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Journal of Business Research xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

The roles of absorptive capacity and cultural balance for exploratory and exploitative innovation in SMEs

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ARTICLE INFO

Keywords:
Absorptive capacity
Cultural balance
PLS-SEM
Exploratory innovation
Exploitative innovation

ABSTRACT

This study investigates whether balanced forms of organizational cultures moderate the effects of potential and realized absorptive capacities (ACs) to simultaneously generate exploratory and exploitative innovations. Using empirical survey data collected from 138 small to medium-sized enterprises (SMEs), we applied partial least squares (PLS) structural equation modeling (SEM) combined with mediation and moderation analyses to test our hypotheses. Our results show that the effects of potential AC on organizations' exploratory and exploitative innovations are fully mediated by the organizations' realized AC. The positive effects of realized AC on innovation are contingent on the overall cultural balance of the organization, which, however, does not affect the strong link between potential AC and realized AC. We thus provide novel empirical insights into the multidimensional nature of AC and the importance of cultural equilibrium for both exploratory and exploitative innovation, which is of particular importance for ambidextrous SMEs facing dynamic markets.

1. Introduction

Effective innovation in organizations remains difficult (Matear, Osborne, Garrett, & Gray, 2002; Rizova, 2006). The activities relating to new products or services in an organization are complex and time-consuming (Greve & Salaff, 2006). The literature highlights two essential factors that affect innovation outcomes. First, organizational absorptive capacity, or the ability of organizations to create knowledge, is frequently a requirement for innovation (Cohen & Levinthal, 1990). In particular, absorptive capacity nurtures learning capabilities and problem-solving skills, which in turn influence innovation performance (Wang, 2008; Zahra & George, 2002). Second, organizational cultures in their various forms play an important role in the activities of knowledge creation and innovation (Rivera-Vazquez, Ortiz-Fournier, & Flores, 2009). Since organizational culture influences employee behavior, it may shape employees' assumptions about which knowledge is worth managing (De Long & Fahey, 2000) and may lead to accepting innovation as a fundamental organizational principle (Hartmann, 2006).

Recent studies point out that innovative activities are particularly challenging for small and medium-sized enterprises (SMEs) due to their serious financial constraints and information asymmetries (Barbaroux, 2014). According to EU guidelines, SMEs can be defined as firms with fewer than 250 employees and an annual turnover not exceeding 50 million euros and/or an annual balance sheet total not exceeding 43 million euros (European Commission, 2005). In this study, we focus on SMEs from knowledge-intensive industries as they need to constantly innovate or improve to meet dynamic markets while having little control over the external environment. An innovation is defined as an idea, practice, or material artifact perceived to be new by the relevant unit of adoption (Dewar & Dutton, 1986; Zaltman, Duncan, & Holbek, 1973). Although there may be innovations in products, services, processes, programs, technology or organizational structures, this study concentrates in the capability of the firm to achieve product or service innovations. Innovations in the literature are frequently classified into different typologies. We choose one well-established and widely adopted classification of innovation, which distinguishes it as being either exploratory or exploitative (Gupta, Smith, & Shalley, 2006; O'Reilly & Tushman, 2004). Organizations that are able to simultaneously accommodate both are ambidextrous (O'Reilly & Tushman, 2013). While prior research has established the importance of ambidexterity for organizational performance and continuity in the long-term (e.g. He & Wong, 2004), how it is best achieved is not fully understood (Jansen, Van den Bosch, & Volberda, 2006; O'Reilly & Tushman, 2013). We therefore used this conceptualization in our research context in terms of distinguishing how organizations innovate. In this sense, we refer to exploratory innovation as the dynamic capability of the firm to explore new possibilities to produce new products and/or services. Likewise, we refer to exploitative innovation as the dynamic capability of the firm to exploit old certainties to produce incremental products and/or services. In the core of these conceptualizations

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http://dx.doi.org/10.1016/j.jbusres.2017.10.052
Received 2 September 2016; Received in revised form 25 October 2017; Accepted 27 October 2017

lies the fact that both exploratory and exploitative innovation are referred to as dynamic capabilities, or to put it briefly, the firm changing capacity to perform innovation activities.

Current research suggests developing absorptive capacity (AC) as the fundamental dynamic capability for improving innovation in organizations (Fosfuri & Tribó, 2008; Limaj, Bernroider, & Choudrie, 2016; Roberts, Galluch, Dinger, & Grover, 2012). The importance of AC for creating value in knowledge-based competition is widely recognized in research (Lane & Lubatkin, 1998; Van den Bosch, Volberda, & De Boer, 1999). Literature suggests that AC and innovation capacity represent closely related organizational capabilities firms can use to develop and sustain a competitive advantage (Lane, Koka, & Pathak, 2006; Zahra & George, 2002). Referring to Cohen and Levinthal's (1990) seminal work, AC constitutes the ability of an organization to value and grasp external knowledge and apply the assimilated knowledge for commercial ends. Later contributions provide revisions of Cohen and Levinthal's (1990) definition and structure of AC (Lane et al., 2006; Lane & Lubatkin, 1998; Todorova & Durisin, 2007; Van den Bosch et al., 1999; Zahra & George, 2002). This study follows Zahra and George's (2002) reconceptualization of AC, which distinguishes between potential absorptive capacity (PAC) and realized absorptive capacity (RAC). While these specific multidimensional levels of AC have advanced our understanding of the concept (Auguste, Jashapara, & Bernroider, 2010; Noblet, Simon, & Parent, 2011), there is in particular a lack of empirical research specifically considering these dimensions (Mariano & Walter, 2015). AC remains to be an elusive construct making it even more difficult to understand how its constituent dimensions mediate innovations (Kim, Kim, & Foss, 2016; Volberda, Foss, & Lyles, 2010). Additionally, there is a general lack of research of AC in the context of SMEs (Zerwas, 2014), which is critical considering how important it is for SMEs to adapt to rapidly changing market conditions while operating with scarce resources.

Likewise, prior research convincingly suggests that specific types of culture can either decrease or increase innovation in organizations (Naranjo-Valencia, 2011; Sanz-Valle, Naranjo-Valencia, Jiménez-Jiménez, & Perez-Caballero, 2011). Given that there is usually a mix of different cultures in any organization reflected by different sets of values, beliefs and assumptions (Cameron & Quinn, 2006; Jaskyte & Dressler, 2005; Martin, 1992; Yilmaz & Ergun, 2008), only scant research has investigated whether and how such co-existence affects innovation. As previous studies report, firms with different levels of balance between cultures experience dissimilar dynamics and organizational outcomes (Blau, 1977; Gregory, Harris, Armenakis, & Shook, 2009) and, more specifically, firms simultaneously accommodating different cultures are more successful at both exploratory and exploitative innovation (O'Reilly & Tushman, 2004). However, Cohen and Levinthal (1990) and virtually all of the sub-sequent AC literature have yet to explore how cultural balance affects the relationships between different AC components and the extent of exploratory and exploitative innovation gained from ACs (Kim et al., 2016). While there is convincing evidence that endogenous factors related to organizational culture affect AC (Auguste et al., 2010; Noblet et al., 2011), innovation contingencies of AC in terms of cultural compositions are neglected in prior AC research.

In this study, we respond to these concerns and target the above identified gaps of AC and organizational culture literatures by asking the following research question: “How does cultural balance affect the exploratory and exploitative innovation outcomes of AC in SMEs?” For this purpose we consider cultural balance as the amount of variation of different cultures co-existing in the organization. Accordingly, in organizations with high-balanced cultures, different types of cultures exist concurrently and the associated values are equally held throughout the organization. Our results not only offer managerial insights into the importance of AC and cultural equilibrium for innovation but also contribute to the literatures by providing the following theoretical and methodological implications. First, we suggest that AC theory and ambidexterity research needs to take into account cultural balance as an important aspect for optimizing exploratory and exploitative innovations gained from AC. Second, we provide empirical support for the assertion that PAC has a positive impact on RAC corroborating the propositions of Zahra and George (2002) on the affiliation between AC dimensions within the AC chain at the second-order level of analysis. However, according to the results the relationship between PAC and RAC does not seem to be subject to cultural balance moderation. Third, further empirical findings supporting the affiliation of PAC and RAC with exploratory and exploitative innovation imply that RAC constitutes the key component through which organizations achieve innovation. They also confirm that the effects of RAC are indeed contingent on the level of cultural balance and that organizations with a high RAC can benefit even more from a balanced culture. Fourth, the study adds to the competing values framework by offering an extension to OCAI measurement approach of organizational culture taking into account the concept of cultural balance for archetypes of cultural values.

The methodology is a quantitative empirical survey of SMEs from a European country based on a final random sample comprising 138 organizations. We used a partial least squares structural equation modeling (PLS-SEM) analysis to validate measurements and test hypotheses (Lohnmöller, 1989). In the following section we review the literature on the relationship between absorptive capacity, innovation and organizational culture and develop the research hypotheses. Then we introduce the research methodology and present the PLS-SEM results together with insights from moderation and mediation analysis. In the final section of the paper we discuss results and suggests various implications and limitations before concluding the article.

