

RESEARCH ARTICLE

Exploring the determinants of ambidexterity in the context of Small and Medium Enterprises (SMEs): A meta-analytical review

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Abstract

Decades of ambidexterity research have gained huge scholarly attention from diverse research areas like marketing, organizational learning, innovation management, supply chain management, strategy, and entrepreneurship. However, it has been observed that past studies do not provide a quantitative assessment of ambidexterity determinants applicable to small and medium firms. In response, this study attempts to address this gap by providing an extensive list of eight determinants that are significantly related to Small and Medium Enterprise (SME) ambidexterity. We employed Random effects meta-analytical procedure to examine the combined effect sizes of each determinant. The analysis was based on 37 empirical publications from 2004 to 2021, involving 8422 SME observations and 48 correlations. The findings of the meta-analysis revealed that all the considered determinants such as Knowledge management, Entrepreneurial orientation, Formalization, Market orientation, Networking, Technological capability, Organization context, and Environmental dynamism are heterogeneous, and they all exert a significant positive impact on ambidexterity.

Keywords: Ambidexterity; heterogeneity; meta-analysis; random effects model; Small and Medium Enterprises (SMEs)

Introduction

Ambidexterity literature has attracted significant scholarly attention over the years (Mathias, Mckenny, & Crook, 2018; Zimmermann, Hill, Birkinshaw, & Jaeckel, 2020) due to the recognition that achieving ambidexterity is critical for sustained business performance (Cao, Simsek, & Zhang, 2010; Marín-Idárraga, Hurtado González, & Cabello Medina, 2020). Organizational ambidexterity implies the capability of firms to not only be efficient at exploiting the current business operations but also to track and explore new business opportunities (Gibson & Birkinshaw, 2004; Mathias, Mckenny, & Crook, 2018). The general agreement is that an equal emphasis on exploitation and exploration is vital for fostering competitive advantage and ensuring long-term business sustainability (Chakma, Paul, & Dhir, 2021; March, 1991; Vahlne & Jonsson, 2017). Literature suggests that firms or Small and Medium Enterprises (SMEs) in particular may outperform their competitors when they become ambidextrous by simultaneously handling multiple innovations such as exploitative or incremental and exploratory or radical innovations (Mueller, Rosenbusch, & Bausch, 2013; Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019). However, achieving ambidextrous innovation is not straightforward because incremental and radical activities require significantly different learning and knowledge processing activities (Pertusa-Ortega & Molina-Azorin, 2018; Smith, Gilbert, & Sutherland, 2017; Tian, Dogbe, Pomegbe, Sarsah, & Otoo, 2020). Exploitative innovation allows modifications in existing

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business processes, skills, and knowledgebase to ensure efficiency in current business operations (March, 1991). Exploratory innovation is associated with challenging the current business activities through experimentation, discovering new initiatives, risk-taking, and searching for new business trajectories (March, 1991) to ensure future business viability. Therefore, many researchers viewed the exploitation-exploration relationship through a paradoxical perspective as they demand different structures, capabilities, processes, and strategies or even may generate tensions within a firm regarding its resource allocation approaches (Andriopoulos & Lewis, 2009; Koryak, Lockett, Hayton, Nicolaou, & Mole, 2018; Smith, Gilbert, & Sutherland, 2017).

A majority of ambidexterity research is dedicated to large firms that have several business units (Heirati, O’Cass, & Sok, 2017; Jansen, Van Den Bosch, & Volberda, 2006) however, many scholars have argued that achieving ambidexterity is more challenging for SMEs as compared to the large companies (Soto-Acosta, Popa, & Martinez-Conesa, 2018; Tian et al., 2020). Contrary to the big companies, SMEs face huge resource limitations such as financial, technological, and human resources to effectively deal with various internal and external issues (Chang & Hughes, 2012; Soto-Acosta, Popa, & Martinez-Conesa, 2018), and as a result, they face several challenges in balancing the contradictions and tensions associated with incremental and radical innovations (Koryak et al., 2018; Lei, Khamkhoutlavong, & Le, 2021; Wenke, Zapkau, & Schwens, 2021; Zimmermann et al., 2020).

Based on the assumption that SMEs require different approaches and means while pursuing ambidextrous innovation (Giampaoli, Ciambotti, & Bontis, 2017; Martinez-Conesa, Soto-Acosta, & Carayannis, 2017; Simao & Franco, 2018), scholars have acknowledged that there should have further research on the determinants of ambidexterity in the unique context of small and medium firms (Soto-Acosta, Popa, & Martinez-Conesa, 2018; Tian et al., 2020). This may be in line with the fact that SMEs play a crucial role in the economic activities of nations in the form of employment generation, GDP growth, and skill development (Ayoko, 2021; Tian et al., 2020). So, there is a requirement to identify the factors that affect ambidexterity in SMEs (Zimmermann et al., 2020). Existing Meta analytical reviews of ambidexterity literature have investigated the impact of ambidexterity on firm performance (Junni, Sarala, Taras, & Tarba, 2013; Mathias, Mckenny, & Crook, 2018), the influence of various internal and external moderators on ambidexterity-performance linkage (Marín-Idárraga, Hurtado González, & Cabello Medina, 2020; Mueller, Rosenbusch, & Bausch, 2013; Shi, Su & Cui., 2020), and also the relative performance implication of ambidexterity, exploitation, and exploration (Wenke, Zapkau, & Schwens, 2021). However, the quantitative synthesis of ambidexterity determinants in the SME context finds no evidence in the literature. Therefore, given the importance of analyzing ambidexterity in the unique context of SMEs, we seek to advance the ambidexterity literature by aggregating its determinants quantitatively.

Organizational ambidexterity has been investigated as a critical strategy in management research as it has a robust theoretical linkage with improved firm performance and profitability (Junni et al., 2013), sales growth (He & Wong, 2004), firm survival in crises (Dolz, Iborra, & Safón, 2019) and innovation performance (Tian et al., 2020). Conversely, the extant literature raises the theoretical relevance of ambidexterity regarding SMEs and their external and internal constraints. Internal constraints include limited access to capital, limited management expertise, lack of talented human resources, lack of marketing, and inadequate slack resources (Chang, Hughes, & Hotho, 2011). As a result of these internal issues, SMEs are highly susceptible to external shocks such as economic crises, natural calamities, and market and technological turbulence (Prajogo & Mcdermott, 2014). Due to these inherent characteristics of SMEs, authors like Ebben & Johnson (2005) and Wenke, Zapkau, and Schwens (2021) have suggested that instead of focusing on exploitative and explorative innovations at the same time, SMEs should direct all their efforts and resources on either one of these. In this study, we seek to reduce these discrepancies of ambidextrous innovation in SMEs by examining the role played by different determinants across multiple empirical papers. With the help of Random Effects Meta-Analysis, this study

has attempted to enhance the combined understanding of SME ambidexterity and its determinants in fostering ambidextrous innovation. The results suggest that all the considered determinants of ambidexterity are heterogeneous, implying diverse views and opinions among past researchers. Therefore, the empirical findings of this study serve as a basis for further research on analyzing the determinants of ambidexterity and identifying the influence of possible factors explaining the variability in identified relationships.

This paper offers a few contributions to scholarly research of ambidexterity. Firstly, our research identifies an extensive list of factors to examine ambidexterity. Secondly, the analysis provides an empirical generalization of significant determinants of ambidexterity by accounting for heterogeneity and true population effect sizes (Hunter & Schmidt, 2004). Thirdly, this study helps clarify the scholarly inquiry by resolving the inconsistencies of previous research in terms of contextual determinants and their significance in implementing ambidexterity in SMEs. Fourthly, the study offers practical insights to SME managers and policymakers regarding the promotion of context, capabilities, and resources to successfully carry out exploitative and exploratory innovation.

Theory and hypothesis

Ambidexterity theory suggests that balancing two competing activities like incremental and radical innovation allows a firm to perform better than their competitors and be profitable (March, 1991). Ambidextrous firms are determined to operate in mature markets (where existing core competencies and efficiency are critical) as well as emerging ones (where experimentation and radical innovation are critical) (Chams-Anturi, Moreno-Luzon, & Romano, 2020). Therefore achieving ambidexterity is a critical and fundamental aspect for SME managers to compete in today's volatile business situation. However, as a large number of studies have investigated ambidexterity by considering the issues addressing big companies, it is unclear to what extent the existing findings and prescriptions put forward by scholars can be applied to SMEs (Chang, Hughes, & Hotho, 2011; Lubatkin, Simsek, Ling, & Veiga, 2006; Wenke, Zapkau, & Schwens, 2021).

