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DRIVING NPD PERFORMANCE IN HIGH-TECH SMES THROUGH IT AMBIDEXTERITY: UNVEILING THE INFLUENCE OF LEADERSHIP DECISION-MAKING STYLES

Tahir Abbas Syed
University of Manchester, tahirabbas.syed@manchester.ac.uk

Constantin Blome
University of Sussex, c.blome@sussex.ac.uk

Thanos Papadopoulos
University of Kent, a.papadopoulos@kent.ac.uk

DRIVING NPD PERFORMANCE IN HIGH-TECH SMES THROUGH IT AMBIDEXTERITY: UNVEILING THE INFLUENCE OF LEADERSHIP DECISION-MAKING STYLES

Research paper

Tahir Abbas, Syed, University of Manchester, Manchester, Tahirabbas.syed@manchester.ac.uk
Constantin, Blome, University of Sussex, Brighton, C.Blome@sussex.ac.uk
Thanos, Papadopoulos, University of Kent, Kent, A.Papadopoulos@kent.ac.uk

Abstract

The scarcity of IT resources and technological advancements in high-tech small and medium enterprises (SMEs) require leaders to embed IT ambidexterity – simultaneous pursuit of IT exploitation and IT exploration activities – into their organization's strategy, which could be challenging. To better understand how leaders enable IT ambidexterity, this study focuses on the leadership decision-making style (directive decision-making and participative decision-making) as a key driving factor. Moreover, we examine how and when leadership decision-making styles are most effective in enacting IT ambidexterity by considering new product development (NPD) team diversity and shared vision as two important contingencies. Finally, we test the role of IT ambidexterity in improving NPD performance. We analyse our research model using survey data from 292 high-tech SMEs. Our findings suggest that both decision-making styles enable IT ambidexterity, however, participative decision-making style is more effective in highly diverse NPD teams and directive decision-making style should be preferred when shared vision is a dominant factor among NPD team members. Our results also show that IT ambidexterity significantly enhances NPD performance. We discuss our contribution to information systems (IS) and ambidexterity research and provide implications for practice.

Keywords: IT ambidexterity, leadership decision-making styles, NPD team diversity, shared vision, NPD performance and high-tech SMEs

1 Introduction

The accelerating rate of technology change in high-tech SMEs rapidly replaces the established product and process technologies, thus reducing opportunities for firms to grow (Hotho and Champion, 2011; Chandrasekaran, Linderman and Schroeder, 2012). To flourish or even survive in these rapidly changing environments, firms are required to develop the ability to simultaneously exploit their existing technologies and explore new technical solutions (Kathuria and Konsynski, 2012). This capability of the firms in the context of IT is defined as IT ambidexterity, simultaneous pursuit of IT exploitation and IT exploration activities (Subramani, 2004; Lee, Sambamurthy, Lim and Wei, 2015). The firm's ability to continuously refine its existing technologies and innovate new technological solutions at the same time assures long-term organizational survival. For instance, Harris cooperation, a 100 years old firm that started off with manufacturing printing presses continued to exploit existing market and gradually explored to diversify into becoming a global leader in high-tech electronics and space-borne products (O'Reilly and Tushman, 2013). On the other hand, Motorola's cell phone division reported a decline in market share during the year 2008 due to their inability to simultaneously develop products for existing and future cell phone markets (Chandrasekaran et al., 2012).

To develop separate structural units for pursuing IT exploitation and IT exploration (termed as structural ambidexterity (O Reilly and Tushman, 2004)) may not be a viable option for SMEs due to lack of expertise and resources. On the other hand, contextual ambidexterity (Gibson and Birkinshaw, 2004) in which the simultaneous pursuit of IT exploitation and IT exploration is exercised within the same firm provides a better opportunity for SMEs to realise IT ambidexterity. However, this may continuously challenge SMEs leaders to make decisions in order to manage the contradicting and paradoxical demands that are inherent to exploitation and exploration activities (Jansen, George, Van den Bosch and Volberda, 2008; Carmeli and Halevi, 2009). This is because the routines, structures, processes and skills required for exploitation are fundamentally different from those required for exploration (O'Reilly and Tushman,

