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Soft quality management practices and product innovation ambidexterity: the mediating role of market orientation ambidexterity

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Abstract

Purpose – This study empirically analyses the direct impacts of Soft Quality Management Practices (SQMP) and Market Orientation Ambidexterity (MOA) on Product Innovation Ambidexterity (PIA). It also examines the mediating role of MOA on the relationship between SQMP and PIA.

Design/methodology/approach – Following a quantitative research methodology, a well-structured questionnaire is used to collect data from 130 Moroccan certified ISO 9001 firms. The conceptual framework of the study was tested using partial least squares structural equation modeling (PLS-SEM).

Findings – The results show that SQMP have no significant association with PIA while they positively and significantly impact MOA. The study also revealed that MOA has a positive and significant impact on PIA and fully mediates the relationship between SQMP and PIA.

Research limitations/implications – Due to the conceptualization of MOA and PIA as combined ambidexterity, the results of the study might be different in the case of balanced ambidexterity.

Practical implications – To achieve PIA, managers need to be aware that implementing SQMP, while important, is not enough. They must invest sufficient resources to properly implement these practices to support MOA. Consequently, MOA will lead their organization to PIA by establishing the significant impact of SQMP on PIA.

Originality/value – Regardless of the abundant literature on the relationship between QM practices and innovation, this study is among the first to examine the impact of SQMP on PIA. Using MOA as a mediator can give a meaningful answer to the indecisive empirical results of the impact of QM on innovation. Furthermore, this research contributes to the scarce literature on relevant studies conducted in developing countries.

Keywords Soft quality management practices, ISO 9001, organizational ambidexterity, innovation ambidexterity, market orientation ambidexterity, product innovation ambidexterity, PLS-SEM, Morocco.

Introduction

In today's dynamic business environment, product innovation is a key strategy that enables firms to create and maintain a competitive advantage (Bagchi-Sen 2001). More than that, they must be able to develop both incremental (IPI) and radical product innovation (RPI) to maintain their performance levels in the short and long term (O'Reilly and Tushman 2013, Ardito *et al.* 2020). In other words, firms need to develop product innovation ambidexterity (PIA) to last in dynamic scenarios characterized by market competitiveness, volatility, and uncertainty (Harmancioglu *et al.* 2020). However, it is unclear how PIA can be achieved (Asif and De Vries, 2015) and inherently challenging, since the two types of innovations require different kinds of organizational settings and practices that compete for scarce resources and create tensions, conflicts, contradictions within a single organization (Andriopoulos and Lewis 2009, Simsek *et al.* 2009, Lin *et al.* 2013). Some theoretical and empirical studies suggest that quality management (QM) (Moreno Luzon and Valls Pasola 2011, Asif and de Vries 2015, Asif 2017, Kafetzopoulos 2020, Pertusa-Ortega *et al.* 2021) and market orientation (MO) (Tan and Liu 2014, Ramachandran *et al.* 2019, Sahi *et al.* 2020) can be designed to support PIA.

The current literature on the impact of QM on innovation ambidexterity encompasses some limits. Empirical studies conceptualize and operationalize QM as a unidimensional concept to separately explain the exploitation and exploration dimensions of innovation ambidexterity (Álvarez Santos *et al.* 2018, Khan and Naeem 2018). These studies have focused only on one hard practice of QM, namely process management (Benner and Tushman 2002, 2003, Moreno-Luzon *et al.* 2014) to the detriment of soft QM practices (SQMP). Also, the recent studies that consider innovation ambidexterity as a combination of exploitation and exploration have conceptualized QM as a one-dimensional concept and disregarded SQMP (Kafetzopoulos 2020, Pertusa-Ortega *et al.* 2021). The one-dimensional view of QM is a bias that must be avoided as it leads to contradictory results in the context of innovation (Abrunhosa and Moura E Sá 2008, Zeng *et al.* 2015, Escrig-Tena *et al.* 2018, El Manzani *et al.* 2019). Consequently, there remains a paucity of empirical studies that help to understand the relevance of SQMP in fostering PIA, as they are known to have the potential to enable exploratory and exploitative product

innovation separately (Prajogo and Sohal 2004, Feng *et al.* 2006, Thai Hoang *et al.* 2006, Moura E Sá and Abrunhosa 2007, Santos-Vijande and Álvarez-González 2007, Abrunhosa and Moura E Sá 2008, Perdomo-Ortiz *et al.* 2009, Song and Su 2015, Kanapathy *et al.* 2017, Gambi *et al.* 2021).

On the other hand, MO has been shown to mediate the impact of QM on specific organizational outcomes such as service quality (Lam *et al.* 2012), customer satisfaction (Pattanayak *et al.* 2017), performance (Raju and Lonial 2001, 2002), marketing capabilities, and market-based learning capabilities (Santos-Vijande and Álvarez-González 2009). Nonetheless, existing literature omits the potential mediating effect of MO between QM (especially SQMP) and PIA. Concerning QM, authors have often operationalized MO using the MARKOR (Kohli *et al.* 1993) or the MKTOR scales (Narver and Slater 1990). These scales have produced inconclusive results as they only reveal the reactive aspect of MO without capturing the totality of this concept. According to Narver *et al.* (2000, 2004), MO is a combination of two essential and complementary dimensions: responsive MO (RMO) and proactive MO (PMO). Few studies have examined MO ambidexterity (MOA) (i.e., the simultaneous adoption of both RMO and PMO) in relationship with market performance (Herhausen 2016), firm performance (Wang *et al.* 2020) and product innovation (Atuahene-Gima *et al.* 2005). However, except for Tan and Liu (2014), no other scholars have investigated the relationship between MOA and PIA, although existing studies have shown the importance of RMO for IPI (Li *et al.* 2008, Tan and Liu 2014, Bucktowar *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015) and PMO for RPI (Li *et al.* 2008, Tan and Liu 2014, Bucktowar *et al.* 2015, Cai, Liu, *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015).

Given all these gaps, this paper sheds light on the relationship between SQMP, MOA, and PIA by addressing two questions: (1) Is there a relationship between PIA and the implementation of SQMP? (2) What is the role of MOA in this relationship? In answering these questions, this study is one of the first to examine the direct effect of SQMP and MOA on PIA and to test the mediating effect of MOA in the relationship between SQMP and PIA. Although there is extensive literature on SQMP, MO, and innovation ambidexterity, studies that integrate these three constructs are rare. Despite significant advances in the literature and practical applications in each of quality management practices, MO, and innovation ambidexterity, there is a dearth

of studies that have looked at the relationship between SQMP, MOA, and PIA, which could provide academics and practitioners with new insights into their interplays.

Next, the paper presents the literature review and the hypotheses proposed. Then, it describes the research method and the results. Finally, it shows a discussion and conclusions section, which includes implications, limitations, and suggestions for further research.

1. Literature review

1.1 Soft quality management practices

To better understand the impact of QM on innovation, studies conceptualize QM as a set of practices divided into hard and soft practices (Prajogo and Sohal 2004, Zeng *et al.* 2015, 2017, Escrig-Tena *et al.* 2018, El Manzani *et al.* 2019, Sciarelli *et al.* 2020, Gambi *et al.* 2021) based on SocioTechnical Systems theory (STS) (Manz and Stewart 1997). This theory views the organization as a functioning system with two interdependent subsystems, the technical/hard system, and the social/soft system. The technical system manages the processes, procedures, tasks, and technologies required to transform inputs into outputs, while the social system focuses on people's relationships, behaviors, attitudes, skills, beliefs, and values (Bostrom & Heinen, 1977; Bostrom & Heinen, 1977).

Following STS theory, SQMP are referred to in the literature with different names as cognitive practices (Kekäle and Kekäle 1995), infrastructural practices (Flynn *et al.* 1995, Zu 2009), or social practices (Cua *et al.* 2001, El Manzani *et al.* 2019). SQM practices reflect the paradigm of soft managerial change which comprises reflection engagement, empowerment, and knowledge capture and dissemination (Bourke and Roper 2017). Based on Bowen & Lawler's (1992) idea that it is employees who realize quality, the SQM practices embrace consists of cultural, social, learning, and relationship-oriented practices of QM (Wilkinson 1992, Sitkin and Sutcliffe 1994, Flynn *et al.* 1995, Rahman and Bullock 2005). These practices are captured at the strategic level by integrating strategic planning (Samson and Terziovski 1999), visionary leadership and shared vision (Anderson *et al.*, 1995; Dow *et al.*, 2009), employee relations (Saraph *et al.* 1989), and open organization (Powell 1995). They are also captured at the inter-organizational level by embodying supplier and customer relationships (Flynn *et al.* 1995).