Existing empirical publications have investigated several factors that potentially influence SME ambidexterity. Our extensive examination of literature revealed eight determinants of ambidexterity for which at least three effect sizes were available. Table 1 provides the bibliographic sources of included studies and it helps us to understand the most impactful journals that empirically assessed the relationship between ambidexterity and its determinants in context of SMEs. Following the work of Pugliese, Bortoluzzi, and Balzano (2022), the temporal distribution of articles for each identified determinant is provided in Figure 1. A complete list of these factors and their respective studies are provided in Table 2. The inclusion criteria for adopting these constructs have been explained in the methodology section. Our literature review demonstrates the importance of various determinants in driving ambidexterity in SMEs and how they offer diverse viewpoints in ambidexterity research.

Environmental dynamism

Previous studies suggest that a firm's innovation strategy is contingent on both external and internal aspects of the environment (Andrade, Franco, & Mendes, 2020; Mammassis & Kostopoulos, 2019; Soto-Acosta, Popa, & Martinez-Conesa, 2018). A dynamic environment implies the rate of variations and uncertainty in a business environment, and it is characterized by several factors like changes in technologies, changes in product or service preferences, and changes in regulatory aspects (Wiratmadja, Profityo, & Rumanti, 2020). The literature considers Environmental Dynamism as a critical aspect for firms that aim to exercise an ambidextrous strategy (Mammassis & Kostopoulos, 2019). High Environmental Dynamism necessitates SMEs to respond quickly to evolving market disruptions by exercising exploratory innovation (Prajogo

Table 1. Summary of publications included in this review

Name of the journal	Number of articles	References
Industrial Marketing Management	3	Tzokas et al. (2015); Mu (2015); Zhang et al. (2016)
European Management Journal	2	Chang and Hughes (2012); Mammassis and Kostopoulos (2019)
IEEE Transaction on Engineering Management	2	Dezi et al. (2021); Santoro et al. (2021)
Journal of Knowledge Management	2	Soto-Acosta, Popa, and Martinez-Conesa (2018); Ramachandran, Lengnick-Hall, and Badrinarayanan (2019)
Academy of Management Journal	2	Subramaniam and Youndt (2005); Patel, Messersmith, and Lepak (2013)
Journal of Management Studies	2	Bierly, Damanpour, and Santoro (2009); Cao, Simsek, and Zhang (2010)
Journal of Business Research	2	Abebe and Angriawan (2014); Cenamor, Parida, and Wincent (2019)
Sustainability	2	Peng, Lin, Peng, and Chen (2019); Abbas et al. (2020)
Review of Managerial Science	1	Andrade, Franco, and Mendes (2020)
European Business Review	1	Berard and Fréchet (2020)
IEEE Access	1	Wiratmadja, Profityo, and Rumanti (2020)
Organization Science	1	Cao, Gedajlovic, and Zhang (2009)
Business Research Quarterly	1	Chams-Anturi, Moreno-Luzon, and Romano (2020)
Management Decision	1	Chang, Hughes, and Hotho (2011)
Journal of Chinese Human Resource Management	1	Fu, Ma, Bosak, and Flood (2015)
Kybernetes	1	Günsel, Altındağ, Kılıç Keçeli, Kitapçı, and Hızıroğlu (2018)
Human Resource Management	1	Heavey, Simsek, and Fox (2015)
Journal of Product Innovation Management	1	Ko and Liu (2019)
International Journal of Emerging Markets	1	Lee et al. (2020)
Journal of Small Business Management	1	Prajogo and Mcdermott (2014)
International Journal of Production Economics	1	Sahi, Gupta, and Cheng (2020)
Strategic Management Quarterly	1	Tran (2016)

Technology Analysis and Strategic Management	1	Tsai and Ren (2019)
Journal of Technology Transfer	1	Vrontis, Thrassou, Santoro, and Papa (2017)
International Journal of Innovation Science	1	Wang (2019)
Journal of International Marketing	1	Yalcinkaya, Calantone, and Griffith (2007)
Strategic Management Journal	1	Zhou and Wu (2010)
Long Range Planning	1	Zimmermann et al. (2020)
Total no of Publications	37	

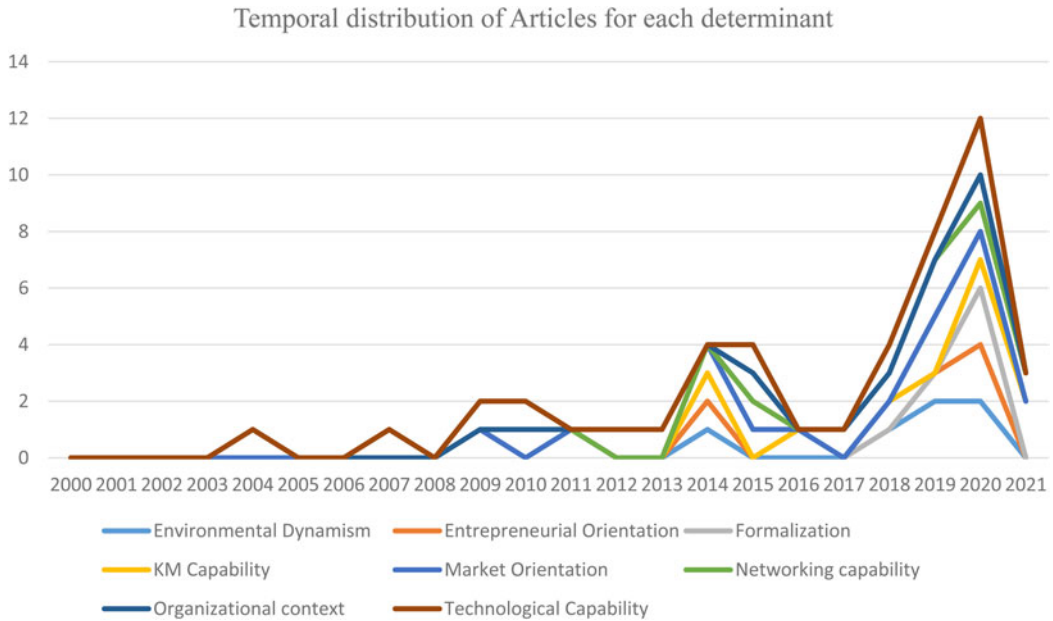


Figure 1. Temporal distribution of articles for each determinant.

& Mcdermott, 2014) with their scant resource base. As a result, several studies have considered Environmental Dynamism as an antecedent to SME ambidexterity (Prajogo & Mcdermott, 2014; Wiratmadja, Profityo, & Rumanti, 2020), whereas other researchers have investigated Environmental Dynamism as a moderator variable between ambidexterity and its other determinants like technological capability (Andrade, Franco, & Mendes, 2020). Therefore, based on the considered studies, we propose that:

H1. Environmental Dynamism impacts SME ambidexterity positively

Entrepreneurial orientation

Entrepreneurial orientation as a strategic capability drives the decision-making activities, resource allocation activities, firm processes, and practices of SMEs that lead to superior competitive advantage (Zhang, Edgar, Geare, & O’Kane, 2016) and desirable performance outcomes (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019; Sahi, Gupta, & Cheng, 2020). Entrepreneurial orientation implies the degree to which the management of small and medium firms inclines innovation, risk-taking, and pro-activeness (Zhang et al., 2016). It also signifies the degree to which these firms give importance to identifying and exploring new markets and opportunities through innovation and risk-taking (Abebe & Angriawan, 2014). Pro-activeness dimension of entrepreneurial orientation follows a forward-looking perspective with a willingness to either enhance current competencies or identify new ones (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019). Therefore, SMEs that strongly emphasize entrepreneurial orientation are more likely to balance exploitative and explorative innovations as they adapt to dynamic environments (Abebe & Angriawan, 2014; Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019; Sahi, Gupta, & Cheng, 2020; Zhang et al., 2016). So, it is hypothesized that:

H2. Entrepreneurial Orientation impacts SME ambidexterity positively

Table 2. List of determinants with their respective studies

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
	Andrade, Franco, and Mendes (2020)	IT and Telecommunication	Portugal	N/A	Summative term of ET and ER	Scale measuring the extent to which the business environment is complex, competitive and unpredictable (adapted from Jansen, Van Den Bosch, and Volberda, 2006)	Positive and significant with ER and ambidexterity, but non-significant with ET
	Cao, Gedajlovic, and Zhang (2009)	High-technology	China	Mid 2006	Multiplicative term of ET and ER (following Gibson and Birkinshaw, 2004)	Volatility in sales growth during the last three years	Positive and significant with ambidexterity
	Chang, Hughes, and Hotho (2011)	Manufacturing and Service	Scotland	From November 2008 to June 2009.	Absolute difference between ER and ET (following He & Wong, 2004)	Rapid changes in technologies, products and market competition (scale measurement)	Positive and significant with ambidexterity
Environmental dynamism (ED)	Mammassis and Kostopoulos (2019)	High-technology	Greece	N/A	Multiplicative term of ET and ER	Rate of variation and instability in external environment (scale measurement)	Positive and significant with ambidexterity
	Prajogo and Mcdermott (2014)	Service	Australia	N/A	Multiplicative term of ET and ER	Scale adapted from Jansen, Van Den Bosch, and Volberda, 2006)	Positive and significant with ER and ET
	Soto-Acosta, Popa, and Martinez-Conesa (2018)	Manufacturing	Spain	From May to June 2016	Multiplicative term of ET and ER	Three item scale adapted from Jansen, Van Den Bosch, and Volberda, 2006)	Positive and significant with ambidexterity
	Wang (2019)	Manufacturing	Taiwan	From 2017 to 2018	ER and ET was measured separately	The rate at which business market is dynamic and uncertain in terms of products, services and customer preferences (scale measurement)	Positive relationship with ER and ET

(Continued)

Table 2. (Continued.)