2008). Thus, firm leaders are frequently required to make clear and consistent decisions to allocate resources and provide guidance to leverage both strategies simultaneously (Raisch and Birkinshaw, 2008; Smith, 2014). The balance of two activities can help firms to avoid falling into a failure trap (excessive exploration at the expense of exploitation) or a success trap (excessive exploitation at the expense of exploration) (Wang, Senaratne and Rafiq, 2015). In particular to high-tech SMEs, where firms have limited availability of scarce resources and market demands change rapidly (Hotho and Champion, 2011), the significance of leadership decision-making style becomes evident as a critical tool to successfully address the contradicting needs of strategic activities (Smith, 2014). The leadership decision-making style characterises the approach that a firm leader takes in reaching a decision (Chandrasekaran et al., 2012). What different decision-making styles allow high-tech SMEs leaders to enable IT ambidexterity, yet remains relatively unexplored.

The decisions are taken to develop IT constructs with the desire to benefit, however, due to misalignment between the leadership decision-making style and firm norms, IT development decisions may not fully realize the expected benefits (Martinsons, 1991). This suggests that the effect of leadership decision-making styles on IT strategies in NPD context may be contingent upon the NPD team attributes. Prior studies (i.e., Raisch and Birkinshaw, 2008; Havermans, Deanne, Anne and Mary, 2015) also highlight the need to examine the role of contexts that may influence the effectiveness of firm leaders when enabling ambidextrous strategies. While previous studies have shown the influence of external environments in this context, the role of internal context remains less explored (Mihalache, Jansen, Van den Bosch and Volberda, 2014). Thus, we examine NPD team values and norms, in particular, diversity and shared vision that may affect the influence of firm leader's decision style when enacting IT ambidexterity. Diversity refers to the extent to which firms values the difference in viewpoints, skills, knowledge, and information (Wang and Rafiq, 2009). Shared vision refers to the collective goals and aspirations of firm members that sets a common strategic direction ameliorating conflicts and disagreements (Tsai and Ghoshal, 1998). The choice of diversity and shared vision as the NPD team factors is based on several reasons. First, in contrast to other dimensions of organizational context that represent processes and systems of firms i.e. discipline, stretch and support (Gibson and Birkinshaw, 2004), organizational diversity and shared vision represents firm members' values and norms (Wang and Rafiq, 2014). Second, theoretical arguments on top management team composition suggest that the attributes of diversity and shared vision may directly influence the outcomes of leadership decisions (Jansen et al., 2008; Mihalache et al., 2014). Consequently, it becomes important to include and examine the potential impact that these factors might have on the effectiveness of leadership decision-making styles. Finally, these NPD team norms and values are reflected in actual behavioural patterns and such behavioural patterns can enhance or diminish the effect of leadership style (Jung and Avolio, 1999). Therefore, we examine the potential moderating role that NPD team diversity and shared vision may impose on the relationship between leadership decision-making styles and IT ambidexterity. This study examines three critical questions:

Q1: What decision-making styles allow high-tech SMEs leaders' to enable IT ambidexterity?

Q2: Whether NPD team diversity and shared vision influence the strength of the relationship between leadership decision-making styles and IT ambidexterity?

Q3: Whether IT ambidexterity influences NPD performance in high-tech SMEs?

To answer these questions we used a survey methodology and collected data from 292 high-tech SMEs (up to 249 employees) in the United Kingdom (UK). The collected data are then analysed using Structural Equation Modelling (SEM).

This study contributes to IS literature in a number of ways. First, our findings explicate how distinct leadership decision-making styles may enact a simultaneous pursuit of IT exploitation and IT exploration. Second, the results extend the leadership effectiveness theory by evidencing when and how leadership decision-making styles might be most or least beneficial by examining the moderating role of NPD team diversity and shared vision. Third, we contribute to IT ambidexterity literature by theoretically developing and empirically testing IT ambidexterity as an effective IT capability to manage IT resources and remain competitive in NPD. Fourth, we contribute to IS project management theory by evidencing the effectiveness of IT ambidexterity that achieves successful NPD project outcomes in high-tech SMEs.

