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Title: Drivers of Innovation Ambidexterity in Small- to Medium-Sized Firms

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Abstract: Balancing explorative and exploitative innovation ambidextrously has emerged as one of the foremost questions in management research. While a firm's ability to jointly pursue both exploitative and explorative innovation has been conceived as having positive performance effects, scholarly efforts to resolve the ambidexterity question have left a disproportionate gap in our understanding of how innovation ambidexterity can be achieved, particularly so in small-to-medium-sized firms (SMEs). The state of the debate is such that SMEs must largely rely on prescriptions tested with large firms to inform their ambidexterity initiatives. This study focuses on the characteristics of top managers and features of organizational structure and context in facilitating the appearance of ambidexterity in SMEs, and the mediation effect of innovation ambidexterity between structural, contextual, and leadership characteristics on SME performance. Results indicated that SMEs could achieve a close balance of explorative and exploitative innovations (BD) through shaping right international organizational structures and adopting appropriate leadership styles. Further, BD mediates the relationship between the structural, contextual, and leadership characteristics on SME performance. SMEs could benefit from BD with relatively resources available.

**RESPONSES TO PROFESSOR Hervé Laroche (THE EDITOR-IN-CHIEF) AND REVIEWERS**

**Executive Summary**

Dear Professor Laroche:
We appreciate your time and your constructive comments. To facilitate our research conversation, we have taken the liberty to *italicize the reviewers'* words, and have inserted our responses point-by-point after each comment. Following your suggestions, we have *copy-edited* the paper.

## Response to Reviewer 1:

*Reviewers' comments:*

*Reviewer #1: The authors have done a good job of addressing my concerns and answering my questions. More specifically, I think the authors now explain their methodology reasonable detailed, successfully rewrote the hypotheses and were able to eliminate weaknesses of the prior version. The explanation why the author choose to subsum the distinct characteristics into three hypotheses convinced me. Overall I am happy with this revision and recommend to accept the paper. One last smallish comment, rather a suggestion: The section "Managerial Contributions" is very brief - you might either combine this more with the "Scholarly Contributions" or enlarge paragraph one on page 41, especially regarding SMEs. On the contrary, "Limitations" might be tighten a bit. Congratulations to an interesting work!*

Thank you for your suggestions. We have merged the managerial contribution with the scholarly contributions in one section as recommended. Please refer to page 36.

Limitations section has been tightened a bit. Please refer to page 39-41.

Reviewer #2
*I already said "accept" in the previous round, so I am happy to stick with this recommendation. However, I decided to read the article through again, to make sure it all made sense. I do worry that the writing is rather poor. Clearly the authors do not have english as a first language, and either they need to invest in getting it copy-edited, or EMJ needs to do some rewriting for them.*

Thank you for your suggestion. We very much appreciate for your constructive comments that helped improved the paper. Following your suggestions, we have copy-edited the paper.

*More specifically, the writing on page 5 when Cao et al's study is introduced is completely inpenetrable. The authors should invest some time in clarifying what they are trying to say here (especially the sentence beginning 'Cao et al (2009) revealed that SMEs.... and the one after it). We have a similar problem on page 9 when the BD/CD distinction is discussed again, but it is less of a problem if we get page 5 correct.*

Thank you for your suggestion. We rewrote the sentence on page 5 and page 9. We also had defined the BD and CD in the paper. Please refer to page 5.

*Finally, the wording of Hypothesis 2, page 20, just doesn't make sense as it stands. Not sure exactly what the solution is, but it needs some fine-tuning for sure.*

Thank you for your suggestion.  We fine-tuned the hypothesis 2. Please refer to page 19.

In closing, we very much appreciate your helpful comments. Thank you very much.

***Title Page (with author details)**

# *Drivers of Innovation Ambidexterity in Small- to Medium-Sized Firms*

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# Drivers of Innovation Ambidexterity in Small- to Medium-Sized Firms

**Summary**

*Balancing explorative and exploitative innovation ambidextrously has emerged as one of the foremost questions in management research. While a firm's ability to jointly pursue both exploitative and explorative innovation has been conceived as having positive performance effects, scholarly efforts to resolve the ambidexterity question have left a disproportionate gap in our understanding of how innovation ambidexterity can be achieved, particularly so in small-to-medium-sized firms (SMEs). The state of the debate is such that SMEs must largely rely on prescriptions tested with large firms to inform their ambidexterity initiatives. This study focuses on the characteristics of top managers and features of organizational structure and context in facilitating the appearance of ambidexterity in SMEs, and the mediation effect of innovation ambidexterity between structural, contextual, and leadership characteristics on SME performance. Results indicated that SMEs could achieve a close balance of explorative and exploitative innovations (BD) through shaping right international organizational structures and adopting appropriate leadership styles. Further, BD mediates the relationship between the structural, contextual, and leadership characteristics on SME performance. SMEs could benefit from BD with relatively resources available.*

***KEYWORDS:*** *small-and-medium sized firms; ambidexterity; innovation; business performance.*

## Introduction

The best firms are increasingly believed to be those who can simultaneously balance explorative innovation with exploitative innovation in an ambidextrous fashion (He & Wong, 2004; Morgan & Berthon, 2008; Raisch & Birkinshaw, 2008; Raisch et al., 2009). However, to be ambidextrous, firms must reconcile the inherent tensions that exist between acts of exploration and exploitation (March, 1991). These tensions are brought about by conflicting task demands (Raisch & Birkinshaw, 2008) and competing firm design requirements (March, 1991; Tushman & O'Reilly, 1996). Although these problems were initially thought of as insurmountable trade-offs forcing firms to choose either explorative or exploitative innovation pathways (Raisch & Birkinshaw, 2008), scholars have recently put forward a series of business solutions to resolve the ambidexterity problem. One solution in particular is that firms can shape an appropriate organizational context supportive of both innovation types (Gibson & Birkinshaw, 2004).

Structural, contextual and leadership solutions to create ambidexterity between both types of innovation have been proposed (see Raisch & Birkinshaw, 2008, for a detailed review). Structural solutions advocate the spatial separation of explorative and exploitative innovations into separate business units to be coordinated by integration mechanisms (Jansen et al., 2006; Raisch & Birkinshaw, 2008; Tushman & O'Reilly, 1996). This is based on the assumption at the origin of ambidexterity theory about the absolute incompatibility of

explorative and exploitative activities (March, 1991). However, recent studies have proposed that both innovations can occur within single firms so long as the organizational context is properly specified.

Gibson and Birkinshaw (2004) suggest that contextual ambidexterity between both innovations can be created by identifying and implementing conditions complementary to both, reducing the risk in turn that one innovation type will self-replicate systems and processes destructive to the other (e.g., Hughes, Hughes, & Morgan, 2007; March, 1991). Proponents of the structural separation view have accepted that achieving ambidexterity is not simply a matter of the spatial separation of conflicting innovation activities. For example, O'Reilly and Tushman (2007), and Tushman and O'Reilly (1996) highlight over-arching vision and values, flexibility and culture as conditions supportive of ambidexterity. It is on this basis that Gibson and Birkinshaw (2004) put forward organizational context as a route to contextual ambidexterity, validating a set of internal firm conditions such as cooperation, autonomy and rewards in the process.

Studies into structural ambidexterity and contextual ambidexterity have also proposed that leadership may be a critical factor in enabling innovation ambidexterity. For example, O'Reilly and Tushman (2007), Birkinshaw and Gibson (2004), Gibson and Birkinshaw (2004), and Tushman and O'Reilly (1996) all suggest that supportive leaders, flexible managers and an aligned top management team are important antecedents underpinning any

form of ambidexterity. In turn, recent studies have extended the leadership theme present in Tushman and O'Reilly's (1996) original thesis to suggest that leaders are essential in the ambidextrous coordination of explorative and exploitative innovation activities (for example, Lubatkin et al., 2006; Mom et al., 2007).

So far, structural, contextual and leadership solutions are all presented as solutions to the ambidexterity problem (Raisch & Birkinshaw, 2008). However, given points raised by Tushman and O'Reilly (1996) and several authors since, it appears increasingly apparent that these pathways overlap. As such, our understanding of how ambidexterity is achieved is incomplete until we consider how these conditions come together (Raisch et al., 2009; Raisch & Birkinshaw 2008). Raisch and Birkinshaw (2008) in their review of the 'state of the art' propose that organizational ambidexterity theory needs development by viewing these paths and their associated variables as complementary rather than competing. Yet, so far, no study has brought all three strands together, leaving an important gap in our knowledge of the theory a practice of ambidexterity.