2. Theoretical background and hypotheses

2.1. Absorptive capacity and innovation

Our study builds on the foundations of a “dynamic capability approach” to innovation. Dynamic capabilities (DCs) are defined as the ability of an organization to integrate, build, and reconfigure internal and external competences to address rapidly changing environments in order to achieve innovative new forms of competitive advantage (Teece, Pisano, & Shuen, 1997). While there has been an inconclusive debate on the nature and characteristics of DCs, the consensus view seem to be that DCs encompass creating change and are influenced by market dynamism (Eisenhardt & Martin, 2000), are path-dependent and are embedded in processes (Wang & Ahmed, 2007), and are often firm-specific (Amit & Schoemaker, 1993).

AC is a key dynamic capability that is likely to create innovation value to sustain an organization's competitive advantage (Zahra & George, 2002; Zahra, Sapienza, & Davidsson, 2006). In terms of conceptualization, organizational AC is a multidimensional, latent, intangible construct (Camisón & Forés, 2010; Flatten, Engelen, Zahra, & Brettel, 2011; Zahra & George, 2002). At the first-order level of analysis, AC includes a set of four capabilities that combine naturally and build upon one another to create new knowledge and commercial outputs. The first two dimensions, namely acquisition and assimilation capabilities, constitute an organization's potential absorptive capacity (PAC). The other two dimensions, namely transformation and exploitation capabilities, constitute an organization's realized absorptive capacity (RAC) (Zahra & George, 2002). In other words, PAC represents the external knowledge that an organization *could* acquire and assimilate or the *creation* of knowledge; RAC represents the external knowledge that an organization *has* transformed and exploited or the *utilization* of knowledge (Lane et al., 2006; Setia & Patel, 2013). PAC and RAC components can be conceptualized as second-order-level constructs (Camisón & Forés, 2010).

Previous studies used the AC lens to explain innovation through theoretical models from different perspectives, for example, including microeconomics (Griffith, Redding, & Reenen, 2003; Koch & Strotmann, 2008), supply chain management (Malhotra, Gosain, & Sawy, 2005),

and strategic management and alliance formation (Lavie & Rosenkopf, 2006; Lichtenthaler & Lichtenthaler, 2009; Tsai, 2001). In addition, organizational theory contributes in highlighting antecedents, reasons, and conditions under which AC creates value (Jansen, Van den Bosch, & Volberda, 2005; Lane et al., 2006; Limaj & Bernroider, 2017; Roper, Du, & Love, 2008; Van den Bosch, Van Wijk, & Volberda, 2003; Zahra & George, 2002). However, to date, studies barely examine the dimensions within the AC chain (Volberda et al., 2010). In particular, prior research draws attention to empirically examine the relationship between PAC and RAC, which would allow to explore important theoretical arguments (Lane et al., 2006) and increase our understanding on the nature of optimal AC (Volberda et al., 2010). The core rationale in the AC model proposed by Zahra and George (2002) is that PAC directly influences RAC. We intend to explore not only this relation, but also how each AC component affects either exploratory or exploitative innovations.

The rejuvenation of an organization's knowledge base starts with the acquisition of external knowledge (Malhotra et al., 2005), which is next assimilated, both by means of PAC capabilities (Zahra & George, 2002). Previous studies propose many determinants that build PAC, such as cross-functional interfaces and job rotation (Jansen et al., 2005), coordination and socialization capabilities (Roberts et al., 2012), and exposure to diverse sources of external knowledge and the firms' past experiences that are internalized (Zahra & George, 2002). To generate value from the assimilated knowledge or, in other words, to utilize its potential, organizations make use of their complementary capabilities (Roper et al., 2008). Obviously, since PAC sets an organization in front of a broad knowledge stock, the next logical step in the AC chain would be to leverage that knowledge by means of RAC. Cohen and Levinthal (1990) also emphasize the cumulative character of AC, meaning that there is a relationship between RAC and its prior related PAC. In other words, how well PAC is distributed across and within the organization in the present will permit a more effective realization in the future (RAC). Zahra and George (2002) also stress that organizations cannot exploit external knowledge without having previously acquired and synthesized it, which suggests that PAC precedes RAC. Furthermore, the external knowledge processed through PAC has to go through various repeated cycles before the organization can commercially apply it through RAC and generate business value (Van den Bosch et al., 1999). As organizations engage in acquiring and assimilating some particular form of knowledge, organizational members are likely to develop new insights, which they may recognize as relevant during exploitation. Earlier forms of knowledge sourcing make positive contributions to later forms (Roper et al., 2008) and should reinforce each other (Senaratne, Wang, & Sarma, 2015). To put it more simply, the more ideas and interpretations of new knowledge develop (PAC), the higher the likelihood that an organization will be proactive in exploiting the new opportunities presenting themselves in the organization's environment (RAC). Hence, PAC can also provide an incentive for increasing RAC. We thus postulate the following relationship:

Hypotheses 1. Potential absorptive capacity (PAC) positively affects realized absorptive capacity (RAC).

An organization's AC is not a goal in itself but can develop important organizational outcomes (Fosfuri & Tribó, 2008), such as innovation performance (Cohen & Levinthal, 1990). On this matter, previous studies highlight the importance of pursuing two types of innovation, exploratory and exploitative (He & Wong, 2004; Jansen et al., 2006). While the nature of exploitative innovations seek incremental and continuous change, exploratory innovations express fundamental rethinking and radical redesign (Day, 1994). In other words, exploratory innovations set up new products and services, whilst exploitative innovations make possible ameliorations to existing products and services. Surprisingly, while abundant literature suggests that AC increases the speed and frequency of exploitative innovation (Anderson & Tushman, 1990; Kim & Kogut, 1996), there is generally insufficient research attempting to understand the relationship between AC and exploratory innovations. We address this issue by examining the link between AC and both exploratory and exploitative innovation.

AC can be characterized as the ability of organizations to learn or to process knowledge (Zahra & George, 2002). Firms need to learn or to absorb some kind of new knowledge in order to produce innovation. However, different types of innovation require the absorption of distinguished types of knowledge domains or contexts. Typically, an overlap of the existing knowledge that the firm has (or prior related knowledge) with external knowledge which is at a relatively short cognitive distance fosters the creation of exploitative innovations (Lord & Ranft, 2000; Nootebooma, Haverbeke, Duysters, Gilsing, & Van den Oordc, 2007). For instance, coordinating the learning capabilities of AC for exploitative innovation demands the combination of external technological knowledge with prior market knowledge (Song, Dyer, & Thieme, 2006). Utilizing a firm's AC in this way can be considered routinized learning, which adds to the existing knowledge base of firms without changing the essential nature of the products and services (Hagedoorn & Duysters, 2002; Rowley, Ehrens, & Krackhardt, 2000).

Similarly, prior related knowledge is essential for catalyzing exploratory innovation but only if combined with external knowledge which is at a larger cognitive distance (Nootebooma et al., 2007; Szulanski, 1996). Exploratory innovation is sustained by learning capabilities of AC which make possible moving beyond contextually localized searches, for instance, seeking new technology based business opportunities (Stuart & Podolny, 1996). Seeking novel contexts at a larger cognitive distance connects with uncertainty which is desired for sparking exploratory innovations (Nootebooma et al., 2007). Van den Bosch et al. (1999) also point out that having AC that provides profound understanding of a broad range of loosely related knowledge contexts best supports exploratory innovation. Thus, we expect AC to influence not only an organization's exploitative innovation (as argued above) but also its exploratory innovation, as follows:

Hypotheses H2–3. Absorptive capacity positively affects (a) exploratory innovation and (b) exploitative innovation [H2: PAC; H3: RAC].

Hypothesis M1. The positive effects of PAC on (a) exploratory innovation and (b) exploitative innovation are mediated by RAC.

2.2. The role of organizational culture

The first challenge in conducting research involving culture is arriving at an understanding of what organizational culture is, given the multiplicity of definitions used to describe this concept. Schein's (1985) three-level model of culture is prominent in the literature as it describes both surface-level manifestations of culture, such as artifacts, and less observable aspects lying at a deeper level. According to Schein's virtually unchanged definition over the course of five editions of his book, organizational culture is "*a pattern of shared basic assumptions learned by a group as it solved its problems of external adaption and internal integration, which has worked well enough to be considered valid, and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems*" (Schein & Schein, 2017). Later research argues that Schein's conceptualization constitutes just one perspective about culture. Beyond Schein's integration perspective, which considers culture as an organization-wide unified phenomenon, Martin (1992) proposes two other additional distinct perspectives, namely the differentiation perspective and the fragmentation perspective. The premises made in the differentiation perspective are that an organization can have many cultures within its boundaries, which may originate in the organizational structure or may reflect differences among organizational members.

The differentiation perspective, which considers different cultures,

is particularly relevant in the context of this study. It is worth mentioning that, in his conceptualization, Schein (1985) acknowledges that the term "culture" can rightfully be applied to any size of social unit that has had the opportunity to learn and stabilize its view of itself and the environment around it. The existence of various cultures, conceptualized in this way, does raise questions about their composition at the organizational level of analysis. For identifying and classifying different organizational cultures, the organizational culture assessment instrument (OCAI) is commonly used. The OCAI was originally built by Quinn and Rohrbaugh (1983) using two dimensions of a bisecting continuum in a competing values framework (CVF) to explore organizational cultures. One dimension reflects change, flexibility and spontaneity versus stability, control and order; the other dimension reflects the internal versus the external focus of the organization. Taken together, the two dimensions create four cultural archetypes, namely, adhocracy, clan, hierarchy and market (Cameron & Quinn, 2006). This allows for not only a comprehensive theoretical framework but also a tested empirical measurement model including reasonably short and validated measurement items (Heritage, Pollock, & Roberts, 2014).