Finally, our findings offer a more integrative model of IT ambidexterity by jointly examining it's determinants and performance consequences.

2 Background

2.1 IT ambidexterity

Ambidexterity signifies the exercise and balance of two competing trade-off activities (Tushman and O'Reilly, 1996). The most commonly used and widely accepted trade-offs in the ambidexterity literature are between exploration and exploitation (Raisch and Birkinshaw, 2008; O'Reilly, Harreld and Tushman, 2009; S. Kang and Snell, 2009; Benitez, Castillo, Llorens and Braojos, 2018). Exploration refers to "search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation" whereas exploitation is associated with "refinement, choice, production, efficiency, selection, implementation, and execution" (March, 1991, p. 71). Consistent with the conceptualizations of ambidexterity perspective, the recent advances in the strategic management of IT resources have operationalized IT ambidexterity – the ability of the firm to undertake IT exploitation and IT exploration at the same time (Lee et al., 2015; Syed, Papadopoulos and Blome, 2016). IT exploitation is associated with continuous refinement, extending skills and capabilities of existing technological resources, whereas, IT exploration represents searching, experimenting, and innovating new technological practices and solutions that firms do not possess (Syed et al., 2016).

With the growing significance of contextual ambidexterity, prior studies contribute to understand its enabling factors such as organizational characteristics (Khazanchi, Lewis, and Boyer 2007), top management team attributes (Carmeli and Halevi, 2009; McCarthy and Gordon, 2011), organizational culture (Wang and Rafiq, 2014), organizational complexity (Havermans et al., 2015) and develop frameworks (i.e., Kang and Snell, 2009). Similarly, some of the nascent work in IS literature has begun to explore implications of IT ambidexterity on performance outcomes such as IT transformation programs (Gregory, Keil, Muntermann and Mähring, 2015), competitive advantage (Subramani, 2004), organizational agility (Lee et al., 2015) and IT investments (Mithas and Rust, 2016). However, there are two gaps in the extant literature. First, most of these studies focus on larger firms, suggesting the antecedents or enablers, which may become irrelevant to SMEs such as structural differentiation. Second, empirical research has mostly examined antecedents and consequences of ambidexterity orientation as separate aspects, lacking research on integrative models (Simsek, 2009). Finally, Havermans et al. (2015) highlights the need of more research into contingent effect of contextual factors. This research addresses these gaps by examining an integrative model of antecedents and consequences of IT ambidexterity, under the influence of contextual moderators, and in the context of SMEs. The joint analysis of antecedents and performance consequences is an interesting and relevant topic, both for academic research and practice, to understand and develop IT ambidexterity.

2.2 Leadership decision-making styles

Theory and practice have both debated the attributes of leadership that influence the enactment of ambidextrous strategy (O'Reilly and Tushman, 2013) such as social integration among top managers (Jansen et al., 2008), decision-making authority (Mom et al., 2009), behavioural integration (Carmeli and Halevi, 2009), top management shared leadership (Mihalache et al., 2014) and interaction between leaders and team members (Havermans et al., 2015). Despite the contribution of previous studies, the leadership attributes of decision-making style as an enabler for ambidexterity has received limited attention, with an exception of Gregory and Keil (2014). In a case study of a financial service industry, Gregory and Keil (2014) report that it takes two IS project managers working in tandem with distinct management styles to achieve ambidextrous orientation of formal and informal control. This study extends the existing research by examining whether a single project manager can enact IT ambidexterity by making use of distinct decision-making styles.