A second important problem in the theory of ambidexterity is that, so far, almost all of the prescriptions put forward by conceptual and empirical works are designed for large, multiunit firms. With few exceptions (e.g., Lubatkin et al., 2006), work on ambidexterity has failed to account for SMEs. SMEs may operate differently and exhibit different operating conditions and characteristics to large, multiunit firms such that generalizing current

prescriptions for ambidexterity into innovation strategies for these firms might prove incorrect, inappropriate or dangerous. Prior studies have found that SMEs tend to use different means to pursue innovation ambidexterity compared to larger firms (Cao, Gedajlovic & Zhang, 2009; Ebben & Johnson, 2005). The reasons for this are grounded in the differences between SMEs and their larger counterparts. Cao et al. (2009) found that resource-constrained firms such as SMEs can benefit from the use of a balanced dimension of innovation ambidexterity (BD) but larger firms are better suit to a combined dimension of innovation ambidexterity (CD) owing to their superior access to internal and external resources. BD refers to "the match in the relative magnitude of explorative and exploitative activities" and CD refers to "increase the combined magnitude of both explorative and exploitative activities" (Cao et al., 2009, p.782). It is well-established that SMEs differ from larger firms on the basis of available resources such as human capital and financial capital (Cooper, Gimeno-Gascon, & Woo, 1994; Forbes & Milliken, 1999), and on the basis of having limited managerial expertise (Pissarides, 1999; Forbes & Millken, 1999) to effectively manage changing internal and external environments (Ebben & Johnson, 2005). SMEs also differ from larger firms in terms of their tendency to be less bureaucratic, structured and diversified (Forbes & Milliken, 1999), possessing fewer formal systems and procedures and fewer planning activities (Busenitz & Barney, 1997). Consequently, SMEs face greater challenges in managing tensions, contradictions, and tradeoffs associated with explorative

and exploitative innovations than larger firms (Andriopoulos & Lewis, 2009).

Concerns also exist about the lack of slack resources needed to create and benefit from innovation ambidexterity in SMEs. Accordingly, SMEs might seek a balanced dimension of ambidexterity (BD) owing to limited resources available to them (Cao et al., 2009). This is because SMEs can enhance business performance by reducing the performance-damaging effects of over-engagement in exploitation to the detriment of exploration, or vice versa (Cao et al., 2009). Given that SMEs differ from larger firms in terms of organizational structures, leadership styles, reactions to the environments, available resources, and the internal contexts they operate (Chen & Hambrick, 1995; Ebben & Johnson, 2005; Man, Lau & Chan, 2002), we expect that achieving BD in these firms will likely require a response to Raisch and Birkinshaw's (2008) concern that structural, contextual and leadership conditions should be explored together to understand how SMEs might balance the contradictory nature of exploration and exploitation. More specifically, we expect that structural, contextual and leadership characteristics could be examined together to investigate how innovation ambidexterity in SMEs is likely to emerge.

The objective of this paper then is to resolve this gap in current research into innovation ambidexterity by studying how the role of structural, contextual and leadership conditions together shape BD in SMEs. In doing so, this study offers several contributions. First, and to the best of our knowledge, this is the first paper to attempt to understand how structural,

contextual and leadership conditions might create and maintain BD in SMEs. In turn, the study is a response to calls by Raisch and Birkinshaw (2008) for multifaceted research into organizational ambidexterity. Second, and to the best of our knowledge, this is one of only a few papers to examine innovation ambidexterity in SMEs. In turn, the study is a response to calls by Lubatkin et al. (2006) to extend and validate research into the antecedents and consequences of BD in SMEs.

## Theory and hypotheses

### Explorative Innovation, Exploitative Innovation, and the Balanced Dimension of Ambidexterity

A product innovation is typically classified by its closeness to one or a confluence (as appropriate) of the following conditions: new or existing technologies; new or existing product features and functions; or new or existing customers, market segments and routes to market (Benner & Tushman 2003; Danneels, 2002; He & Wong 2004; Jansen et al., 2006; Smith & Tushman 2005). Therein, explorative product innovations meet new or emerging customer needs in new or emerging markets with new technologies, features and functions materially different to existing products; exploitative product innovations on the other hand meet the existing needs of customers in existing markets with improvements in existing technologies, features and functions that incrementally differentiate it beyond competitor products (Danneels, 2002; Jansen et al., 2006; Morgan & Berthon 2008; Raisch & Birkinshaw 2008; Smith &

Tushman 2005). Explorative innovations depend on new knowledge and creative insights developed through acts of play, experimentation and discovery whereas exploitative innovations build on existing knowledge through acts of refinement and gradual improvement (He & Wong 2004; March 1991; Smith & Tushman 2005).

Explorative and exploitative innovations are interdependent activities. March (1991) suggested that maintaining the balance between explorative and exploitative innovations is crucial to firm survival. As Levinthal and March (1993) argue, "the basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to ensure its future viability" (p.105). Achieving a high level of BD could contribute to firm performance through more structural control of the performance risk attributable to an inadequate balance of both innovation types (Cao et al., 2009). Failure to do so can result in the firm being mediocre at both types of innovation, and suffer the performance consequences of this mediocrity in turn (March, 1991). More specifically, a firm is most likely to suffer the risk of obsolescence if the firm overemphasizes exploration innovation excessively over exploitation innovation (Cao et al., 2009). On the other hand, firms may put long term success at risk should they focus solely on exploiting existing products and services by refining the competencies underpinning them (Atuahene-Gima, 2005). This is because existing competencies held by firms can become obsolete in time without explorative efforts to renew.

The firm will then become inflexible, further hindering the firm's ability to learn and revitalize itself (Leonard-Barton, 1992).

The need for an appropriate balance between exploration and exploitation has been emphasized by Tushman and O'Reilly (1996). An ambidextrous firm has the management and organizational capability to both compete in a mature market (where the cost, efficiency, and exploitation innovation are crucial) and to expand new products and services in an emerging market (where exploration innovation, speed, and flexibility are critical) (Tushman & O'Reilly, 1996). Thus, firms need to be able to balance exploration and exploitation innovations simultaneously to achieve better performance (He & Wong, 2004; Tushman & O'Reilly, 1996). Cao et al. (2009) put forward that a balanced approach (BD) and a combinative approach (CD) are different because BD can better prevent over-commitment in exploitation at the expense of exploration or vice versa that would be harmful for firm performance, whereas CD improves firm performance specifically by placing emphasis on leveraging more complementary resources across exploitation and exploration as warranted. A close balance of exploration and exploitation (i.e., BD) might then enhance SMEs' performance by easing the risks associated with over-commitment to exploration or exploitation innovation while at the same time prompting their presence and ambidextrous use (Cao et al., 2009).

Andriopoulos and Lewis (2009) found that firms could promote BD by managing nested paradoxes of innovation across levels using integration and differentiation. Integration emphasizes interdependence between seemingly opposite constructs by enabling coordination to help actors share and connect divergent knowledge. O'Reilly and Tushman (2007) propose that achieving a high level of BD activities requires both to be integrated around a common set of values and a shared vision set out by top managers coupled with an over-arching structure, complementary context and a proper governance process. Prior studies also argue that top management need to produce supportive structures and context to facilitate the ideal type of organizational ambidexterity required by the firm (BD in this instance) (Gibson & Birkinshaw, 2004; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). In turn, Raisch and Birkinshaw (2008) propose that the theory of innovation ambidexterity requires extension to consider the simultaneous effects of structural, contextual and leadership characteristics in achieving BD. We examine these in turn.

**Structural Characteristics**

Theory has so far associated explorative activity with organic structures and loosely-coupled systems that support path-breaking behaviour, and exploitative activity with mechanistic structures and tightly-coupled systems that support path-refining behaviour (He & Wong, 2004). Exploitative activity then appears to thrive from mechanistic structures in which standardised rules, procedures and routines exist to efficiently coordinate the actions of

individuals; explorative activity instead appears to thrive on simple organic structures with limited routines that offer only priorities, vision and boundary conditions to inform the actions of individuals (Kang & Snell, 2009). The firm's structure may then influence the firm's ability to pursue each type of innovation. Current prescriptions put forward two structural conditions, formalization and connectedness, as pertinent to this debate (Jansen et al., 2006). This study focuses on formalization and connectedness as structural characteristics since the impact of formalization and connectedness as chief coordination mechanisms to facilitate the appearance of explorative and exploitative innovations have not been examined in an integrative model.