For this study, SQMP include four practices (Bakotić and Rogošić 2017, El Manzani *et al.*

2019). (1) Leadership is the responsibility of leaders to create and communicate to all members a shared vision and clear and visible values and goals of quality and how to adopt them at all levels of the organization (Anderson & Rungtusanatham, 1994; Conca et al., 2004; Rao et al., 1997). (2) Customer focus means that all activities of QM are driven by understanding the present and future needs of the customer and everyone in the organization should be aware of this (Ahire *et al.* 1995, Powell 1995, Rao *et al.* 1997). (3) Employee involvement consists of the idea that people at all levels are the essence of an organization and their full involvement individually and collectively enables their skills to be used for the benefit of the organization (Dale, 2015). (4) Supplier relationship means that an organization can only increase its level of quality and reduce time and costs if it has a long-term relationship with a few good suppliers characterized by trust, loyalty, and cooperation (Trent and Monczka 1999, Tarí *et al.* 2007).

1.2 Market orientation ambidexterity

In response to the criticism that MO does not approach the expected results for the firms, Jaworski et al. (2000) introduced the two approaches of market-driven and market driving for MO. The former is based on understanding and responding to the behavior of actors within a given market structure, while the latter seeks to influence the market structure and/or the behavior of actors to improve the firm's competitive advantage (Jaworski et al., 2000). Similarly, Narver et al. (2004) brought a two-dimensional view to MO by dichotomizing it into RMO and PMO. Viewed as a customer-led culture, RMO can be described as a set of capabilities to meet customer expressed needs and focus on current products and markets (Narver *et al.* 2004, Atuahene-Gima *et al.* 2005, Li *et al.* 2008, Tsai *et al.* 2008). Considered as a lead-the-customer culture, PMO can be described as a set of capabilities enabling the firm to meet latent customer needs and focus on new products and emerging markets (Narver *et al.* 2004, Atuahene-Gima *et al.* 2005, Li *et al.* 2008, Tsai *et al.* 2008).

Despite some distinctions between RMO and PMO, they are complementary, not substitutes at opposite ends of a continuum, without being in conflict or presenting a significant managerial paradox (Atuahene-Gima et al., 2005; Jaworski et al., 2000; Li et al., 2008; Slater & Mohr, 2006; Slater & Narver, 2000). Since a total MO involves both reactive and proactive behavior, firms can be ambidextrous by engaging in both orientations simultaneously, and the shift from one form to the other is part of a dialectic influenced by the relationship between the firm and its environment (Jaworski et al., 2000; Slater & Narver, 2000); we speak of ambidextrous MO.

From existing research (Leng *et al.* 2015, Herhausen 2016), MO ambidexterity is the ability of an organization to combine both responsive and proactive MO. Following Kohli and Jaworski (1990) and Narver *et al.*, (2004), we conceptualize MO ambidexterity as the organization's production of information about customers' current needs (i.e., exploiting customer needs), the dissemination of this information across the organization's departments, and the organization's reaction to this information, while being able to generate information about customers' latent needs (i.e., exploring customer needs), the dissemination of this information across the organization's departments, and the organization's reaction to this information.

1.3 Product innovation ambidexterity

Innovation ambidexterity refers to an organization's ability to pursue both exploratory and exploitative innovations simultaneously (He and Wong 2004). Thus, ambidextrous firms exploit their current capabilities and resources to refine and improve the existing product while at the same time they explore new technological paths and experience unfamiliar knowledge, capabilities, and resources required to create new and truly unique products (AndrPIoulos and Lewis, 2009; Asif, 2017). It follows that ambidexterity in terms of product innovation occurs when the firm somehow engages to carry out various product innovations types (Estrada and Faems 2015).

The Oslo Manual considers that product innovation is “*a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market*” (OECD/Eurostat, 2018, p. 70). Damanpour (1991) describes product innovations as new products or services introduced to meet an external customer or market need. Through these definitions, product innovations can be divided into incremental product innovations (IPI) and radical product innovations (RPI) (Danneels 2002, Jansen *et al.* 2006, Ardito *et al.* 2020). The former, which are more related to exploitative innovation, seeks to satisfy existing customers or market needs and rely more on processes such as refinement, choice, efficiency selection, and improvement. On the other hand, radical PI, which is more associated with exploratory innovation, seeks to respond to new customer and market needs that require more breakthrough thinking, search, variation, experimentation, and discovery (Chang & Hughes, 2012; Jansen *et al.*, 2006; Lin *et al.*, 2013; March, 1991; Tushman & O'Reilly, 1996). If incremental innovation helps maintain a level of performance necessary for the survival of the

firm in the short term, radical innovation provides continuity in a long-term changing and dynamic business environment (Ardito *et al.* 2020).

Based on the above, PIA is considered in this study as the simultaneous realization of incremental and radical product innovations. More specifically, the ability of firms to bring to market a product that is significantly improved over those previously developed by the firm in terms of its essential characteristics, intended use, or components, along with new products that are very different from the previous products of the firm and those of its competitors (El Manzani *et al.* 2019).

2. Hypotheses development

2.1 Soft quality management practices and product innovation ambidexterity

According to theoretical and empirical studies, QM can be a significant antecedent of innovation ambidexterity because it does not inhibit the pursuit of exploratory and exploitative goals (Moreno-Luzon *et al.* 2014, Asif 2017, Álvarez Santos *et al.* 2018, Kafetzopoulos 2020, Pertusa-Ortega *et al.* 2021) and involves practices that support ambidexterity characteristics (Perdomo-Ortiz *et al.* 2006). SQMP can promote PIA by creating a fertile atmosphere that develops the firm's product innovation capability. For example, studies have shown that SQMP are positively associated with the development of new or significantly improved products (Prajogo and Sohal 2004, Feng *et al.* 2006, Song and Su 2015, Zeng *et al.* 2017, Khan and Naeem 2018).

Top management's leadership role in quality not only leads to a quality strategy but could also guide the firm's innovation strategies (Tang 1998, Ravichandran and Rai 2000). In this regard, the leadership role in PIA is to provide the necessary human and material resources, create and maintain an organizational climate with a culture capable of cultivating and recognizing innovation (Ahmed 1998), and encourage participation in generating innovative ideas at all organizational levels (Sadikoglu and Zehir 2010, Manders *et al.* 2016). Employee involvement includes various aspects of human resource management (e.g., empowerment, training, and teamwork) that increase employee satisfaction and support their motivation to continuously contribute with creative ideas to improve existing products or recommend new ones (Prajogo and Sohal 2004, Abrunhosa and Moura E Sá 2008, Sadikoglu and Zehir 2010, Zeng *et al.* 2017). Teamwork also facilitates organizational cohesion that enables knowledge sharing and the

creation of new knowledge for exploration and exploitation (Pertusa-Ortega *et al.* 2021). Customer focus is a fundamental requirement for the development of incremental and radical product innovation because it keeps the organization open to its customers (Chang & Taylor, 2016; Bulent Menguc *et al.*, 2014). Through this openness, the organization continuously learns (Dean and Susman 1989) and adapts to fluctuating customer expectations by developing and introducing new incremental and radical products beyond enforcing basic standards (Prajogo and Sohal 2001, 2003). Benner & Tushman (2003) emphasized that the focus on market/customer trends is important to solve the exploration-exploitation innovation dilemma. Supplier relationships enable the organization to adapt to environmental changes as it is often known that high-performing suppliers play an important role in new product development (Song and Thieme 2009, Lau *et al.* 2010, Menguc *et al.* 2014). Suppliers could share their resources, expertise, knowledge and experience with the organization, which improves their knowledge base and consequently increases their innovation capacity and develops incremental and radical product innovations (Petersen *et al.* 2005, Kim *et al.* 2012).

Considering this theoretical development, we believe that the SQMP of leadership, employee involvement, customer focus and supplier relationship together could support PIA by helping the organization in realizing exploitation and exploration product innovation-related activities.

H1. SQMP positively and significantly impact PIA.

2.2 Market orientation ambidexterity and product innovation ambidexterity

Narver, Slater & MacLachlan (2004) state that MO, responsive or proactive, must be the basis for an organization's innovation efforts. Accordingly, an ambidextrous MO enables PIA since the responsive and proactive dimensions are respectively related to incremental (Li *et al.* 2008, Tan and Liu 2014, Bucktowar *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015) and radical product innovation (Li *et al.* 2008, Tan and Liu 2014, Bucktowar *et al.* 2015, Cai, Liu, *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015).

Firms that adopt an RMO have a strong familiarity with their market, often leading them to redefine and/or improve their products (Narver *et al.* 2004, Yannopoulos *et al.* 2012). In this sense, an RMO strategy is very well suited for incremental product innovation as it can generate, disseminate and exploit external information about the expressed needs of current customers (Atuahene-Gima *et al.* 2005, Li *et al.* 2008). Firms then mobilize a set of skills,

procedures, and techniques to discover and deeply understand the needs of the market segments (Narver *et al.* 2004, Atuahene-Gima *et al.* 2005, Li *et al.* 2008). In doing so, they can integrate market information that is closely related to their existing knowledge base and organizational experiences (Baker and Sinkula 1999, Berthon *et al.* 1999, Tsai *et al.* 2008). As a result, the search for information in the process of developing incremental product innovations becomes more predictable, less complex, and more reliable (Atuahene-Gima *et al.* 2005).