Ambidexterity posits competing strategic demands and requires consistent and committed decision-making (Smith, 2014). For instance, in SMEs, the implementation of IT ambidexteirty involves committed decisions in planning and organizing i.e., set priorities, specify tasks, and resource allocation (Miller, Wilson and Hickson, 2004). Depending upon decision-making style, executives process information and allocate their attention and time in delegating responsibilities and avoiding uncertainty

(Håkonsson, Burton, Obel and Lauridsen, 2012). Although literature suggests multiple decision-making styles, this study examines the decision-making styles that are identified by Vroom and Yetton (1973) seminal taxonomy of organizational decision making regimes — directive decision-making and participative decision-making. Leadership directive decision-making (DDM) style provides team members with a framework for decision making and expects action in alignment with the superior's guidelines, whereas leadership participative decision-making (PDM) style makes joint decisions with their employees (Somech, 2005). We focus on these two leadership styles for several reasons. First, leadership DDM and PDM styles are two well-vetted, foundational models of leadership decision-making style that can form the basis for examining more complex leadership styles e.g. transformational leadership style (Somech, 2006). Second, both leadership DDM and PDM styles have been associated with higher performance outputs (Somech, 2005, 2006; Martin, Liao and Campbell, 2013). Finally, recent studies (i.e., Sims, Faraj and Yun, 2009, Van Lange, Balliet, Parks and Van Vugt, 2014) argue that leadership DDM and PDM styles represent dominant and omnipresent leadership decision-making styles which leaders refer to when managing individuals. Thus, we examine the role of DDM and PDM styles in resolving the conflicts and ambiguities that occur when enabling IT ambidexterity.

3 Hypotheses

3.1 Leadership decision-making styles and IT ambidexterity

Leadership decision-making styles have been argued to resolve the paradoxical tensions that might arise due to the simultaneous pursuit of two differing activities (Smith, 2014). Building on that, this study evaluates the role of leadership DDM and PDM styles in enabling IT ambidexterity. Leadership DDM style initiates straightforward decisions that aim to guide followers' participation by providing clear instructions for problem-solving. Leadership PDM style is referred to joint decision-making, or at least shared influence in decision making, by supervisors and their subordinates.

The defined roles, responsibilities, and clear directions by leadership DDM style may help to reduce the ambiguities such as of resource allocation, goal setting, defined targets etc. while pursuing IT exploitation and IT exploration at the same time. On contrary, some studies suggest that leadership DDM style may lead to the commonality of purpose among employees and does not support creativity (i.e., Somech, 2006; Kesting, Ulhøi, Song and Niu, 2015). They argue that leadership DDM style tends to develop social control mechanisms that can stifle attempts for radical thinking and new idea generation as it restricts communication and dampens the leader's ability to draw on lower-level expertise (Somech, 2006). However, the social exchange theory (Blau, 1964) and cognitive evaluation theory (Deci and Ryan, 1985) argue otherwise. Social exchange theory implies that if the employees are satisfied with their leaders, leadership DDM style is more likely to offer clarity and guidance about their roles, which will increase their willingness to perform better and they will reciprocate by taking proactive actions (Martin et al., 2013). Cognitive evaluation theory suggests that leadership DDM style has both control and information. Hence, if the control factor is not particularly salient, the information component may become dominant. This results in providing a host of benefits, particularly in relieving the stress of uncertainty, reducing role ambiguity, increasing employee confidence and self-efficacy, which are the key attributes in managing ambidextrous orientation (Lubatkin et al., 2006). SMEs, in particular, with the lack of structural complexity, comparatively fewer number of employees than larger firms can become a more integrated unit with strong social values may accommodate DDM style as a nurturing style, in which employees accept the leader's authority and form a coherent force to meet complex targets (Martin et al., 2013). Therefore, we expect DDM style will be able to ensure IT exploitation and IT exploration activities to flourish at the same time.