Formalization captures the extent to which a firm's structure exhibits mechanistic properties, and is defined as the degree to which rules, procedures, job instructions and communications are formalized, written down or have records kept of (Jansen et al., 2006; Khandwalla, 1977). Standardized processes and structures, detailed routines, and written rules tend to reinforce efficiency and the refinement and improvement of existing activities by establishing ingrained patterns of behaviour (Kang & Snell, 2009). Organizational learning under these conditions tends to focus on refining and improving existing knowledge (Kang & Snell 2009), which is reflective of an act of exploitation (March, 1991) and supportive of exploitative innovation (He & Wong, 2004).

Some firms can be successful at generating explorative innovations even when the firm exhibits a level of formalization, however. Informal mechanisms can cause firms to fail to gain the full benefits of their explorative activity because their structural conditions do not effectively integrate these innovations into the firm's existing activities (Zahra & Nielsen, 2002). Also, in a test of large multiunit firms, Jansen et al. (2006) found no evidence of a negative effect between formalization and explorative innovation. Kang and Snell (2009) offer support for the view that mechanistic structures can support the use of entrepreneurial capital. In sum, these studies suggest that formal mechanisms might not necessarily prevent explorative innovation despite initial theoretical expectations to the contrary (March, 1991). One would expect formalization to positively affect exploitative innovation but the state of evidence is such that one could not predicted beyond a 'no effect' relationship with explorative innovation.

Organic or informal structural conditions support simplified routines and are more loosely connected to rules and traditional expectations about work and its outputs, which in turn should provide individuals with opportunities for autonomy to experiment with the way they work and the way they organize that work (Kang & Snell, 2009). Interdepartmental connectedness is one feature of such organic or informal structural conditions. Connectedness increases opportunities for informal knowledge sharing by exposing an individual to pockets of knowledge from across the firm (Atuahene-Gima 2005; Jansen et al., 2006; Jaworski & Kohli

1993). Connectedness allows individuals to combine unrelated matrices of knowledge in ways that may encourage explorative learning (March, 1991) and explorative innovation in turn (He & Wong 2004; Ireland, Hitt, & Sirmon, 2003).

Connecting unrelated parts of the firm together through a structure that encourages informal communication and knowledge sharing can enable the firm to consistently search and absorb novel information; but it can also enable the integration of disparate pockets of knowledge to improve the overall knowledge base (Kang & Snell, 2009). In turn, connectedness can help individuals to acquire knowledge that refines their current understanding of existing technologies, product features and functions, and fuel exploitative innovation as a consequence (Jansen et al., 2006). Connectedness can then enable a firm to synthesise, assimilate and apply exploitative and explorative knowledge to shape explorative and exploitative innovations (Atuahene-Gima, 2005).

Some concern still exists over the informality attribute of connectedness, however. Jansen et al. (2006) found connectedness to be positively associated with explorative and exploitative innovations in large multiunit firms, but SMEs lack the amount of slack resources needed to cope with profuse autonomous experimentation by individuals (confer, Lubatkin et al., 2006). For instance, SMEs are short of managerial expertise to manage know-how owned by the entrepreneur or existing in the firm from other sources (Cooper et al., 1994). Hadjimanolis (2000) found that SMEs require critical resources such as managerial skills and capabilities,

internal technological resources (R&D expenditure, variety in technological information sources, external training) to achieve innovation ambidexterity. Kyriakopoulos and Moorman (2004) and Raisch and Birkinshaw (2008) suggest that achieving organizational ambidexterity may be contingent on the availability of sufficient resources particularly as operating complexity grows. Nonetheless, the coexistence of parallel structures–formalization and connectedness–should allow SMEs to pursue a balance of exploration and exploitation innovation activities. Thus:

*Hypothesis 1: In SMEs, the more the structure is characterized by formalization and connectedness, the higher the appearance of ambidexterity.*

**Contextual Characteristics**

Theory has recently specified that ambidexterity between contradictory activities may be found when the managers of a business develop a supportive firm context that enables individuals to make their own judgments on how best to manage conflicting task demands (Gibson & Birkinshaw, 2004). In this instance, although ambidexterity is a characteristic of the firm, it manifests itself in the actions of individuals across the firm (Gibson & Birkinshaw, 2004). Individuals must constantly choose how to allocate their time and effort but the presence of fixed instructions and specific incentives can direct individuals' towards acts of exploitation or acts of exploration (Gibson & Birkinshaw 2004; Griffin, Neal, & Parker, 2007). By shaping a set of systems and processes that define a context that allows exploration and exploitation to

take place, individuals can be directed to innovate ambidextrously (Birkinshaw & Gibson 2004; Gibson & Birkinshaw 2004). We examine two contextual conditions: social context and performance management (Gibson & Birkinshaw 2004).

Knowledge underpins acts of explorative and exploitative innovation (He & Wong 2004; March 1991; Morgan & Berthon 2008). But knowledge possesses a social component (Kogut & Zander, 1992), which renders acts of exploration and exploitation subject to the social context of the firm. Social context contributes to knowledge processing activities, particularly by shaping a common communication system within interpersonal social relationships (Verona, 1999), improving a firm's ability to acquire, assimilate, transform and leverage new knowledge over time (Jansen et al., 2005). In addition, due to resources constraints in SMEs, SMEs need to utilize their specific knowledge towards exploration and exploitation innovation through close social interaction among individual in the firm to increase the depth, breadth and efficiency of knowledge exchanges among people (Lane & Lubatkin, 1998). Also, prior studies (Tsai & Ghoshal, 1998) report that a trustful social relation can contribute to effective knowledge exchanges and its recombination. This should then shape an internal organizational ecology in which the occurrence of exploratory and exploitation innovations is supported.

A firm's social context enables ties to form among individuals from different functional backgrounds (De Luca & Atuahene-Gima, 2007; Tsai & Ghoshal, 1998)—as ties form among



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individuals, new channels for knowledge flows emerge which enable individuals to gain access to the knowledge stocks of other individuals from across the firm. Accordingly, social context conditions underlie a firm's ability to effectively combine knowledge that is embedded across different functional areas of the firm (De Luca & Atuahene-Gima, 2007). Two effects are then likely. First, the cross-pollination of knowledge across individuals at different points in the firm's structure enables individuals to creatively combine unrelated matrices of knowledge (Ireland et al., 2003), which should promote the entrepreneurial pursuit of exploratory innovation. Social context conditions can potentially increase the conversion rate of individuals' explorative ideas into explorative innovations (Nonaka, 1994). Second, as social ties among individuals across the firm increase, both the volume and quality of knowledge unlocked increases as well (Tsai & Ghoshal, 1998), and so does the firm's ability to take advantage of exploitative knowledge to refine and improve existing products (Atuahene-Gima, 2005; De Luca & Atuahene-Gima, 2007; March 1991).

Social context conditions supplant the need for more formal, restrictive structural mechanisms to generate knowledge flows within the firm. Thus, a firm context that encourages socialization among individuals can increase the firm's ability to benefit from extensive and high-quality internal knowledge exchange (Gibson & Birkinshaw, 2004), which ought to be amenable to both types of innovation given their dependence on knowledge. Andriopoulos and Lewis (2009) also found that ambidextrous small firms with a supportive social context

though supportive communications avoided contradictory visions being interpreted as impractical.

Adler et al. (1999) posited that the tension between explorative- or refinement-led behaviour and exploration-led behaviour can be reconciled by enabling individual employees to make their own choices on systematizing the creative process and by managers enabling workers to become more innovative and flexible in their day-to-day tasks. Such task enrichment can be framed through performance management (Gibson & Birkinshaw, 2004). Performance management is concerned with stimulating individuals within a firm to deliver high-quality outcomes, and stimulating a sense of responsibility for the achievement of those outcomes (Birkinshaw & Gibson, 2004). Contemporary performance management acknowledges the growing interdependence and uncertainty among work activities that result from complex business activities, such as the firm's innovation initiatives (Griffin et al., 2007). A performance management regime must therefore account for a broader range of individuals' behaviours to understand a firm's effectiveness at innovation (Griffin et al., 2007; Birkinshaw & Gibson, 2004). A rounded performance management system will seek to account for the behaviours that contribute to the firm's adaptability to new market opportunities and its gradual improvement of products for short-term value creation (Birkinshaw & Gibson, 2004; Parker, William, & Turner, 2006; Pulakos et al., 2000); doing so ought to facilitate explorative and

exploitative innovations to appear (Gibson & Birkinshaw, 2004). Thus, performance management should affect the extent to which both types of innovation occur within the firm.