Firms with PMO are more likely to discover and gather relevant market information to satisfy the latent needs of customers that are not yet in their awareness (Narver *et al.* 2004). A strong PMO gives the firm the ability to obtain, process, and store market information that can alert it to the emergence of opportunities related to new market developments and new technologies (Atuahene-Gima *et al.* 2005, Tsai *et al.* 2008, Zhang and Duan 2010). To identify these new market opportunities, firms with a PMO use new mechanisms and tools to closely monitor customers' behavior and learn more and faster about their latent needs. For example, they can conduct in-depth analyzes of customer data such as complaints, product returns, and warranty claims (von Hippel 1986, von Hippel *et al.* 1999). They can also establish cooperative relationships with various environmental stakeholders (Leenders and Wierenga 2002, Deeds and Rothaermel 2003), including close collaboration with led users (von Hippel 1986, Narver *et al.* 1998, Atuahene-Gima *et al.* 2005, Bodlaj *et al.* 2012), or make extensive use of IT (Tzokas *et al.* 2004, Song *et al.* 2007).

According to Tan & Liu (2014), ambidextrous MO is significantly positively related to innovation ambidexterity. Based on this result, it was assumed that an ambidextrous market-oriented firm can simultaneously pursue both exploitative (IPI) and exploratory innovation strategies (RPI) by balancing responsive and proactive MO simultaneously.

H2. MOA positively and significantly impacts PIA.

2.3 Soft quality management practices and market orientation ambidexterity

To understand the SQM effect on MOA, it is necessary to highlight that QM and MO are two synergistic business orientations (Mohr-Jackson 1991, O'Neal and LaFief 1992, Lu and Kuei 1995, Gummesson 1998, El Manzani 2019). Both are based on a similar theoretical architecture built on a fundamental philosophy that is translated into a practical and operational approach. This architecture is explicitly rooted in the concept of customer satisfaction (Day, 1994;

Demirbag, Lenny Koh, Tatoglu, & Zaim, 2006; Lai, 2003; Lai et al., 2012; Mele, 2007; Mohr-Jackson, 1998; Yam, Tam, Tang, & Mok, 2005) and value creation (McNaughton *et al.* 2002, Mele 2007, Rönnbäck *et al.* 2009).

Previous studies have investigated and confirmed that QM supports MO (Raju and Lonial 2001, Sittimalakorn and Hart 2004, Yam *et al.* 2005, Samat *et al.* 2006, Santos-Vijande and Álvarez-González 2009, Lam *et al.* 2012, Malik *et al.* 2012, Wang *et al.* 2012, San Miguel *et al.* 2016, Pattanayak *et al.* 2017, Al-Swidi *et al.* 2019). These empirical shreds of evidence imply that QM is another antecedent of MO. Some scholars noted that organizations that implement QM in their organizational strategy and culture are inherently market-oriented (Mohr-Jackson, 1998; Litton, 2001, cited in Samat et al., 2006). However, no study was interested in the relationship between SQMP and MOA.

SQMP could be an organizational driver of MOA as the implementation of MO requires essential backgrounds such as the role of senior management (leadership), employee training, participation and empowerment, and strong departmental coordination (Demirbag et al., 2006; Lam, Lee, Ooi, & Phusavat, 2012; Mohr-Jackson, 1991; Samat, Ramayah, & Mat Saad, 2006). All of these backgrounds are incorporated by SQMP. Samat et al. (2006) showed that customer orientation and employee empowerment have a positive influence on market orientation, with the former having a stronger influence than the latter. Similarly, San Miguel et al. (2016) found that the soft TQM practices of leadership, resources, and alliance and people, have a significant positive relationship with MO. For Malik et al. (2012), leadership commitment shared beliefs and values regarding systematic information sharing, internal and external values on customer orientation, and integration of functional and cross-functional teams enable the organization to be market-oriented by formulating an appropriate organizational response to its market and especially to the needs of its customers.

A compelling aspect of the development of MOA is the implementation of a MO culture within the organization that places the satisfaction of customers' expressed and latent needs at the center of the organization's belief system. SQMP could enable this culture to be accepted by employees by creating and maintaining a good working environment that develops a customer-centric mindset and makes them highly receptive to changes in the external environment (Mohr-Jackson, 1991; Yam et al., 2005). Therefore, this study assumes that the implementation of SQMP has a positive impact on the organization's MOA.

H3. SQMP positively and significantly impact MOA.

2.4 The mediating role of market orientation ambidexterity

Although there is clear evidence that SQMP promote new or significantly improved products (Prajogo and Sohal 2004, Feng *et al.* 2006, Thai Hoang *et al.* 2006, Moura E Sá and Abrunhosa 2007, Santos-Vijande and Álvarez-González 2007, Abrunhosa and Moura E Sá 2008, Perdomo-Ortiz *et al.* 2009, Song and Su 2015, Kanapathy *et al.* 2017), their direct impact on PIA could not always be established. It has been shown that SQMP have only an indirect impact on innovation (e.g., Zeng *et al.*, 2015) or performance (e.g., Ho *et al.*, 2001). They need to pass through other organizational capabilities to have a positive impact on PI (Menguc and Seigyoung 2006, Prajogo and Sohal 2006a, Pekovic and Galia 2009, Manders *et al.* 2016, El Manzani 2019). In this regard, MOA is an organizational capability that could play a mediating role between SQMP and PIA, as it is generally considered a dynamic capability in the literature (Day 1994, Slater and Narver 1998, Easterby-Smith and Prieto 2008, Zhou *et al.* 2008).

Excepting Jiménez-Jiménez *et al.* (2019), no research has analyzed the mediating effect of MOA in the relationship between SQMP and PIA, although some studies have shown that MO mediates the relationship between QM and organizational performance (Raju and Lonial 2001, 2002, Wang *et al.* 2012, Bhaskar 2020). Other studies have investigated the moderating role of MO between some organizational social aspects (e.g. leadership) related to SQMP and innovation ambidexterity (S. Kraft and Bausch 2016). Besides, MOA might channel SQMP to achieve PIA by opening them up to the external environment of the organization. According to Chang *et al.* (2011), innovation ambidexterity is dependent on both external and internal antecedents. An organization needs to pay attention to both antecedents' categories to stimulate the appearance of PIA. MOA is considered to fall into the category of external antecedents and SQMP to fall into the category of internal antecedents (Johnson and Gustafsson 2001). Through SQMP, the firm executes internal continuous improvement actions to improve the efficiency of its exploratory and exploitative innovation while through MOA, this continuous improvement gets external insights from the firm's better understanding of customers' needs and preferences as well as market structure. Building on these arguments, the previous hypotheses, and the findings of Jiménez-Jiménez *et al.* (2019), who showed that MO mediates the relationship between TQM and innovation, it is proposed that SQMP support PIA innovation through MOA.

H4. MOA positively and significantly mediates the impact of SQMP on PIA.

All the hypothesized relationships are modeled as illustrated in Figure 1.

Figure 1: Here

3. Methodology

3.1 Sample and data collection

The target sample for this study was innovative ISO 9001 certified Moroccan companies. The objective of focusing exclusively on ISO 9001 certified firms is to homogenize our sample to be sure that the organizations share the minimum requirements for QM implementation and to avoid certain biases that could occur between certified and non-certified firms.

After purposive sampling and considering the firm as the unit of analysis, we identified 240 firms from different sources: Directories of public institutions and professional associations of the Moroccan industry, firm websites and commercial websites offering firm directories. We proceeded in this way because there is no database of innovative ISO 9001 certified Moroccan firms, and their population is unknown. Therefore, purposive sampling may be the only alternative option when the researcher has no sampling frame or the study population is rare or unidentifiable (Burnette and Williams 2005, Royer and Zarlowski 2014).

Before conducting the survey, we iteratively designed a questionnaire. First, we identified the measurement scales of the variables from the existing literature. Second, all the questions and items were translated from English to French with the help of two bilingual French and English professors using the double back-translation procedure. Thirdly, the preliminary questionnaire was reviewed and adjusted in its content clarity and design appropriateness according to the various feedbacks received from two experts in innovation surveys and market research, as well as from four quality managers, two quality and marketing professors, and three Ph.D. students in economics and management. Finally, a pilot study was conducted with 20 respondents to ensure the comprehensibility of the questionnaire and to check the psychometric quality of the items before the questionnaire was administered to the shortlisted firms.

