The interrelatedness of organizational ambidexterity, dynamic capabilities and open innovation: a conceptual model towards a competitive advantage

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Abstract

Purpose – Establishing a competitive advantage in today's dynamic environment involves optimizing an organization's exploration and exploitation strategy. This paper aims to explore how an open innovation strategy complements the organization's ambidextrous strategy in attaining a competitive advantage. Organizational ambidexterity and dynamic capability theories are also explored to investigate the impact of open innovation on the organization's ambidextrous strategy and competitive advantage – especially inbound and outbound open innovation.

Design/methodology/approach – The authors conducted a systematic literature review using Boolean search techniques, which was focused on the research fields of the sub-areas of general management, strategy, innovation, organization studies, information management, entrepreneurship, international business, marketing, and economics, supplemented by the snowball technique.

Findings – Organizations that combine their ambidextrous strategy with open innovation attributes achieve a competitive advantage through developing their dynamic capabilities by which organizations change their value proposition. This study also shows that an ambidextrous strategy should no longer be viewed as a structural solution implemented by management, but also as a bottom-up intervention. Additionally, the authors found that the organization's dynamic capabilities establish a feedback loop, which changes the organization's ambidextrous strategy to resolve the efficiency–agility paradox.

Originality/value – Previous research has focused on strategic orientation; however, hardly any research has investigated how the interrelatedness of open innovation, organizational ambidexterity and dynamic capabilities support a competitive advantage. The authors present a conceptual model that inspires new research avenues.

Keywords Organizational ambidexterity, Dynamic capabilities, Open innovation, Micro-foundations, Strategy, Exploration, Exploitation, Competitive advantage

Paper type Research paper

1. Introduction

An organization's competitive advantage can be viewed as the ability, gained through resources and attributes, to perform at a higher level than competitors in the same market

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(Porter, 1985). Within today's scholarly debate, three theoretical perspectives seek to explain how organizations achieve competitive advantages: organizational ambidexterity, dynamic capabilities and open innovation. First, organizational ambidexterity can be conceptualized as the organization's capability for managing paradoxical tensions that arise during the allocation of resources between either exploration or exploitation (March, 1991). The literature shows that most authors focus on managing paradoxical tensions between exploration and exploitation and view organizational ambidexterity as a high-level dynamic capability (e.g. Andriopoulos and Lewis, 2009; O'Reilly and Tushman, 2008; Papachroni *et al.*, 2015). Second, open innovation focuses on establishing third-parties' involvement, whereby open innovation uses external ideas to further the organization's explorative strategy and uses the organization's internal ideas to improve its exploitative strategy (Chesbrough, 2003). Open innovation consists of inbound open innovation and outbound open innovation; exploring external knowledge from third parties internally within the organization creates inbound open innovation, whereas exploiting internal knowledge for external exploitation in new markets or establishing spin-offs creates outbound open innovation (Huizingh, 2011). The open innovation framework enables organizations to create a competitive advantage by creating and commercializing innovative ideas and products (e.g. Chesbrough, 2003; Lee and Yoo, 2019; Reed *et al.*, 2012). Third, dynamic capabilities can be considered as the outcome of managerial routines and organizational processes established and shaped through asset positions that enable the organization with strategic change (Teece *et al.*, 1997). Hence, these dynamic capabilities act as a bridge between ambidexterity and open innovation. The organization's dynamic micro-foundational sensing, seizing and reconfiguring capabilities support the organization to be ambidextrous and enable the opening up of its innovation processes.

Up until now, the interrelatedness between organizational ambidexterity, open innovation and the micro-foundations of dynamic capabilities has only been partly researched within the literature, and therefore, this research adopts a multidimensional perspective. Earlier studies have focused on the macro-level relationship between organizational ambidexterity and dynamic capability (e.g. O'Reilly and Tushman, 2008), or on the macro-level relationship between organizational ambidexterity and open innovation (e.g. Ferrary, 2011; Vrontis *et al.*, 2017). Others, like Lee and Yoo (2019), have focused on the macro-level relationship between open innovation and dynamic capabilities. Despite these attempts, several gaps remain.

First, even though organizations actively search for open innovation strategies for establishing a competitive advantage (Chesbrough and Bogers, 2014), it was Vanhaverbeke and Cloodt (2014) who argued that open innovation was not fully implemented into the organization's strategy. According to Vanhaverbeke and Roijakkers (2013, p. 23), "it is time to explicitly incorporate open innovation into firms' strategy." In this vein, these authors pointed out the link between the organization's innovation strategy and the literature on dynamic capabilities and organizational ambidexterity. However, to date, previous studies on open innovation have not yet successfully implemented and understood how and what organizational capabilities are needed to secure competitive advantage. Second, Popadiuk *et al.* (2018) made clear that previous work on organizational ambidexterity and dynamic capabilities has been dominated by the conviction that sensing is focused on exploration, and that seizing is focused on exploitation. This focus, however, neglects that these dynamic capabilities (sensing, seizing and reconfiguring) could also be implemented from an inside-out perspective (i.e. outbound open innovation) and an outside-in perspective (i.e. inbound open innovation). This alternative viewpoint enables an organization to actively carve out a newly developing market outside its core business, change its own innovational development path and possibly capture a leading role and competitive advantage in its core business. Based on this, it can be concluded that it would be useful for scholars to adopt a multidimensional

perspective (organizational ambidexterity, dynamic capabilities and open innovation) to fill the gap in the literature on how to conceptualize an open innovation strategy that complements, strengthens and is aligned with the organization's ambidextrous innovation strategy (i.e. explorative and exploitative innovations) and organizational capabilities to create a competitive advantage.

In response to the above-mentioned account, we address the following sub-questions in this literature review: First, how can an organization's ambidextrous innovation strategy achieve a competitive advantage? Second, how can dynamic capabilities influence the ambidextrous innovation strategy and a competitive advantage? Third, how can open innovation attributes (i.e. inbound and outbound open innovation) fit with the ambidextrous innovation strategy and achieve a competitive advantage?

More specifically, in this review, we explore how open innovation can be transformed from a strategy to a practice associated with an ambidextrous organizational strategy. To do so, we view organizational ambidexterity as a strategic deliberation for the organizational implementation of open innovation. In addition, focusing on the organization's strategic ambidextrous intent, we argue that the organization must combine internal and external knowledge sources and should ensure that its knowledge management capabilities are aligned and integrated with its dynamic strategy (Chesbrough and Bogers, 2014). This perspective implies that organizations should manage their dynamic capabilities and resources to achieve organizational ambidexterity. Accordingly, dynamic capabilities, conceptualized as dynamic organizational processes (Teece, 2007), can bridge the organization's ambidextrous strategy and enable open innovation practices. Building on the dynamic capabilities and organizational ambidexterity concepts in the strategic management literature, we argue that organizational ambidexterity can be viewed as a strategic orientation (exploitation and exploration), enabling organizations to adapt to and proactively shape their competitive environment. The organizational dynamic capabilities are developed following the organization's ambidextrous strategy, which is further deconstructed in detailed micro-foundations enabling organizational sensing, seizing and reconfiguring capabilities. Furthermore, this research focuses on the organization's ability to adapt to organizational opportunities and threats that arise from environmental dynamism, instead of focusing on deconstructing the concept of environmental dynamism.