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
	Zimmermann et al. (2020)	Manufacturing	Germany	2012 for the first survey and 2014 for the second	Multiplicative term of ET and ER	Scale adapted from Jansen, Van Den Bosch, and Volberda, (2006)	Positive relationship with ambidexterity
	Abebe and Angriawan (2014)	Manufacturing and Service	USA	From September to December, 2009)	Separate measure of ER and ET	Scale measuring three dimensions of EO such as pro-activeness, risk-taking and innovation	Positive and significant with ER, but non-significant with ET
	Ramachandran, Lengnick-Hall, and Badrinarayanan (2019)	High-technology	USA	N/A	Summative term of ET and ER	Scale adapted from the literature	Positive and significant with ambidexterity
Entrepreneurial Orientation (EO)	Sahi, Gupta, and Cheng (2020)	Manufacturing	India	January to September 2017	Absolute difference between ER and ET	Scale measuring innovativeness, pro-activeness and risk-taking	Positive and significant with ER and ET
	Tran (2016)	Manufacturing and Service	USA	N/A	Absolute difference and Summative term of ER and ET	Existing scale	Positive and significant with ambidexterity
	Zhang et al. (2016)	Manufacturing and Service	China	N/A	Summation term of ER and ET	Operationalized as a second-order construct measuring innovation, risk-taking and pro-activeness	Positive and significant with ER and ET
	Berard and Fréchet (2020)	Manufacturing and Service	France	N/A	Separate measures of ET and ER	Scale measuring the existence of well-defined rules, procedures and instruction manuals	Positive and significant with ER and ET

(Continued)

Table 2. (Continued.)

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
Formalization	Chams-Anturi, Moreno-Luzon, and Romano (2020)	Organic agro-food manufacturing	Spain	N/A	Multiplicative term of ET and ER is divided by their synergies	Scale of enabling formalization (adapted from the extant literature)	Positive and significant with ER and ET
	Prajogo and Mcdermott (2014)	Service	Australia	N/A	Multiplicative term of ET and ER	Scale adapted from the extant literature	Non-significant with ET, and significant with ER
	Abbas et al. (2020)	Manufacturing	Pakistan	N/A	Separate measures of Innovation	Scale measuring the expectations of associations, rewards, and the contribution of knowledge	Positive and significant with ET and ER
KM Capability	Dezi et al. (2021)	Manufacturing	Italy	N/A	Absolute difference between ER and ET	Scale measuring the sub-dimensions of KM, such as knowledge acquisition, dissemination and responsiveness	Positive and significant with ambidexterity
	Santoro et al. (2021)	High-technology	Italy	N/A	Absolute difference between ER and ET	KM strategy and KM infrastructure scales	Positive and significant with Ambidexterity
	Soto-Acosta, Popa, and Martinez-Conesa (2018)	Manufacturing	Spain	From May to June 2016	Multiplicative term of ET and ER	The extent to which different KM practices are utilized across the functional boundaries (Scale measurement)	Positive and significant with ambidexterity
	Abebe and Angriawan (2014)	Manufacturing and Service	USA	From September to December, 2009)	Separate measures of ET and ER	Scale measuring three dimensions of MO, such as inter-functional coordination, customer and competitor orientation	Positive and significant with ET and ER

(Continued)

Table 2. (Continued.)

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
	Mu (2015)	High-technology	USA	N/A	Separate measures of ET and ER	Scale adapted from the extant literature	Positive and significant with ET, but non-significant with ER
Market Orientation (MO)	Peng et al. (2019)	High-technology	Taiwan	From March 2018 to May 2018	Multiplicative term of ET and ER	Scale measuring inter-functional coordination, customer and competitor orientation	Positive and significant with ET, ER and ambidexterity
	Ramachandran, Lengnick-Hall, and Badrinarayanan (2019)	High-technology	USA	N/A	Summation term of ER and ET	Existing scale	Positive and significant with ambidexterity
	Sahi, Gupta, and Cheng (2020)	Manufacturing	India	January to September 2017	Absolute difference between ER and ET	Scale adapted from the extant literature	Positive and significant with ET and ER
	Cao, Simsek, and Zhang (2010)	High-technology	China	N/A	Absolute difference between ER and ET	Extensiveness of CEOs information networks	Positive and significant with ambidexterity
	Cenamor, Parida, and Wincent (2019)	Manufacturing	Sweden	N/A	Separate measures of ET and ER	Existing scale	Positive and significant with ET and ER
	Dezi et al. (2021)	Manufacturing	Italy	N/A	Absolute difference between ER and ET	Scale measuring the characteristics of networks for a focal firm	Positive and significant with ambidexterity
Networking capability (NC)	Günsel et al., (2018)	Information Technology	Turkey	N/A	Separate measures of ET and ER	Scale adapted from the extant literature	Positive relationship with ET and ER
	Heavey, Simsek, and Fox (2015)	High-technology	USA	N/A	Multiplicative term of ET and ER	Scale measuring the strength of networking extensiveness	Positive and significant with ambidexterity

(Continued)

Table 2. (Continued.)

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
	Lee et al. (2020)	Manufacturing and Service	Ecuador and China	N/A	Multiplicative term of ET and ER	Scale adapted from Subramaniam and Youndt (2005)	Positive and significant with ambidexterity
	Subramaniam and Youndt (2005)	Manufacturing and service	USA	N/A	Separate measures of ET (Incremental innovation) and ER (Radical innovation)	Development of scale	Positive relationship with ET and ER
	Tsai and Ren (2019)	Manufacturing	Taiwan	N/A	Strategic ambidexterity	The number of director linkages outside a focal firm	Positive but non-significant with ambidexterity
	Vrontis et al. (2017)	High-technology	Italy	N/A	Summative term of ET and ER	Existing scale	Positive and significant with ambidexterity
	Chang and Hughes (2012)	Manufacturing and service	Scotland	November 2008 to June 2009	Absolute difference between ER and ET	Scale adapted from Gibson and Birkinshaw (2004)	Positive and significant with ambidexterity
Organizational context (OC)	Fu et al. (2015)	Professional Service	China	N/A	Absolute difference between ER and ET	Existing scale	Positive and non-significant with ET, ER and ambidexterity
	Patel, Messersmith, and Lepak (2013)	High-technology	USA	October 2009 to January 2010	Ambidexterity congruence (ER – ET)	Scale development	Positive and significant with ambidexterity
	Zimmermann et al. (2020)	Manufacturing	Germany	2012 for the first survey and 2014 for the second	Multiplicative term of ET and ER	Scale adapted from Gibson and Birkinshaw (2004)	Positive and significant with ambidexterity

(Continued)

Table 2. (Continued.)

Determinants	Author (year)	Industry	Country	Data collection period	Adopted measures of ambidexterity	Operationalization and measurement of determinants	Correlation with ER, ET and ambidexterity
	Andrade, Franco, and Mendes (2020)	IT and Telecommunication	Portugal	N/A	Summative term of ER and ET	Scale	Positive and significant with ER and ambidexterity but non-significant with ET
	Bierly, Damanpour, and Santoro (2009)	Manufacturing and High-technology	USA	N/A	Separate measures of knowledge ET and ER	Scale measuring technological relatedness and R&D investment	Positive and significant with ER and ET
	Ko and Liu (2019)	Manufacturing	UK	March to September 2017	Multiplicative term of ET and ER	Scale measuring IT assimilation	Positive and significant with ER and ET
Technological Capability (TC)	Soto-Acosta, Popa, and Martinez-Conesa (2018)	Manufacturing	Spain	From May to June 2016	Multiplicative term of ET and ER	Scale assessing the extent to which IT is used to support business operations	Positive and significant with ambidexterity
	Tzokas et al. (2015)	High-technology (Semiconductor)	South Korea	Mid 2011	Separate measures of ET and ER	Usage of technology as compared to the competitors (Scale)	Positive relationship with ET and ER
	Wiratmadja, Profityo, and Rumanti (2020)	Broiler poultry	Indonesia	October 2019 to May 2020	Absolute difference between ER and ET	Existing scale	Positive and significant with ambidexterity
	Yalcinkaya, Calantone, and Griffith (2007)	Manufacturing	USA	N/A	Separate measures of ET and ER capability	Sourcing of technological resources	Significant and positive with ER but negative relationship with ET
	Zhou and Wu (2010)	High-technology	China	N/A	Separate measures of ET and ER	Scale measuring the ability to use various technologies	Positive and significant with ET but curvilinear relationship with ER

Notes: ER, Exploration; ET, Exploitation; N/A, Not Available.