A self-administered online questionnaire was sent primarily to the CEOs, quality, marketing and R&D managers of the 240 selected firms with a cover letter between January and June

2017. This method was chosen because it allows the survey to reach a larger number of firms at a lower cost, there is less pressure to respond immediately, and it gives the respondents a greater sense of autonomy. The managers approached are more likely to have a comprehensive understanding and knowledge of their organizations' QM, MO, and innovation and provide relevant information (El Manzani *et al.* 2019). In addition, collecting responses for the independent and dependent variables from different respondents could help avoid concerns about overall method bias (Ferrerias-Méndez *et al.* 2015).

Each firm that did not reply initially was mailed several reminders. In the end, 130 reliable returned questionnaires were used for the analysis, after rejecting those with missing and/or suspicious responses, representing a response rate of 54.16%. This response rate could be acceptable according to (Baruch and Holtom 2008) as the response rate in business and management studies should preferably be between 50% and 80%. Furthermore, the G*Power 3.1.9.7 software (Erdfelder *et al.* 2009) was used to conduct a power analysis of the sample size required for the study. According to the results of the power analysis, the minimum sample size required to test our hypotheses is 98 with an effect size of 0.15, α of 0.05, and power of 0.80 (see Memon *et al.*, 2020). Hence, the statistical power of the study sample of 130 observations is satisfactory.

Of the 130 firms, most (41.54%) are SMEs with between 200 and 500 employees, and 60% have annual sales of between 10 and 175 million MAD. The largest industry segments are agribusiness (21.5%), followed by electrical and electronics (11.5%), services (10.8%), and building and civil engineering (10%). Of the respondents, 60% were predominantly men while women constituted 40%. Almost half of the respondents (40%) were between 31 and 40 years old. 79.3% of them belong to the quality department, followed by CEOs (10.8%) and R&D managers (8.5%). The rest of the respondents (22.2%) belong to different departments.

3.2 Variables measure

SQMP consist of four practices, namely leadership (five items), customer focus (five items), employee involvement (five items), supplier relationship (four items) (Bakotić and Rogošić 2017, El Manzani *et al.* 2019). All items of the four dimensions were adopted from Lee, To & Yu (2009). Following the recommendations of Becker, Klein, & Wetzels (2012) and Sarstedt, Hair, Cheah, Becker & Ringle (2019), SQMP is operationalized as a reflective-reflective

second-order construct (Mode A) (Sarstedt *et al.* 2019) reflected by its four dimensions. Accordingly, several studies using PLS-SEM operationalize SQMP as a reflective-reflective second-order construct (Kanapathy *et al.* 2017, Sciarelli *et al.* 2020, Gambi *et al.* 2021).

In the literature, ambidexterity has been conceptualized as either balanced or combined (see Birkinshaw and Gupta, 2013; Cao *et al.*, 2009; He and Wong, 2004; Junni *et al.*, 2013). According to these two conceptualizations, some studies operationalized ambidexterity as subtraction in the balanced perspective or addition and multiplication in the combined perspective (see Birkinshaw & Gupta, 2013; Herhausen, 2016). Since some studies suggest that the combined measures of ambidexterity capture performance effects better than balanced measures (e.g. Junni *et al.*, 2013), in this paper we pursue the combined perspective of ambidexterity to operationalize MOA and PIA.

MOA was measured by its two dimensions responsive MO (seven items) and proactive MO (eight items) using the measurement scales developed by Narver *et al.* (2004). These scales have been widely accepted by scholars who have studied numerous questions related to innovation in different industries and countries (Tsai *et al.* 2008, Zhang and Duan 2010, Beck *et al.* 2011, Chou and Yang 2011, Bodlaj *et al.* 2012, Yannopoulos *et al.* 2012, Ozdemir *et al.* 2017). Based on our organizational ambidexterity definition, MOA is operationalized as a second-order reflective-formative construct (Mode B) (Sarstedt *et al.* 2019). We believe that responsive and proactive MO are two dimensions that combine to shape and cause the MOA construct. Any change in either dimension will result in a visible change in MOA (Hair *et al.*, 2011).

Similarly, and considering exploration and exploitation as two separate dimensions of learning behavior rather than as two opposite extremes of a one-dimensional scale (He and Wong 2004), we conceptualized PIA as a second-order reflective-formative construct (Mode B) (Sarstedt *et al.* 2019) that contains the two dimensions of IPI (eight items) and RPI (eight items). The two product innovation types should work together cumulatively to support the end purpose of developing the PIA. This conceptualization is consistent with similar previous research (Pertusa-Ortega and Molina-Azorín 2018, Mom *et al.* 2019, Pertusa-Ortega *et al.* 2021). Their items were adopted from Guimarães, Severo, Dorion, Coallier, & Olea (2016), Kim, Kumar, & Kumar (2012), and Prajogo & Sohal (2006).

We use the disjoint two-stage approach to create MOA and PIA (Becker *et al.* 2012, Sarstedt *et al.* 2019). The execution of this approach consists of saving the scores of the lower-order construct and then using them as a measure of the higher-order construct (Sarstedt *et al.* 2019).

All the lower-order constructs are based on multi-item Likert scales ranging from 1: strongly disagree to 5: strongly agree (see Appendix A for details of the constructs measurement instrument).

Control variables: based on the literature (Naveh and Marcus 2004, Nair and Prajogo 2009, Prajogo 2011, Castka *et al.* 2015, Bourke and Roper 2017), we controlled for certification duration, firm size, industry type, and in-house R&D as these influence firms' innovation behavior. Certification duration was measured by a scale ranging from less than one year to more than 5 years. Firm size was analyzed by the number of employees. Industry type was coded as 1 for industrial firms and 0 for service firms. A zero-one dummy variable was used to ask firms whether they have an R&D department that performs internal R&D activities (coded 1) or not (coded 0).

4. Results

The hypotheses of our conceptual framework were tested with Partial Least Squares (PLS)-based SEM using the SmartPLS 3 software. Five reasons applying to our study led us to use the PLS-SEM method. This method has the ability to (1) predict endogenous variables for theory development (Chin, 2010; Hair *et al.*, 2011); (2) deal with the nonnormality of data (Hair, Hult, *et al.*, 2017); (3) give good statistical power for studies with sample size less than 250 observations (Reinartz *et al.* 2009), (4) reliably estimate both formative and reflective low and higher-order variables (Henseler *et al.* 2009) and (5) outperform regression analysis in assessing mediation (Hair *et al.*, 2019).

4.1 Common method bias

To ensure that our research did not suffer from common method bias (CMB), a bias related to the use of survey methodology, we took several steps to limit this bias. First, the final questionnaire was validated by a panel of academic and industry experts for clarity, syntax, accuracy, etc. before it was completed. Second, respondents were informed that there were no right or wrong answers and were assured that their responses would be kept strictly confidential

and anonymous for a purely scientific purpose. Second, following Podsakoff et al. (2003), Harman's single factor was calculated. This is a post-hoc method conducted after data collection, consisting of an exploratory principal component factor analysis of all items to investigate whether a single latent factor might emerge from the data. The results of our exploratory factor analysis showed that only one factor accounted for 43.272 % of the variance, which is below the threshold of 50% (Podsakoff et al., 2003), indicating that CMB is not a pervasive problem in this study.

4.2 Measurement model

Because the measures were taken from existing studies, a confirmatory factor analysis (CFA) was conducted in SmartPLS to determine the dimensionality and psychometric properties of the constructs. In the first step, the convergent validity of all reflective latent low constructs and the SQMP second-order construct was tested by item loadings, composite reliability (CR), and average variance extracted (AVE). As shown in Table 1, except for the deleted SR1 item, the loadings exceeded the recommended value of 0.6, the CR values exceeded the recommended value of 0.7, and the AVE for all latent constructs exceeded the generally accepted threshold of 0.5 (Hair et al., 2014). The HTMT criterion is more conservative and is considered a stronger method than Fornell & Larcker's (1981) criterion for evaluating discriminating validity. Tables 3 and 4 show that the HTMT values for lower and higher-order constructs are less than 0.9 (Henseler *et al.* 2015), which means that discriminant validity is achieved for all constructs.

The guidelines of the formative measurement model were applied to evaluate the two second-order formative constructs of MOA and PIA. In this regard, we evaluate the multicollinearity between their lower-order constructs and the significance and relevance of their outer weights. From Table 2, it can be seen that there is no multicollinearity as no variance inflation factor (VIF) value exceeds the proposed threshold of 3.3 (Diamantopoulos and Siguaw 2006) and the outer weights of all the lower-order constructs are significant. This confirms the quality of the measures of MOA and PIA.

Table 1, 2, 3, 4: Here

4.3 Structural model

Before evaluating the structural model shown in Figure 1, the exogenous variables were tested for multicollinearity. The VIF values of SQMP and MOA are below the usual cutoff of 5 (Hair, Hollingsworth, Randolph, & Chong, 2017) indicating that multicollinearity is not a problem in our study.