This paper contributes to the dynamic capability and organizational ambidexterity literature in several ways. First, it integrates open innovation into the conceptual framework of Popadiuk *et al.* (2018) to explore new insights into how open innovation fits within an organization's dynamic capabilities and ambidextrous strategy.

Second, it expands the current understanding of dynamic capabilities and organizational ambidexterity and interrelates the different elements of dynamic capabilities (sensing, seizing and reconfiguring) with organizational ambidexterity and inbound and outbound open innovation. We link the inbound and outbound open innovation practices to sensing internal exploitational activities and seizing external explorational activities.

Third, we connect the organizations reconfiguring capability with their exploration and exploitation efforts. Fourth, we offer a conceptual model that visualizes the relationships between organizational ambidexterity, open innovation practices, and the micro-foundational activities of dynamic capabilities that underpin the organization's strategy and process for securing a competitive advantage.

The article is structured in three sections. First, we discuss the three perspectives (dynamic capability, ambidexterity, open innovation) separately. Second, we then interrelate the main theoretical elements and their overlap. Third, we interrelate the sensing, seizing and reconfiguring micro-foundations of dynamic capabilities to organizational ambidexterity and open innovation to establish a conceptual framework. We conclude by discussing the conclusion, discussion, limitations and future research avenues.

2. Three approaches to competitive organizational advantage

2.1 Organizational ambidexterity, exploration and exploitation

Duncan (1976) coined the term "organizational ambidexterity" and explained how organizations simultaneously operate exploration and exploitation. Since its early conceptualization, many scholars have followed March's approach (1991), which described ambidexterity as the constant tradeoff between allocating organizational resources to support exploitation activities on the one hand, and to support the exploration of new sources of renewal and income, on the other hand. Exploitation activities are improvements in "production, efficiency, selection, implementation and execution" (March, 1991, p. 71). Organizations create new knowledge to refine their current capabilities by means of exploitation activities (Csaszar, 2013). These activities create new learnings that are focused on refining and routinizing knowledge, creating reliable exploitation processes (Holmqvist, 2004). Exploration activities involve "terms such as search, variation, risk-taking, experimentation, play, flexibility, discovery, innovation" (March, 1991, p. 71). To pursue new competencies and skills that are different from their existing competencies, exploration activities focus on finding new organizational routines, processes, technologies and products (McGrath, 2001; Tushman *et al.*, 2010). The tradeoff between exploitation and exploration results in fundamental organizational behavior and learning differences that impact the firm's long-term performance (March, 1991).

Currently, scholars have started to view organizational ambidexterity as the organization's ability to harmonize the tensions between the different learnings of exploitation and exploration (Papachroni *et al.*, 2015; Werder and Heckmann, 2019). Specifically, organizational ambidexterity "refers to the ability of an organization to both explore and exploit - to compete in mature technologies and markets where efficiency, control, and incremental improvement are prized and to also compete in new technologies and markets where flexibility, autonomy, and experimentation are needed" (O'Reilly and Tushman, 2013, p. 324). In line with this approach, Cameron (1986) had already noted that an efficient organization simultaneously needs both contradictory and mutually exclusive capabilities.

Within the organizational ambidexterity literature, differences exist between the nature of ambidextrous activities. The literature describes three separate ways on how an organization can become ambidextrous: structural ambidexterity, contextual ambidexterity and cyclical ambidexterity. Structural ambidexterity balances exploration and exploitation through separate units to execute these conflicting innovation strategies (O'Reilly and Tushman, 2008; Raisch and Birkinshaw, 2008). Structural ambidexterity consists of two organizational forms: spatial separation and parallel structures (Raisch *et al.*, 2009). Most researchers view spatial separation as the autonomous structural separation of units for exploitation and exploration, with an overarching vision to enable exploration and exploitation, whereby the internal resources are leveraged to support both units and create synergies (Jansen *et al.*, 2009; O'Reilly *et al.*, 2009; O'Reilly and Tushman, 2013; Smith and Tushman, 2005). Within structural ambidexterity, also parallel structures have been studied in the functional domain of internationalization, alliancing, project teams or networks and mergers and acquisitions (e.g. Lavie *et al.*, 2011; Lavie and Rosenkopf, 2006; Lucena and Roper, 2016; Raisch and Birkinshaw, 2008).

Contextual ambidexterity mitigates the paradoxical tensions that are inherent when executing contradicting activities in an organization or at the team or individual level, such as exploration and exploitation activities (Birkinshaw *et al.*, 2016; Gibson and Birkinshaw, 2004; Junni *et al.*, 2013). According to Gibson and Birkinshaw (2004), contextual ambidexterity is best achieved not through a structural separation of exploration and exploitation activities, but rather "by building a set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for

alignment and adaptability" (p. 210). Contextual ambidexterity spans all organizational levels. In a current organizational context in conjunction with discipline, support, trust and stretch, conditions are created for individuals to switch between alignment and adaption (i.e. exploitation and exploration activities). This suggests that contextual ambidexterity is best suited for emerging ambidexterity, where the employee opts for exploration and exploitation.

Sequential ambidexterity mitigates the paradoxical tensions between exploitation and exploration through temporal separation (Boumgarden *et al.*, 2012). This form of ambidexterity revolves around the notion that organizations change their focus and attention toward exploration during certain periods and switch their attention to exploitation during other periods (Chen, 2017).

Moreover, the overarching framework of organizational ambidexterity consists out of conduct, context and performance. These contextual antecedents of organizational ambidexterity are comprised of the organizational characteristics, external environment and senior management cognition (Lavie *et al.*, 2010). The organization's antecedents influence the strategic tension of exploitation and exploration through modes of conduct that lead to long- and short-term performance outcomes, while these long- and short-term measures can be contradictory or contextual dependent (Lavie *et al.*, 2010). Furthermore, it has become clear that the adoption of organizational ambidexterity should not be limited to just within the organization's boundaries. Extant research has shown that exploration-exploitation tension should be implemented in the context of inter-organizational alliances and partnerships, to enable a better balancing of this tension (e.g. Kauppila, 2010; Lavie and Rosenkopf, 2006; Lin and McDonough III, 2014; Lucena and Roper, 2016). It has become clear that these interorganizational alliances and partnerships are seen as antecedents for both dynamic capabilities (i.e. absorptive capacity) (Jansen *et al.*, 2005b; Zahra and George, 2002) and open innovation (Radziwon and Bogers, 2019; Sakkab, 2002), which supports further research on open innovation beyond strategic alliances.