Formalization

Formalization implies the extent to which work-related activities are defined explicitly in terms of formal procedures, rules, and instructions (Prajogo & Mcdermott, 2014). According to previous studies, the debate on formalization and ambidexterity relationship is conflicting (Chams-Anturi, Moreno-Luzon, & Romano, 2020). For instance, few studies found that formalization encourages exploitative innovation, but it also slows explorative innovation by emphasizing routines that hinder experimentation (Berard & Fréchet, 2020; Jansen, Van Den Bosch, & Volberda, 2006). These authors have argued the differential influence of formalization on SMEs' exploitation and exploration initiatives. Conversely, scholars like Chams-Anturi, Moreno-Luzon, and Romano (2020) have found that formalization helps to promote ambidextrous innovation in SMEs by encouraging knowledge creation and creativity. They emphasized that the role of formalization on ambidexterity is confusing because earlier studies have not paid enough attention to different kinds of formalizations, such as enabling formalization and coercive formalization. However, by investigating organic food manufacturers (239 responses) based in Spain, Chams-Anturi, Moreno-Luzon, and Romano (2020) found that enabling formalization impacts ambidexterity positively, and coercive formalization has a non-significant impact on ambidexterity. Therefore, in line with these studies, the following hypothesis is proposed:

H3. Formalization impacts SME ambidexterity positively

Knowledge management capability

Ambidexterity literature has considered knowledge management (KM) capability a critical determinant of innovation (Soto-Acosta, Popa, & Martinez-Conesa, 2018) because of the recognition that the acquisition and application of diverse knowledgebase help SMEs cope with dynamic and the competitive environment (Santoro, Thrassou, Bresciani, & Del Giudice, 2021). Also, the knowledge-based view contemplates knowledge as a valuable strategic resource in fostering innovation capabilities and better sustainable firm performance (Abbas, Zhang, Hussain, Akram, Afaq, & Shad, 2020; Li, Lin, & Cui, 2018; Soto-Acosta, Popa, & Martinez-Conesa, 2018) because unique and tacit knowledgebase is not easily imitable. Therefore, past studies have investigated the contribution of KM capability in balancing knowledge exploitation and exploration efficiently (Dezi, Alberto, Armando, & Demetris, 2021). This is even more critical for SMEs to reduce external risks and complexities (Soto-Acosta, Popa, & Martinez-Conesa, 2018). Based on all the considered studies, we hypothesize that:

H4. KM capability impacts SME ambidexterity positively

Market orientation

Firms with better market orientation pay significant attention to customers, competitors, and inter-functional coordination (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019). Customer orientation emphasizes fostering customer satisfaction by identifying and meeting current and prospective customer needs, whereas competitor orientation helps examine competitors' relative weaknesses and strengths by identifying the issues related to current product or service offerings (Abebe & Angriawan, 2014; Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019). Inter-functional integration enables production efficiency with effective communication and collaboration (Mu, 2015). Literature has studied the impact of market orientation on ambidexterity (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019; Sahi, Gupta, & Cheng, 2020) and the degree of exploitation and exploration (Abebe & Angriawan, 2014). Market orientation helps to foster a culture of enabling exploitative and exploratory innovation for delivering and enhancing superior customer values (Abebe & Angriawan, 2014). Based on the studies mentioned above, we propose that:

H5. Market Orientation impacts SME ambidexterity positively

Networking capability

Scholars have studied various concepts related to networking and ambidextrous innovations (Cao, Simsek, & Zhang, 2010; Cenamor, Parida, & Wincent, 2019; Heavey, Simsek, & Fox, 2015; Lee, Cortes, Zhuang, & Herrmann, 2020; Tsai & Ren, 2019). Networking enables a firm to access various resources through collaboration and continuous interaction (Subramaniam & Youndt, 2005). Similarly, speed to innovation can also be enhanced by increasing intra-firm and inter-firm knowledge dissemination (Cenamor, Parida, & Wincent, 2019). Heavey, Simsek, and Fox (2015) argued that managerial network extensiveness (ties with internal and external actors) provides a dual knowledge base necessary for exercising ambidexterity. Similarly, Cenamor, Parida, and Wincent (2019) investigated manufacturing SMEs in Sweden and established that networking capability is a mediator in the relationship between technological capability and SMEs' performance. Therefore, we propose the following hypothesis:

H6. Networking capability impacts SME ambidexterity positively

Organizational context

Organizational context is characterized by the interaction between discipline, trust, stretch, and support. It encourages individual employees to apply their acumen while distributing their time and efforts to pursue exploitative-oriented and exploratory-oriented innovations (Gibson & Birkinshaw, 2004). Similarly, other researchers (e.g., Patel, Messersmith, & Lepak, 2013), in line with Gibson and Birkinshaw (2004), have established a link between ambidexterity and HPWS (High-performance work systems). They argued that HPWS practices like training, staffing, and job-related rewards are associated with four characteristics of organizational context such as discipline, trust, stretch, and support that facilitate ambidexterity in SMEs ((Patel, Messersmith, & Lepak, 2013). Therefore, we propose the following hypothesis as:

H7. Organizational context impacts SME ambidexterity positively

Technological capability

Technological Capability enables a firm to track, identify, organize and apply various technological resources to achieve favorable performance outcomes (Wiratmadja, Profityo, & Rumanti, 2020). Each firm possesses specific technological resources like the number of patents owned, the number of technical people employed, or the amount of available technological knowledge (Zhou & Wu, 2010). Previous literature also demonstrated the vital contribution of technological capability in enabling ambidexterity and new product or process innovations within SMEs (Andrade, Franco, & Mendes, 2020; Soto-Acosta, Popa, & Martinez-Conesa, 2018; Tzokas, Kim, Akbar, & Al-Dajani, 2015; Yalcinkaya, Calantone, & Griffith, 2007). For instance, Andrade, Franco, and Mendes (2020) argued that technological capability facilitates exploitative innovation at an accelerated pace. Also, the accumulation of technical expertise over time enables exploratory innovation by identifying, evaluating, and selecting external knowledge, information, and technologies (Andrade, Franco, & Mendes, 2020). However, a few studies also posited that technological capability has a differential implication on ambidexterity (Andrade, Franco, & Mendes, 2020; Zhou & Wu, 2010). For example, Zhou and Wu (2010), by analyzing hi-technology firms based in China, found that technological capability has a favorable impact for exploitative orientation; however, it has an inverted *U* shape association with exploratory orientation. Therefore, we propose that:

H8. Technological Capability impacts SME ambidexterity positively

Methodology

Survey of the literature and identification of studies

An extensive literature search was conducted to identify all the relevant empirical studies published by 2021. Databases like Web of Science and SCOPUS were explored with the help of multiple keywords like ‘organizational ambidexterity’ OR ‘exploration and exploitation’ AND ‘Small and Medium enterprises’ OR ‘SMEs’ in ‘Title, Abstracts and Keywords’ category. We further screened our search strategy by filtering the subject area to ‘Business, Management and Accounting’ and language to ‘English’ to ensure the availability of relevant publications. We also manually looked at the more appropriate journals of ambidexterity research (as described by Birkinshaw & Gupta, 2013), such as the Journal of Management Studies, Strategic Management Journal, Academy of Management Journal, and Organization Science. In addition, other influential management journals like Journal of Business Venturing, Journal of Product Innovation Management, Journal of Small Business Management, Long Range Planning, Entrepreneurship theory and Practice were also considered for retrieving the papers that used SMEs as their sample study. Finally, We adopted the snowball sampling approach by manually looking at the references and citations of previously retrieved empirical as well as review articles of the field (e.g., Fourné, Rosenbusch, Heyden, & Jansen, 2019; Junni et al., 2013; Marín-Idárraga, Hurtado González, & Cabello Medina, 2020; Mathias, Mckenny, & Crook, 2018; Mueller, Rosenbusch, & Bausch, 2013; Wenke, Zapkau, & Schwens, 2021). All these strategies helped us accommodate the valuable and relevant articles left behind. Overall, the adopted search strategy identified approximately 450 records, and 385 articles were screened after removing the duplicates. Figure 2 elaborates on the data retrieval process, providing an overview of article screening, exclusion, and inclusion criteria.