In the absence of general goodness-of-fit indices for PLS-SEM, the quality of the structural model should be assessed by the coefficient of determination (R^2), effect size (f^2), cross-validated redundancy (Q^2), strength and significance of path coefficients, standardized root mean square residual (SRMR), and PLS predict (Hair et al., 2014; Henseler, 2017; Henseler et al., 2009; Ringle et al., 2018; Shmueli et al., 2019).

Table 6 displays the results of the hypotheses testing. Both SQMP and MOA explain 29% of PIA, and SQMP explains 79.4% of MOA. Thus, according to Cohen's (1988) criteria for sorting the R^2 values, PIA ($R^2 = 0.290$) and MOA ($R^2 = 0.794$) can be described as small and moderate effects. Likewise, following Cohen's (1988) criteria for sorting the effect size SQMP ($f^2 = 0.003$) and MOA ($f^2 = 0.067$) have a small effect size on PIA. The Q^2 for the endogenous variable of PIA ($Q^2 = 0.181$) and AMO ($Q^2 = 0.618$) was determined using cross-validated redundancy procedures, indicating acceptable predictive relevance (Leguina 2015). Finally, an acceptable value of 0.050 (< 0.08) was observed for SRMR for this study, indicating adequate model fit (Henseler *et al.* 2016).

We also evaluated the predictive power of the research model using the PLS predict algorithm. This requires comparing the values of the root means squared error of predictions (RMSE) or mean absolute error (MAE) values in the PLS-SEM analysis with the linear regression model (LM). Since the prediction errors of IPI and RPI are not highly symmetrically distributed, we choose to MAE for the comparison (Shmueli *et al.* 2019). The MAE results in Table 5 show that the values of all the items of MOA and PIA in the PLS-SEM analysis are lower than in the naïve LM benchmark. Therefore, it can be concluded that the research model has high predictive power (Shmueli *et al.* 2019).

Table 5: Here

A bootstrapping procedure of 5,000 iterations with no sign change was used to determine the significance of the path coefficients of the structural relationships and hypotheses testing (Leguina 2015). As can be seen in Table 6, the results reveal that SQMP have no significant direct effect on PIA ($\beta = -0.086$; $T = 0.510$), while MOA has a positive significant direct effect on PIA ($\beta = 0.444$; $T = 2.547$; $p < .0001$). SQMP show a positive significant direct effect on MOA ($\beta = 0.859$; $T = 32.197^{***}$; $p < .0001$). Consequently, H2 and H3 are accepted while H1 is rejected.

To test mediation, we used the BCa method (5,000 bootstrap samples with the Complete Bootstrapping) to calculate 95% confidence intervals (Hair, Hult, et al., 2017). In support of H4, the mediation analysis result confirms that AMO positively and significantly mediates the relationship between SQMP and PIA ($\beta = 0.382$; $T = 2.511$; $p < .0001$). The indirect effect of SQMP by AMO is significant because none of the 95% confidence intervals include zero). Furthermore, because H2 and H3 are significant while H1 is not, we infer that AMO fully mediates the relationship between SQMP and PIA.

Table 6: Here

4.4 Robustness check

To test robustness, we performed another regression analysis. First, we set MOA as a moderator of the impact of SQMP on PIA and found that this moderation was not significant ($\beta = -0.030$; $T = 0.395$), indicating that MOA is more likely to be a mediator of the SQMP-PIA relationship. Second, we tested the SQMP mediation of the impact of MOA on PIA and found that this mediation is not significant ($\beta = 0.006$; $T = 0.040$), indicating that the possibility of reverse mediation is of little importance. Thus, the results of this further analysis strongly confirmed the findings of this study.

Figure 2: Here

5. Discussion

An unanticipated finding of our study was that SQMP do not have a significant impact on PIA as this contradicts several empirical studies and theoretical views that SQMP enable to innovate more (Abrunhosa & Moura E Sá, 2008; Feng et al., 2006; Gambi et al., 2020; Kanapathy et al., 2017; Moura E Sá & Abrunhosa, 2007; Perdomo-Ortiz et al., 2009; Prajogo & Sohal, 2004;

Santos-Vijande & Álvarez-González, 2007; Song & Su, 2015; Hoang et al., 2006). However, this result might be consistent with that of El Manzani et al. (2019) who revealed a non-significant relationship between SQMP (ISO 9001) and both IPI and RPI, as well as with Escrig-Tena et al. (2018) et Zeng et al. (2015) who showed that SQMP have no impact on product innovation performance. This counter-intuitive result is likely related to how organizations understand and implement QM practices. They can be either more driven by social practices or more driven by technical practices (Martínez-Costa and Martínez-Lorente 2008). Organizations often fall into the trap of more emphasizing the technical QM practices (quality instrumental tools and methods) (HQMP) while to some extent neglecting the social practices to some extent (Seymour and Low 1990, Pheng 1993). A low emphasis on SQMP does not allow them to reach the necessary level to support the PIA. Another possible explanation for the SQMP insignificant impact could be that they alone are not sufficient to support PIA and need to be combined with technical practices (Ferdows and De Meyer 1990, Kim *et al.* 2012, Zeng *et al.* 2015, Khan and Naeem 2018). As a socio-technical system, QM is a comprehensive management system that includes co-dependent social and technical subsystems that must work together to enhance the effectiveness of PIA development, as their complementarity helps overcome the limitations of one by leveraging the benefits of the other (El Manzani *et al.* 2019). Accordingly, Moreno-Luzon et al. (2013) found that the implementation of the technical practice of process management generates a shift towards a culture of exploitation and exploration that leads to organizational ambidexterity.

Our results show that MOA has a positive and significant effect on PIA. This may be consistent with previous results that have shown that RMO and PMO are respectively associated with IPI (Li *et al.* 2008, Bucktowar *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015) and RPI (Atuahene-Gima *et al.* 2005, Li *et al.* 2008, Tsou *et al.* 2014, Bucktowar *et al.* 2015, Cai, Yu, *et al.* 2015, Chen 2015). In particular, the obtained result is in line with the conclusions of Tan & Liu (2014) showing that ambidextrous MO is positively related to innovation ambidexterity. MOA enables the organization to adopt and combine two modes of organizational learning that need to be joint and embedded to generate innovation ambidexterity. On the one hand, RMO is guided by adaptive or single-loop learning that focuses on routine problem-solving activities using existing knowledge rather than developing new knowledge (Argyris and Schön 1978, Kümmel *et al.* 1985, Senge 1997). Through this learning, which is a prerequisite for any incremental innovation strategy that essentially aims at satisfying manifest customer need (Slater and Narver

1998, Atuahene-Gima *et al.* 2005, Baker and Sinkula 2007, Li *et al.* 2008), RMO emphasizes the in-depth and detailed exploitation and treatment of the pre-existing knowledge that the company has about its current and expressed customers' needs to continuously upgrade its products (Atuahene-Gima *et al.* 2005, Grinstein 2008, Li *et al.* 2008, Yannopoulos *et al.* 2012). On the other hand, PMO provides the foundation for generative or double-loop learning that focuses on developing new ways of looking at one's environment (Chang *et al.*, 2014; Mayer, 2007; Slater & Narver, 1998). This learning is revolutionary and is more likely to lead to revolutionary innovations (Slater and Narver 1995). Firms with a PMO explore the latent and future customers' needs over the long term (Cai, Liu, *et al.* 2015), allowing them to learn from the market and generate highly innovative ideas that translate into radical product innovations. They guide customers in meeting their latent needs by thinking creatively about how to provide radical solutions to those needs (Day, 1994; Jaworski & Kohli, 1993; Slater & Narver, 1998).

Our research confirms that SQMP has a positive and significant impact on MOA. It extends existing studies that have shown that QM could be an organizational driver of MO (Bhaskar, 2020; Lam *et al.*, 2012; Malik *et al.*, 2012; Pattanayak *et al.*, 2017; Raju & Lonial, 2001; Samat *et al.*, 2006; San Miguel *et al.*, 2016; Santos-Vijande & Álvarez-González, 2009; Sittimalakorn & Hart, 2004; Wang *et al.*, 2012; Yam *et al.*, 2005; Zhou *et al.*, 2008). Moreover, our research provides empirical evidence that ambidextrous MO could be achieved through SQMP. Leadership, customer focus, employee involvement, and supplier relationship are part of the practices highlighted in the literature as an important precondition for organizational ambidexterity (Gibson and Birkinshaw 2004, Raisch and Birkinshaw 2008, Asif 2017, Ardito *et al.* 2020). Therefore, leadership is crucial in creating an organizational context that reinforces the importance of both responsive and proactive MO by encouraging individuals within the organization to monitor changing markets, share market knowledge with others and respond to market demands (Jaworski & Kohli, 1993). Employee involvement which is one of the fundamental pillars in the process of developing MO in the organization is achieved through the interdepartmental dynamic created by SQMP (Dale, 2015). This interdepartmental dynamic improves communication and collaboration, increases connectivity, and reduces conflict between organizational departments (Spector and Beer 1994, Ahire *et al.* 1995, Anderson *et al.* 1995, Flynn *et al.* 1995). Since both QM and MOA emphasize customer satisfaction, customer focus helps the firm to be more customer-oriented by understanding current and potential customer needs, meeting their requirements, and striving to exceed their expectations. The firm

can also raise the level of its MOA by building a long-term, trusting, and loyal relationship with a small number of selected key suppliers. A mutually beneficial relationship with suppliers based on reciprocated trust, open communication, and cooperation encourages them to engage in teams to jointly develop product innovations (Kaynak 2003, Kim *et al.* 2012), and provide the firm with important information about changes in customer demand and knowledge to develop incremental and radical product innovations (Kim *et al.* 2012).

