empirical Assessment". *Journal of Marketing*. 68. 90-108.

Morgan, N. A., Slotegraaf, R. J., & Vorhies, D. W. (2009). Linking marketing capabilities with profit growth. *International Journal of Research in Marketing*, 26(4), 284-293.

Narver, J. C. and Slater, S. F. (1990), "The effect of a market orientation on business profitability". *Journal of Marketing*. 20-35.

Pavlou, P. A. and El Sawy, O. A. (2011), "Understanding the elusive black box of dynamic capabilities". *Decision sciences*, 42(1), 239-273.

Perry, J. T., Chandler, G. N., and Markova, G. (2012), "Entrepreneurial effectuation: a review and suggestions for future research". *Entrepreneurship Theory and Practice*. 36(4), 837-861.

Pinheiro, J., Lages, L. F., Silva, G. M., Dias, A. L., & Preto, M. T. (2021). Effects of absorptive capacity and innovation spillover on manufacturing flexibility. *International Journal of Productivity and Performance Management*. (published ahead of print). pp. 1-22 https://doi.org/10.1108/IJPPM-04-2020-0156

Porter, M.E. (1996), "What is Strategy?" *Harvard Business Review*. 61-78.

Rasmussen, E., Mosey, S. & Wright, M. (2011), "The Evolution of Entrepreneurial Competencies: A Longitudinal Study of University Spin-Off Venture Emergence". *Journal of Management Studies.* 48(6), 1314-1345.

Rastkhiz, A.E., Mobini Dehkordi, A., Yadollahi Farsi, J., and Azar, A. (2019), "A new approach to evaluating entrepreneurial opportunities". *Journal of Small Business and Enterprise Development*, 26(1), 67-84.

Rothaermel, F.T. and Hess, A.M. (2007), "Building Dynamic Capabilities: Innovation Driven by Individual-, Firm-, and Network-Level Effects". *Organization Science*. 18(6). 898–921.

Ryals, L. (2005). "Making customer relationship management work: The measurement and profitable management of customer relationships". *Journal of Marketing*, 69(4), 252–261.

Shane, S. and Venkataraman, S.(2000), "The Promise of Entrepreneurship as a Field of Research". *Academy of Management Review*. 25 (1). 217-226.

Shepherd, D. A., McMullen, J. S., and Jennings, P. D. (2007), "The formation of opportunity beliefs: Overcoming ignorance and reducing doubt". *Strategic Entrepreneurship Journal*, 1(1-2), 75-95.

Schreyögg, G. and Kliesch-Eberl, M. (2007), "How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization". *Strategic Management Journal*. 28 (9). 913–933.

Sethi, R., Iqbal, Z., and Sethi, A. (2012), "Developing New-to-the-Firm Products: The Role of Micropolitical Strategies". *Journal of Marketing*. 99 (76). 99–115.

Sherman, D. J., Berkowitz, D., & Souder, W. E. (2005). "New product development performance and the interaction of cross-functional integration and knowledge management". *Journal of product innovation management*, 22(5), 399-411.

Singh, R. P. (2001), "A Comment on Developing the Field of Entrepreneurship through the Study of Opportunity Recognition and Exploitation". *Academy of Management Review*. 26 (1). 10-12.

Sirmon, D.G., Hitt, M.A., and Ireland, R. D. (2007), "Managing Firm Resources in Dynamic Environments to Create Value: Looking Inside the Black Box". *Academy of Management Review*. 32 (1). 273-292.

Sivadas, E., & Dwyer, F. R. (2000). "An examination of organizational factors influencing new product success in internal and alliance-based processes". *Journal of marketing*, 64(1), 31-49.

Slater, S. F., & Narver, J. C. (2000). "Intelligence generation and superior customer value". *Journal of the academy of marketing science*, 28(1), 120.

Song, M., Droge, C., Hanvanich, S., and Calantone, R. (2005), "Marketing and technology resource complementarity: an analysis of their interaction effect in two environmental contexts". *Strategic Management Journal*. 26 (3). 259–276.

Tang, J., Kacmar, K. M. M., and Busenitz, L. (2012), "Entrepreneurial alertness in the pursuit of new opportunities". *Journal of Business Venturing*, 27(1), 77-94.

Teece, D.J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance". *Strategic Management Journal*. 28. 1319–1350.

Teece, D.J. (2009), *Strategic Management and Dynamic Capabilities*. Oxford University Press. New York.

Teece, D. J., Pisano, G., and Shuen, A. (1997), "Dynamic capabilities and strategic management". *Strategic Management Journal*. 18. 509-533.

Tsai, K., Chou, C., and Kuo, J. (2008), "The curvilinear relationships between responsive and proactive market orientations and new product performance: A contingent link". *Industrial Marketing Management*. 37. 884-894.

Tumasjan, A. and Braun, R. (2012), "In the eye of the beholder: How regulatory focus and self-efficacy interact in influencing opportunity recognition". *Journal of Business Venturing*. 27. 622–636.

Wang, G., Dou, W., Zhu, W., and Zhou, N. (2015), "The effects of firm capabilities on external collaboration and performance: The moderating role of market turbulence". *Journal of Business Research*, 68(9), 1928-1936.

Wilden, R., Gudergan, S.P., Nielsen, B.B., and Lings, I. (2013), "Dynamic capabilities and performance: Strategy, structure and environment". *Long Range Planning*, 46, 72–96.

Wong, S. S., & Tong, C. (2012). The influence of market orientation on new product success. *European Journal of Innovation Management*. 15(1), 99-121

Wood, M. S. and McKinley, W. (2010), "The production of entrepreneurial opportunity: a constructivist perspective". *Strategic Entrepreneurship Journal*, 4(1), 66-84.

Vorhies, D.W. and Morgan, N.A. (2005), "Benchmarking Marketing Capabilities for Sustainable Competitive Advantage". *Journal of Marketing*. 69. 80-94.

Voss, G.B. and Voss, Z.G. (2000), "Strategic orientation and firm performance in an artistic environment", *Journal of Marketing*, 64(1), 67-83.

Welpe, I. M., Spörrle, M., Grichnik, D., Michl, T., and Audretsch, D. B. (2012), "Emotions and opportunities: the interplay of opportunity evaluation, fear, joy, and anger as antecedent of entrepreneurial exploitation". *Entrepreneurship Theory and Practice*. 36(1), 69-96.

Zacca, R. and Dayan, M. (2018). "Linking managerial competence to small enterprise performance within the dynamic capability logic". *Journal of Small Business and Enterprise Development*, 25(2), 256-276.

Zacca, R., Dayan, M., and Elbanna, S. (2017). “The influence of conflict and intuition on explorative new products and performance in SMEs”. *Journal of Small Business and Enterprise Development*, 24(4), 950-970.

Zahra, S. A. and George, G. (2002). “Absorptive capacity: A review, reconceptualization, and extension”. *Academy of management review*, 27(2), 185-203.

Zahra S. A., Sapienza H. J., and Davidsson, P. (2006). “Entrepreneurship and dynamic capabilities: a review, model and research agenda”. *Journal of Management Studies*. 43 (4). 917-955.

Zollo, M. and Winter, S. G. (2002). “Deliberate learning and the evolution of dynamic capabilities”. *Organization Science*. 13 (3). 339-351.

Zott, C. and Huy, Q. N. (2012, July). “The Affective Side of Dynamic Capability: Emotion Regulation, and Resource Activation In Firms”. In *Academy of Management Proceedings* (Vol. 2012, No. 1, p. 10385). Briarcliff Manor, NY 10510: Academy of Management.