Cameron and Quinn (2006) point out that organizations have different orientations towards the four major culture archetypes. Assessing the level of orientation towards each of the four culture archetypes is a pre-condition for analyzing how the interplay between the four archetypes influences organizational phenomena. In this regard, one can analyze the level of cultural balance based on the relative emphasis that organizations put on the values associated with each of the four culture archetypes. Cultural balance has proved to be a valuable construct for ameliorating the categorization of different types of organizational cultures. In particular, previous studies used cultural balance in terms of investigating its impact on organization effectiveness (Gregory et al., 2009; Yilmaz & Ergun, 2008). What is more, the importance of cultural balance seems to be especially relevant to the SME context. According to stakeholder theory, SMEs tend to have different levels of stakeholder involvement that influence firm activities (Atkins & Lowe, 1994; Westrenius & Barnes, 2015). The ability of SMEs to deal with various demands from a wide range of stakeholders in particular including customers, suppliers, investors, creditors, local community and government regulators, while maintaining a financially viable operation should be contingent upon the individuals in the organization carrying out behaviors that connect with multiple cultures.

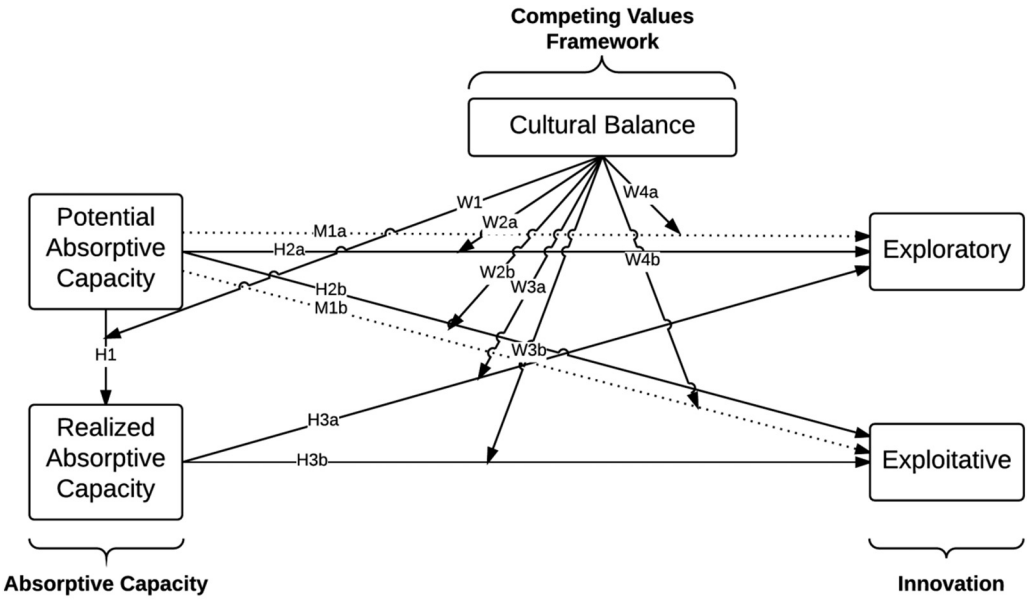
Along similar lines, a popular view in literature seems to be that organizations with a high-balanced composition of cultural types are more successful in overcoming the ongoing diverse challenges that they face (Cameron & Quinn, 2006; Denison, 1990; Gregory et al., 2009; Quinn, 1988). The basic argument supporting this view rests on the idea that successful organizational performance leans on the ability to complement the values of flexibility and dynamism with stability and control, and balance internal orientation and unity with external orientation and rivalry. Hence, we investigate the viability of the balanced culture hypothesis. More specifically, we seek to validate whether high-balanced and low-balanced forms of organizational culture play a different role in converting PAC to RAC and in linking AC to innovation.

The ability of the firm to process knowledge or, in other words, to convert PAC into RAC can be affected by its organizational culture, and more specifically, is associated to how cultural values influence behavior of organizational members (Zheng, Yang, & McLean, 2010). These cultural values determine the basic beliefs and norms in terms of why and how knowledge is digested, shared and integrated in an organization (De Long & Fahey, 2000). Making sense of new data and information, sharing different interpretations, restructuring shared meanings, and designating specific courses of actions based on their understanding requires different cultural values. Management research has long recognized that contradictory values are important attributes for managing organizations effectively (Barnard, 1968; Cameron & Quinn, 1988). For instance, Thompson (1967) points out that "the paradox of administration involves the dual searches for certainty and flexibility". More recent studies in the context of AC suggest that values such as flexibility and dynamism (Zahra & George, 2002), but also control and formalization (Alavi, Kayworth, & Leidner, 2006), can both positively impact knowledge processing. Likewise, it is important to find a balance between external forces for innovation and change and internal inertial forces (He & Wong, 2004; Virany, Tushman, & Romanelli, 1992). In terms of processing external knowledge, it is easier when employees collaborate in an open innovation environment where knowledge flows into, within and out of the organization (Molina & Lloréns-Montes, 2006). In particular, the greater the extent to which network connections span organizational boundaries, the greater the willingness of individuals to devote time and effort to assisting others (Reagans & McEvily, 2003). Thus, employees need to adapt and develop their relations both internally and externally simultaneously, as knowledge is shared more easily within close relationships between collaborative people. Based on these arguments, we propound the view that a balance between competing values constituting the four cultural archetypes should better sustain converting PAC into RAC, thus hypothesize that:

Hypothesis W1. The positive effects of PAC on RAC will be stronger when organizations are characterized by a high-balanced culture.

While there is a general agreement that the levels of organizational AC are positively associated with improved innovation performance (Ahlin, Drnovšek, & Hisrich, 2014; Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011; Leal-Rodríguez, Ariza-Montes, Roldán, & Leal-Millán, 2014; Roper et al., 2008), there is less evidence on the question of how culture affects the relationship between AC and innovation. A review of relevant literature indicates that studies which examine AC, organizational culture and innovation together generally assert that the impact of organizational culture on both AC and innovation is direct, or that AC mediates the relationship between organizational culture and innovation (Sanz-Valle et al., 2011). However, in the present study we advocate a different perspective. In line with the essence of Schein's definition (Schein & Schein, 2017) that culture comprises beliefs, values and behavioral norms that are shared by members of a given group, De Long and Fahey (2000) suggest that the values manifested in an organization are a reflection of the mechanism through which employees act and communicate. In other words, provided that culture exists at different levels of the organization and influences behavior, the central idea is that the effects of stimuli, such as AC, on behavior are moderated by the culture internalized in the organization. Hence, organizational culture can be seen as the active organism affecting the direction and strength of organizational phenomena.

While earlier studies suggest that innovation in terms of exploration and exploitation requires different strategies, structure, people and culture (He & Wong, 2004), we seek to highlight the role of cultural balance. Successfully building exploratory and exploitative innovation capabilities is imperative but challenging because exploring and exploiting are associated with paradoxical values. Indeed, exploratory innovation is based on variance-increasing activities and requires divergent thinking, flexibility and experimentation, while exploitative innovation is based on variance-decreasing activities and requires convergent thinking, focus and efficiency (Flynn & Chatman, 2004; Rivkin & Siggelkow, 2003; Smith & Tushman, 2005; Van De Ven, Polley, Garud, & Venkataraman, 1999). However, based on extant literature, it seems reasonable to infer that organizations need to find a balance between competing values associated with different cultures so that the firm can both explore and exploit. Indeed, Adler, Goldoftas, and Levine (1999) found evidence that an organization relying on contradictory values of efficiency (related with hierarchy and market cultures) and flexibility (related with Clan and Adhocracy cultures) can operate at superior levels in producing innovative products. Similarly, Rivkin and Siggelkow (2003) argue that to be successful an organization must



Notes: H, M, W: Hypotheses
Dotted lines (M1, M2) represent hypotheses with mediation (indirect) effects via RAC.

Fig. 1. Model and hypotheses.

balance broad search and stability (again related with different cultures). Finally, Smith and Tushman (2005) point out that top management teams excel when they effectively balance strategic contradictions that allows them to pursue simultaneously exploratory and exploitative agendas. Hence, we assume that balancing cultural forms would stimulate exploratory and exploitative innovation, and thus hypothesize:

Hypotheses W2–3. The positive effects of AC on (a) exploratory innovation and (b) exploitative innovation will be stronger when organizations are characterized by high-balanced cultures [W2: PAC; W3: RAC].

Hypothesis W4. The mediated effects of PAC on (a) exploratory innovation and (b) exploitative innovation will be stronger when organizations are characterized by high-balanced cultures.

We are now able to define the basic structure of the moderation research model in Fig. 1 outlining the relationships between organizational culture, AC and innovation. The research model and hypotheses are presented in Fig. 1.

3. Research methods

3.1. Research process and data

3.1.1. Sampling

The data for this research were acquired by surveying members of top management in active SMEs across knowledge-intensive industries in Austria. Previous research suggests that members of top management are more familiar with ideas and values within an organization and therefore best positioned to respond to the questionnaire (Hambrick & Mason, 1984). We obtained the target population from the widely used Amadeus database, which provides comprehensive information on public and private European companies (Bureau-Van-Dijk, 2009), and then randomly selected 1000 companies from thereby gained population of 6636 entries (Trochim & Donnelly, 2006).