Our findings also supported the full mediating role of MOA in the relationship between SQMP and PIA. The non-significant direct effect of SQMP on PIA supports the argument that SQMP does not enable PIA in the absence of MOA. This confirms the idea that SQMP have a cumulative sequential effect on innovation through the mediation of some organizational practices. This result may be consistent with Escrig-Tena *et al.* (2018) who found that proactive behavior mediates the relationship between SQMP and innovation performance; also, the result of Jiménez-Jiménez *et al.* (2019) showing that MO mediates the relationship between TQM and innovation. Therefore, MOA implementation supported by SQMP stimulates the two organizational learning modes (i.e., adaptive/single-loop learning and generative/double-loop learning) driven by the MO dimensions. As previously discussed, these two organizational learning modes are essential to IPI and RPI, and consequently to the achievement of PIA. This confirms previous empirical studies that showed that organizational learning bridges the gap between QM and innovation (Hung *et al.* 2011, Aminbeidokhti *et al.* 2016). In addition, MOA can elicit both competence exploitation and exploration through the associated modes of organizational learning, which account for the effect of SQPM on PIA. Competence exploitation refers to a firm's propensity to invest resources to improve and enhance its current knowledge, skills, and processes to increase the efficiency and reliability of existing product innovation, while competence exploration refers to a firm's propensity to invest resources to develop entirely new knowledge, skills and processes to achieve flexibility and originality in product creation through more variation and experimentation (Atuahene-Gima 2005).

6. Conclusion

This research aimed to analyze the direct impacts of SQMP and MOA on PIA, as well as the mediating role of MOA on the relationship between SQMP and PIA. A PLS-SEM analysis of data from 130 Moroccan ISO 9001-certified firms revealed that SQMP have no significant relationship with PIA, while they positively and significantly impact MOA. The study also

showed that MOA positively and significantly PIA, and fully mediates the relationship between SQMP and PIA. Below, we outline the main implications and limitations of the study.

6.1 Theoretical and managerial implications

The findings of this study contribute to theory in several ways. Although the relationship between QM and product innovation has been the subject of several studies, there is a lack of attention to the effect of SQMP on PIA. In particular, this study complements studies that had examined only the hard practice of process management (Benner and Tushman 2002, 2003, Moreno-Luzon *et al.* 2014) by comprehensively considering SQMP. Indeed, it extends our understanding of the QM-innovation relationship by highlighting the importance of considering MOA to establish the significant influence of SQMP on PIA and empirically confirming the hypothesis speculated by some researchers that QM needs to be integrated with other organizational resources or capabilities to strengthen its relationship with product innovation (Prajogo and Sohal 2006b, Pekovic and Galia 2009, Manders *et al.* 2016). In this way, we show that MO is the missing link in the relationship between QM or its practices and innovation, apart from its mediating role linking QM to service quality (Lam *et al.* 2012), customer satisfaction (Pattanayak *et al.* 2017), performance (Bhaskar, 2020; Raju & Lonial, 2001, 2002; Wang *et al.*, 2012), marketing capabilities, and market-oriented learning capabilities (Santos-Vijande and Álvarez-González 2009). Our study particularly advances the MOA literature by emphasizing that MOA is not only positively associated with performance (Herhausen, 2016; Wang *et al.*, 2020) but furthermore supports innovation ambidexterity.

Existing literature has acknowledged the importance of structural and contextual factors to address ambidextrous tensions (Duncan 1976, Gibson and Birkinshaw 2004). More particularly, some studies have established the importance of internal organizational factors (i.e., centralization, formalization, connectedness, and informal linkage) for explorative and exploitative innovation (Jansen *et al.* 2006, Chang *et al.* 2011). By confirming that MOA is another antecedent of PIA, our findings add to this body of literature because it pushes the organization to be less centralized and formalized with a greater interdepartmental connectedness (Jaworski and Kohli 1993). From this, it can be inferred that the implementation of innovation ambidexterity may also sometimes require other ambidexterity (e.g., MOA) in other organizational domains.

The findings of this study provide some practical evidence and managerial insights for firms in developing and emerging economies such as Morocco that seek business excellence by adopting QM and investing in innovation. Firms need to be aware that SQMP are necessary but not sufficient to support PIA. Firms should invest resources to align SQMP more closely with maximizing the complementarity of RMO and PMO, which in turn will enable realizing the full potential of SQMP to improve PIA. From an organizational point of view, firms must establish a close collaboration between quality and marketing teams. The interaction between the two teams is not always obvious, even more so in a product innovation project. Firms must avoid certain problems that handicap this collaboration: (i) they must unify perceptions and mindsets between the staff of the two departments due to the nature of their areas of specialization (e.g., *cognitive proximity problem*); (ii) reduce the spatial distance between the two departments to facilitate their interaction (e.g., *geographical proximity problem*); (iii) choose the right project manager with the necessary managerial skills to bring the two departments together around a single objective which is the success of the product innovation project through the establishment of a good group dynamic (e.g., *team management problem*).

The results suggest that managers should focus on SQMP to create MOA that will promote PIA. These practices are essential in supporting the general market orientation antecedent through enhancing top management, interdepartmental connectedness, and market-oriented training; and lowering interdepartmental conflict, centralization, and formalization (Kirca *et al.* 2005). To further facilitate the adoption of an ambidextrous MO, they can, on the one hand, conduct market research to measure the satisfaction of existing customers and then focus on improving products and other critical areas based on their expressed needs and preferences. On the other hand, they need to develop some methodological skills such as predicting market trends, brainstorming, and analyzing consumer demand models (Narver *et al.* 2004).

Another important implication is that managers hoping to achieve PIA are called upon not to overemphasize hard QM practices (HQMP), to the detriment of soft ones. In related research, Moreno Luzon & Valls Pasola (2011) claimed that SQMP and HQMP can be a barrier to ambidexterity if they do not support each other. As mentioned earlier, organizations tend to neglect SQMP because they are more abstract and difficult to adopt compared to technical practices which are more observable and actionable (Lewis *et al.* 2006, Gadenne and Sharma 2009, Calvo-Mora *et al.* 2013). A possible solution to this problem is to move away from the

traditional QM towards Quality 4.0 and digitalize the HQMP so that the organization can focus on the effective implementation of soft practices (e.g., *leadership, customer focus employee involvement, supplier relationship*).

In line with this, it is also important for firms to not be so locked up in adopting only some QM practices. They need to effectively adopt both SQMP and HQMP in an integrated and holistic manner as these practices have a synergistic effect on incremental and radical product innovation (El Manzani, 2019). More specifically, firms can place more emphasis on some single important SQMP (e.g., leadership) and HQMP (e.g., process management) that directly or indirectly influence incremental and radical innovation through the strong support of other QM practices. Kim et al. (2012) found that leadership indirectly and positively impacts IPI and RPI through training, employee relations, supplier quality management, customer relations, and product and service design. They also found that quality data and reporting through process management had a positive relationship with IPI and RPI.

6.2 Limitations and future studies

Our work has three major limitations. First, it does not consider HQMP, which in combination with soft practices are essential to the effectiveness of an organization's QM system (Zu 2009), especially in the innovation context (Flynn 1994, Kim *et al.* 2012, Psomas and Antony 2015, Zeng *et al.* 2015, 2017, Khan and Naeem 2018, El Manzani 2019). Therefore, it would be of interest for researchers to integrate SPQM and HQMP to increase the contribution of QM to PIA. For example, considering the two types of practices, Pertusa-Ortega et al. (2021) found that the whole QM favors the development of innovation ambidexterity.