Additionally, when deciding between exploitation or exploration, knowledge management is an important consideration. It is the application of knowledge inside and outside the organization's boundaries that delivers customer value (Grant, 1996). Taking into account the organization's boundary and knowledge evolution process (exploitation, retention, exploration), six knowledge management capabilities have been identified: "inventive, absorptive, transformative, connective, innovative, and desorptive capacity" (Lichtenthaler and Lichtenthaler, 2009, p. 1318). Much attention and research has been devoted to the inbound flow of knowledge, known as absorptive capacity, which is the organization's ability to recognize, assimilate and reconfigure knowledge from external sources for internal purposes (Cohen and Levinthal, 1990). The general organizational ability to seek out knowledge and to manage its knowledge repository has been described as a dynamic capability (Lichtenthaler and Lichtenthaler, 2009) and has been argued to be essential for an open innovation strategy within organizations (Santoro *et al.*, 2018). The organization's ambidextrous innovation strategy is likely to impact organizational performance, as it allows the organization to balance its tensions between explorational and exploitational innovation in order to enable value creation and capturing to attain competitive advantage.

Based on the above account, we propose the following research question to investigate this knowledge gap in the current literature on organizational ambidexterity and open innovation.

RQ1. How can an organization's ambidextrous innovation strategy achieve a competitive advantage?

2.2 Dynamic capabilities

Scholarship in dynamic capabilities presents an active research field with many conceptualizations and interpretations (Di Stefano *et al.*, 2010). However, despite the differences in conceptualizations, the overall consensus is that dynamic capabilities are organizational processes that allow organizations to adjust their resource base (Helfat *et al.*, 2009). Research on dynamic capabilities follows various theoretical perspectives. The definition of dynamic capabilities presented by Teece *et al.* (1997) is widely adopted. In these authors' view, dynamic capabilities refer to "the firm's ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments" (p. 516). Teece *et al.* (1997) adopted an outside-in and reactive perspective, where the organization reacts to environmental changes. Danneels (2008) states that dynamic capabilities allow an organization to build new competencies that enable change within an organization and that environmental scanning is a prerequisite for organizational change. Eisenhardt and Martin (2000) view dynamic capabilities as processes that integrate, reconfigure, gain resources and release resources that are aimed to match and even create market changes. Dynamic capabilities were conceptualized to address scholars' criticisms of the traditional resource-based theory as being a "static" theory (Wernerfelt, 1984), and Teece *et al.* (1997) outlined the capability to manage organizational resources in an agile manner, such as dynamic capabilities. These dynamic capabilities consist of high-level routines that facilitate organizational change and decision-making (Teece, 2007; Winter, 2003). This suggests that there is a need to shift our attention to the micro-foundations of dynamic capabilities and investigate how organizations and their managers create and capture competitive advantages.

In an earlier paper, Teece (2007) had already presented three micro-foundations of dynamic capabilities, namely, "(1) to sense and shape opportunities and threats; (2) to seize opportunities; and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets" (p. 1319). More explicit micro-foundations of the sensing capability involve individuals' learning, creative and interpretative capabilities, as well as integrated organizational processes supporting scanning, creating and interpreting, processes that enable searching stakeholders (suppliers, complementors, customers) within the overall business ecosystem and actively searching out collaboration possibilities, and also the management's ability to perform scenario planning and evaluations (Teece, 2007).

Seizing capability includes practices that allow creating and making changes to the organization's business model by defining its boundaries, which leads to benefiting from complimentary resources, managing co-specialized resources across different platforms, overcoming biases and performing corrective strategies (Teece, 2007).

The reconfiguring capability consists of decentralization through a multidivisional organization configuration and a collaborative management approach, the management of its co-specialization resources by the integration and sourcing of its complementary assets and innovation, processes that manage inside-out knowledge transfer and outside-in knowledge absorption, and also governance processes that support business renewal (Teece, 2007).

All of these micro-foundational capabilities of sensing, seizing and reconfiguring contain open innovation aspects. The sensing open innovation aspects are viewed as the capability to scout technological advances from external sources and collaborate with external research and development (R&D) partners to develop a customer's solution (Teece, 2007). The seizing open innovation aspects are viewed as the co-specialization of the organization's internal and external resources to develop and commercialize customer solutions (Teece, 2007). The reconfiguring open innovation aspects are viewed as processes that enable cross-boundary knowledge sharing to deliberately enable co-specialization within and across organizational boundaries (Teece, 2007).

Furthermore, Day and Schoemaker (2016) attempted to deconstruct the organizational-level micro-foundational dynamic capabilities of sensing, seizing and reconfiguring. They divided these micro-foundational capabilities into six components. Sensing comprises (1) a "peripheral vision," consisting of the organization's capabilities of scanning and scoping; and (2) "vigilant learning," as the organizations' capability of vigilance for external signals that stem from the market (Day and Schoemaker, 2016). Seizing consists of (3) "probe and learn," which includes the capabilities of experimental design for exploring new innovative initiatives, trial-and-error learning and a tolerance for failure; and (4) "flexible investing," which is the organizations' ability to innovate with regards the speed of technological developments and environmental market changes (Day and Schoemaker, 2016). Reconfiguring consists of (5) "organizational redesign," entailing the organization's ability to design the organization's structure to support strategic change and explore radical strategic initiatives through structural separation; and (6) "external shaping," which allows the organization to change and reshape the organization's ecosystem proactively and co-evolve with its stakeholders (Day and Schoemaker, 2016). The two aspects within the reconfiguring capability are largely orientated toward open innovation, owing to their structural separation focus beyond single business units and their focus on co-evolution and co-development through external partnerships (Day and Schoemaker, 2016). These aspects have much in common with comparable similarities from the organizational ambidexterity perspective.

The managerial antecedents to these sensing, seizing and reconfiguring capabilities are managerial human capital, managerial social capital and managerial cognition, which enable managers to carry out the sensing, seizing and reconfiguring tasks (Ambrosini and Altintas, 2019). This implies that managers can exert significant organizational changes through their investment decisions, following their assessment of the market, product and technological developments (Teece, 2007). In other words, entrepreneurial management is required to modify and improve the organizational routines, practices and processes to strategically transform the organization and its ecosystem (Teece, 2012). Top management teams (TMTs) need to support the organization's dynamic capabilities by combining the sensing, seizing and reconfiguring stages to achieve a sustainable competitive advantage (Teece, 2007, 2012).

According to Barreto (2010), the processes of dynamic capabilities are either directly linked to an organizational competitive advantage or indirectly, by altering the organization's operational capabilities or altering its knowledge base, thus improving the organizations' performance. However, it is less clear how these dynamic capabilities impact the organization's explorative or exploitative innovation strategy and competitive advantage through sensing, seizing and reconfiguring. To investigate this knowledge gap in the current literature, we propose the following research question:

RQ2. How can dynamic capabilities influence the ambidextrous innovation strategy and a competitive advantage?