3.2. Testing

Before disseminating the survey questionnaire within the wider population, we pretested it over a three-stage process, which included professionals operating in IT and management roles (in the first two stages) and three target persons, that is, managers in SMEs (in the third stage). We conducted a debriefing after each round based on which we modified some questionnaire items to properly tap into the study's specific context. The questionnaire was originally developed in English. To provide a better understanding and greater clarity of the questions the questionnaire was translated into the native language (German) before the third round of pretesting. We used the back translation method to ensure that the identical or an adequate similar meaning remains across the two language versions (Brislin, 1970).

3.3. Data collection

The survey was distributed among participants through a multistage process. In the first stage, we sent out an invitation letter explaining the conditions of participation. Next, we sent out a pre-notification letter that guaranteed the survey's legitimacy. Afterwards, we sequentially mailed and emailed the survey. In the second stage, we randomly contacted 675 companies by telephone. Those that declined to participate were classified as nonrespondents, while others agreed to participate online or in an ad hoc interview. Over the process, which took 66 full person days, 205 questionnaires were completed. Accordingly, we attained a net return quota of 20.96% taking into consideration neutral dropouts (22 companies), which refer to nonactive companies that could not be contacted.

3.4. Outliers and bias examination

Initially we dropped the nontarget firms including 26 μ enterprises and 13 large enterprises. Then, following Hair, Tomas, Hult, Ringle, and Sarstedt (2017), the collected data were examined for (i) missing data, (ii) suspicious response patterns, (iii) inconsistencies in answers and (iv) outliers. First, when the amount of missing data exceeded 15%, or if a high proportion of data was missing for a single construct, the observation was removed. We used mean value replacement to treat missing data that were not considered problematic. Second, by means of the “straight-lining” strategy we tried to detect answers that were the same for all questions. Third, we inspected and removed inaccurate and

inconsistent data sets. Fourth, using the modified Thompson technique (Dieck, 2006), we tested for outliers and removed data sets that contained extreme responses to a particular question, or an extreme response to all questions. Altogether, 28 data sets were removed, resulting in 138 observations for further analysis.

We also used wave analysis (Moore & Tarnai, 2002; Van Der Stede, Young, & Chen, 2006) to assess if our respondents are likely to be different from those who did not respond (non-response bias). We thereby compared early versus late respondents supposing that late respondents are likely to be similar to non-respondents. While splitting respondents into two equally sized groups depending on the time online responses were recorded, no difference was found between groups in terms of respondents' attributes such as gender (χ^2 test, $p = 0.555$) or age (two-sample unpaired *t*-tests, $p = 0.582$), and organizations' attributes in terms of number of employees (χ^2 test, $p = 0.153$) or turnover (χ^2 test, $p = 0.476$). Thus, based on wave analysis, we see no evidence for response-bias.

Furthermore, as the survey used a mono-method research design and responses were self-reported, we assessed for common method variance (CMV) biases, which may cause a certain amount of covariance sharing within all items (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Following Chang, Witteloostuijn, and Eden (2010), we used three *ex post* CMV remedies. First, we added complexity to the model by modeling higher-order components and considering mediation and moderation effects based on theory. Second, we used the Harman single-factor technique to test whether a single or general factor emerges that accounts for the majority of covariance among measures (Podsakoff et al., 2003). The result of this analysis showed nine factors, in which the first accounted for 37.5% of the variance and the other eight (with eigenvalues greater than one) contributed to the remaining 37.1% of the variance, suggesting that the CMV effect is relatively small and cannot be regarded as a problem in this study. Third, we tested two times applying the marker variable approach to control for common method variance (Rönkkö & Ylitalo, 2011). The results presented in Table B.3 (see Appendix B) show that the significance of the hypothesized path coefficients is not different between the baseline model and the models with the marker variables. Thus, neither the traditional single-factor test nor the marker variable approach suggest a threat of common method bias.

Finally, we considered the possibility of halo effects as response bias which occur when the respondent is unconsciously affected by the sequence of questions in particular in association with belief or perception ratings (Beckwith, Kassarjian, & Lehmann, 1978). Since the degree of haloing is expected to vary between individuals, we considered individual level control variables (respondents' age, role tenure and respondents' gender), which did not show any effects on the dependent variables. Thus, we assume that haloing did not affect our results.

3.5. Structural equation modeling (SEM) approach

Structural Equation Modeling (SEM) is largely used in business research to test for theories and concepts (Rigdon, 1988), however, when applying SEM two types of methods are put into question: covariance-based techniques (CB-SEM) (Jöreskog, 1978) and variance-based partial least squares (PLS-SEM) (Lohnmöller, 1989). Maximum likelihood-based CB-SEM requires normally distributed data, whereby PLS-SEM, the chosen approach for this study, is a non-parametric statistical method that responds positively to deviations from a normal distribution (Gefen, Straub, & Boudreau, 2000; Hair, Sarstedt, Ringle, & Mena, 2012). We examined skewness and kurtosis using SPSS to determine data distributions (Kim, 2013). The analysis showed that the majority of our data variables are non-normal but not excessively non-normal, therefore, adopting a PLS-SEM approach was deemed to be the better choice in particular from this perspective. Besides, PLS-SEM is not concerned by identification problems while CB-SEM is typically restricted when models become complex (such as in our case) including using latent variables scores in subsequent analysis, higher order components, mediation and multiple group comparison (Hair, Ringle, & Sarstedt, 2011). To support model evaluation, we also tested model fit by asking the question how substantial the discrepancy between the model-implied and the empirical correlation matrix is using the standardized root mean square residual (SRMR), which generally broadens the applicability of PLS-SEM (Henseler et al., 2014; Henseler, Hubona, & Ray, 2016). While PLS has advantages over other techniques when analyzing relatively small sample sizes (Gefen et al., 2000), it is still recommended considering it against a given model and data characteristics (Hair et al., 2017). In our model the maximum number of independent variables in any structural path is two. Therefore, assuming the commonly used level of statistical power of 80%, we needed at least 110 data sets to detect R^2 values of at least 0.1 with an error probability of 5%. Hence, the acquired 138 data sets are sufficient in terms of both requirements and were used to assess the model by means of the SmartPLS 3 software (Ringle, Wende, & Becker, 2015).

3.6. Operationalization of constructs

All of the variables were operationalized using multi-item reflective indicators on a seven-point Likert-type scale, as it has been suggested that these types of response categories provide the most reliable and valid scores (Preston & Colman, 2000). Table A.1 (see Appendix A) presents all items adapted from literature. Organizational culture was measured based on the four archetypal profiles proposed in the OCAI framework (Cameron & Quinn, 2006). As suggested in previous research (Kalliath, Bluedorn, & Gillespie, 1999; Quinn & Spreitzer, 1991), we opted for a reduced version of the instrument that included four key dimensions: dominant characteristics, organizational leadership, measurement of employees and organizational glue. In order to determine cultural balance, we first used the measure of standard deviation (SD) to quantify the dispersion of the OCAI scores. Initially, by following instructions from Cameron and Quinn (2006), we calculated the OCAI scores, generating a score for each of the four cultural types of every organization. Next, we considered the distribution of cultural scores by calculating the SD of the OCAI scores for each organization. Based on the SD, we decided to perform a median split to arrive at two different groups (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015; Mitchell & Jolley, 2012), and thereby contrast a group of organizations with high-balanced cultures (and low SD) and a group with low-balanced cultures (and high SD). This median split procedure is consistent with our dichotomous idea of having either more or less of cultural balance and matches our theoretical purpose, which is not about possible heterogeneity of cultural dimensions within groups. Such a dichotomization was also implemented in other studies for similar reasons (e.g. Crawford, 2005; Sujan, Sujan, & Bettman, 1988; Wong, Lai, & Bernroider, 2015). Consequently, organizations from the sample of high-balanced cultures hold values associated with the four different archetypes that are more equally spread out than organizations belonging to the low-balanced group.

To measure AC, we adopted AC items that were developed and tested in Camisón and Forés (2010) and Flatten et al. (2011) and deemed valid and reliable. Next, we applied hierarchical component models (HCMs) to obtain PAC and RAC. The link between lower-order components (LOCs) and higher-order components (HOCs) was characterized by a reflective-reflective type relationship, which allows for a more parsimonious PLS model and reduces levels of collinearity among indicators. To establish the HCM we used the repeated indicator approach (Hair et al., 2017). We calculated the latent variable scores for LOCs, which served as manifest variables in the HOC measurement model. Exploratory and exploitative innovation were measured using items proposed in Jansen et al. (2006). As control variables we used organization size, respondents' age, role tenure and respondents' gender.

Table 1
Sample descriptives.

	#	Valid %
Organizations' sector		
Information and communication	34	27.2
Financial and insurance activities	3	2.4
Professional, scientific and technical activities	64	51.2
Administrative and support service activities	12	9.6
Manufacturing	12	9.6
Unknown sector	13	
Organizations' size		
Small	93	67
Medium	45	33
Respondents' gender		
Men	127	92
Women	11	8
Respondents' age		
22–44 years	55	40.7
45–59 years	70	51.9
≥ 60 years	10	7.4
No response	3	
Respondents' role tenure		
< 3 years	11	8.4
3–8 years	36	27.5
Over 8 years	84	64.1
No response	7	

4. Results

4.1. Survey sample properties and goodness of model fit

The Statistical Classification of Economic Activities (NACE) in the European Union (European Commission, 2008) was used to classify the organizations into five industry sectors (see Table 1). The final sample consisted of 67.4% small organizations and 32.6% medium organizations. In terms of size attribution, we also followed current EU guidelines. Accordingly, medium organizations employ between 50 and 249 employees and small organization between 10 and 49 (European Commission, 2005). In terms of the respondents, 92% were male. The mean age of respondents was 46.08 years with the youngest and oldest respondent being 23 years and 67 years old, respectively. The respondents have been working in a management capacity at the SME for 12.7 years in the mean and only 8.4% of them have been working in such a capacity for less than three years.