Gibson and Birkinshaw (2004) and Ghoshal and Bartlett (1994) argue that a context promoting discipline, stretch, support and trust is necessary to direct employees' behaviors towards explorative and exploitative tasks. Such a set of conditions involves setting clear standards of performance and behaviour, a system of open and rapid feedback and consistent reward and sanction to reinforce performance. Also, individuals should be involved in the goal-setting process and encouraged to set increasingly ambitious goals. Mechanisms should then be in place to allow individuals to access resources to pursue these goals (Gibson & Birkinshaw, 2004). Importantly, such implementation of the performance management system is designed to create a supportive environment that encourages individuals to take ownership in delivering results, not instead to dictate specific types of action (Gibson & Birkinshaw, 2004).

The commitment of employees towards achieving managers' desired outcomes depends on those individuals seeing the strategic relevance of their actions (Fletcher & Williams, 1996). When individuals are set and self-set challenging goals, the absence of strategic relevance would weaken the likelihood that specific innovation outcomes occur. However, contextualizing performance management around strategically-relevant goals can inspire behaviour and ownership towards those goals (Mathieu & Zajac, 1990). Managers that encourage employees to self-set challenging goals and managers that issue creative challenges



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to employees instead of narrowly defined tasks would be expected to see a consequent increase in the innovation behaviour of employees (Birkinshaw & Gibson, 2004; Gibson & Birkinshaw, 2004). Meta-analyses have also shown that the impact of such performance management interventions is greater in small firms (Guzzo, Jette, & Katzell, 1985), and prior studies report that a goal-oriented performance management approach is a critical success factor for SMEs (Chawla, Pulling, & Alexander, 1997). Top managers can use a goal-based approach to manage their employees' competitiveness (Covin & Slein, 1989). Used intelligently, such mechanisms signal managers' support for employees' behaviour along strategically relevant criteria. Thus, a well-designed performance management system should encourage explorative and exploitative innovations to appear. Following prior studies (Gibson & Birkinshaw, 2004; Ghoshal & Bartlett, 1994; Raisch & Birkinshaw, 2008), a firm's context is characterized by a combination of hard elements (goal-based and effort-based performance management) and soft elements (supportive and devotion) which should facilitate the balancing of exploration and exploitation innovation. Thus,

*Hypothesis 2: In SMEs, the more its internal context is characterized by supportive and dedicative social context and goal-based and effort-based performance management, the higher the appearance of ambidexterity.*

**Leadership Characteristics**

Recent theory developments have suggested that the actions of top managers can engender explorative and exploitative innovations to emerge (Lubatkin et al., 2006; Mom et al., 2007). Andriopoulos and Lewis (2009) revealed that top managers can use a combination of integration and differentiation management approaches to help SMEs be ambidextrous, by using these mechanisms to emphasize exploitation of existing practices and exploring within and pressing towards new frontiers. The important role played by top managers is one of resource marshalling. SMEs require top managers to secure slack resources such as human capital and financial capital to pursue a balance of explorative and exploitative innovations. Human capital provides top managers with the resources and ability necessary to explore and exploit new opportunities (Covin & Slevin, 1997; Wiklund & Shepherd, 2003). Also, SMEs need to secure a great amount of financial resources that fuel both explorative and exploitative innovations (Greene & Brown, 1997; Wiklund & Shepherd, 2005). A lack of financial capital limits top managers from moving towards new opportunities (Wiklund & Shepherd, 2003). For instance, an individual manager exhibiting risk-tolerant leadership would encourage large and risky resources commitments such as investing in new products and services with new technology, thereby requiring access to financial resources to alleviate the danger posed by a risky project failing (Wiklund & Shepherd, 2005). A risk-tolerant leader that marshals slack financial resources can motivate firms' innovation ambidexterity

by encouraging a culture of experimentation and protecting firms from the tentative results of risky projects (Wiklund & Shepherd, 2005).

Proponents of structural (Tushman & O'Reilly, 1996) and contextual (Gibson & Birkinshaw, 2004) views also recognize the value of supportive leaders and flexible managers as drivers of ambidexterity. Mom et al. (2007) indicate that firms' exploitation or exploration may be a product of the exploitation or exploration properties their individual managers exhibit. This view is consistent with the top management literature which suggests that firms over time become reflections of their top managers (Hambrick & Mason, 1984). We examine two leadership conditions: risk-taking and adaptation.

Kohli and Jaworski (1990) argue that if top managers demonstrate a tolerance to take risks and to accept the cost of possible failures, employees will then be more likely to propose and introduce new product-service offerings in response to emerging market opportunities. However, if top managers are risk averse and intolerant of failures, employees are less likely to generate new solutions to market opportunities and instead will focus on gradually improving or refining existing product-service offerings (He & Wong, 2004). Research into entrepreneurial risk taking has concluded that those managers displaying entrepreneurial risk tolerance frame risk in different ways to non-entrepreneurial managers, obtaining a better understanding of the opportunities available to them in turn (Janney & Dess, 2006; Mullins & Forlani, 2005).

Risk tolerance, and a bias to take risky action, is likely to lead top managers to favour higher return, innovation-led opportunities (Lumpkin & Dess, 1996). However, managers with a tolerance for risk-taking can also exhibit a tendency to protect current investments and will not seek to sink their ventures with improper decision making (Janney & Dess, 2006; Mullins & Forlani, 2005). In turn, risk tolerance is based on an understanding of the market-based consequences of choice and incorporates both the cost and magnitude of a failed decision as well as the opportunity cost of a decision (Dickson & Giglierano, 1986).

Individuals within firms benefit from clear signals from top managers about the importance of specific activities (Hambrick & Mason, 1984). Thus, the actions of top managers signal to employees the sort of behaviour considered desirable among top managers (Ireland, Covin, & Kuratko, 2009; Jaworski & Kohli, 1993). Managers that exhibit adaptability to new and emerging conditions in the face of the demands placed on them by the firm's existing operations will signal to employees the need to ambidextrously manage innovation opportunities. To this end, Burgelman (2002) posited the existence of induced and autonomous processes in top managers' decision-making.

Burgelman (2002) relates induced processes to exploitation and autonomous processes to exploration. The induced process builds initiatives that are within the scope of the firm's current activities and build on existing knowledge and competencies. The autonomous process concerns initiatives that emerge outside the scope of the firm's current activities, providing

opportunities for new knowledge and competencies to emerge. Both processes determine the firm's strategic direction and method of operation. The adaptability of top managers to the two sets of activities ought to instil the value of managing current product-services in relation to existing market needs while adapting to face new challenges (Atuahene-Gima, 2005; Birkinshaw & Gibson, 2004; Jaworski & Kohli, 1993).

Adaptability depends on the knowledge managers and individuals possess on the firm's markets, technologies, product-services and customers (Jaworski & Kohli, 1993). Managers that repeatedly stress to employees the importance of adapting to market trends, being sensitive to the activities of competitors and the need to act now to meet customers' future needs ought to shape action to increase individuals' learning and knowledge about these constituencies (Jaworski & Kohli, 1993), which in turn ought to promote both explorative and exploitative innovations to appear (Morgan & Berthon, 2008). Thus:

*Hypothesis 3: Among the top managers of SMEs, the more top managers' leadership is characterized by risk-taking tolerance and adaptability, the higher the appearance of ambidexterity.*

**The Mediating Role of Innovation Ambidexterity on Business Performance**

The consequences of structural characteristics, contextual characteristics and leadership characteristics on firm performance might be due to a balance of explorative and exploitative innovations (BD). Previous studies (Pinto, Pinto & Prescott, 1993)

suggest that internal organizational structural factors have indirect effects on firm performance when firms engage in both explorative and exploitative innovations. In addition, prior studies suggest that innovation ambidexterity has a mediation effect on the relationship between contextual attributes and firm performance (Gibson & Birkinshaw, 2004; Birkinshaw & Gibson, 2004). Gibson and Birkinshaw (2004) also argued that without combining other attributes from structure and leadership, firms will lack capacity to develop innovation ambidexterity. A lack of innovation ambidexterity can cause firms to fail to adapt to changing markets needs or shape new trajectories to generate superior performance as the risk of rigidity to change is higher. He and Wong (2004) and studies since have reported positive firm performance returns to explorative and exploitative innovations. Thus, we expect a balance of explorative and exploitative innovations to affect SME performance by mediating the effects of structural characteristics, contextual characteristics, and leadership characteristics.