Inclusion/exclusion of publications

Following the past Meta-analytic studies (Junni et al., 2013; Khosravi, Newton, & Rezvani, 2019; Wagner, 2021), we included the publications based on the following criteria: (1) studies that reported correlation coefficients representing the relationship between ambidexterity and its determinants, (2) studies that included SMEs or firms with employees less than 500 as their sample of interest because the comparison among studies with different level of analysis is not

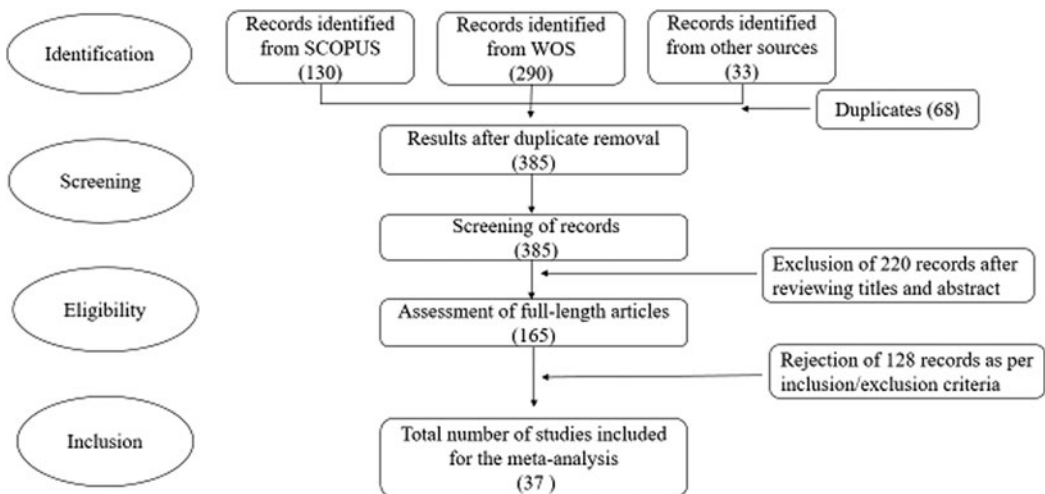


Figure 2. Data Retrieval process

straightforward and we were interested in exploring the factors that have been investigated in the context of SMEs only (3) factors for which at least three effect sizes are available in the literature. Therefore, publications based on conceptual studies, qualitative studies, review articles, or papers that did not report correlation are not included in our study sample. We finally retrieved 37 studies representing 8,422 SMEs and 48 correlations.

Measures and coding of key constructs

After identifying the relevant articles, the constructs were coded as Dependent and Independent variables. The ambidexterity construct was coded as a dependent variable because the primary objective of this analysis is to synthesize the determinants of ambidexterity by investigating their role in driving ambidexterity. The dimensions of ambidexterity, such as exploitative and explorative orientation, have been interchangeably investigated as incremental versus radical innovation in the literature (Mueller, Rosenbusch, & Bausch, 2013). In a few primary studies, different effect sizes were available to define the relationship between the determinants and exploitation and exploration. Therefore, following Hunter and Schmidt (2004), we averaged the effect sizes of those studies to produce a single estimate for each study. We coded the variables such as Entrepreneurial orientation (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019), Organization context (Gibson & Birkinshaw, 2004), Market orientation (Abebe & Angriawan, 2014), Environmental dynamism (Soto-Acosta, Popa, & Martinez-Conesa, 2018), Technological capability (Wiratmadja, Profitoyo, & Rumanti, 2020), Networking capability (Cenamor, Parida, & Wincent, 2019), Formalization (Prajogo & Mcdermott, 2014) and KM capability (Santoro et al., 2021) as independent and examined the effect sizes depicting their relationship with ambidexterity construct. In order to consolidate every effect size into a summary effect, multiple analyses were performed to assess the mean effect of each factor separately (Borenstein, Hedges, Higgins, & Rothstein, 2010).

Meta-analytic procedure

Meta-analysis is considered the best methodological tool that helps to combine and summarize the results of existing empirical publications explaining a particular association or relationship (Durán & Aguado, 2022; Lin & Yi, 2021; Nguyen, Huang, & Tian, 2021). Meta-analysis helps to assess the heterogeneity or variability among the considered pool of studies and to identify the characteristics or issues impacting the obtained results (Paul & Barari, 2022; Schmid and Morschett, 2020). The assessment of heterogeneity is pivotal in the meta-analysis because the presence and absence of heterogeneity may influence the decision of model selection (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006). Two sources of variability have been considered in the literature for explaining the heterogeneity, such as with-in and between-study variability. The fixed effects meta-analytical model assumes that the heterogeneity is due to the sampling error or with-in-study variation. On the contrary, Random effects (RE) model assumes that the presence of both with-in and between-studies variability may lead to heterogeneous findings. Between-studies variability may be linked to the influence of several factors that may vary for each study, such as differences in sample characteristics, measurement of constructs, level of analysis, and so on. Therefore, RE models are more realistic than fixed effect models as they provide more reliable and conservative estimates. In this study, we adopted Random Effects Meta-analysis to consider the distribution of effect sizes among all the studies.

Following the previous meta-analytical reviews (Bailey, 2018; Hur, 2019; Mathias, Mckenny, & Crook, 2018), we used correlation values to calculate the effect sizes of considered factors or determinants. We applied the RE model to capture the variations in effect sizes and allow for differences in methods, settings, contexts, or procedures used in ambidexterity research. R Studio software (version 1.3.1056) was used to calculate the summary effect size and confidence intervals (CIs) for each determinant. *Q* statistic has also been calculated for each considered factor

using R studio because the primary aim of this analysis is to explore the homogeneity or heterogeneity in listed variables. If the Q value is less than the degree of freedom (df), then it can be said that the factor is homogeneous, meaning there is statistically insignificant heterogeneity and a Q value greater than degrees of freedom indicates heterogeneity among studies. Another measure of heterogeneity is I^2 statistic which reports the variation across publications as a result of heterogeneity and not by chance (in percentage). I^2 was estimated using the formula, $I^2 = 100\% \times (Q - df) / Q$. Factors with I^2 value of 80% or greater are considered highly heterogeneous, 50% or more are moderately heterogeneous, and below 50% indicates low heterogeneity. In addition to estimating sample size un-weighted correlation (Avg r), we calculated a 95% CI for each summary effect size of considered factors. As the CI does not have zero for each determinant, it can be said that the calculated effect size represents a significant relationship (Kirca & Yaprak, 2010; Singh, Dhir, Gupta, Das, & Sharma, 2020).

Results

Characteristics of included publications

Although the search strategy was inclined to capture the articles published till 2021, the inclusion and exclusion criteria adopted for this methodology led us to retrieve our first empirical article published in 2004. A total of 8,422 SME samples and 48 correlations were utilized for this meta-analytical review. Figure 3 shows the yearly distribution of the number of publications. Out of all the articles, nine papers (24.32%) were published in 2020, and five papers (13.51%) were published in 2019. It suggests that researchers have begun to pay attention to examining ambidexterity in the unique context of SMEs. Also, implementing an ambidextrous strategy within SMEs is a crucial concern from a practitioner's point of view to effectively solve today's business issues and achieve sustainable competitive advantage. Simple counting of publications was carried out to identify the countries with the most empirical examination of ambidexterity with SME samples. Figure 4 represents the frequency of publications per country. The results suggest the USA as the most productive country (11 studies), followed by China (6).

Results of meta-analysis

As explained earlier, we included the factors or determinants that were examined in at least three independent studies. Table 2 gives an overview of investigated factors and how they were investigated in the literature. Overall, we analyzed 48 effect sizes representing the considered

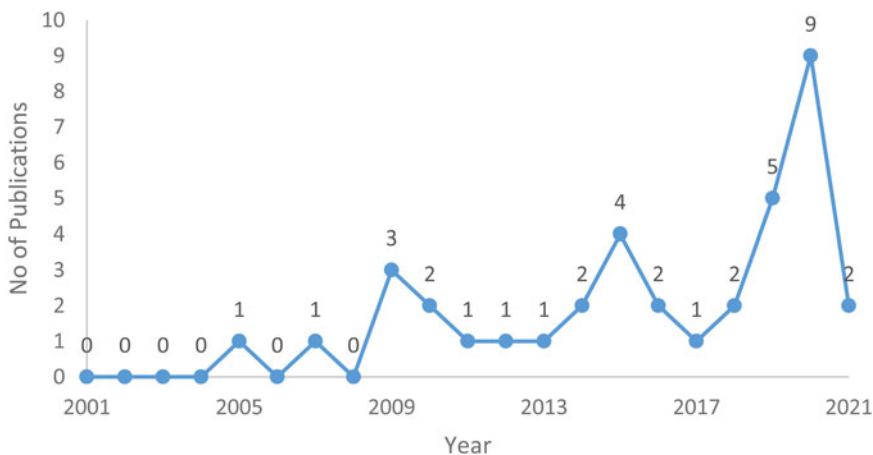


Figure 3. Year wise frequency distribution of publications.