We started our model assessment by examining the standardized root mean squared residual (SRMR), to evaluate the goodness of structural model fit (Henseler et al., 2014; Henseler et al., 2016). A value of < 0.1 (Henseler et al., 2014) or 0.08, a more conservative view (Hu & Bentler, 2009), is a good fit for SRMR. In addition, the resulting SRMR should be lower than the 95% of bootstrap quantile (HI95). The SRMR-measure was 0.089 for the first-order model and 0.076 for the second-order model and the value of the HI95 bootstrap quantile was 0.148 for the first-order model and 0.083 for the second-order model, hence the model quality can be deemed satisfactory.

4.2. Test of the measurement model

Examination of PLS-SEM estimates requires evaluation of the reliability and validity of the constructs' measures (Lee, Petter, Fayard, & Robinson, 2011). Our reflective measured constructs PAC, RAC, EXPR and EXPI were tested for internal consistency reliability, convergent and discriminant validity and indicator reliability (Hair et al., 2017; Ringle, Sarstedt, & Straub, 2012). Internal consistency reliability was tested using composite reliability. The different outer loadings of the indicator variables show acceptable composite reliability values above 0.708. Convergent validity was tested using the average variance extracted (AVE) and showed acceptable values of 0.5 or higher as, on average, the construct explains more than half of the variance of the indicators (Hair et al., 2017). Discriminant validity was tested using the Fornell-Larcker criterion (Fornell & Larcker, 1981). This criterion was satisfied since the square root of the AVE value is larger than its highest correlation with any other construct (Fornell & Larcker, 1981). Further, adding to construct validity is the consideration of indicator reliability. Both when the standardized indicator's outer loading values are above 0.708, and the indicator's loadings on a construct are higher than all of its cross loadings with other constructs, suggest that discriminant validity is established. Finally we looked at the Heterotrait-Monotrait Ratio (HTMT) and the HTMT inference as recently proposed by Henseler, Ringle, and Sarstedt (2015). The HTMT equals the disattenuated correlations between two constructs, whereby values below 0.85 (the conservative criterion) indicate the establishment of discriminant validity. We also used bootstrapping to test whether the HTMT inference is significantly different from one. In all, the results, summarized in Table B.1 and B.2 (Appendix B), suggested that all measures were valid and reliable.

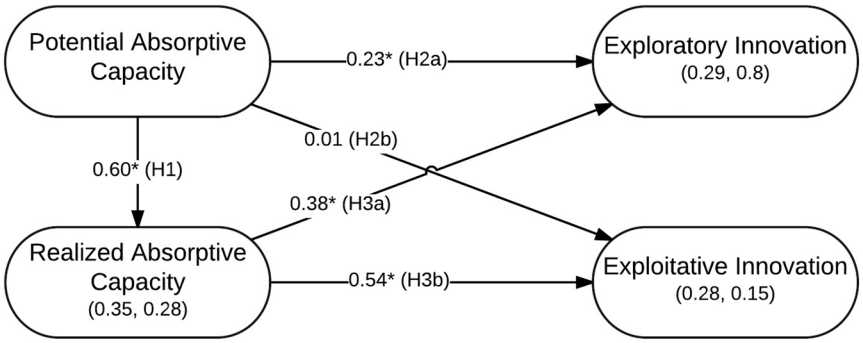
4.3. Test of the structural model

Once we confirmed that the construct measures were reliable and valid, the next step required evaluation of the structural model results. The evaluation is important to obtain the best parameter estimates that fit PLS-SEM to the sample data by maximizing the explained variance of the endogenous latent variables (Ringle et al., 2012). Hence, we assessed the R^2 level, the f^2 effects, the Q^2 predictive relevance and the q^2 effect size. After running the PLS-SEM algorithm (using the factor weighting scheme and the stop criterion parameter set at 10^{-7} with 5000 maximum iterations), we obtained standardized values of between -1 and $+1$ (shown in Fig. 2). Values closer to the boundaries represent stronger effects and values closer to zero represent weaker effects (respectively nonsignificant effects). To avoid bias towards complex models, we adjusted R^2 according to the number of exogenous constructs relative to the sample size (Hair et al., 2017). Based on the resulted adjusted R^2 values the model shows adequate predictive accuracy. The f^2 effects were calculated to evaluate whether the erased constructs had a significant impact on the endogenous constructs. The empirical t-values were obtained using bootstrapping with 5000 subsamples as a nonparametric resampling procedure (Chin, 1998). In addition, we calculated the *p*-values for the two-tailed test to interpret the significance of the coefficients. The Q^2 predictive relevance was

Table 2
Verdict on structural relationships.

Hypothesis	Path	Path co-efficient (β)	Effect size (f^2)	Effect size (q^2)	Standard deviation	t -Value	*P* values
H1	PAC ➔ RAC	0.60	0.55	N/A	0.07	9.01	0.000*
H2a	PAC ➔ EXPR	0.23	0.05	0.02	0.09	2.62	0.009*
H2b	PAC ➔ EXPI	0.01	0.00	0.00	0.09	0.07	0.944
H3a	RAC ➔ EXPR	0.38	0.14	0.07	0.11	4.01	0.000*
H3b	RAC ➔ EXPI	0.54	0.26	0.09	0.10	5.12	0.000*

PAC (Potential Absorptive Capacity), RAC (Realized Absorptive Capacity), EXPR (Exploratory Innovation), EXPI (Exploitative Innovation).
* $p < 0.01$.



*p<.01
(R^2 adjusted, Q^2) given for endogenous constructs

Fig. 2. PLS-SEM results.

calculated using the blindfolding procedure with an omission distance of 7 (Hair et al., 2017). Table 2 shows the results of the hypothesized relationships, effect sizes and standardized coefficients, including their respective standard errors and t-values.

The PLS-SEM results, presented in Fig. 2, show that PAC has a large positive effect ($\beta = 0.60$, $p < 0.01$) on RAC, supporting hypothesis H1. Further, PAC has a small positive effect ($\beta = 0.23$, $p < 0.01$) on exploratory innovation, supporting hypothesis H2a, but has no effect on exploitative innovation, thereby not supporting hypothesis H2b. Finally, RAC has a small positive effect ($\beta = 0.38$, $p < 0.01$) on exploratory innovation, supporting hypothesis H3a, and a medium positive effect ($\beta = 0.54$, $p < 0.01$) on exploitative innovation, supporting hypothesis H3b.

4.4. Mediation analysis

The model proposed and validated in this study hypothesized that RAC would mediate the relationship between PAC and (exploratory and exploitative) innovation. Here we further test for mediation following the approach outlined by Baron and Kenny (1986).

For M1a, initially we tested without the mediator variable (RAC), with the resulting coefficient between PAC and exploratory innovation being equal to 0.46 at a level of $p < 0.01$. Likewise for M1b, coefficients between PAC and exploitative innovation equaled 0.33 at a level of $p < 0.01$. Next, we included the mediator variable (RAC) in the PLS path model and assessed the significance of the indirect effects. The effect between PAC and both exploratory and exploitative innovation was smaller (as presented in Table 3), which indicated mediation effects. Since indirect effects were significant, and therefore satisfied Step 2, we proceeded to calculate the variance accounted for (VAF) to determine the level of mediation for each case. As summarized in Table C.1 (see Appendix C), RAC partially mediated the relationship between PAC and exploratory innovation, supporting hypothesis M1a, and fully mediated the relationship between PAC and exploitative innovation, supporting hypothesis M1b.

Table 3
Results of mediation analysis.

Hypotheses	M1a		M1b	
	DV: exploratory		DV: exploitative	
Mediator: RAC	1	2	1	2
Path PAC → DV	0.46	0.23	0.33	0.01
Sobel mediation test	*Z*-value: 3.67		Z-value: 4.53	
Two-tailed probability	$p < 0.000$		$p < 0.000$	
Effect ratio	VAF: 50%		VAF: 98%	

Note 1: DV represents dependent variable.
Note 2: Column (1) represents direct path coefficients that are estimated without including the mediator variable for the given DV. Column (2) represents direct path coefficients that are estimated for the full model (i.e. including mediator) for the given DV.

4.5. Moderation analysis

We applied a multi-group moderation analysis to assess the cultural conditions that influence the strength of the relationships in Fig. 3 between absorptive capacity and innovation. Hypotheses W1, W2a-b, W3a-b, W4a-b postulate the moderation model and we follow recommendations provided by Baron and Kenny (1986) and analytical procedures suggested by Lowry and Gaskin (2014) to test these hypotheses. For visualizing and interpreting the results of the moderation analysis we used recommendations by Hayes (2013).

Our approach required the data set to be split into two groups as we have already described above when explaining the operationalization of cultural balance. We established one dichotomous variable classifying the organizations into high-balanced and low-balanced culture groups with a sample size of 69 data sets each. In order to determine whether the difference in the PLS path coefficients (βs) is significant, we applied pairwise *t*-tests (Chin, 2000). The multi-group moderation test statistic (for W1, W2a-b, W3a-b) implied using the regression weight and SD values of the *path coefficients* resulting from bootstrapping. Similarly, the moderated mediation test statistic (for W4a-b) implied using the regression weight and SD values of the *total effects* resulting from bootstrapping.