PDM style allows employees' participation in mutual discussions, ad-hoc problem solving and information sharing which creates a pool of diverse ideas and knowledge (Sagie et al., 2002; Somech, 2006). Organizational members can use this knowledge pool to refine their existing practices and to discover new opportunities simultaneously (Jansen et al., 2006; 2008). The continuous feedback and information flow through mutual discussions incorporate the diverse knowledge that broadens firm members' perspective and enhances their work efficiency (Somech, 2006), fostering IT exploitation activities. On the other hand, the sense of empowerment and authority through leadership PDM style tends to increase employees commitment and involvement in creativity and innovation activities (He and

King, 2008) that can foster IT exploration. Therefore, we expect leadership PDM style will stimulate simultaneous pursuit of IT exploration and IT exploitation activities by encouraging comprehensiveness in the decision making process and strong motivation. Therefore, we hypothesize:

> ***H1a, b****: Both directive and participative decision-making will enable IT ambidexterity.*

3.2 Moderating role of NPD team diversity

In this research, organizational diversity refers to the extent to which organizations values the differences in viewpoints, skills, knowledge, and information (Wang and Rafiq, 2009). The differences in viewpoints, opinions, and skills can help to create a valuable and broader informational and knowledge resource (Somech, 2006). Prior research argues that team diversity can support and enhance the quality of decisions made by firm leaders and its implementation because of diverse problem-solving skills and knowledge base (Van et al., 2007). However, depending on the leadership decision-making style and the characteristics of the task, it may also have detrimental effects on group functioning due to emotional conflict (Mannix and Neale, 2005).

Diverse team attributes include not only varying knowledge and information but also different vocabularies, cognitive patterns, and styles (Van et al., 2004). This may reflect on the way team members perceive leadership decisions, resulting differences can lead to social integration that may disrupt the group process (Somech, 2006). Leadership DDM style induces hierarchy and formal authority (Martinsons and Davison, 2007), which lacks open discussions and DDM style may not be able to resolve the potential negative impacts inherited in team diversity i.e. conflict and social integration that may result into lack of motivation among employees (Drach-Zahavy and Somech, 2001). Additionally, DDM style misses on extracting and combining the knowledge of potential advisors from various areas of expertise to enhance decision quality (Mannix and Neale, 2005). The simultaneous pursuit in IT ambidexterity is challenging and requires making some tough decisions. The successful implementation of such decisions can only be realized when there is a strong cohesion among firm members (Chandrasekaran et al., 2012; Wang and Rafiq, 2014). Therefore, the high levels of organizational diversity may result in decreasing the effectiveness of leadership DDM style when enabling IT ambidexterity. On the other hand, leadership PDM style necessitates discussion, consultation, and involvement of firm members in decision-making process resolving the potential social integration and avoiding the negative impacts of team diversity (Drach-Zahavy and Somech, 2001). Leadership PDM style can view and consider the factors they had not previously considered by exploiting the patterns of heterogeneity in thoughts, skills, and information of employees (Somech, 2006). Therefore, a high level of organizational diversity among team members can benefit leadership PDM style to create an atmosphere where ambidextrous tasks can be discussed, questioned, and reflected on to the knowledge of the diverse set of advisors in making better decisions. Hence, we hypothesize:

> ***H2a, b****: High levels of organizational diversity negatively (positively) moderate the relationship between DDM (PDM) and IT ambidexterity.*

3.3 Moderating role of shared vision

Shared vision refers to the collective goals and aspirations of firm members that sets a common strategic direction ameliorating conflicts and disagreements (Tsai and Ghoshal, 1998). Shared vision channels firm members in a common direction, set a sense of purpose and promotes integration among them. In other words, shared vision encourages collective behaviour by translating diverse ideas into focused actions (Wang and Rafiq, 2014).

Firm members with high levels of shared vision can foster decision directives with active involvement and higher motivations as it goes with their own strategic intentions (Jansen et al., 2008). A shared vision can help in effective implementation of complex decisions that require employees effort and commitment (Tsai and Ghoshal, 1998; Jansen et al., 2008) i.e. the simultaneous pursuit of IT exploitation and IT exploration in SMEs where limited resources are available for deployment. Wang and Rafiq (2009) characterise the firm without a shared vision as a group of highly committed employees who are pulling the organization in different directions. Shared vision channels their commitment towards common objectives, thus, boosting the firm's ability to implement complex decisions. It represents the internal processes that enable NPD team members to handle large amounts of information and deal with conflict

and ambiguity (Li, 2013; Li, Lin and Huang, 2014). Based on the aforementioned arguments we expect shared vision to assist an effective implementation of decisions, irrespective of decision-making styles. Hence, we hypothesize:

> ***H3a, b****: High levels of shared vision positively moderates the relationship between DDM (PDM) and IT ambidexterity.*

3.4 IT ambidexterity and NPD performance

Although IT ambidexterity has been examined in the context of the competitive supply chain (Subramani, 2004), IT investment (Mithas and Rust, 2016) and organizational agility (Lee et al., 2015), there has been limited attention on IT ambidexterity in the context of NPD performance. NPD performance is defined in terms of NPD process efficiency and product quality. NPD process efficiency measures the extent to which the NPD process meets the defined cost and schedule targets while product quality assesses adherence to quality standards and technical performance of the product.

We expect IT ambidexterity to enhance NPD performance. IT exploration activities help organizations to discover significant and radical new technologies, while IT exploitation allows the firm to further refine the existing technologies (Lee et al., 2015). This allows firms to enhance the efficiency of existing technology resources and compete in existing markets at the same time create new IT solutions and breakthroughs to sustain a competitive position in future markets. In particular to high-tech SMEs, where market turbulence and competitive intensity are considered to be common market characteristics of high-tech environments (Tsai, Raghu and Shao, 2013). Under such conditions, some of the key technologies might become obsolete. Thus, to survive in the high-tech industry the simultaneous approach in IT exploitation and IT exploration becomes particularly essential, not only to upgrade existing IT resources but also to integrate and adjust new technological breakthroughs (Lee et al., 2015). IT exploitation ensures the effective and efficient use of the latest IT resources to meet the defined objectives in the NPD process while IT exploration ensures the integration of the latest technologies to deliver the top-notch technological outcomes. Based on the aforementioned arguments, we hypothesize:

> ***H4****: IT ambidexterity will enhance NPD performance.*

4 Methodology

4.1 Empirical context

A sample of one thousand high-tech SMEs was drawn from the Financial Analysis Made Easy (FAME) database of registered UK firms. FAME provides complete descriptive information of all UK-based small, medium and large firms including the ones not listed in the London Stock Exchange. The firms were selected via the utilization of a systematic random selection procedure based on a variety of criteria, including date of registration (minimum three years in operation), number of employees (up to 249) and high technological specialities (manufacturing and service firms in computer and electronic industry, precision equipment tools, control instrument development, telecommunication equipment, medical equipment manufacturing, and optics apparatus development).

High-tech SMEs should be an important context of a study for management researchers for several reasons. First, because of technological changes and survival stress high-tech SMEs need to react rapidly, develop mechanisms to quickly assess opportunities and allocate resources to benefit from it (Crick and Spence, 2005). Such uncertain and demanding environments may provide an important setting to test the influence of a leader's decision-making styles. Second, this sector of SMEs is expected to employ approx. 40% of high proficiency workers that includes computer workers, scientists and engineers (Bharati and Chaudhury, 2015) and can provide a good context of a diverse NPD team. Third, studies suggest that technological intensive firm leaders' are often confronted with the decisions pressures to explore new technological practices due to frequent changes in customer demands, technologies, and competitions. At the same time, they face pressures to exploit existing technologies due to short-term competitive pressures in terms of an increased focus on efficiency and the growing importance of economies of scale (Chandrasekaran et al., 2012). Finally, owing to low structural and operational complexity in SMEs (Crick and Spence, 2005), IT exploitation activities, IT exploration activities, decision-making styles and the performance impact may be assessed more precisely.