2.3 Open innovation

The literature on open innovation has multiplied since Chesbrough (2003) first coined the term. Open innovation focuses on establishing third-parties' involvement and exploiting and exploring internal and external ideas to improve organizational prosperity. Open innovation is defined as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough, 2003, p. 22). This requires organizations to leverage external resources of innovation based on "purposely managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough and Bogers, 2014, p. 17). The necessity for

organizations to look beyond their internal development (Bahemia and Squire, 2010) and collaborate with outside parties is attributable to the fast-paced, changing markets (Han *et al.*, 2012; Nonaka, 1994). Such comprehension takes into account the multiple knowledge flow directions during the innovative process and its integration into the organization's business model to create value (Chesbrough and Bogers, 2014). Open innovation makes use of inflows and outflows of knowledge to enhance internal innovation and access other markets to profit from externalized innovation (Chesbrough and Crowther, 2006). Within open innovation, the funnel view is adopted (Chesbrough, 2003; Chesbrough and Bogers, 2014), allowing innovations to be gathered both internally and externally from the organization via customers, suppliers, employees and various other external sources. The knowledge acquisition process focuses on upstream research and developments and downstream marketing and manufacturing, assuming that knowledge flows through the organization's permeable boundaries (Chesbrough, 2003; Chesbrough and Bogers, 2014). Using external knowledge internally within the organization creates inbound open innovation, whereas using internal knowledge for external exploitation creates outbound open innovation (Huizingh, 2011). Inbound open innovation and outbound open innovation are two sides of the same coin. Inbound open innovation can be viewed as an outside-in approach that allows organizations to combine external knowledge with existing internal knowledge, often at a lower investment cost. Outbound open innovation is considered an inside-out approach and is based on using internal knowledge into commercial ideas outside its core business and market (Chesbrough, 2012). The outside-in approach focuses on collaboration with external knowledge sources, such as competitors, suppliers, universities and users. The inside-out approach is focused on opening up new markets through licensing and spin-offs (Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011). Such a large pool of diverse activities can provide opportunities and solutions for various organizational challenges, whereby the anticipated innovational outcomes are focused on product innovations (radical and incremental) or process innovations (Greco *et al.*, 2015). Thus, open innovation as a strategic utilization of organizational resources both complements and supports the organization's organizational ambidexterity and dynamic capability perspectives.

As described above, it becomes clear that the organization's open innovation strategy is interrelated to and supports organizational exploration and exploitation activities. This research assumes that an open innovation strategy will likely influence the organizations' competitive advantage. However, how these open innovation attributes influence the organizations' competitive advantage through exploration and exploitation actions is less clear. To investigate this gap in the knowledge in the current literature, we propose the following research question:

RQ3. How can open innovation attributes (i.e. inbound and outbound open innovation) fit with the ambidextrous innovation strategy and achieve a competitive advantage?

3. Method

We started by examining how articles individually defined the three perspectives of organizational ambidexterity, dynamic capabilities and open innovation. After this step, we researched how authors related the literature of organizational ambidexterity toward dynamic capabilities, organizational ambidexterity toward open innovation and dynamic capabilities toward open innovation. We started the search for our literature review with articles and reviews published between 1975 and 2021 on Google Scholar and EBSCOhost. The keywords used were **ambidex***, **dynamic capabil***, **open innovation*** and **competitive advantage***. Boolean search techniques were implemented and formed different combinations of keywords that used "or" and "and." We further refined the results of our search query by titles, abstracts and keywords. After this step, we then refined the

research fields to the sub-areas of general management, strategy, innovation, organization studies, information management, entrepreneurship, international business, marketing and economics. During the scoping of the size and relevance of the literature, research was manually excluded when it was not relevant for this goal of this study. After carrying out the literature review, we supplemented our search with the snowball technique, searching within the literature list of relevant articles. According to Greenhalgh and Peacock (2005, p. 1065), "snowball methods such as pursuing references of references and electronic citation tracking are especially powerful for identifying high-quality sources in obscure locations."

4. The interrelatedness of organizational ambidexterity, dynamic capabilities and open innovation – as sources for competitive advantage

Although the three perspectives of ambidexterity, dynamic capabilities and open innovation are often presented separately, they are interrelated. It becomes clear from Randhawa *et al.* (2016) citation analysis of 321 articles on open innovation that there is a connection between the open innovation perspective and its research domains regarding (1) exploration and exploitation, absorptive capacity, knowledge-based view; and (2) dynamic capabilities and resource-based view. These authors' bibliometric review also clarifies that a significant gap exists concerning the strategy formulation and implementation of open innovation within an organization. To fill this gap, this study adopts organizational ambidexterity as an organizational innovation strategy. Organizational ambidexterity can be strategized to work within and beyond organizational boundaries (Lavie *et al.*, 2010). This implies that the organization's strategic exploration should work side by side with both the exploitation of its services and products in its internal innovation process (Vanhaverbeke and Cloodt, 2014) and the exploitation of its process. "To generate incremental growth in current business requires a different form of the internal organization compared to the case when companies intend to develop completely new business in the long-run … open innovation should be explicitly linked to corporate growth strategy" (Vanhaverbeke and Cloodt, 2014, pp. 260–261). Vanhaverbeke and Cloodt (2014) indicate that open innovation needs to be connected and integrated within the organization's corporate innovation strategy.

The question of how to implement the organization's corporate innovation strategy is solved by connecting the strategy to dynamic capabilities. The definition of dynamic capabilities shares a similarity with open innovation with regard to its focus on a turbulent environment. This turbulent environment is characterized by uncertainty in the environment, stemming from disruptions from new technologies, globalization and other types of disruptive sources (Teece and Leih, 2016). An open market economy enables the orchestration and recombination of the organization's dynamic capabilities (Teece, 2007). "Dynamic capabilities demand both an external (outside the organization) and internal orientation by management" (Teece, 2014, p. 337). The management of an organization that is trapped in a turbulent environment is supported by its dynamic capabilities that facilitate the creation, integration and reconfiguration of the organization's external and internal resources (Teece, 2014).

When connecting open innovation to the other two streams of research that are focused on in this paper, attention needs to be paid to the linkages between dynamic capabilities and organizational ambidexterity, since "dynamic capabilities are rooted in both exploitative and explorative activities" (Benner and Tushman, 2003, p. 238). These dynamic capabilities enable changes within the organization's existing capabilities or facilitate new capabilities (Di Stefano *et al.*, 2014). This seemingly paradoxical situation is not necessarily contradictory when implemented from the organizational ambidexterity perspective (Benner and Tushman, 2003; Di Stefano *et al.*, 2014), with much research arguing for combining both research streams.

The first to research the relationship between organizational ambidexterity and dynamic capability were O'Reilly and Tushman (2008). According to these authors, empirical studies that focus on the antecedents of organizational ambidexterity, namely, environmental dynamism (e.g. Jansen *et al.*, 2005a) and the experienced senior team (Beckman, 2006), imitate the same conditions in which dynamic capabilities can thrive and are the most valuable. Birkinshaw *et al.* (2016) also combine the organizational ambidexterity and dynamic capabilities perspectives to solve organizational challenges that arise when adapting to discontinuous change. They propagate the use of specialized dynamic capabilities to different organizational strategic settings and strategic focuses for the structural, contextual or sequential modes of organizational ambidexterity (Birkinshaw *et al.*, 2016). These three ambidextrous modes are more complementary than exclusively separated (O'Reilly and Tushman, 2013). More specifically, these modes contribute to theory by including organizational culture and vision, and they show the multi-level nature of dynamic capabilities and organizational ambidexterity (Birkinshaw *et al.*, 2016). O'Reilly and Tushman (2008) argued that all three forms of organizational ambidexterity (structural, contextual and sequential) are complex routines and decisions that enable an organization to sense threats and opportunities and to seize these opportunities. However, these modes should be considered to be symbolically adopted while the literature missed the opportunity to properly link these to the micro-foundations of dynamic capabilities (i.e. sensing, seizing and reconfiguring). To theoretically integrate the research streams, Birkinshaw *et al.* (2016) proposed to separate the sensing, seizing and reconfiguring organizational dynamic capabilities of Teece *et al.* (1997). Sensing capabilities are affiliated with exploration, while seizing capabilities are affiliated with exploitation (Birkinshaw *et al.*, 2016). These organizational sensing mechanisms consist of "generative sensing, sense-making, use of scenario planning, and the 'purchase' of real options" (Teece *et al.*, 2016, p. 21). Seizing mechanisms consist of "flexible sourcing arrangements, building 'slack' into the organization, re-engineering rule-bound hierarchies, and adopting open innovation processes" (Teece *et al.*, 2016, p. 22). The reconfiguring mechanisms consist out of a "build-measure-learn" method that focuses on resolving the efficiency and agility paradox through a practical outlook on decentralization, co-specialization of complementary assets between internal and external partners, knowledge management and corporate governance (Teece, 2007; Teece *et al.*, 2016).