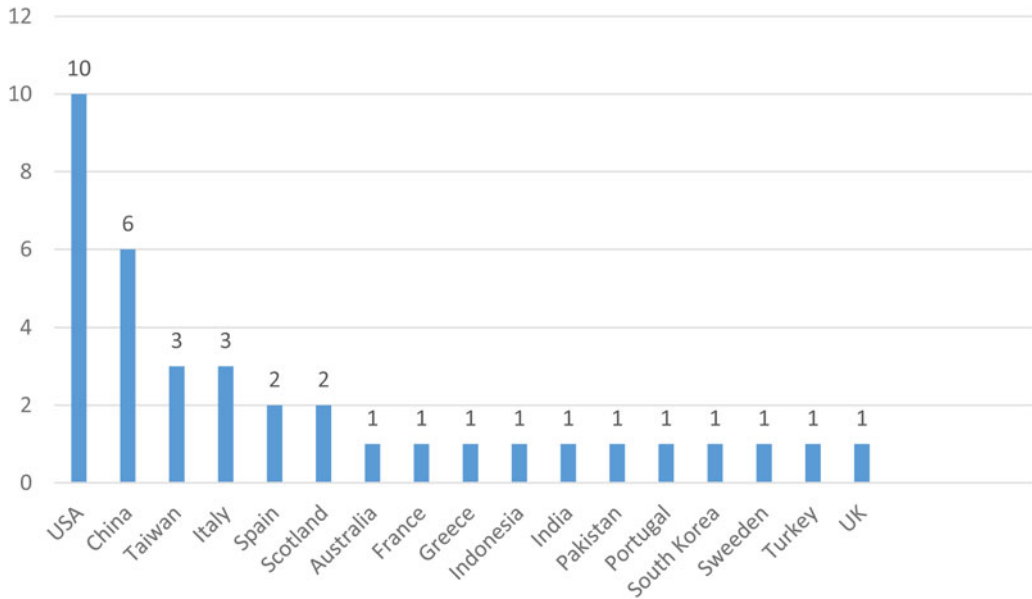


Figure 4. No of publications per country.

determinants of ambidexterity. The findings of the meta-analysis are presented in Table 3. We analyzed five effect sizes for Entrepreneurial orientation, four effect sizes for organizational context, nine effect sizes for technological capability, eight effect sizes for Environmental dynamism, five effect sizes for Market orientation, three effect sizes for formalization, four effect sizes for KM capability and ten effect sizes for Networking capability. The range of SME observations for each determinant varies from 633 to 1,894. Table 4 represents the analysis of heterogeneity among the considered determinants. The obtained value of Q statistics is greater than the degrees of freedom for every factor, which provides evidence of heterogeneity present in the studies. Therefore, we reject the null hypothesis of RE model that considers the homogeneity of factors ($p < .05$) and ascertain that all the factors are heterogeneous.

Table 3. Results of random effects meta-analysis model

Determinants	<i>k</i>	<i>n</i>	Mean <i>r</i>	<i>r</i>	95% CI (low to high)		Z value	<i>p</i> value
Environmental Dynamism	8	1619	.332	.361	.1941	.5071	4.09	<.01
Entrepreneurial Orientation	5	839	.404	.455	.1886	.6588	3.21	<.01
Formalization	3	957	.227	.232	.1469	.3122	5.27	<.01
KM capability	4	947	.578	.599	.3928	.7476	4.91	<.01
Market Orientation	5	1614	.325	.314	.1888	.4287	4.77	<.01
Networking capability	10	1320	.342	.356	.2104	.4854	4.61	<.01
Organization context	4	633	.245	.239	.1022	.3664	3.39	<.01
Technological Capability	9	1894	.459	.423	.2703	.6131	4.45	<.01

Notes: *k* (No of correlations), *n* (total SME observations), Average *r* (un-weighted), *r* (weighted mean effect size), CI (Confidence interval), Z statistics (for testing of significance of difference in effect sizes).

Table 4. Test of heterogeneity

Relationships	<i>k</i>	<i>n</i>	Q Statistics	<i>p</i> value	df	<i>I</i> ²
Environmental Dynamism and Ambidexterity	8	1619	90.63	<.01	7	92%
Entrepreneurial Orientation and Ambidexterity	5	839	70.82	<.01	4	94%
Formalization and Ambidexterity	3	957	3.43	<.17	2	42%
KM capability and Ambidexterity	4	947	50.71	<.01	3	94%
Market Orientation and Ambidexterity	5	1614	32.84	<.01	4	85%
Networking capability and Ambidexterity	10	1320	74.23	<.01	9	88%
Organizational context and Ambidexterity	4	633	8.7	<.03	3	64%
Technological Capability and Ambidexterity	9	1894	180.17	<.01	8	96%

Notes: Q statistics (χ^2 test for heterogeneity), df (degrees of freedom), *I*² (Index of heterogeneity).

Environmental Dynamism (ED) and ambidexterity

The results of the meta-analysis suggest that ED has a significant and positive association with ambidexterity ($r = .361$, $Z = 4.09$, $p < .01$). This analysis was based on eight correlations with 1,619 SME samples. The test of heterogeneity ($Q = 90.63$, $df = 7$, $p < .01$) also provides evidence of diverse opinions among scholars on ED as a determinant of SME ambidexterity. For instance, scholars like Soto-Acosta, Popa, and Martinez-Conesa (2018) investigated environmental dynamism as an essential key driver of ambidexterity, whereas other researchers like Andrade, Franco, and Mendes (2020) considered environmental dynamism as a moderator variable in ambidexterity research. As the value of *I*² was 92%, we accept the alternative hypothesis of the absence of a common effect size among the studies.

Entrepreneurial orientation and ambidexterity

EO has a significant as well as positive impact on ambidexterity ($r = .455$, $Z = 3.21$, $p < .01$). This analysis is based on five publications and 839 SME observations. Test of heterogeneity for EO indicates the presence of significant heterogeneity among the studies ($Q = 70.82$, $df = 4$, $p < .01$). Similarly, *I*² value of the factor reveals a high heterogeneity of 94%. Therefore, we accept the alternative hypothesis that considers the distribution of true effect size.

Formalization and ambidexterity

The result of the Random-effects meta-analytical model regarding the relationship between formalization and ambidexterity was positive and significant, with an average RE size of .232 ($Z = 5.27$, $p < .01$). This analysis was based on three studies and 957 SME observations. However, the Q value as a measure of heterogeneity was found insignificant ($p < .17$), which may be due to the presence of less diverse opinions in the past studies. Also, *I*² value of 42% indicates a low level of heterogeneity. Therefore, it can be said that past studies do not have high divergences in the view of formalization as a determinant of ambidexterity because the literature has enough evidence on the importance of organization structure in implementing ambidexterity (Chams-Anturi, Moreno-Luzon, & Romano, 2020). Therefore, Hypothesis 3 is supported.

KM capability and ambidexterity

The association between KM capability and ambidexterity is positive and significant, with an un-weighted average value of .578 and a combined effect size of .599 ($Z = 4.91$, $r = .599$, $p < .01$). The analysis was done for four studies and a 947 SME sample size. Q value as a measure

of heterogeneity was found significant ($Q = 50.71$, $df = 3$, $p < .01$). Further, the value of I^2 shows 94% heterogeneity among the effect sizes. Therefore, Hypothesis 4 is supported.

Market Orientation (MO) and ambidexterity

The analysis supports hypothesis 4 because market Orientation has a significant impact on ambidexterity (e.g., $r = .314$, $Z = 4.77$, $p < .01$), and this is based on five publications with a 1,614 SME sample size. Therefore, we reject the null hypothesis of homogeneity based on significant Q statistics ($Q = 32.84$, $df = 4$, $p < .01$) and accept the alternative hypothesis of the presence of heterogeneity. Also, the value of I^2 is 85% indicating high heterogeneity among the studies.