4.2 Data collection and screening

We used the survey methodology for data collection. In an effort to improve content validity and response rates, the online questionnaire was designed, formulated, and implemented in a manner which closely followed the recommendations of a variety of authors (i.e., Podsakoff et al., 2003). In order to limit the potential measurement errors, responses were collected from key informants that were most knowledgeable for each construct. The key informants thus chosen were IT executives for IT ambidexterity construct, project/product managers for NPD performance construct, NPD team members for leadership decision-making styles, diversity and shared vision constructs. IT executive or project managers were contacted directly by telephone or email and were asked to identify the remaining respondents i.e., NPD team member, project manager or IT executive to complete the relevant survey part. This approach is consistent with prior IS research studies (i.e., Keil, Rai and Liu, 2013). In this way, we used multiple respondents matched data to reduce the threat of bias (Podsakoff et al., 2003). In addition, secondary data were collected for some of the control variables, such as a number of employees, total assets and industry characteristics of the sample firms form the FAME database.

In the total data collection span of five months and after two follow up reminders, 314 responses were received. Unfortunately, 22 responses were ineligible due to incomplete information, missing data values, or disengagement (evident with the same response for each question). After data screening, 292 valid responses (29.2 percent response rate) were obtained. The key informants had worked for 4.5 years on average in their firms. Table 1 shows the characteristics of our sample firms.

Firm size	Small (up to 49 full-time employees)	160	54.79
	Medium (between 50 to 249 full-time employees)	132	45.20
Firm age	Up to 5 years	35	11.98
	Between 5 and 10 years	71	24.32
	Between 10 and 15 years	84	28.76
	More than 15 years	102	34.93
Firm type	Manufacturing	167	57.19
	Service	125	42.80

Table 1. Key characteristics of the respondent's firms

To test for non-response bias and late-response bias, we examined differences between the respondents and non-respondents groups and between early and late respondents groups respectively. T-tests showed no significant differences between these groups based on the number of full-time employees, industry sector (service versus manufacturing), and firm age. We also compared early and late respondents in terms of model variables. These comparisons did not reveal any significant differences, indicating that non-response bias and late response bias were not a problem in this study.

4.3 Measurement and validation of constructs

All the measures in the study were adopted form the well-established scales in literature (Table A1, Appendix). Every attempt was made to use existing validated measures that have good psychometric properties.

Following the methodological operationalization of ambidexterity constructs in prior studies (i.e., Jansen et al., 2006; Lee et al., 2015), we operationalized IT ambidexterity by taking the multiplicative interaction of IT exploitation and IT exploration measures. A four-item scale (α=0.89, mean=3.63, SD=1.43) that assesses the competency of the firm to refine existing IT operations measured IT exploitation. IT exploration was measured by a four-item scale (α=0.94, mean=3.58, SD=1.36) that assesses the competency of the firm to introduce new technology practices and applications. The scales for IT exploitation and IT exploration were adopted from the study of Lee et al. (2015) .

To measure DDM, a four-item scale (α=0.94, mean=3.46, SD=1.03) that assesses the extent to which firm leader provides team members with defined guidelines and targets was adopted from the study of Sagie et al. (2002). To measure PDM, a three-item scale (α=0.89, mean=3.11, SD=1.24) that assesses the extent of involvement of team members with leaders to solve problems, initiate new tasks or set goals was adopted from the study of Schriesheim and Kerr (1974).

NPD team diversity measures the extent to which differences in viewpoints and functional backgrounds are acceptable in NPD teams. The three-item scale (α=0.81, mean=3.02, SD=1.52) to measure NPD team diversity was adopted from the study of Wang and Rafiq (2014).

Shared vision defines the extent to which NPD team members have collective goals and shared aspirations. The three-item scale (α=0.88, mean=3.72, SD=0.89) was adapted from the study of Tsai and Ghoshal (1998) to measure shared vision.

NPD performance was measured by process efficiency and product quality. Process efficiency was measured by comparing the actual cost and project completion time with respect to pre-defined cost and schedule targets. The product quality was measured by asking respondents about whether the developed product met pre-defined technical and quality standards. All four items adapted from the study of Chandrasekaran et al. (2012) were loaded on a single factor in exploratory factor analysis and this factor was defined as NPD performance (α=0.92, mean=3.26, SD=1.54).