The second limitation of our work is related to our conceptualization of ambidexterity which can be either balanced or combined (He and Wong 2004, Gupta *et al.* 2006, Cao *et al.* 2009, Junni *et al.* 2013). In our research, MOA and PIA are conceptualized as combined ambidexterity where their dimensions are considered complementary regardless of their absolute difference in the firm. We believe that the contribution of the study can be extended by investigating how the influence of SQMP on PIA and the mediating role of MOA might be in the case of balanced ambidexterity. Considering balanced ambidexterity may unearth interesting results as this conceptualization views exploration and exploitation as opposing (conflicting) activities competing for scarce resources and pursuing divergent goals (March

1991, He and Wong 2004, Cao *et al.* 2009). Also, future works could consider examining how multiple environmental conditions moderate the relationships of our conceptual framework in the case of balanced ambidexterity as it has been shown that the ability to both explore and exploit is strongly conditioned by the dynamism of the environment (Gibson and Birkinshaw 2004, Jansen *et al.* 2006). In this sense, it will be very interesting to replicate this research in the current highly dynamic conditions generated by the COVID-19 pandemic to understand how SQMP and MOA can support PIA and help organizations deal with the crisis.

Finally, the study is unable to infer causality due to the use of cross-sectional data. Future research based on a longitudinal design is needed to evaluate the hypotheses in the short and long term in a larger sample than the one in our study (e.g., Bourke and Roper, 2017).

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Appendix A. Construct measurement instrument

Constructs	Items
Leadership	<p>Top Management establishes a clear vision of the organization's future (L1).</p> <p>Top Management sets ambitious objectives (L2).</p> <p>Top Management creates shared value at all levels of the organization (L3).</p> <p>Top Management provides employees with the requisite resources (L4).</p> <p>Top Management provides employees with the requisite training programs (L5).</p>
Customer Focus	<p>Our organization analyzes customer needs and requirements (CF1).</p> <p>Our organization ensures that customer needs are known by all employees (CF2).</p> <p>Our organization periodically measures customer satisfaction (CF3).</p> <p>Our organization reacts to customer complaints/ feedback (CF4).</p> <p>Our organization has a customer relationship management system (CF5).</p>
Employee Involvement	<p>Employees are aware of their role in the organization (EI1).</p> <p>In case of mistakes or problems committed, employees do not blame their colleagues (EI2).</p> <p>Employees accept to take responsibility of problem-solving (EI3).</p> <p>Employees seek opportunities to improve their skills (EI4).</p> <p>Employees openly share their knowledge (EI5).</p>
Supplier relationship	<p>Our organization has a precise number of key suppliers (SR1) *.</p> <p>Our organization shares information with the main Suppliers (SR2).</p> <p>Our organization encourages its main suppliers to participate in new products/ services development (SR3).</p> <p>Our organization rewards suppliers' contributions (SR4).</p>
Responsive MO	<p>We constantly monitor our level of commitment and orientation to serving customer needs (OM_Resp1)</p> <p>We freely communicate information about our successful and unsuccessful customer experiences across all business functions (OM_Resp2).</p> <p>Our strategy for competitive advantage is based on our understanding of customers' needs (OM_Resp3).</p> <p>We measure customer satisfaction systematically and frequently (OM_Resp4).</p> <p>We are more customer-focused than our competitors (OM_Resp5)</p> <p>I believe this business exists primarily to serve customers (OM_Resp6).</p> <p>Data on customer satisfaction are disseminated at all levels in this business unit on a regular basis (OM_Resp7).</p>
Proactive MO	<p>We help our customers anticipate developments in their markets (OM_Pro1)</p> <p>We continuously try to discover additional needs of our customers of which they are unaware (OM_Pro2)</p> <p>We incorporate solutions to unarticulated customer needs in our new products and services (OM_Pro3).</p> <p>We brainstorm on how customers use our products and services (OM_Pro4).</p> <p>We innovate even at the risk of making our own products obsolete (OM_Pro5).</p> <p>We search for opportunities in areas where customers have a difficult time expressing their needs (OM_Pro6).</p> <p>We work closely with lead users who try to recognize customer needs months or even years before the majority of the market may recognize them (OM_Pro7).</p> <p>We extrapolate key trends to gain insight into what users in a current market will need in the future (OM_Pro8).</p>
Incremental Product Innovation	<p>Our new products differ slightly from our existing products (IPI1).</p> <p>We introduce incremental product innovations into market more frequently than our competitors (IPI2).</p> <p>Our percentage of incremental product innovations in the product range is significantly higher compared to the competition (IPI3).</p> <p>The quality of our new products is higher than that of our competitors (IPI4).</p> <p>The use of the latest technological innovations in our new products (IPI5)</p> <p>The percentage of total sales from incremental product innovations is up substantially. (IPI6).</p>

	We are well known by our customers for incremental product innovations (IPI7).
	The quality of our incremental product innovations is higher than that of our competitors (IPI8).
	Our new products differ substantially from our existing products (RPI1).
	We introduce radical product innovations into the market more frequently than our competitors (RPI2).
	Our percentage of radical product innovations in the product range is significantly higher compared to the competition (RPI3).
Radical Product Innovation	The quality of our new products is higher than that of our competitors (RPI4).
	The use of the latest technological innovations in our new products (RPI5).
	The percentage of total sales from radical product innovations is up substantially (RPI6).
	We are well known by our customers for radical product innovations (RPI7).
	The quality of our radical product innovations is higher than that of our competitors (IPI8).

*Deleted from the analysis

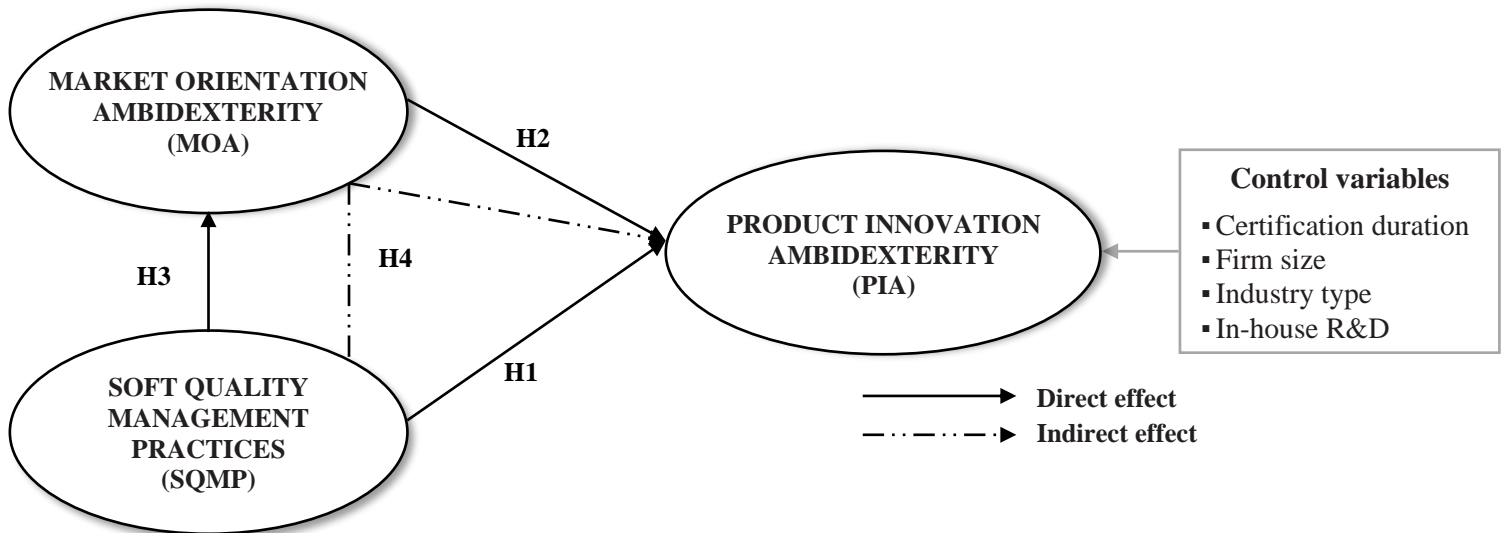


Figure 1. Conceptual framework of the study

Table 1. Assessment of reflective low-order and higher-order constructs

Constructs	Items	Items loading	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Leadership (L)	L1	0.858	0.924	0.929	0.942	0.766
	L2	0.885				
	L3	0.892				
	L4	0.877				
	L5	0.864				
Customer Focus (CF)	CF1	0.886	0.927	0.928	0.945	0.773
	CF2	0.879				
	CF3	0.895				
	CF4	0.893				
	CF5	0.842				
People Involvement (PI)	PI1	0.814	0.917	0.922	0.938	0.753
	PI2	0.801				