*Hypothesis 4: In SMEs, ambidexterity mediates the relationship between structural characteristics, contextual characteristics and leadership characteristics and firm performance.*

## Methodology

### Sample and data collection

The sampling frame consisted of 1000 SMEs in Scotland. The choice of SMEs in

Scotland is due to the fact that the Scottish government has made a significant push over the last several years to stimulate innovation among businesses for economic growth owing to the very complex competitive conditions at national and international levels its firms face (Scottish Government, 2009). These firms were randomly selected from the FAME database. Of this sample, 243 firms (24.3%) responded to a questionnaire survey. Manufacturing and service industries are represented by the firms in the sample (Table 1). Managing directors (MDs) in SMEs were selected as informants for data collection owing to their knowledge of the processes, activities, pressures and overall identity of their businesses (Cohen & Musson, 2000; Kumar, Stern, & Anderson, 1993). Together with the MD, we selected Chief Product Design Managers (PDM) as a second informant because our sample consisted of manufacturing and services sector that compete on providing new products and services. Thus, we reason that PDMs will play a vital role in establishing innovation strategies in these SMEs. Respondents' participation in this study was voluntary and all respondents were asked to complete a survey questionnaire. Following Dillman's (2000) guidelines for the Total Design Method, an invitation letter was sent explaining the nature and purpose of the study. In total, 243 firms responded with both informants providing data. This was achieved through three rounds of attempts (two postal mailings and a final round of phone calls) with incentives (i.e., voucher and company report) provided.

We used an interrater reliability coefficient created by James et al. (1993) to inspect the

intragroup reliability ($r_{wg}$) of responses (details see).[1] The rwg for adaptability, risk-taking, formalization, connectedness, social context, performance management, exploration innovation, exploitation innovation, business performance are .89, .79, .77, .78, .88, .82, .85, .88, .89, respectively, all above .70 (George & Bettenhausen, 1990). These scores suggest acceptable agreement between the two informants. These findings authorize the aggregation of individual scores. Moreover, following Burke and Dunlap (2002), we computed interrater agreement with the average deviation (AD) index. The upper-limit cutoffs for acceptable interrater agreement with 7-point Likert scale when employing AD is 1.2 (Burke & Dunlap, 2002). The AD values for adaptability, risk-taking, formalization, connectedness, social context, performance management, exploration innovation, exploitation innovation, business performance are .29, .47, .46, .30, .25, .26, .44, .32, .28 , respectively, all less 1.2 (Burke & Dunlap, 2002). These scores suggest acceptable agreement between individual members. In addition, we validated the data reliability through checking the representativeness of the sample. First, respondents were divided into two subsamples (responses from 1-122 and responses from 123-243). These subsamples were compared based on the hypothesis that those who responded late might be more similar to those who did not respond than those who responded earlier (Armstrong & Overton, 1977). The subsamples were compared on firm age, profit and sales, and the number of employees. The results revealed no significant difference ($p$<0.05).

Also, we compared the responses of the first round and 30 of the final phone call round (Armstrong & Overton, 1977). No significant differences were found ($p<0.01$). All data were collected during an eight-month period from November 2008 to June 2009. We also run nonlinearity and multicollinearity checks.[2]

*Analysis of respondents*

The characteristics of the 243 respondents are shown in Table 1. A wide distribution of industries can be seen among the respondents. Overall, 79 respondent firms (32.51 percent) operated in manufacturing industries while 164 respondent firms (67.49 percent) operated in service industries. In terms of firm size, 111 SMEs employ from 11 to 49 employees (45.3 percent) and 132 firms (54.7 percent) employ from 50 to 249 employees.

[Please insert Table 1 here]

**Measures**

*Independent variables*

All items used to measure constructs were framed around 7-point Likert scales. Respondents were asked to assess the extent to which their firm had undertaken a range of activities (1 = strongly disagree; 7 = strongly agree). Measures for operationalizing the constructs were drawn from existing studies. Leadership characteristics were measured with items adapted from Jaworski and Kohli (1993), Covin and Slevin (1989), and Miller (1983). Respondents were asked questions regarding the characteristics of top management with

respect to their risk tolerance and adaptability. A confirmatory factor analysis (CFA) test indicated that adaptability and risk-taking tolerance were distinct from each other. The two-factor model ($x^2$=36.26, d.f. = 4, $p$<0.1, RMSEA = 0.22, CFI=.82, GFI=.92, NFI=.81) fit the data better than one factor model $x^2$=98.07, d.f. = 5, $p$<0.1, RMSEA = 0.28, CFI=.67, GFI=.86, NFI=.67).

The measures for structural characteristics were adapted from Jaworski and Kohli (1993) and Jansen et al. (2006). Respondents were asked questions regarding the relationship between organizational structure in terms of the degree of formalisation and connectedness. A CFA test indicated that formalization and connectedness were distinct from each other. The two-factor model ($x^2$=11.43, d.f. = 4, $p$<0.1, RMSEA = 0.09, CFI=.96, GFI=.98, NFI=.95) fit the data better than one factor model $x^2$=17.27, d.f. = 5, $p$<0.1, RMSEA = 0.11, CFI=.94, GFI=.97, NFI=.94).

Contextual characteristics were adapted from Gibson and Birkinshaw (2004). The measure for contextual characteristics relating to social context and performance management captured the extent to which systems encourage employees' contributions at their level/position in the firm (Gibson & Birkinshaw, 2004). A CFA test indicated that social context and performance management were distinct from each other. The two-factor model (social context as one factor, performance as one factor) ($x^2$=505.35, d.f. = 34, $p$<0.1, RMSEA = 0.19, CFI=.68, GFI=.78, NFI=.58) fit the data better than one factor model

$x^2$=625.29, d.f. = 35, $p$<0.1, RMSEA = 0.23, CFI=.58, GFI=.71, NFI=.41).

To measure exploitative innovation, a four–item measure was adapted measure from Jansen et al. (2006) and captured the extent to which the firm builds upon existing knowledge to pursue incremental innovations that meet the needs of existing customers. Explorative innovation was adapted from Jansen et al. (2006), He and Wong (2004), and Birkinshaw et al. (1998) and captured the extent to which the firm departs from existing knowledge and pursues radical innovations for emerging customers or markets. A CFA test indicated that exploration innovation and exploitation innovation were distinct from each other. The two-factor model ($x^2$=119.19, d.f. = 23, $p$<0.1, RMSEA = 0.13, CFI=.88, GFI=.86, NFI=.84) fit the data better than one factor model ($x^2$=120.59, d.f. = 18, $p$<0.1, RMSEA = 0.24, CFI=.74, GFI=.72, NFI=.63).

We also conduct a CFA to examine the discriminant validity of three dimensions (structural characteristics, contextual characteristics, leadership characteristics). The three-factor model fit the data better than six-factor model: $\chi^2$ = 109.15, d.f. = 21, $p$ < .01, RMSEA = .08, CFI = .88, GFI = .87, TLI = .83. The results, therefore, supported the proposed three dimensions for innovation ambidexterity.

*Dependent variables*

Performance was measured with four items adapted from Gibson and Birkinshaw (2004). These items reflect on performance over the last five years and ask respondents to

indicate the degree to which they agree with the extent to which the firm had met certain performance criteria. These were: (1) Our company is achieving its full potential; (2) People at all levels are satisfied with the level of business performance; (3) Our company does a good job of satisfying our customers; (4) This company gives me the opportunity and encouragement to do the best work I am capable of. These four items captured the extent to which SMEs used their exploitative and exploratory innovations to achieve business and market potential (Gibson and Birkinshaw, 2004). A CFA test indicated that the one factor model ($x^2$=9.79, d.f. = 2, $p$<0.1, RMSEA = 0.12, CFI=.97, GFI=.98, NFI=.96) fit the data well.

To test the reliability of our subjective measure, we obtained annual sales figures (computed over the same time period as our subjective measure) from the FAME database to correlate with this four-item subjective performance construct. Following He and Wong (2004), we used average sales growth as an objective performance measure. A positive and significant association ($r$ = 0.761, $p$<0.001) between the subject performance measure and the archival-based sales growth measure was found. Average sales growth estimates are more reliable than profitability as it does not suffer from accounting measurement problems, and has been found to be a reliable proxy for other dimensions of firm performance (He & Wong, 2004). This finding provides evidence of the convergent validity of the self-report performance measure.

*Control variables*

We controlled for firm age, firm size (number of employees) and industry sector. We controlled for firm size and firm age because these can influence firm growth by affecting the resource stocks available to the firm and the existence of formal routines. The natural log of firm age and firm size were used to compensate for skewness. Two broad industry sectors (manufacturing and service) were used as a third control variable. Industry sector has been associated with firms' motivation regarding adaptation to unpredictable resource conditions and performance fluctuations (Lubatkin et al., 2006). We also controlled for environmental instability. We also controlled firm resource level as studies have revealed that this can have an influence on the effect of ambidexterity on firm performance (Kyriakopoulos & Moorman, 2004).