The results show that βs from RAC to exploratory (W3a) and exploitative (W3b) innovation for high-balanced cultures is significantly stronger (t-statistic = 2. 14 and t-statistic = 2.00, respectively) than the corresponding path in the structural model for the low-balanced cultures, thereby supporting W3a–b at the 0.05 level of significance. On the other hand, the moderation effects were not significant between PAC and RAC, thereby not supporting W1. The results were also not significant when testing for multi-group moderation and moderated mediation between PAC and exploratory (respectively exploitative) innovation, thereby not supporting W2a–b and W4a–b. An overview of the results is presented in Table D.1 (see Appendix D). It is pertinent to note that we repeated the analysis using the mean absolute deviation and variance to mean ratio as alternative metrics to the SD. The results were theoretically consistent leading to the same conclusions and thereby supporting the robustness of our findings.

Fig. 3 shows a visual depiction (of W3a–b) produced from the interaction of exploratory innovation (left graphic) and respectively exploitative innovation (right graphic) and RAC for high-balanced (solid line) and low-balanced (dashed line) culture. The R^2 values indicate how much the total variation in the dependent variable (EXPR and EXPI) can be explained by the independent variable (RAC). Accordingly, RAC explains 42% of the variation of EXPR for high-balanced cultures compared to 19.9% for low-balanced cultures. Similarly, RAC explains 55.8% of the variation of EXPI for high-balanced cultures

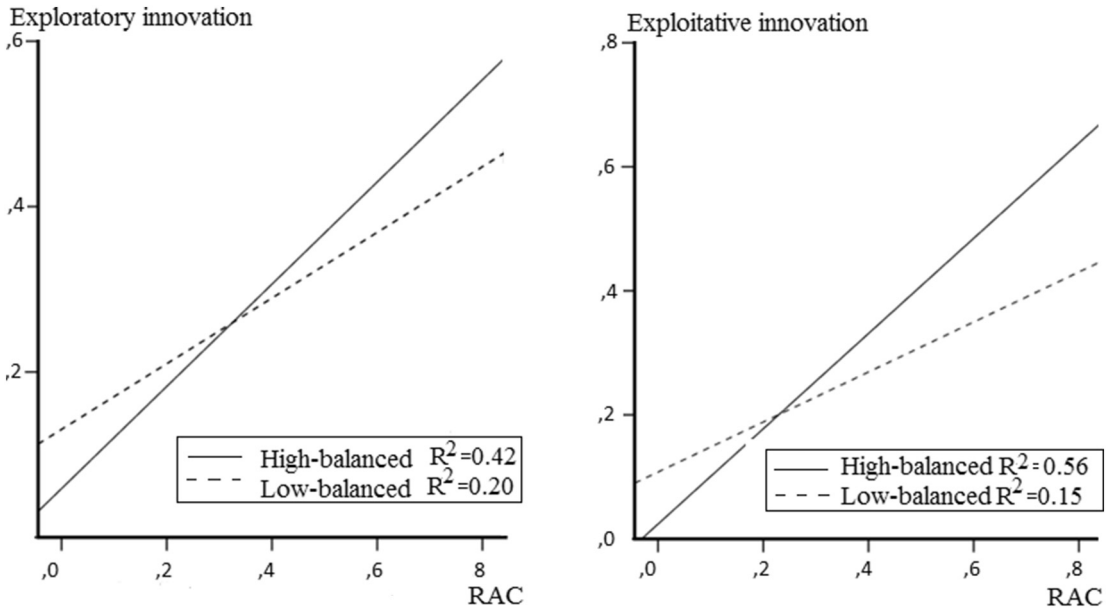


Fig. 3. The moderation effects of high-balanced and low-balanced cultures on the links between realized absorptive capacity (RAC) and exploratory (left) and exploitative (right) innovation.

compared to 15.3% for low-balanced cultures. We further calculated the descriptive measure of incremental increase in R^2 (that is, the difference in the squared multiple correlations $R^2_{\text{high-balanced}}$-$R^2_{\text{low-balanced}}$), which shows that the model with high-balanced cultures fits better than the model with low-balanced cultures. Nevertheless, the R^2 values of the endogenous reflective construct models are very acceptable in respect of the overall model, showing a good prediction.

5. Discussion

In this study, we have examined how and under what cultural circumstances absorptive capacities provide more support in developing exploratory and exploitative innovation. More specifically, we argued for a more nuanced understanding of the important complementary roles of PAC and RAC in fostering both types of innovation, and explained to which extent cultural balance affects these relationships. As reported above, our hypotheses testing results establish important insights into the mechanisms by which innovations are affected and the conditions that facilitate such effects. To begin, PAC has a strong positive effect on RAC, which is in line with the key assumptions on AC in terms of its cumulativeness (Cohen & Levinthal, 1990; Roper et al., 2008), especially in regard to PAC and RAC (Zahra & George, 2002). However, this effect is not contingent on the level of cultural balance based on our conceptualization. Previous studies suggest that the effects of PAC on RAC are positively moderated by social integration mechanisms (Zahra & George, 2002), in particular, in relation to knowledge stocks (Marzec, Tan, & Matthews, 2014) and relational learning (Leal-Rodríguez et al., 2014), and negatively moderated by cultural barriers, such as language, conflict and risk avoidance, bureaucracy, hierarchy and top-down approach (Leal-Rodríguez, Ariza-Montes, & Leal-Millán, 2014). As our study suggests that the effects on PAC on RAC are not subject to cultural balance, we assume that the PAC-RAC link is best maintained by optimizing these and other specific factors rather than focusing on balancing out the various values associated with different cultures.

Further, our results show that RAC mediates the positive effects of PAC on exploratory and exploitative innovation, whilst there is also a direct significant positive effect of PAC on exploratory innovation. These findings support the argument that SMEs should build on AC to drive innovation, as a critically important source of competitive advantage (Harris, McAdam, McCausland, & Reid, 2013). In addition, one peculiarity of SMEs is that by using people-centered knowledge management, they can put AC immediately into practice (Desouza & Awazu, 2006). This is translated into improved work practices and institutionalization of new insights. In contrast, the results do not support the argument that PAC directly affects exploitative innovation. We thus suggest that PAC is necessary but not sufficient to turn the newly acquired and assimilated knowledge into marginally improved products or services. This pattern adds to previous studies that could not find a direct relationship between PAC and innovation outcomes by clarifying that RAC is the central mechanism through which PAC affects exploitative innovation (Leal-Rodríguez et al., 2014).

Furthermore, the results of the moderation analysis show that all slopes linking RAC and innovations are positive and differ for high- and low-balanced organizations. According to the *t*-tests, organizations that have high-balanced cultures seem to perform better than organizations with low-balanced cultures in using their RAC to produce (exploratory and exploitative) innovations. Nevertheless, our results suggests more complex moderation as organizations with high-balanced cultures perform better (that is, realize more innovations) than organizations with low-balanced cultures from a certain level of RAC. In circumstances where organizations do not yet possess a sufficiently high level of RAC, those with low-balanced cultures seem to actually innovate more. Finally, the results did not support the moderated mediation hypotheses meaning that the indirect effects of PAC (mediated by RAC) on (exploratory and exploitative) innovation, are not moderated by cultural balance.

5.1. Theoretical implications

Our findings contribute to the existing literature on the multi-dimensional nature of AC and required complementarity of different ACs. Much of the literature, as noted earlier, proposes that there are reinforcing links between different forms of ACs (e.g. Limaj et al., 2016; Roper et al., 2008). Our study extends these considerations by specifically confirming that PAC positively affects RAC in the context of SMEs. Considering the nature of AC, in particular, the dynamic aspect of how AC develops based on a co-evolutionary approach (Van den Bosch et al., 1999; Zahra et al., 2006), our findings imply that a well-developed PAC is linked with a well-developed RAC. This reasoning is in line with previous studies noting that dynamic capabilities associated with

knowledge processing (such as PAC and RAC) can mutually reinforce each other (Senaratne et al., 2015). Van den Bosch et al. (1999) explain that the higher the AC, the more proactive firms are at anticipating the emergence of valuable developments and at seizing more opportunities presented in its environment. While it seems reasonable to consider that a high PAC can leverage RAC and subsequently AC as a whole, focusing on developing PAC only does not seem to be enough. Zahra and George (2002) argue that many organizations, due to exogenous and endogenous forces, can still be inefficient in leveraging RAC. While we proposed that cultural balance might be one of these forces, we could not find empirical evidence to ascertain moderation effects of cultural balance on the PAC-RAC link.

Our analysis designates that RAC is the primary mechanism through which organizations produce innovation corroborating the view that RAC is most fundamental for performance improvements (Zahra & George, 2002). In particular, our findings imply that organizations that have a high-balanced composition of adhocracy, hierarchy, clan and market cultures perform better at producing exploratory and exploitative innovation in comparison with low-balanced organizations. Nevertheless, the analysis also indicates that there is little value for innovation in having high-balanced organizational cultures if organizations have not sufficiently developed their RAC, again emphasizing the important role of RAC for innovation. Thus, we specifically contribute to AC research by emphasizing the importance of not only RAC but also the positive interaction effects of RAC and cultural balance on innovation outcomes once a certain threshold of RAC is reached. We thereby propose to include innovation contingencies in current AC conceptualizations considering the differentiation perspective of organizational culture (Martin, 1992), where an equilibrium of fundamentally competing values of various cultures (Denison & Mishra, 1995; Gregory et al., 2009; Quinn & Rohrbaugh, 1983) seems to play an important role in deriving innovations from RAC. Empirically, we have extended the work of AC scholars who have employed a culture-independent view on the AC-innovation value chain (Kostopoulos et al., 2011; Roper et al., 2008).