The literature shows that most authors focus on the connection between sensing exploration and seizing exploitation (e.g. Benner and Tushman, 2003; Birkinshaw *et al.*, 2016; Popadiuk *et al.*, 2018) while neglecting how the open innovation attributes fit within the organization's ambidextrous strategy. By means of routines and complex decisions, the open innovation perspective focuses on establishing explorative partnerships with third parties to incorporate external ideas and knowledge into the organization (inbound open innovation) and seizes upon this new knowledge to improve their internal organizational ideas. Additionally, the open innovation perspective senses within its own organization's knowledge base opportunities for new, sizable exploitation opportunities of internal knowledge outside its current business (outbound open innovation), to create organizational prosperity (Chesbrough, 2003; Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011). By doing so, the organization establishes a competitive advantage through innovation of the organization's product, process or service, both inside or outside the organization's core market.

4.1 Modeling the competitive advantage framework

The conceptual model in Figure 1 integrates and links the theoretical perspectives of organizational ambidexterity, dynamic capabilities and open innovation. The logical reasoning, ranging from strategy to practices, is outlined as follows.

Organizations strive to optimize their balance between exploration and exploitation through an ambidextrous strategy. Dynamic capabilities are the organization's processes that form the bridge between ambidexterity and open innovation. These dynamic capabilities transform the ambidextrous open innovation strategy into practices. These practices can be further divided into clusters of organizational sub-processes that support sensing, seizing and reconfiguring. These sub-processes enable the organization to establish a competitive advantage through implementing improvements to the organization's products, processes and services. Where sensing is affiliated with exploration in scanning and searching for new technologies and marketing opportunities (O'Reilly and Tushman, 2008; Teece, 2007), the organization's seizing capability rather aligns its strategy and activities through resource allocation and its business model (O'Reilly and Tushman, 2008). Seizing is tasked with implementing and executing the organization's strategic objectives (Teece, 2007), and thus, it is more focused on exploitation (March, 1991). The reconfiguring capability is tasked to change sensing and seizing capabilities, which, in line with the literature, is focused on balancing exploitation and exploration for maximal flexibility and efficiency (O'Reilly and Tushman, 2008).

A similar process is applied for the open innovation perspective, although it is slightly different. Through routines and complex decisions, the open innovation perspective focuses on establishing explorative partnerships with third parties to incorporate external ideas and knowledge into the organization (inbound open innovation) and seizes upon this new knowledge to improve their internal organizational ideas, leading to lower inherent development costs. Additionally, the organization is actively involved in searching within its organization's knowledge base for new opportunities for the exploitation of internal knowledge outside its current business (outbound open innovation) to create organizational prosperity (Chesbrough, 2003; Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011), through establishing a competitive advantage by innovation of the organization's product, processes or services.

The three dynamic capabilities can be linked to different ambidextrous orientations and timing. This timing-related aspect becomes clear from the article of Birkinshaw *et al.* (2016), who extracted two views on organizational ambidexterity from the literature. First, organizational ambidexterity is an antecedent of dynamic capabilities, whereby the organization first chooses its ambidextrous model, after which it develops dynamic capabilities that fit with this ambidextrous model. Second, organizational ambidexterity is an outcome or manifestation of different dynamic capabilities, whereby organizations establish their capabilities through processes such as mergers and acquisitions, or product

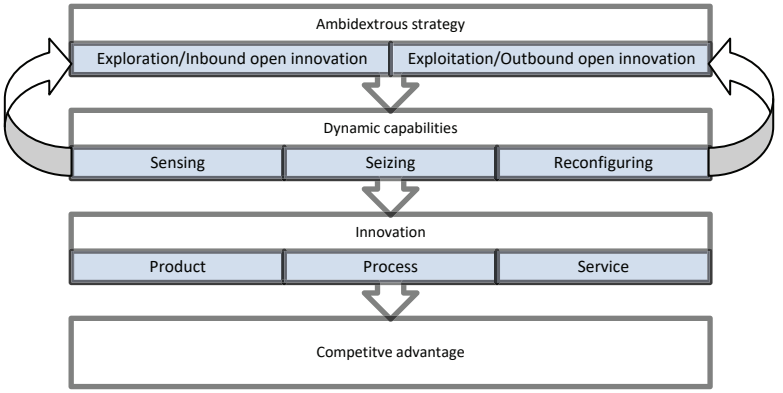

Figure 1.
Conceptual model of the interrelatedness of organizational ambidexterity, dynamic capabilities and open innovation to attain a competitive advantage

development processes (Eisenhardt and Martin, 2000). It is very likely that an organization conscientiously choices a specific ambidextrous strategy on which the organization will further develop its sensing, seizing and reconfiguring capabilities. Whereas time progresses and markets change, the organization might find itself in a position where its current ambidextrous strategy is not effective anymore. Thus, the organization would need to reevaluate and alter its sensing, seizing and reconfiguring capabilities, which in turn would loop back and lead to a demand for a change in the organization's ambidextrous strategy to maintain a competitive advantage. This results in making the organization's ambidextrous innovation strategy dependent on a top-down and a bottom-up strategy.

4.2 Dynamic capabilities' micro-foundations interrelated with organizational ambidexterity and open innovation

The three theories of organizational ambidexterity, dynamic capabilities and open innovation show elemental convergences. For organizations to survive, they need to sense new external knowledge (sense), internalize this knowledge (seize) and apply it internally (reconfigure) (Chesbrough, 2003; Helfat and Peteraf, 2015; Teece, 2007; Tripsas, 2009). These dynamic capabilities are also known as an organization's absorption capacity (Cohen and Levinthal, 1990). An organization's absorptive capacity improves its interaction with its external environment (Rosenkopf and Nerkar, 2001) and allows it to explore market opportunities and apply new technologies (Cohen and Levinthal, 1990; Rothaermel and Alexandre, 2009).