	PI3	0.907				
	PI4	0.919				
	PI5	0.892				
Supplier relationship (SR)	SR2	0.913				
	SR3	0.896	0.867	0.869	0.919	0.790
	SR4	0.857				
Responsive MO (RMO)	OM_Resp1	0.833				
	OM_Resp2	0.865				
	OM_Resp3	0.829				
	OM_Resp4	0.824	0.888	0.895	0.914	0.608
	OM_Resp5	0.886				
	OM_Resp6	0.830				
	OM_Resp7	0.846				
Proactive MO (PMO)	OM_Pro1	0.804				
	OM_Pro2	0.827				
	OM_Pro3	0.873				
	OM_Pro4	0.837				
	OM_Pro5	0.717	0.940	0.944	0.951	0.707
	OM_Pro6	0.907				
	OM_Pro7	0.867				
	OM_Pro8	0.881				
Incremental Product Innovation (IPI)	IPI1	0.841				
	IPI2	0.947				
	IPI3	0.944				
	IPI4	0.940				
	IPI5	0.926	0.978	0.980	0.981	0.867
	IPI6	0.949				
	IPI7	0.939				
	IPI8	0.955				
Radical Product Innovation (RPI)	RPI1	0.907				
	RPI2	0.961				
	RPI3	0.961				
	RPI4	0.967				
	RPI5	0.943	0.986	0.987	0.988	0.913
	RPI6	0.968				
	RPI7	0.970				
	RPI8	0.967				
Reflective higher-order construct	Lower-order constructs	Items loading	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Soft Quality Management Practices (SQMP)	Leadership	0.898				
	Customer Focus	0.882				
	Involvement of people	0.893	0.897	0.927	0.761	0.897
	Supplier relationship	0.815				

Table 2. Assessment of formative higher-order constructs

Formative higher-order construct	Lower-order constructs	Outer loading	Outer weight	T-value	95% BCa Confidence Interval	VIF
MO ambidexterity	Responsive MO	0.959	0.64	43.484***	[0.454-0.999]	2.195
	Proactive MO	0.899	0.421	18.722***	[0.784-0.970]	2.195
Product innovation ambidexterity	Incremental Product Innovation	0.979	0.706	8.923***	[0.799-1.000]	2.832
	Radical Product Innovation	0.908	0.340	5.878***	[0.454-0.999]	2.832

* $p < 0.10$ ($t > 1.645$); ** $p < 0.05$ ($t > 1.96$); *** $p < 0.01$ ($t > 2.57$)

Table 3. Heterotrait-Monotrait Ratio of Correlations (HTMT) – Lower-order constructs

	CF	DoC	FS	IPI	IndT	PI	L	SR	PMO	R&D	RPI
CF											
DoC	0.229										
FS	0.078	0.203									
IPI	0.386	0.149	0.129								
IndT	0.074	0.287	0.128	0.104							
PI	0.778	0.071	0.122	0.277	0.170						
L	0.790	0.178	0.057	0.311	0.094	0.804					
SR	0.631	0.126	0.030	0.413	0.086	0.653	0.607				
PMO	0.686	0.137	0.093	0.524	0.091	0.617	0.609	0.623			
R&D	0.108	0.225	0.114	0.346	0.187	0.055	0.069	0.235	0.185		
RPI	0.278	0.033	0.202	0.817	0.017	0.276	0.239	0.287	0.429	0.308	
RMO	0.885	0.208	0.082	0.435	0.138	0.844	0.736	0.735	0.774	0.177	0.35

Notes: CF: Customer Focus; DoC: Duration of Certification; FS: Firms size; IPI: Incremental Product Innovation; IndT: Industry Type; PI: Involvement of people; L: Leadership; SR: Supplier Relationship; PMO: Proactive MO; R&D: In-house R&D; RPI: Radical Product Innovation; RMO: Responsive MO.

Table 4. Heterotrait-Monotrait Ratio of Correlations (HTMT) – higher-order construct

	DoC	FS	IndT	R&D
FS	0.174			
IndT	0.275	0.200		
R&D	0.254	0.122	0.198	
SQMP	0.165	0.083	0.118	0.089

Notes: DoC: Duration of Certification; FS: Firms size; IndT: Industry Type; R&D: In-house R&D; SQMP: Soft Quality Management Practices.

Table 5. PLS-predict assessment

	PLS		LM		(PLS – LM)	
	RMSE	MAE	RMSE	MAE	RMSE	MAE
IPI	0.932	0.757	0.951	0.764	-0.019	-0.007

RPI	0.939	0.798	0.959	0.813	-0.02	-0.015
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Notes: PLS: PLS-SEM, LM: linear regression IPI: Incremental Product Innovation; RPI: Radical Product Innovation.

Table 6. Hypothesis testing results

Hypotheses	β	T-value	CI		R ²	f ²	Q ²	SRMR	Decision
			2.5%	97.5%					
H1: SQMP → PIA	-0.086	0.510 ^{ns}	-0.401	0.257	0.290	0.003	0.181		Rejected
H2: MOA → PIA	0.444	2.547***	0.093	0.782		0.067		0.050	Supported
H3: SQMP → MOA	0.859	32.197***	0.794	0.901	0.738	2.819	0.618		Supported
H4: SQMP → MOA → PIA	0.382	2.511***	0.089	0.691	0.290	-	0.181		Supported

Notes: CI: 95% Confidence Intervals Bias Corrected (Direct/Indirect Effect), * $p < 0.10$ ($t > 1.645$); ** $p < 0.05$ ($t > 1.96$); *** $p < 0.01$ ($t > 2.57$); ns: not significant.

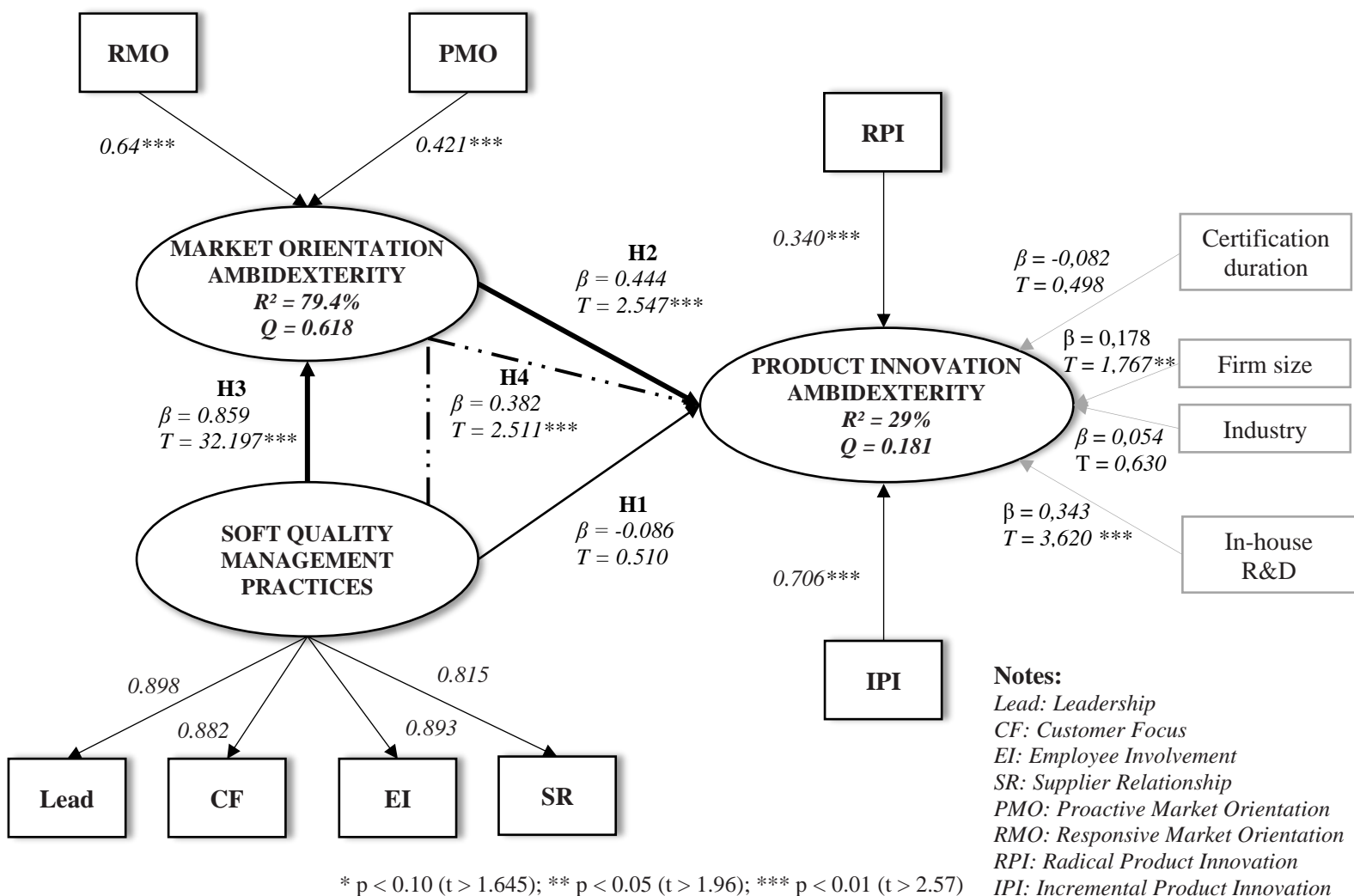


Figure 2. Test of the conceptual framework

————→ Direct effect
 - - - - -> Indirect effect