Turning to organizational culture research, this study offers an extension of the OCAI measurement approach by proposing a new conceptualization of cultural balance operationalized by an equal distribution of the cultural values that are present in the organization regardless of their specific strengths. This alternative conceptualization refines Gregory et al.'s (2009) notion of cultural balance in which values associated with each of the CVF culture domains are strongly held, while also differing from their operationalization based essentially on a cluster analysis. Likewise, it differs from Yilmaz and Ergun (2008) study operationalizing cultural balance as the sum of the absolute values of the pair-wise differences between four cultural traits (involvement, consistency, adaptability, and mission). We operationalized cultural balance based on the amount of variation of OCAI scores. This implies distinguishing between organizations with high-balanced cultures and those with low-balanced cultures. This distinction is important for studying the effects of organizational culture on organizational-level phenomena. In our context, this distinction helps explain why certain organizations perform better than others in using their RAC to produce better innovation outcomes. Future work should seek to explore this construct in other settings.

Our findings in relation to cultural balance are particularly relevant to the SME context. SMEs need to constantly and quickly adapt to changing external environments (Ates & Bititci, 2011) while coping with competing demands of various internal and external stakeholders (Atkins & Lowe, 1994; Westrenius & Barnes, 2015). Previous research has focused largely on the relationship between specific types of cultures and performance; however, there is little understanding on how different compositions of cultures help SMEs to deal with change. To some extent, an exception is a study by Yilmaz and Ergun (2008), which was conducted in the context of Turkish manufacturing companies and not SMEs. Their results demonstrate that the combination of certain pairs of cultural traits exerts positive and negative effects on measures of firm effectiveness. In particular, an imbalance between the consistency trait and the involvement trait negatively correlates with the organization's new product development capability (innovativeness). The authors conclude that organizations should focus on all cultural traits for effective functioning in competitive environments. Our results extend this study by presenting new evidence supporting the view that a high-balanced composition of the investigated cultural domains helps SMEs in responding to changing situations through both exploratory and exploitative innovations.

5.2. Managerial implications

Our study has several managerial implications, particularly in answering the managerial question related to the role of PAC and RAC, and the cultural conditions under which AC is useful for improving innovations. First, in terms of facilitating PAC and RAC, managers need to acknowledge that developing PAC alone is insufficient for SMEs to optimize innovations, in particular in terms of exploitation. The key mechanism is RAC through which any effects of PAC on exploitative innovations are governed.

Second, previous work stated that companies aiming to enhance organizational learning and innovation should change hierarchy culture (as it has a negative effect) and should foster adhocracy culture (as it has a positive effect), nevertheless, promoting simultaneously an external and internal orientation (Sanz-Valle et al., 2011). We suggest that organizations should rather opt for a high-balanced composition of cultures when aiming at high levels of innovations. Cameron and Quinn (2006) provide a framework and methodology to help managers of SMEs guide the change process of cultural levels according to their demands. The assessment instrument determines the level of each culture (clan, market, hierarchy and adhocracy) present in the organization. It would then be possible to create a high-balanced cultural composition, thus a "cultural equilibrium", by following a set of systematic steps that balance the key values, assumptions, preferences and inclinations associated with seemingly competing cultures. Managers are advised to not allow one set of characteristics associated with a certain cultural archetype to dominate their entire organization in order to fully utilize the positive effects of RAC on innovations.

Third, stakeholder theory argues that the success of an organization depends not only on internal but also on external stakeholders, which in turn, have different levels of salience moderated by organizational culture (Buysse & Verbeke, 2003; Jones, Felps, & Bigley, 2007; Laplume, Sonpar, & Litz, 2008). Additionally, these stakeholders have competing claims and influence the organization according to their own culture (Jones et al., 2007). While we recognize the challenges related to stakeholder pressure, we contend that creating a balanced internal cultural landscape should help the organization meet the likely divergent stakeholder needs in terms of achieving exploratory and exploitative innovations. Consistent with this view, Sivula, Van den Bosch, and Elfring (2001) show that organizations need to equally develop internal (e.g. employees) and external (e.g., shareholders, intermediaries, and customers) relationships to foster a better strategic direction.

Fourth, ambidexterity research has called our attention to explore under what conditions ambidexterity is achieved (Jansen et al., 2006; Junni, Sarala, Taras, & Tarba, 2013; O'Reilly & Tushman, 2004, 2013). We also add to this stream of research by propounding the view that organizations could support the development of ambidexterity, that is, a balance between exploratory and exploitative innovation, by balancing the different sets of values, beliefs and assumptions that are associated with different cultures (Khazanchi, Lewis, & Boyer, 2007). In other words, working towards cultural balance might be a possible strategic mechanism that helps organizations accommodate conflicting alignments for innovation and efficiency.

5.3. Limitations and future research

We recognize that our analysis is subject to some limitations. One of the major issues in any empirical research is reliability. However, we ensured a good representation of all targets via random sampling and non-response bias analysis. While we recognize that using multiple informants would be a more effective method in assessing culture, we could not avoid the use of a single-respondent strategy, which, however, is common in many studies of similar designs (e.g. Fink & Neumann, 2009). In an attempt to increase the validity of the culture measurements, we carefully analyzed response behavior and controlled the role of the target person. The respondents were CEOs, which we identified by name through Internet and database searches. Most of CEOs completed the survey personally by telephone, whereas we used filter questions to recognize who was completing the other surveys. Smith and Tushman (2005) argue that an important function of the CEO is to determine the organizational forms and cultures that sustain exploration and exploitation. Accordingly, CEOs might create different units associated with contradictory innovation agendas. Yet, we assume to have a diverse sample of high and low-balanced cultures. As we considered SMEs only, CEOs can be assumed to be key informants as they typically are owner managers (considering that in our sample 67.4% of the organizations are small firms) and have been working in the firm for a long time (considering that in our sample respondents have been working in a management capacity at the firm for 12.7 years in the mean and only 8.4% have been working in such a capacity < 3 years). Hence, our target persons have a satisfying level of job maturity and we assume that they have acquired a more developed understanding and oversight of the firm especially in comparison with their peers in larger firms. However, our instrument did not inquire about cumulative experiences of the firm and the important role of path dependency (Van den Bosch et al., 1999; Zahra et al., 2006). For example, related research shows that higher levels of repetitive and accumulative diversification activities help firms build valuable experience to perform better in their diversification programs (Andreou, Louca, & Petrou, 2016). In this regard, future studies could therefore also consider the roles of firms' past repetitive and accumulative exploratory and exploitative innovation experiences in conjunction with cultural balance in the evaluation of innovation performance.

With regard to response bias, neither the Harman's single-factor test nor the marker variable approach did not reveal concerns regarding common method bias (Malhotra, Kim, & Patil, 2006) and the analysis of effects of our individual level control variables did not reveal haloing concerns (Beckwith et al., 1978). The multiple pretests should have ensured a low rate of measurement error, in particular regarding the inquiry about specific cultures. However, due to ambiguities and differing naming conventions, some imprecision in terms of responses seems likely. To test for moderation effects of cultural balance, we applied a multiple-group moderation analysis for discrete moderators. We therefore dichotomized the variation of cultural balance and accepted a loss of statistical power to arrive at two equally sized groups. We also repeated the analysis using the mean split, which created two unequal group sizes further reducing the statistical power of our analysis. With the alternative classification, one assumed moderation was no longer statistically significant (Hypothesis W3a). However, since our SD distribution is left skewed, we concluded that the median split was the better measure of central tendency.

In terms of nationality bias, future research could try to replicate our findings across different economies. In regard to other European countries, the same Amadeus Database could be used to gain a comparable sample of SMEs (Bureau-Van-Dijk, 2009). However, we believe that our empirical findings should also be relevant for SMEs in other economies, especially to those from developed economies within the European Union. Finally, future research may wish to investigate more closely the identified threshold level of RAC, which is needed to exploit cultural balance to produce better innovation outcomes. For instance, by probing the interaction (in Fig. 3) using the pick-a-point approach or the Johnson-Neyman technique (see Hayes, 2013 for more details).

5.4. Conclusion

The objective of this research was to study the link between absorptive capacity and exploratory and exploitative innovation in the context of SMEs by paying particular attention to the role of cultural balance in this relationship. We confirmed that potential absorptive capacity positively impacts realized absorptive capacity, but it seems that this relationship evolves independently from the high-balanced or low-balanced form of organizational cultures. We found that the effects of potential absorptive capacity on exploratory and exploitative innovation are generally mediated by realized absorptive capacity. Interestingly, the “best” culture for exploiting realized absorptive capacity for exploratory and exploitative innovation seems to be one of equilibrium in which organizations display the qualities of fundamentally competing value systems. We believe that the key for SMEs to build a strategic innovation mechanism is based initially on developing higher levels of potential and realized absorptive capacities and then accommodate high-balanced forms of organizational cultures. We hope that this paper will stimulate new ideas and research to extend or refute our rationale.

Appendix A

Table A.1
Measurement items.