The three literature perspectives focus on three strongly related complex phenomena. The dynamic capabilities perspective focuses on organizational sustainable competitive advantages by searching, identifying and capitalizing on these opportunities by reconfiguring its intangible and tangible assets. The organizational ambidexterity perspective explores the organization's new opportunities and focuses on improving the organization's current exploitation business, and the open innovation perspective focuses on inflows and outflows of knowledge to enhance internal innovation and access other markets to profit from externalized innovation (Chesbrough and Crowther, 2006). Using external knowledge internally within the organization creates inbound open innovation, whereas using internal knowledge for external exploitation creates outbound open innovation (Huizingh, 2011).

To interrelate open innovation with dynamic capabilities and organizational ambidexterity, we follow Popadiuk *et al.* (2018), who divided organizational ambidexterity's main concepts into the three above-mentioned micro-foundations of dynamic capabilities (sensing, seizing and reconfiguring).

4.2.1 Sensing micro-foundation. Sensing micro-foundations are related to the exploration, identification and interpretation of threats and opportunities (Popadiuk *et al.*, 2018; Teece *et al.*, 1997). These sensing capabilities are divided into four processes: processes where internal R&D selects new technologies; processes that identify target-market segments, customer innovation and changing customer needs; processes to tap supplier and complementary innovations; and processes to tap developments exogenous science and technology (Teece, 2007). Sensing capabilities enable the organization's ambidextrous innovation strategy to emerge.

Managers can utilize these sensing processes to enhance their practical knowledge about customers' needs and to support managers to explore new opportunities. Top executive managers are responsible for the decision-making about changes in technology and markets. The TMT, thus, requires skills that enable it to evaluate the available information through processes and routines and go beyond just problem-solving (Teece, 2007).

The organizational ambidexterity theory operationalizes exploration as "search, variation, risk-taking, experimentation, play, flexibility, discovery, innovation" (March,

1991, p. 71). Exploration activities focus on finding new organizational routines, processes, technologies and products (McGrath, 2001; Tushman *et al.*, 2010). Organizational ambidexterity scholars with strong roots in organizational learning also adopt exploration to search for new knowledge (March, 1991; Popadiuk *et al.*, 2018). The open innovation perspective also focuses on using inflows of knowledge to enhance internal innovation (Chesbrough and Crowther, 2006).

Exploration is dominated by the view that it occurs in the sensing micro-foundation. The organizational ambidexterity and dynamic capability perspectives search externally for new information, knowledge, resources and assets for internal innovative projects (O'Reilly and Tushman, 2008; Teece, 2007). However, the ability to sense untapped internal knowledge can also be found within the sensing micro-foundation, which can be used to match and create market changes. This is known as "outbound open innovation" within the open innovation literature and is considered an inside-out approach based on implementing internal knowledge into commercial ideas outside the organization's core business and market (Chesbrough, 2012). The inside-out approach is focused on opening up new markets through licensing and spin-offs (Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011).

Within the organizational ambidexterity literature, organizational context also exerts a vital role during sensing. Contextual awareness enables organizations to sense environmental opportunities and threats and to act in response to explorational and exploitational organizational needs (Popadiuk *et al.*, 2018). Top managers are also crucial in orchestrating dynamic capabilities when developing, evaluating and rejecting scenarios for aligning the organization's assets and resources to achieve the best match to its needs (Teece, 2012). The organizational ambidexterity literature views managers as an essential organizational resource (Lubatkin *et al.*, 2006). The literature review showed that executive management is responsible for crafting a shared vision, organizational context and strategic agenda (Carmeli and Halevi, 2009; Jansen *et al.*, 2008; Probst *et al.*, 2011; Tushman *et al.*, 2010).

4.2.2 Seizing micro-foundation. The seizing micro-foundations are related to product development, services or processes that enable the opportunity to seize new opportunities. This seizing capability is divided into four micro-foundations: the delineation of the customer solution and the business model; the selection of the decision-making protocols; the selection of enterprise boundaries to manage complements and platforms control; and the building of loyalty and commitment to avoid information asymmetry (Teece, 2007). Seizing capabilities enable a planned approach to the organization's ambidextrous strategy.

In short, seizing requires the TMT to make investment decisions to capture opportunities. Duncan (1976) first studied how organizations organize themselves to seize an innovation within the organizational ambidexterity literature. The organizational ambidexterity theory operationalized exploitation as improvements in "production, efficiency, selection, implementation and execution" (March, 1991, p. 71). Through exploitation activities, organizations create new knowledge to refine their current capabilities (Csaszar, 2013). Exploitation activities create new learning opportunities that are focused on refining and routinizing knowledge, creating reliable exploitation processes (Holmqvist, 2004). The open innovation perspective uses the outflows of knowledge to access other markets, to profit from externalized innovation (Chesbrough and Crowther, 2006).

Exploitation manifests itself as a seizing capability when the organization can refine and improve on existing products and knowledge within its existing business. This is enabled by means of internal organizational movements, which results in the orchestration of resources and assets, economies of scale and others (Popadiuk *et al.*, 2018). Exploitation is dominated by the view that it occurs during the seizing micro-foundation (March, 1991). However, within the seizing micro-foundation also lies the ability for exploration to seize external knowledge and profits, sustaining long-term organizational profitability. Within the open innovation literature, this is known as "inbound open innovation," which is viewed as an outside-in

approach that allows organizations to combine external knowledge with internal knowledge, often at a lower investment cost (Chesbrough, 2012). The outside-in approach focuses on collaboration with external knowledge sources such as competitors, suppliers, universities and users (i.e. organizational buy-ins or takeovers) (Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011).

The organizational ambidexterity literature states that these exploitation activities, together with exploration activities, need to be managed by the TMT. In turn, these TMTs should share knowledge and information to solve the paradoxical tensions between exploration and exploitation to initiate the organization's strategy top-down (Zimmermann *et al.*, 2015). It is the middle manager who engages the employees and implements the organizational strategy (Popadiuk *et al.*, 2018).

4.2.3 Reconfiguring micro-foundation. The reconfiguring micro-foundations consist out of four groups: decentralization and near decomposability, co-specialization, governance and knowledge management (Teece, 2007). Reconfiguring capabilities ensure that the organization's ambidextrous strategy can be executed in a planned manner. In short, an organization requires decentralization and decomposition to remain flexible and responsive to changing market conditions. The organizational structure should provide a certain level of autonomy while enabling organizational units to improve the processes and routines that are required by exploitation (Popadiuk *et al.*, 2018). The organizational ambidexterity literature also uses organizational structure to steer and enforce organizational operations. These structures allocate responsibilities, power and resources between different business units and functions (Lavie *et al.*, 2010).

Regarding co-specialized assets, these are assets that act as complementary value-adding functions when used in conjunction with other assets. The management's role is to identify, develop and utilize these specialized assets and combine them with (outside) assets to reap the benefits of innovation (Teece, 2007). Within an organization, ambidexterity alignment between assets, either inside or outside, is discussed by the TMT as part of structural ambidexterity (Tushman and O'Reilly, 1996). Another option within organizational ambidexterity focuses on the organizational context and supports individuals and teams in finding a balance between exploration and exploitation (Birkinshaw and Gibson, 2004).