*Factor analysis and intercorrelations*

All factor analysis results are contained in Appendix A.1. Factor analyses were conducted using principal component extraction with varimax rotation. All of the expected constructs were formed. Although we used existing scales by Gibson and Birkinshaw (2004), these scales did not form their anticipated study constructs. As such, our factor analysis adds another layer of purification to their measures.

The internal consistency (Cronbach alpha) of the constructs was in the range of 0.698 to 0.921 (Appendix A.1) and is comparable to that obtained in previous studies using the same

measures (Gibson & Birkinshaw, 2004; He & Wong, 2004; Jansen et al., 2006). These values exceed the minimum suggested by Nunnally (1978) and are taken as evidence of acceptable reliability. Table 2 shows the intercorrelations, means and standard deviations for the variables used in the regression analyses.

[Please insert Table 2 here]

**Analysis methods**

We applied hierarchical regression to test our hypotheses. Regression analysis was used because, first, the SEM model was too big for the number of data this study had so the study would break the acceptable parameter-to-observation ratio as argued by Bentler and Chou (1987); and, second, use of mediation regression can provide a better solution to explore the mediation effect as it does not assume normality of distribution of the indirect effect (Preacher & Hayes, 2004). Hierarchical regression adds controls and independent variables incrementally to gauge their relative contributions to explaining variance in the dependent variable. Following prior studies (e.g., Bandalos & Finney, 2001; Enticott, Boyne, & Walker, 2008), we subsumed the average mean of adaptability and risk-taking tolerance together as leadership characteristics, the average mean of formalization and connectedness together as structural characteristics, the average mean of social context (devotion-based and supportive-based) and performance management (goal-based and effort-based performance management) together as contextual characteristics. A two-layer echelon[3] approach to

produce an overall firm score was used because this approach reflects 'the most significant managerial fissures within the firm' between MDs and PDMs and 'is less likely to lead to the exclusion of organizations from statistical analyses because of missing respondents' (Enticott et al., 2008: 246). We used Preacher and Hayes' (2004) mediation regression method to test our mediation hypothesis. The use of mediation regression method is due to the fact that bootstrapping provides a better option to explore the mediation effect as it does not assume normality of distribution of the indirect effect (Preacher & Hayes, 2004). We followed Baron and Kenny's (1986) procedure to conduct the hierarchical regression analyses and used stepwise regression to evaluate the order of importance of variables. Stepwise regression methods provide researchers with a methodology with which to determine a predictor's individual meaningfulness as it is introduced (Pedhazur, 1997). Use of stepwise regression methods can also help researchers to evaluate a group of independent variables one variable at each stage which has largest contribution to $R^2$ (Cohen & Cohen, 1975: 102). Table 3 and 4 summarizes the results.

## Results

We deployed several post hoc tests including the Harman single-factor test, CFA and bivariate correlations to search for common method bias (Podsakoff et al., 2003). Exploratory factor analysis combining items from the dependent and independent variables revealed that several factors were extracted. The first factor accounted for 22.042 percent of variance with

an eigenvalue of 3.792. This offers evidence that there is no single factor emerging from these variables to suggest common method bias in the data. Moreover, all dependent and independent variables were loaded onto a one-factor, a two-factor, and a three-factor CFA model to examine fit. If common method variance exists among these variables, then the one-factor CFA model will fit the data well. The results of a one-factor, a two-factor, and a three-factor of CFA disclosed that the fit of a one-factor model as the poorest containing wholly unacceptable fit statistics ($\chi^2$=585.62, d.f.=54, p=0.00, CFI=0.62, GFI=0.72, NNFI=0.53, RMSEA=0.19). Finally, in order to more directly exclude the common method bias in our data, we examined bivariate correlations between subjective performance from respondents and objective performance obtained from the FAME database. These were significantly correlated ($r$ = 0.761, $p$<0.001). Thus, we conclude that common method bias does not affect the data.

**Hierarchical regression results**

Tables 3 and 4 present the results of hierarchical regression analyses for leadership, structural and contextual characteristics onto exploitative innovation and explorative innovation respectively. The baseline model 1 contains control variables. For hypothesis 1, there appears a significantly positive relationship between structural characteristics and BD ($\beta$=0.313, $p$<0.001) (model 2, Table 4). Thus, hypothesis 1 is supported. Regarding hypothesis 2, no significant relationship is found between contextual characteristics and BD.

Hypothesis 2, therefore, is not supported.

For hypothesis 3, a positive significant relationship is found between leadership characteristics and BD. Thus, hypothesis 3 is supported ($\beta$=0.075) (model 2, Table 4).

[Please insert Table 3, 4 here]

Table 3 and 5 present the mediation analysis of BD on the link between structural characteristics, contextual characteristics, and leadership characteristics and firm performance. These results indicate that BD partially mediates the effects of structural characteristics, contextual characteristics, and leadership characteristics on firm performance. The 95% confidence limit was constructed based on Meeker, Cornwell, and Aroian (1981) and MacKinnon (2008). The results support hypothesis 4 and signal the importance of the confluence of structural characteristics, contextual characteristics, and leadership characteristics and BD for SMEs to secure superior performance.

[Please insert Table 5 here]

## *Discussion, contributions and implications*

The intentions of this study were to first determine the relevance to SMEs of structural, contextual and leadership conditions put forward by theory to shape BD, given that the research into conditions underpinning ambidexterity are so far almost exclusively aimed at large, multiunit firms; and then second to test whether innovation ambidexterity is in fact a

relevant strategy to enable superior performance in SMEs.

Our findings contribute to the debate surrounding how to manage and organize for BD. Our results contrast with Tushman and O'Reilly's (1996) arguments that ambidexterity can only be created in separate organizational units, a prescription largely irrelevant to SMEs. Instead, our findings support beliefs that internal organizational structures can create conditions by which BD are supported as a precursor to ambidexterity (Gibson & Birkinshaw, 2004). However, our findings differ to studies promoting contextual and structural conditions in large firms (Birkinshaw & Gibson, 2004; Jansen et al., 2006), demonstrating that such prescriptions do not apply directly to SMEs. Contextual conditions receive little support in comparison to the actions of top managers when examining how SMEs might achieve these innovations. We extend prior studies therefore (e.g., Mom et al., 2007) to show the hitherto ignored role of top managers in achieving innovation ambidexterity in SMEs, and add new value by demonstrating how leaders can use their management approach in conjunction with feasible structural design to shape and reinforce these innovations. These findings offer several important contributions to scholars and managers.

**Scholarly and Managerial Contributions**

First, we find that both structural characteristics and leadership characteristics are both theoretically and statistically relevant to SMEs except contextual characteristics. This supports our concern that prescriptions put forward for large firms do not sufficiently



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represent conditions suitable for SMEs. This conclusion validates our argument that ignoring SMEs in the conceptual and empirical debates on the theory of ambidexterity represents a dangerous scholarly and managerial gap. To the best of our knowledge, this is among the first to consider the confluence of structural, contextual and leadership conditions in an attempt to understand how SMEs can create and maintain BD. In turn, the study directly contributes to calls by Raisch and Birkinshaw (2008) for multi-faceted research into innovation ambidexterity to understand its antecedents.

Second, we discover that both structural conditions and leadership characteristics assist SMEs to pursue BD. The results reported here shed light on how SMEs with limited resource availability can mobilize firm design and management actions to achieve a close balance of explorative and exploitative innovations. Prior studies have reported that firms tend to make a trade-off between explorative and exploitative innovations as organizations face opposition between these two innovation processes (March, 1991). However, we find that for SMEs, performance advantages accrue to those that succeed in generating a close balance of innovation ambidexterity. In turn, these findings support Cao et al.'s (2009) contention that a close balance of explorative and exploitative innovations (i.e., BD) is beneficial to SMEs with fewer resources, and supporting prior studies' assertion (e.g., Andripoulos & Lewis, 2009) that SMEs could achieve innovation ambidexterity through the use of appropriate organizational structures. In turn, the study directly contributes to calls by Gibson and

Birkinshaw (2004) to extend and validate research regarding the antecedents of innovation ambidexterity. In contrast with prior studies (e.g., Gibson and Birkinshaw, 2004) though, we find that SMEs failed to contextualize performance management systems and to create a supportive organizational context to facilitate a close balance of innovation ambidexterity. This might be due to their relatively resource-constrain nature requiring a tighter focus on organizational activity. However, supporting previous research's debate (e.g., Gibson & Birkinshaw, 2004; Raisch & Birkinshaw, 2008), our findings support the mediation effect of BD between contextual characteristics and business performance in SMEs.