Items	Literature
Exploratory innovation	Jansen et al., (2006)
Our organization accepts demands that go beyond existing products and services (EXPR1).	
We invent new products and services (EXPR2).	
We experiment with new products and services in our local market (EXPR3).	
We commercialize products and services that are completely new to our organization (EXPR4).	
We frequently utilize new opportunities in new markets (EXPR5).	
Our organization uses new distribution channels (EXPR6).	
Exploitative innovation	
We frequently refine the provision of existing products and services (EXPI1).	
We regularly implement small adoptions to existing products and services (EXPI2).	
We introduce improved, but existing products and services for our local market (EXPI3).	

We improve our provision's efficiency of products and services (EXPI4).	
We increase economies of scale in existing markets (EXPI5).	
Our organization expands services for existing clients (EXPI6).	
Potential absorptive capacity	Adapted from (Camisón & Forés, 2010; Flatten et al., 2011)
Searching for relevant external information is everyday business in our organization (PAC1-Acq1).	
Our employees are encouraged to identify and consider external information sources (PAC1-Acq2).	
We expect our employees to acquire relevant external information (PAC1-Acq3).	
Ideas and concepts obtained from external sources are quickly analyzed and shared (PAC2-Ass1).	
We work together across the organization to interpret and understand external information (PAC2-Ass2).	
In our organization, external information is quickly exchanged between business units (PAC2-Ass3).	
We regularly organize and conduct meetings to discuss new insights (PAC2-Ass4).	
Realized absorptive capacity. Our employees…	
…have the ability to structure and use newly collected information (RAC3-Tra1).	
…are used to preparing newly collected information for further purposes and making it available (RAC3-Tra2).	
…are able to integrate new information into their work (RAC3-Tra3)	
…have immediate access to stored information, e.g. about new or changed guidelines or instructions (RAC4-Exp1).	
…regularly engage in the development of prototypes or new concepts (RAC4-Exp2).	
…apply new knowledge in the workplace to respond quickly to environment changes (RAC4-Exp3).	
Dominant Characteristics. The organization …	(Cameron & Quinn, 2006)
…is a very personal place. It is like an extended family. People seem to share a lot of themselves (DC1).	
…is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks (DC2).	
…is very results-oriented. The main concern is with getting the job done. People are very competitive and achievement-oriented (DC3).	
…is a very controlled and structured place. Formal procedures generally govern what people do (DC4).	
Organizational leadership. The leadership is generally considered to exemplify…	
… mentoring, facilitating and nurturing (OL1).	
… entrepreneurship, innovation and risk taking (OL2).	
… a no-nonsense, aggressive, results-oriented focus (OL3).	
… coordinating, organizing and smooth-running efficiency (OL4).	
Management of employees. The management style in the organization is characterized by…	
… teamwork, consensus and participation (ME1).	
… individual risk taking, innovation, freedom and uniqueness (ME2).	
… hard-driving competitiveness, high demands and achievement (ME3).	
… security of employment, conformity, predictability and stability in relationships (ME4).	
Organizational glue. The glue that holds the organization together is…	
… loyalty and mutual trust. Commitment to this organization runs high (OG1).	
… commitment to innovation and development. There is an emphasis on being at the cutting edge (OG2).	
… the emphasis on achievement and goal accomplishment (OG3).	
… formal rules and policies. Maintaining a smooth-running organization is important (OG4).	

Appendix B

Table B.1
Internal consistency, convergent validity, discriminant validity and cross-loadings for reflective constructs.

Latent construct	Composite reliability	AVE	Fornell-Larcker criterion			
			PAC	RAC	EXPI	EXPR
Potential absorptive capacity (PAC)	0.84	0.73	**0.85**			
Realized absorptive capacity (RAC)	0.91	0.83	*0.60*	**0.91**		
Exploitative innovation (EXPI)	0.88	0.59	*0.33*	*0.54*	**0.77**	
Exploratory innovation (EXPR)	0.92	0.66	*0.46*	*0.52*	*0.43*	**0.81**
Cross-loadings						
PAC1			**0.84**	0.48	0.28	0.37
PAC2			**0.86**	0.53	0.28	0.41
RAC3			0.52	**0.88**	0.39	0.32
RAC4			0.56	**0.94**	0.57	0.59
EXPI1			0.37	0.59	**0.90**	0.42
EXPI2			0.28	0.54	**0.90**	0.33
EXPI3			0.19	0.29	**0.72**	0.30
EXPI4			0.27	0.45	**0.90**	0.38
EXPI5			0.13	0.23	**0.68**	0.46
EXPI6			0.23	0.30	**0.77**	0.38
EXPR1			0.38	0.45	0.33	**0.77**
EXPR2			0.46	0.53	0.35	**0.88**
EXPR3			0.35	0.48	0.43	**0.86**
EXPR4			0.37	0.38	0.40	**0.88**
EXPR5			0.36	0.31	0.28	**0.74**
EXPR6			0.27	0.30	0.29	**0.72**

Composite reliability (ρ_c) = $(\Sigma \lambda_i)^2 / ((\Sigma \lambda_i)^2 + \Sigma$ var.$(\varepsilon_i))$, where λ_i is the component loading to an indicator and var. $(\varepsilon_i) = 1 - \lambda_i^2$; AVE is the average variance extracted (AVE) by latent constructs from their indicators; on the diagonal are the square roots of AVE in bold font and in the lower right triangle are the correlations among latent constructs in italic font.

Table B.2
Heterotrait-Monotrait ratio (HTMT).

	Potential absorptive capacity (PAC)	RAC	EXPI
Realized absorptive capacity (RAC)	0.841		
Exploitative innovation (EXPI)	0.439	0.597	
Exploratory innovation (EXPR)	0.602	0.572	0.484

Table B.3
Marker variable analysis: model comparison.

Path	Baseline model			Model with marker M1			Model with marker M2		
	Est.	S.E	Sig.	Est.	S.E	Sig.	Est.	S.E	Sig.
PAC ➜ RAC	0.60	0.07	9.01	0.60	0.07	8.77	0.60	0.07	8.87
PAC ➜ EXPI	0.01	0.09	0.07	0.01	0.09	0.08	0.01	0.09	0.05
PAC ➜ EXPR	0.23	0.09	2.62	0.23	0.09	2.58	0.23	0.09	2.58
RAC ➜ EXPI	0.54	0.11	5.12	0.54	0.11	5.00	0.54	0.11	5.26
RAC ➜ EXPR	0.38	0.10	4.01	0.38	0.10	4.07	0.38	0.10	4.00
M1 ➜ RAC				− 0.01	0.07	0.11			
M1 ➜ EXPI				− 0.05	0.08	0.67			
M1 ➜ EXPR				− 0.03	0.07	0.41			
M2 ➜ RAC							0.02	0.07	0.31
M2 ➜ EXPI							− 0.04	0.07	0.61
M2 ➜ EXPR							− 0.01	0.06	0.19

Appendix C

Table C.1
Summary of hypotheses and findings.

ID	Hypothesis	Verdict
	Potential absorptive capacity (PAC) is an antecedent of realized absorptive capacity (RAC).	
H1	PAC positively affects RAC.	Supported
	Absorptive capacity positively impacts innovation:	
H2a	PAC positively affects exploratory innovation.	Supported
H2b	PAC positively affects exploitative innovation.	Not supported
H3a	RAC positively affects exploratory innovation.	Supported
H3b	RAC positively affects exploitative innovation.	Supported
	Mediation effects of RAC for PAC on innovation:	
M1a	The positive effects of PAC on exploratory innovation are mediated by RAC.	Partial mediation
M1b	The positive effects of PAC on exploitative innovation are mediated by RAC.	Full mediation
	Moderation effects of organizational culture for AC on innovation:	
W1	The positive effects of PAC on RAC will be stronger when organizations are characterized by high-balanced cultures.	Not supported
W2a	The positive effects of PAC on exploratory innovation will be stronger when organizations are characterized by high-balanced cultures.	Not supported
W2b	The positive effects of PAC on exploitative innovation will be stronger when organizations are characterized by high-balanced cultures.	Not supported
W3a	The positive effects of RAC on exploratory innovation will be stronger when organizations are characterized by high-balanced cultures.	Supported
W3b	The positive effects of RAC on exploitative innovation will be stronger when organizations are characterized by high-balanced cultures.	Supported
	Moderated mediation:	
W4a	The mediated effects of PAC on exploratory innovation will be stronger when organizations are characterized by high-balanced cultures.	Not supported
W4b	The mediated effects of PAC on exploitative innovation will be stronger when organizations are characterized by high-balanced cultures.	Not supported

Appendix D

Table D.1
Results of moderation analysis.

Hypothesis	Path	β low-balanced	β high-balanced	t-Statistic
W1	PAC ➔ RAC	0.65	0.55	0.65
W2a	PAC ➔ EXPR	0.37	0.16	1.25
W2b	PAC ➔ EXPI	0.12	− 0.08	1.01
W3a	RAC ➔ EXPR	0.19	0.54	**2.14***
W3b	RAC ➔ EXPI	0.30	0.75	**2.00***
W4a	PAC^M ➔ $EXPR^M$	0.49	0.46	0.23
W4b	PAC^M ➔ $EXPI^M$	0.32	0.34	0.13

PAC^M ➔ $EXPR^M$ and PAC^M ➔ $EXPI^M$ represent moderated mediation relationships.
* In bold fond t-statistic significant for $p < 0.05$.

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