Networking capability (NC) and ambidexterity

The results of the Meta-analysis show that NC impacts ambidexterity in a positive and significant manner, with an average RE size of .356 ($Z = 4.61$, $p < .01$). The analysis was conducted for ten studies with a 1,320 SME sample size. Q statistic as a measure of heterogeneity was found to be significant ($Q = 74.23$, $df = 9$, $p < .01$). I^2 value was 88%, implying a high variation in the perspective of scholars on NC as a determinant of ambidexterity.

Organizational context (OC) and ambidexterity

The result of Meta-analysis (Table 3) shows that organization context influences ambidexterity significantly ($r = .239$, $Z = 3.39$, $p < .01$). This result is found on the basis of four studies and 633 SME samples. The calculated value of Q statistics is significant ($Q = 8.7$, $df = 3$, $p < .03$), indicating the acceptance of the null hypothesis or common effect sizes (homogeneity). Also, the value of I^2 is 64% indicating the existence of moderate heterogeneity among the considered publications.

Technological Capability (TC) and ambidexterity

The impact of TC on ambidexterity was found to be positive as well as significant (e.g. $r = .423$, $Z = 4.45$, $p < .01$). Therefore, hypothesis 8 is supported. The analysis was based on nine studies with 1,894 SME observations. The value of Q is significant ($Q = 180.17$, $df = 8$, $p < .01$), indicating heterogeneous effect sizes. Also, I^2 test signifies a huge heterogeneity (96%) among the past studies.

Discussion and implications of the study

In past decades, the research on organizational ambidexterity has grown spectacularly, with many review articles seeking to summarize the literature conceptually (e.g., Gupta, Smith, & Shalley, 2006; O'Reilly & Tushman, 2013) and empirically (e.g., Junni et al., 2013; Mathias, Mckenny, & Crook, 2018). As far as the quantitative review of literature is concerned, it has been found that the literature lacks the integration of knowledge regarding ambidexterity and its corresponding determinants (Pertusa-Ortega & Molina-Azorín, 2018). Also, the extant literature has varied conclusions and different perspectives about what drives a firm's propensity to balance both the exploratory and exploitative innovation (Fourné et al., 2019).

Existing meta-analytical reviews of ambidexterity research address the performance implications of ambidexterity (Junni et al., 2013), the influence of environmental and firm-level contingencies that facilitate simultaneous attainment of radical and incremental innovations (Fourné et al., 2019), and impact of various moderators (such as methodological, extrinsic and substantive) on exploitation, exploration and performance relationship (Marín-Idárraga, Hurtado González, & Cabello Medina, 2020). However, researchers did not seek to identify and summarize the relationship between ambidexterity and its various determinants quantitatively. Our analysis examines this gap by identifying and assessing the direct effect of eight determinants on SME ambidexterity. The determinants could be grouped as firm-specific factors (Formalization, OC,

KM capability, and TC), environmental (ED), strategic (EO and MO) and inter-firm factors (NC). It has been found that a 95% CI does not include zero for each determinant which is an indication of a significant relationship. The mean effect size of each determinant was calculated with the help of the Pearson Product moment correlation value or *r*-index. We found that all the identified determinants are heterogeneous and exert a positive and significant impact on ambidexterity. KM capability has emerged as one of the major determinants of firm-specific factors that influence the ambidextrous behavior of employees. The tacit knowledge base concerning employees' personnel skills, experiences, and learnings is a complex resource that is difficult to codify and imitate. SMEs with higher KM capability can manage the paradox of ambidexterity by developing complementary knowledge processing capabilities (Lei, Khamkhoutlavong, & Le, 2021). Therefore, enhancing the KM capability becomes imperative for firms in resource-constrained countries.

Similarly, Entrepreneurial orientation was found to be a significant determinant of SME ambidexterity, indicating the importance of fostering a culture that supports innovation, risk-taking, and pro-activeness in exploring new opportunities and catering to the existing ones. The founders and managers of SMEs should continuously strive to develop an entrepreneurial spirit of innovation and experimentation to support new practices and ideas in exercising exploitative and explorative strategies and becoming ambidextrous. Furthermore, the study's results indicate how other firm-level and inter-firm level determinants, such as technological and networking capability, impact SME ambidexterity by helping mitigate several exploration challenges. For instance, IT infrastructure development is critical for SMEs to build and adopt more complex technologies to allow better internal coordination of resources, capabilities, skills, and goals. It also leads to better communication with external partners to pursue multiple business goals jointly. Therefore, SMEs with better technological and networking capabilities can achieve cost-effectiveness while seeking to explore new markets or growth trajectories.

Considering the combined effect size between Environmental dynamism and Ambidexterity, the literature suggests that SMEs are highly sensitive to environmental variations and contingencies (Andrade, Franco, & Mendes, 2020; Prajogo & Mcdermott, 2014). Their ability to implement exploratory and exploitative innovation processes and become ambidextrous may depend on their internal capabilities and how quickly they respond to the various environmental contingencies by reconfiguring those internal capabilities (Soto-Acosta, Popa, & Martinez-Conesa, 2018). Jansen, Van Den Bosch, and Volberda (2006) found that exploiting existing capabilities provides a good performance outcome in low market dynamism. However, evolving consumer preferences, transforming digital technologies, increasing product obsolescence, evolving product life cycle, and changes in consumer behavior, require a firm to focus more on balancing incremental and radical innovations to stay relevant in the market.

As the results of the meta-analysis help us verify the heterogeneity among the studies, we also identified a few contextual and methodological moderators that may have caused such variability (Marín-Idárraga, Hurtado González, & Cabello Medina, 2020). The determinants were studied in multi-county contexts such as the USA, UK, Japan, Australia, and Europe, signifying the region as an extrinsic moderator. Although the context of this analysis is SMEs or firms employing less than 500 employees, the sample studies have varied perspectives on the size of the SMEs. For instance, in a few studies, SMEs are considered the firms employing less than 250 employees (Andrade, Franco, & Mendes, 2020; Berard & Fréchet, 2020; Dezi et al., 2021), whereas some studies have considered the firms with less than 500 employees as their SME samples. Therefore, the number of employees defining small and medium firms also acts as the source of heterogeneity for the hypothesized relationships.

Similarly, the industries in which the sample SMEs operated were manufacturing, services, IT and telecommunication, semiconductor, and Broiler poultry industries. These industries exhibit differential responses toward implementing ambidexterity. For instance, ambidextrous innovation was found to be more prominent and robust for the high-tech and service sectors than the

manufacturing sector (Marín-Idárraga, Hurtado González, & Cabello Medina, 2020). The heterogeneous results also exhibit the existence of methodological moderators as a source of variability such as types (primary, secondary, or combination of both) and nature of data (cross-sectional data produces greater effect size) of sample studies; and measurement and operationalization of variables. The sample studies have adopted various conceptualizations and measurements of the ambidexterity construct. These include balanced dimension (absolute difference between Exploration and Exploitation), combined dimension (measured by multiplying Exploration with Exploitation), or a combination of these. In a few studies, a separate measure of both exploitation and exploration was adopted. Similarly, there are variations in how each identified determinant was operationalized, adapted and measured in the sample studies. All these issues indicate divergent perspectives among the authors leading to heterogeneous results.

Theoretical implications

This Meta analytical analysis helps extend the knowledge structure of ambidexterity research. The study goes beyond the recent review work of Wenke, Zapkau, and Schwens (2021) by identifying and empirically assessing the determinants that have a positive and significant relationship with SME ambidexterity. The most significant underlying theoretical approaches that describe the impact of determinants on ambidexterity in SMEs are the Resource-based view, Knowledge-based View, and Dynamic capability View. SMEs with dynamic capabilities (e.g. EO and MO) can modify, upgrade, re-orient and reconfigure their resources, skills, knowledge, and business processes to adapt to evolving market, technological and environmental opportunities for promoting ambidexterity by implementing both knowledge exploration and exploitation. Similarly, the Knowledge-based view (e.g. KM capability and NC) helps SME managers realize the importance of intangible, inseparable, and interdependent knowledge repository, which are difficult for competitors to understand, assess, and imitate as it involves path dependencies. These theories can also be linked and studied in other related aspects such as Innovation management, human resource practices, digital platform capability, and supply-chain ambidexterity of SMEs. Therefore, our research complements the ambidexterity literature in several ways. Firstly, we offer a quantitative assessment of the drivers of SME ambidexterity. In this way, we also address the call by Koryak et al. (2018) demanding additional research related to the drivers of ambidexterity. The results of the Random-effects meta-analysis help us to confirm the theoretical lenses such as Dynamic capabilities, Resource-based, and Knowledge-based views in supporting the impact of identified determinants on SME ambidexterity. Secondly, this analysis could also reveal the extent to which these determinants are homogeneous/heterogeneous. Thirdly, the study provides theoretical and empirical evidence regarding the importance of strategic orientations, such as marketing and entrepreneurial orientation, in fostering SME ambidexterity. Fourthly, this study views ambidexterity as one of the most crucial aspects of SME performance and its long-term survival.