Theoretical concerns have been raised that resource limitations in SMEs might render ambidexterity a suboptimal strategy (see for example, Raisch & Birkinshaw 2008, for a review). However, it is apparent from our findings that those firms capable of shaping the right internal environment and adopting both risk-taking and adaptability leadership methodologies to support both innovation types as a precursor for a balance of explorative and exploitative innovation may overcome such resource limitations to generate superior performance. Our findings suggest such firms might do better than those that spend their resources exclusively on an exploitative or explorative innovation strategy alone. Thus, our work contributes a platform from which scholars and managers can reassess the superiority of some SMEs in comparison to others.

The importance of achieving innovation ambidexterity is given weight by the fact that

we find a significant partial mediation effect of a BD on SME performance. These findings confirm the mediation effect of innovation ambidexterity and demonstrate the importance of advancing an organizational environment supportive of achieving BD. In turn, a performance advantage can accrue to those SMEs who develop BD and therefore offers managers a basis by which their firms can sustainably compete against competitor firms over time.

**Limitations and Future Research**

Some limitations do constrain these contributions. First, although the firms in the sample are heterogeneous by industry, they are geographically homogenous. Research has suggested that environment might affect the innovation activities of larger firms although such studies report only turbulence and dynamism as opposed to cultural difference and offer no evidence for SMEs (e.g., Jansen et al., 2005). Second, longitudinal data would help illustrate how the evolution of firms' internal environments might impact on the management of innovation and the returns to ambidexterity over time. Third, our antecedents are not an exhaustive set of conditions and additional factors might support or undermine innovation ambidexterity and the returns to it that are not accounted for here. Fourth, the methodology cannot fully mitigate the risk of common method variance. Several aspects of good practice were undertaken, and the nature of the results and their complementarities to each other do suggest that any such variance is marginal. It should also be borne in mind that objective measures of organizational structure, context and leadership conditions as well as innovation are few and

particularly scarce.

Several positive avenues for future research emerge from this work. First, while understanding internal environment conditions is critical from a management perspective to understand the creation, maintenance and returns to innovation ambidexterity, a hitherto ignored variable is the role of firms' resource endowments. Following the logic of the resource-based view, a firm's unique bundles of resources enable and disable specific strategies. By extension, which resources or bundles of resources might enable exploitative, explorative and ambidextrous innovation is a relevant question. Studies suggest that long-established resource bundles can generate the risk of core rigidity whereby firms fall into a trap of constantly exploiting current resource strengths while increasingly reducing their motivation and willingness to cannibalize these resources bundles in favour of explorative innovation (Atuahene-Gima, 2005; Chandy & Tellis, 1998; Leonard-Barton, 1992).

Second, beyond structural, contextual and leadership antecedents, behavioural antecedents arguably require examination. For example, firms exhibiting high entrepreneurial orientation may not benefit from introducing exploitative activity owing to their orthogonal relationship, in theory (e.g., Hughes et al., 2007). However, contextual conditions such as control systems and the nature of collaboration among employees may offset this issue (Birkinshaw & Gibson, 2004). Entrepreneurial orientation can also shape culture when

deployed in conjunction with structural and contextual features (Lumpkin & Dess, 1996). In turn, future research should account for behavioural components of firms' internal environments along with typical structural and contextual antecedents to examine the formation of innovation ambidexterity in more complete terms.

Finally, Raisch and Birkinshaw (2008) imply the existence of different forms of ambidexterity beyond innovation ambidexterity, for example, strategy ambidexterity between induced and autonomous processes or between efficiency and flexibility. In reality, the 'ambidexterity' term encapsulates any scenario in which firms balance two or more contradictory activities. These forms of ambidexterity or yet to be sufficiently explored, and we know not whether the antecedents to innovation ambidexterity hold for its other forms. Resolving this issue will broaden the conceptual and empirical bases of ambidexterity theory.

**Notes:**

1. There is a sign of good agreement within a group if an $r_{wg}$ is greater than or equal to 0.70 (George & Bettenhausen, 1990). We computed the intragroup reliability by using James et al.'s (1984, 1993) procedure: first, we calculated the standard deviation of items in each construct; second, we then calculated standard deviation square value of items in each construct; third, we then calculated the average value of items in each construct. All the three steps were conducted with syntax in SPSS.
2. We used scatterplot methods in SPSS to run the nonlinearity check between independent variables and two types of innovations. The values of $R^2$ revealed that independent variables have strong linearity relationship with two types of innovations (all $R^2$ ranged from .956 to .975). To avoid multicollinearity among all variables, we checked whether VIF (variance inflation factor) of all variables is bigger than 10. Results showed that VIF values of all variables (ranged from .767 to 0.921) are less than 10. Thus, the multicollinearity is not a concern for this study.
3. Enticott et al. (2008) proposed a two-layer echelon approach to average the responses of two groups: MDs and PDMs in each firm. The two scores were then averaged to create an overall firm score in SPSS.

## Appendix:

### A1 Factor Analysis of Characteristics of Top Managers, Process and Structure, Exploitation Innovation, Exploration Innovation, and Business Performance

| Factor content | | Factor loadings | |
|---|---|---|---|
| **A: Leadership – (1) adaptability and (2) risk-taking tolerance** | | 1 | 2 |
| **A01** | We repeatedly tell employees that this firm's survival depends on its adapting to market trends | 0.853 | |
| **A02** | We often tell employees to be sensitive to the activities of our competitors | 0.702 | |
| **A03** | We keep telling people around here that they must gear up now to meet customers' future needs | 0.728 | |
| **A05** | We like to take financial risks | | 0.871 |
| **A06** | We encourage the development of innovative marketing strategies, knowing well that some will fail. | | 0.871 |
| Eigenvalue | | 1.773 | 1.518 |
| Accumulated variance explained (%) | | 44.335 | 50.603 |
| Cronbach's α for the scale | | 0.739 | 0.698 |
| **B**: **Structural Characteristics – (1) Formalisation and (2) Connectedness** | | 1 | 2 |
| **B02** | Written records are kept of everyone's performance. | 0.831 | |
| **B04** | Written job descriptions are formulated for positions at all levels in our company. | 0.813 | |
| **B01** | Rules and procedures occupy a central place in our company | 0.769 | |
| **B3** | In our company, employees from different departments feel comfortable calling each other when the need arises | | 0.821 |
| **B5** | In our company, it is easy to talk with virtually anyone you need to, regardless of rank or position | | 0.681 |

| | | | |
|---|---|---|---|
| Eigenvalue | | 1.989 | 1.755 |
| Accumulated variance explained (%) | | 49.724 | 43.879 |
| Cronbach's α for the scale | | 0.712 | 0.723 |
| **C: Social context – (1) devotion and (2) supportive** | | 1 | 2 |
| **C01** | devote considerable effort to developing their subordinates | 0.768 | |
| **C02** | give everyone sufficient authority to do their jobs well | 0.756 | |
| **C03** | push decisions down to the lowest appropriate level | 0.858 | |
| **C05** | work hard to develop the capabilities needed to execute our overall strategy/vision | 0.910 | |
| **C06** | base decisions on facts and analysis, not politics | | 0.988 |
| **C07** | treat failure (in a good effort) as a learning opportunity, not something to be ashamed of | | 0.987 |
| Eigenvalue | | 2.897 | 1.822 |
| Accumulated variance explained (%) | | 48.284 | 30.371 |
| Cronbach's α for the scale | | 0.707 | 0.721 |
| **D: Performance Management – (1) goals and (2) efforts** | | 1 | 2 |
| **D01** | Our company encourages people to set challenges/demanding goals | 0.910 | |
| **D02** | Our company issues creative challenges to our people, instead of narrowly defining tasks | 0.859 | |
| **D03** | Our company is more focused on people getting the job done well than on getting promoted | | 0.901 |
| **D04** | Our company makes a point of stretching our people | | 0.806 |
| Eigenvalue | | 1.947 | 1.206 |
| Accumulated variance explained (%) | | 48.664 | 31.511 |
| Cronbach's α for the scale | | 0.807 | 0.791 |
| **E**: **Innovation Ambidexterity –(1) Exploitative Innovation and (2)** | | 1 | 2 |
| **E01** | We improve our provision's efficiency of products and services. | 0.865 | |
| **E02** | We increase economies of scales in existing markets | 0.876 | |