Teece (2007) also includes learning, corporate governance and knowledge management as micro-foundations for organizational reconfiguring. Within dynamic capabilities, integrating, realignment and combining assets and processes with new knowledge is a core and necessary skill for bringing about an organization's prosperity. Within the open innovation and organizational ambidexterity literature, a salient point is that organizations can only survive by their ability to recognize new external knowledge and apply it internally (Chesbrough, 2003; Helfat and Peteraf, 2015; Tripsas, 2009).

Within the reconfiguration phase, the task falls to the manager to keep employees and teams motivated through corporate mechanisms (i.e. shared values and financial incentives). Financial incentives as a corporate governance mechanism are addressed within the dynamic capability and organizational ambidexterity literature (Jansen *et al.*, 2008; Probst *et al.*, 2011; Teece, 2007).

If required, organizations need to reconfigure their context and be open to acquiring new assets, resources and knowledge, subject to contextual changes (Popadiuk *et al.*, 2018). This contextual change assumes that organizations need to employ a variety of different organizational practices, such as intensive lateral and vertical communication, extensive delegation and rewards for knowledge sharing (Foss *et al.*, 2011), simply because many innovative solutions are not "plug and play" solutions that interact with the organization's internal product, processes and services (Bogers *et al.*, 2019). Accordingly, this forces the organization to maintain its explorational ability to incorporate new knowledge and innovation into internal knowledge and innovation and to be able to reconfigure its

organization to exploit the newly acquired knowledge or innovation. The adoption of the open innovation perspective within the reconfiguring capability shows that the organization needs to invest to maintain its R&D capability and ensure the effective exploration of new technologies, and that it needs to change its culture and realign its organization in such a way that enables the organization to effectively exploit its new technology and innovation (Bogers *et al.*, 2019).

Table 1 shows a matrix adapted from Popadiuk *et al.* (2018) that explains the relationships between organizational ambidexterity elements and the micro-foundations of dynamic capabilities and the open innovation perspective.

5. Discussion

In this literature review/discussion section, the theoretical interrelation was researched between the organization's ambidextrous strategy, open innovation and the micro-foundations of dynamic capabilities toward a competitive advantage. Based on this study, we deduced that an organization's dynamic capabilities act as a bridge between the organization's ambidextrous and open innovation activities in its quest to gain a competitive advantage.

Regarding RQ1, we show that the literature that integrates organizational ambidexterity and dynamic capabilities presents slightly different assumptions. Most scholars view organizational ambidexterity as a dynamic capability (Carter, 2015; García-Lillo *et al.*, 2016; Kriz *et al.*, 2014; Nosella *et al.*, 2012; O'Reilly and Tushman, 2008). However, some research studies argue that organizational ambidexterity is complementary to dynamic capabilities as an essential element for the construction of these dynamic capabilities (sensing, seizing and reconfiguring). Others have proposed organizational ambidexterity as a mediating element for obtaining an organizational competitive advantage (Birkinshaw *et al.*, 2016; Jurksiene and Pundziene, 2016; Zimmermann and Birkinshaw, 2016). Certain studies place organizational ambidexterity as a preceding element for constructing dynamic capabilities or as an outcome of the management and creation of dynamic capabilities (Birkinshaw *et al.*, 2016; Pasamar *et al.*, 2015). Our analysis and conceptual model both clearly show that organizational ambidexterity adapts to new market circumstances over time, and that organizational ambidexterity first starts as an antecedent of dynamic capabilities, where the organization first chooses its ambidextrous model, after which it proceeds to develop dynamic capabilities that fit with this ambidextrous model. As time advances and as markets change, the organization can find itself in a position where its current ambidextrous strategy is not effective anymore. This leads to the demand for the organization to re-evaluate the value offering of its products, processes or services, and the need to alter its sensing, seizing and reconfiguring capabilities. In turn, this would loop back and demand a change in the organization's ambidextrous strategy to maintain a competitive advantage. In this way, organizational ambidexterity becomes both an outcome and a consequence of adapted dynamic capabilities, which thus makes the organization's ambidextrous innovation strategy dependent on both a top-down and a bottom-up strategy.

With regard to RQ2, we show that the organization's dynamic capabilities are first developed based on the management's strategic ambidextrous decision to explore or to exploit. After a market change, which can lead to the organization's value offering losing its competitive advantage, the organization's dynamic capabilities then sense this change, requiring the organization to change its ambidextrous strategy and corresponding dynamic capabilities, as is elaborated in detail above in RQ1.

Moving to RQ3, we show that the open innovation attributes (i.e. inbound and outbound open innovation) are interlinked with exploration and exploitation, and that they can be viewed as complementary to the organization's ambidextrous strategy. Where sensing is

Ambidexterity components	Open innovation	Micro-foundations of dynamic capabilities		
		Sensing	Seizing	Reconfiguring
Exploration	Inbound open innovation	The company's capability in using local and nonlocal resources, assets, sources of knowledge and innovation	The company's capability to capitalize on external knowledge and innovation from outside sources	The company's ability to invest and maintain its R&D capability
Exploitation	Outbound open innovation	The company's capability in implementing internal knowledge into commercial ideas outside the organization's core business and market	The company's capability to evolve constantly. This is observed through the company's internal movements, resulting in economies of scale, efficiency in the orchestration of assets and resources, and others	The company's ability to realign its organization, culture to integrate external knowledge and innovation into internal knowledge and innovation
Organizational structure		The company's capability to organize itself to integrate and allocate new resources, assets, knowledge and innovation		The company's capability to organize itself to meet the improvements required by exploitation
Organizational context		The company's capability to build a context that fosters the awareness of environmental opportunities and threats and perceive the need for exploration and exploitation	The company's capability to absorb needed change	The company's capability to continually be attentive to the changes in the context required by new resources, assets, knowledge acquisition and improvements
Manager and employee roles		The TMT's capability to know where and when to search for assets, resources, knowledge and innovations and identify allies who support and help during this search	The capability of the manager to connect previous movements with the organization's goals and strategies. The manager acts as a pivot, engaging people and implementing the changes required in the organization	Manager capability to keep teams motivated to pursue agreed-upon actions

Table 1.
Interrelatedness between organizational ambidexterity, dynamic capabilities and open innovation

Note(s): Adapted and adjusted from Popadiuk *et al.* (2018)

affiliated with exploration in scanning and searching for new technologies and marketing opportunities (O'Reilly and Tushman, 2008; Teece, 2007), the organization's seizing capability aligns the organization's innovation strategy and activities through both the allocation of resources and its business model (O'Reilly and Tushman, 2008). Seizing is tasked with implementing and executing the organization's strategic objectives (Teece, 2007), and is thus more focused on exploitation (March, 1991). In turn, the reconfiguring capability is

tasked to change sensing and seizing capabilities, which, in line with the literature, is focused on balancing exploitation and exploration for maximal flexibility and efficiency (O'Reilly and Tushman, 2008).