Managerial implications

This article identifies several firm-specific and industry-specific constructs like technological capability, KM capability, organization context, formalization, and environmental dynamism which are essential for enabling ambidexterity in small and medium firms. Managers and policymakers can examine, analyze and exercise these factors in different contexts and situations, which will help derive the right strategies and policies for implementing ambidexterity within SMEs. The meta-analytical review highlights important behavioral attributes that SME managers can contemplate in their strategies. For example, it has been noticed that organizational context representing the combination of four behavioral factors, such as stretch, discipline, support, and trust, as a critical determinant of ambidexterity is more suitable for SMEs than their large counterparts. This view also contradicts the argument put forward by Tushman and O'Reilly (1996)

that ambidexterity can be exercised in separate units, each dedicated to exploratory and exploitative innovations individually. However, building two separate units is not viable for SMEs considering their limited resource base, knowledge assets, skills, and insufficient managerial expertise. Therefore, in line with other researchers (Garcia, Guidice, & Mero, 2019; Zimmermann et al., 2020), we suggest creating and enabling an internal context characterized by the interaction between discipline, trust, support, and stretch may help in promoting ambidexterity in SMEs. Managers can also adopt a formalized organizational structure in an enabling way to generate synergies between exploitative and exploratory orientations.

This study also sets an agenda for managers of SMEs to focus on KM capabilities and technological or IT capabilities to enhance innovativeness and competitiveness in ongoing business practices. SMEs should depend on internal knowledge processing activities and be open to external knowledge sources like customers, business partners, suppliers, competitors, and research institutes to lessen the risk of innovations and exploration of new products and markets. Hence, our research sheds light on the role and importance of various firm-level and environment-level predictors in enhancing SMEs' exploratory and exploitative innovation activities.

Future research directions and limitations

We examined the determinants of ambidexterity in the context of SMEs. The review of twenty years of ambidexterity research gives an idea of the current status of the research domain by aggregating the determinants of ambidexterity that are useful for SMEs. Meta analytical reviews are also helpful in providing direction to future studies by developing more extensive and comprehensive research frameworks (Schmid & Morschett, 2020). In this context, we proposed a research framework integrating the determinants of SME ambidexterity from various research findings. The framework (Figure 5) helps define the role of considered determinants in predicting ambidexterity. This proposed research framework could also be assessed in different industries to allow context-specific comparison, such as developing countries vs. developed countries and manufacturing versus service sectors.

The results of the analysis suggest that all these constructs share dissimilar effect sizes, paving the way for further research on identifying and analyzing the impact of various moderators on the relationship between ambidexterity and its determinants (Borenstein et al., 2010). For instance, incorporating external contingencies (e.g., competitive intensity) through Meta-regression would help provide an empirical assessment of the validity of the established relationships. In addition, hierarchical modeling of factors would be beneficial for understanding the interplay among the identified determinants of ambidexterity. Also, the determinants for which at least three correlation values were not available have been excluded from our Meta-analysis. For instance, the less explored constructs, such as CEO's goal orientation and Top management team diversity, could provide significant insights to future scholars for validating the scantily explored theories like Organizational learning and Upper echelons. Similarly, García-Granero, Fernández-Mesa, Jansen, and Vega-Jurado (2018) insisted that there is little explanation for why diverse Top Management Teams (TMTs) can better handle the paradoxes and implement ambidextrous behavior compared to others. Understanding the influence of diverse TMTs will also confirm the theoretical perspective of Upper Echelons that suggests how managerial characteristics in terms of age, education, and functional diversity predict strategic innovation and subsequent SME performance.

However, similar to other meta-analytic reviews, this study also possesses a few limitations. Firstly, the meta-analysis results are based on correlations and the sample size of selected publications; and we were interested in examining the various determinants of ambidexterity, thereby leaving the scope to investigate various moderator variables in further studies. Secondly, the observed SME samples are taken from multiple countries, such as the USA, UK, Spain, China,

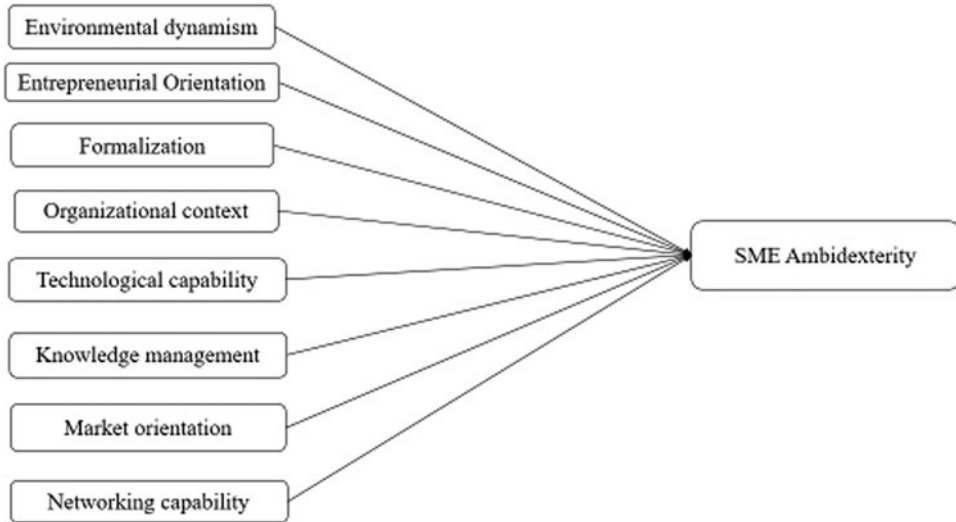


Figure 5. Modeling of determinants explaining SME ambidexterity.

etc., which could bias the results due to the cultural and institutional differences among the included countries. Thirdly, the implications of the selected variables on exploratory and exploitative initiatives may vary across the sectors or industries where the SMEs operate. Fourthly, we were only able to include the studies or variables that reported correlation with ambidexterity or its two components (exploration and exploitation), which may limit the theoretical and empirical research advancement.

Conclusion of the study

Over the years, organizational ambidexterity has become a popular research topic among academicians and managers because of its favorable implications on sales growth, sustained performance, competitiveness, and innovation performance (Cao, Simsek, & Zhang, 2010; Soto-Acosta, Popa, & Martinez-Conesa, 2018; Tian et al., 2020). Researchers also acknowledged the importance of organizational ambidexterity for firm survival during uncertain business conditions such as financial crises (Dolz, Iborra, & Safón, 2019). Regardless of the increasing number of studies analyzing the factors that help firms achieve ambidexterity, the literature lacks the studies that integrate and provide an extensive list of factors affecting ambidexterity in SMEs. To the authors, this analysis is the first attempt toward quantitative summarization of empirical studies concerning the determinants of ambidexterity in the SME context. Our meta-analytical review results indicate that all the selected determinants have a significant and positive association with ambidexterity. We adopted a RE model to analyze the effect sizes of all the factors, and the results of the analysis supported all the proposed hypotheses. It was found that the selected determinants are heterogeneous as they have a high I^2 index.

This study also favors the theory of organizational learning (March, 1991) by clarifying the premises related to firm-specific, environment-specific, and contextual factors that impact SMEs' ability to be ambidextrous. Our analysis assumes that current theorizations are not generalizable to the unique context of SMEs because prior meta-analyses have conflicting findings on the relative implications of exploitation, exploration, and ambidexterity on firm performance. For instance, Mathias (2014) found no significant differences in effect sizes between ambidexterity, exploitation orientation, exploration orientation, and performance for firms of all sizes, and this is contradictory to the findings of Wenke, Zapkau, and Schwens (2021) that posits

ambidexterity as less beneficial to SMEs as compared to either exploitative or explorative activities. Therefore, our research findings contribute to examining ambidexterity enablers that SMEs may focus on to operate effectively in today's dynamic and evolving market conditions. Also, cross-functional integration of the identified enablers may benefit SMEs while addressing the tensions between exploitative and explorative activities. For example, SMEs may emphasize formalization (Prajogo & Mcdermott, 2014) and enhancing marketing capabilities while exploiting (Yalcinkaya, Calantone, & Griffith, 2007). On the other hand, SMEs may enhance technological capability (Wiratmadja, Profityo, & Rumanti, 2020) and emphasize entrepreneurial orientation (Ramachandran, Lengnick-Hall, & Badrinarayanan, 2019) for sensing and seizing the new market opportunities. Overall, this paper contributes to ambidexterity research by reviewing and consolidating the statistical combination of factors that may help SMEs to become ambidextrous.

Conflict of interest. The author(s) declare none*

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* represents the included articles for the meta-analysis

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