| | | | |
|---|---|---|---|
| **E03** | Our company expands services for existing clients. | 0.781 | |
| **E04** | Lowering costs of internal processes i an important objective. | 0.741 | |
| **E05** | New-to-market products or services | | 0.902 |
| **E06** | Transformation of new-to-market ideas into product lines | | 0.895 |
| **E07** | New-to-product innovations first started in our firm | | 0.837 |
| **E08** | Introduction of new generations of products | | 0.830 |
| **E09** | New-to-market product innovations in Research and Development. | | 0.827 |
| **E10** | Addition of new elements in currer product range | | 0.789 |
| **E11** | Opening up new markets for current products or services | | 0.726 |
| **E12** | Improvement of our distribution channels in our current market | | 0.591 |
| Eigenvalue | | 2.674 | 5.188 |
| Accumulated variance explained (%) | | 66.84 | 64.854 |
| Cronbach's α for the scale | | 0.828 | 0.895 |

| **F**: **Business Performance** | | 1 | 2 |
|---|---|---|---|
| **F02** | People at all levels are satisfied with the level of business performance. | 0.900 | |
| **F01** | Our company is achieving its full potential | 0.852 | |
| **F04** | This company gives me the opportunity and encouragement to do the best work I am capable of. | 0.673 | |
| **F03** | Our company does a good job of satisfying our customers | 0.805 | |
| Eigenvalue | | 2.219 | |
| Accumulated variance explained (%) | | 55.473 | |
| Cronbach's α for the scale | | 0.921 | |

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**Table(s)**

**Table 1 Respondent Characteristics**

| Industry type (main) | Industry type (sub) | Frequency | Percent |
|---|---|---|---|
| Manufacturing | Transportation equipment | 5 | 2.1 |
| | Electrical equipment | 3 | 1.2 |
| | Industrial and precision equipment | 4 | 1.6 |
| | Metal, rubber, stone, glass & leather | 6 | 2.5 |
| | Chemical & pharmaceuticals | 5 | 2.1 |
| | Food, tobacco & textiles | 11 | 4.5 |
| | Wood, wood products, pulp & paper | 11 | 4.5 |
| | Other manufacturing industry | 34 | 14.0 |
| | **Total number of firms in manufacturing industries** | **79** | |
| Services | Computer services | 5 | 2.1 |
| | Engineering & architecture | 16 | 6.6 |
| | Wholesale & retail trade | 23 | 9.5 |
| | Banking, insurance & real estate | 4 | 1.6 |
| | Hotels & restaurants | 2 | 0.8 |
| | Transportation services | 12 | 4.9 |
| | Other services industry | 102 | 42.0 |
| | **Total number of firms in service industries** | **164** | |
| **Number of total employees** | 11-49 | 111 | 45.3 |
| | 50-249 | 132 | 54.7 |
| **Total** | | 243 | 100.0 |

**Table 2 Intercorrelations, Means, and Standard Deviations of Variables**

| **Variables** | **(`1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** | **Mean** | **SD** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Tenure of the company | -- | | | | | | | | | | 42.98 | 40.18 |
| (2) Size (number of employees) | ˙.19** | -- | | | | | | | | | 72.41 | 61.03 |
| (3) Sector | -.15* | -.04* | --- | | | | | | | | 11.65 | 4.50 |
| (4) Environmental instability | .002 | -.017 | -.08 | --- | | | | | | | 19.25 | 15.46 |
| (5) Firm resource level | -.25** | -.35** | .35** | -.01 | --- | | | | | | 5.34 | 0.78 |
| (6) Leadership characteristics | -.18** | -.17** | .038 | .45** | .169* | --- | | | | | 4.46 | 0.95 |
| (7) Structural characteristics | .17** | -.021 | -.25** | .114 | -.33** | -.14* | --- | | | | 5.41 | 0.92 |
| (8) Contextual characteristics | .017 | -.111 | -.25** | .23** | -.087 | .20** | .42** | --- | | | 5.27 | 0.92 |
| (9) Balanced dimension of ambidexterity | .12* | .092 | -.23** | 0.013 | -.19* | .25** | .36** | .15* | --- | | 1.16 | 1.04 |
| (10) Business performance | -.050 | .008 | .17 | .17** | .19** | .24** | .37** | .30** | .21** | --- | 5.10 | 0.86 |

Number = 243

*$p$<0.05.

**$p$<0.01.

**Table 3 Results of Hierarchical Regression Analysis for Business Performance**

| Variables | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Dependent<br>Business Performance | | | |

| Step1: Control variables | | | |
|---|---|---|---|
| Constant (B) | 2.331 | .420 | .595 |
| Tenure of the company | .069 | .084 | .123 |
| Firm size (no. of employees) | .049 | .126 | .170 |
| Sector | .242* | .264* | .252 |
| Environmental turbulence | .254* | .034 | .084 |
| Firm resource level | .145 | .141 | .157 |
| Step 2: main effect variables | | | |
| Leadership characteristics (adaptability + risk-taking tolerance) | | .251** | .197* |
| Structural characteristics (formalization + connectedness) | | .054 | .033 |
| Contextual characteristics (social context + performance management) | | . 364*** | .347*** |
| Step 3: mediation effect variable | | | |
| Balanced dimension of Innovation ambidexterity | | | .270*** |
| $R^2$ | .155 | .321 | .376 |
| Adjusted $R^2$ | .127 | .286 | .339 |
| Change | | .159 | .053 |
| F | 5.639*** | 8.943*** | 10.046*** |
| Change (F) | | 3.304 | 1.103 |

Number =243.

*$p$<0.05.

**$p$<0.01.

***$p$<0.001.

**Table 4 Results of Hierarchical Regression Analysis for Balanced Dimension of Innovation Ambidexterity**

| Variables | Model 1 | Model 2 |
|---|---|---|
| Dependent<br>Balaced Dimension of Innovation<br>ambidexterity | | |
| Step 1: Control variables | | |
| Constant (B) | 0.264 | -0.629 |
| Tenure of the company | .209** | .141 |

| | | |
|---|---|---|
| Firm size (no. of employees) | .243** | .178* |
| Sector | -.148 | -.059 |
| Environmental turbulence | .109 | .189* |
| Firm resource level | .001 | .063 |
| Step 2: main effect variables | | |
| Leadership characteristics (adaptability + risk-taking tolerance) | | .202* |
| Structural characteristics (formalization + connectedness) | | .313*** |
| Contextual characteristics (social context + performance management) | | .075 |
| $R^2$ | .174 | .267 |
| Adjusted $R^2$ | .147 | .229 |
| Change( $R^2$) | | .082 |
| F | 6.556*** | 6.965*** |
| Change (F) | | .409 |

Number =243.

*$p$<0.05.

**$p$<0.01.

***$p$<0.001.

**TABLE 5**

**Tests of the Significance of the Indirect Effects**

| The Indirect Effect of | Bootstrapping Statistics | 95% Confidence Limit |
|---|---|---|
| Leadership characteristics on business performance through balanced dimension of ambidexterity | .19*** | (.12, .34) |
| Structural characteristics on business performance through balanced dimension of ambidexterity | .12** | (.19, .37) |
| Contextual characteristics on business performance through balanced | .27** | (.36, .58) |

dimension of ambidexterity

Number =243.

$^{*}p<0.05$.

$^{**}p<0.01$.

$^{***}p<0.001$.

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***Author Biography (80 words or less for each author)**

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***Highlights**

*Balancing explorative and exploitative innovation ambidextrously has emerged as one of the foremost questions in management research. While a firm's ability to jointly pursue both exploitative and explorative innovation has been conceived as having positive performance effects, scholarly efforts to resolve the ambidexterity question have left a disproportionate gap in our understanding of how innovation ambidexterity can be achieved, particularly so in small- to medium-sized firms (SMEs). The state of the debate is such that SMEs must largely rely on prescriptions tested with large firms to inform their ambidexterity initiatives. This study focuses on the characteristics of top managers and features of organizational structure and context in facilitating the appearance of ambidexterity in SMEs, and the mediation effect of innovation ambidexterity between structural, contextual, and leadership characteristics on SME performance. Results indicated that SMEs could achieve a close balance of explorative and exploitative innovations (BD) through shaping right international organizational structures and adopting appropriate leadership styles. Further, BD mediates the relationship between the structural, contextual, and leadership characteristics on SME performance. SMEs could benefit from BD with relatively resources available.*