A similar process is applied from the open innovation perspective, although in a slightly different way, which thus complements and fills a gap left open by organizational ambidexterity and dynamic capabilities. Through routines and complex decisions, the open innovation perspective focuses on establishing explorative partnerships with third parties to incorporate external ideas and knowledge into the organization (inbound open innovation) and seizes upon this new knowledge to improve their internal organizational ideas, leading to lower development costs. Additionally, the organization becomes actively involved in sensing within its organization's knowledge base for new opportunities for the exploitation of internal knowledge outside its current business (outbound open innovation), leading to organizational prosperity (Chesbrough, 2003; Chesbrough and Crowther, 2006; Giannopoulou *et al.*, 2010, 2011) through establishing a competitive advantage by the innovation of the organization's product, process or service.

6. Conclusion

This study aims to determine how the relationship between organizational ambidexterity, dynamic capabilities and open innovation influence the organizations' competitive advantage, and also how the same is brought about by the organization's components of organizational ambidexterity (i.e. exploration and exploitation), open innovation (i.e. inbound and outbound open innovation) and the micro-foundations of dynamic capabilities (i.e. sensing, seizing, reconfiguring).

This study contributes to the conceptual development of organizational ambidexterity, dynamic capabilities and open innovation by advancing organizational ambidexterity–open innovation–dynamic capability interrelatedness through proposing a conceptual framework with the main elements of all three theories. Earlier articles focused on either the organizational ambidexterity–dynamic capability relationship (e.g. Popadiuk *et al.*, 2018), or the dynamic capability–open innovation relationship (e.g. Bogers *et al.*, 2019; Teece, 2020); however, this study addresses both the research avenue adopted by Popadiuk *et al.* (2018) to further extend the interrelationship of organizational ambidexterity and dynamic capability theories and also the approach taken by Vanhaverbeke and Roijakkers (2013) to explicitly incorporate open innovation into the organization's strategy.

The first of our three main findings is that the organization's ambidextrous strategy achieves competitive advantage by developing its dynamic capabilities through which the organization changes its value proposition. Second, our study shows that organizational ambidexterity can no longer be viewed solely as a structural solution implemented by management, but rather also as a bottom-up intervention. For we found that the organization's dynamic capabilities establish a feedback loop, which changes the organization's ambidextrous exploration and exploitation innovation strategy to resolve the efficiency–agility paradox. Third, the open innovation attributes (i.e. inbound and outbound) complement the organization's ambidextrous strategy to achieve a competitive advantage.

This article contributes to the growing body of literature by interrelating open innovation with dynamic capabilities and organizational ambidexterity in a conceptual model following the framework of Popadiuk *et al.* (2018), which is linked to both the micro-foundations of dynamic capabilities (sensing, seizing and reconfiguring) and to elements from the organizational ambidexterity literature.

The study concludes that dynamic capabilities are a fundamental concept, and that this concept acknowledges that open innovation and organization ambidexterity are integrated

processes that enable organizations to adapt to dynamic environments. Accordingly, the authors agree with Teece (2020) that open innovation is a standalone principle; however, they add that it is also a set of processes through which the organization enables the higher-level dynamic capabilities of sensing, seizing and reconfiguring. The authors also agree with Jurksiene and Pundziene (2016) that the organizational ambidexterity concept (structural, contextual and sequential) supplements and strengthens the dynamic capability perspective in its quest to obtain a more robust, stable and more durable competitive advantage. However, by combining the dynamic capabilities, organizational ambidexterity and open innovation perspectives, a greater whole than the sum of its parts is achieved. Open innovation and organizational ambidexterity effectively reinforce the organization's dynamic capabilities, and vice-versa, where strong dynamic capabilities can improve the organization's efforts and the effectiveness of its open innovation and ambidextrous strategy.

Our conceptual model and framework highlight the integrating of the open innovation literature with the dynamic capabilities and organizational ambidexterity perspectives, which were neglected in the model of Popadiuk *et al.* (2018). Furthermore, we reveal elements of the organizational ambidexterity literature that are related to the micro-foundations of dynamic capabilities. In addition, we identify and integrate open innovation literature elements (inbound and outbound open innovation) and organizational ambidexterity literature elements (exploration, exploitation, organizational structure, manager and employee roles, and organizational context) into the micro-foundations of the dynamic capabilities of sensing, seizing and reconfiguring. These elements underpin the micro-foundations of dynamic capabilities.

All three literature perspectives, namely, organizational ambidexterity, dynamic capabilities and open innovation, can be observed through processes and routines that exist in the organization. For example, the sensing capability can be observed through the organization's ability to explore new knowledge outside the organization and exploit internal knowledge into commercial ideas outside the organization's core business and market. The seizing capability is observed by the organization's exploration capability to capitalize on external knowledge and innovation from outside sources and exploitation capability to evolve constantly. This is demonstrated in the company's internal movements, which result in economies of scale and the improved efficiency of the orchestration of assets and resources, etc. Finally, the reconfiguration capability is observed through the organization's R&D capability to explore and incorporate new technologies and exploit this new knowledge by realigning its organization and culture to integrate external knowledge and innovations with internal knowledge and innovations.

6.1 Limitations and future avenues for research

The nuances and similarities within the literature, together with the elements that make up the three perspectives, all reflect the complex and challenging task of interrelating perspectives. Another limiting factor was the lack of articles that evaluate the interrelatedness between the theories of organizational ambidexterity, dynamic capabilities and open innovation.

Future avenues for research could investigate how organizations operationalize the micro-foundations (sensing, seizing and reconfiguring) through empirical research. Further research into how organizations implement routines, processes, skills and organization structures could help top managers, line managers and human resources management (HRM) improve the allocation of the company's assets, resources and capabilities.

Further studies could also seek to explain in more depth how sensing, seizing and reconfiguring capabilities influence an organization's sustainable competitive advantage. Additional in-depth research could reveal how top management implements these sensing,

seizing and reconfiguring capabilities in practice, and how these combined capabilities strengthen the organization's strategic management.

Another research opportunity would be to investigate the different types of dynamic capabilities (i.e. sensing, seizing and reconfiguring) for different types of organizational ambidexterity (i.e. structural, contextual and sequential ambidexterity) (O'Reilly and Tushman, 2013). In addition, research studies are required to investigate the functioning of dynamic capabilities in real-life managerial actions (Teece, 2016), as research into this matter could lead to understanding how organizations grow, how they become heterogeneous and they create value and capture resources.

Given the lack of longitudinal research in organizational ambidexterity, open innovation and dynamic capability studies, we support the carrying out of studies that evaluate whether an organization has adapted its dynamic capabilities that result from its ambidextrous strategy and whether an organization has adapted its ambidextrous strategy that results from its dynamic capabilities.

Furthermore, as the interrelationship of open innovation with dynamic capabilities and organizational ambidexterity theories has not been fully explored in previous literature (Vanhaverbeke and Cloodt, 2014), this shows that this area is a promising area for future research. We, therefore, encourage research "to explicitly incorporate open innovation" into the organization's ambidextrous strategy (Vanhaverbeke and Roijakkers, 2013, p. 23), and suggest that future empirical research studies could assist in strengthening the relationship between organizational ambidexterity, open innovation and the micro-foundations of dynamic capabilities, as well as explore how the three organizational ambidexterity types (i.e. structural, contextual and sequential) and the two open innovation attributes (i.e. inbound and outbound) influence the orchestration and development of sensing, seizing and reconfiguring capabilities and their relationship with a competitive advantage.

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