4.4 Control variables

We included the control variables in the form of organizational characteristics to control for the potentially confounding impact on both moderating and dependent variables. Firm size and NPD team size are included as control variables as resource-munificent firms are less restricted by the challenge of resources allocation (Lubatkin et al., 2006). Firm size was measured by taking the natural logarithm of the number of full-time employees in the firm and NPD team size as the natural logarithm of the number of full-time employees in the NPD project. We also included firm age and NPD project duration as control variables as younger firms or smaller duration projects may not face challenges of core rigidities or competency traps but may have limited endowment of resources to balance exploration and exploitation (Venkatraman, Lee and Iyer, 2007). Firm age was measured as the natural logarithm of the number of years the firm had been in business and NPD project duration as the natural logarithm of the number of months taken to complete the projects.

4.5 Common method bias

We adopted ex-ante procedural measures such as multiple respondents, the most reliable assessors of organizational information, assurance of anonymity and confidentiality to respondents, and mixed the order of predictor and criterion variables to reduce common method bias. To assure common method bias issues were not associated with our data, we conducted Herman's one-factor test and confirmatory factor analysis (CFA) for all construct variables consistent with the recommendations of Podsakoff et al. (2003). Exploratory factor analysis (EFA) revealed that there was no presence of a single factor that accounted for more than half of the total variance explained, which scree plots further confirmed. The analysis generated six distinct factors, with the largest factor accounting for 17.34% of the total variance (68.15%). We performed confirmatory factor analysis in which a one-factor, two-factor, and three-factor model structures were compared to our measurement model, with the single-factor model producing the poorest fit (χ^2/df=17.76, p<0.001; CFI=0.64; GFI=0.62; RMSEA=0.15; SRMR=0.13). Our hypothesized model clearly outperformed other configurations in terms of discriminant validity as evidenced by significant chi-square reductions (χ^2/df=2.60, p<0.001; CFI=0.93; GFI=0.87; RMSEA=0.04; SRMR=0.03). These results suggest that common method variance is not of great concern in our data.

5 Analysis and results

5.1 Measurement validation

In EFA, all items loaded on the intended constructs and CFA confirmed the standardized loadings greater than 0.70, evidencing convergent validity (Fornell and Larcker, 1981). The Cronbach's alpha (CA) values and composite reliability (CR) scores were all greater than the minimum cut-off value of 0.70 (Table A1, Appendix). This indicates that all the constructs demonstrate good internal consistency and reliability (Peterson and Kim, 2013). Discriminant validity is additionally tested using the average variance extracted (AVE). Table 2 presents the means, standard deviations, and correlations of the construct variables. The diagonal values in bold (Table 2) represent the square root of AVE. They are higher than the correlation values of the construct with other latent variables, which indicates the evidence of discriminant validity among the multi-indicator construct (Hair, Anderson, Tatham and Black, 1998).

Variables		Mean	SD	1	2	3	4	5	6	7	8	9	10
1	IT ambidexterity	12.17	8.98	**0.82**									
2	DDM	3.46	1.03	0.21	**0.84**								
3	PDM	3.11	1.24	0.29	-0.17	**0.85**							
4	NPD team diversity	3.02	1.52	0.25	0.14	0.12	**0.83**						
5	Shared vision	3.72	0.98	0.32	0.09	0.24	0.13	**0.84**					
6	NPD performance	3.26	1.54	0.42	0.27	0.29	0.07	0.15	**0.83**				
7	Ln Firm size	4.13	1.02	0.23	0.06	0.11	0.14	0.10	0.28	-			
8	Ln NPD team size	1.89	1.67	0.35	0.19	0.07	0.04	0.14	0.15	0.41	-		
9	Ln Firm age	2.58	1.07	0.05	-0.03	-0.06	0.05	-0.17	0.01	0.37	0.05	-	
10	Ln project duration	2.16	0.92	0.06	0.01	-0.03	0.02	-0.13	-0.01	0.32	0.07	0.7	-

Table 2: Descriptive statistics of model variables; the diagonal values in bold represent average variance extracted; SD, Standard Deviation.

To examine the issue of multicollinearity, we calculated variation inflation factors (VIF) which indicated no problems of multicollinearity as all values were below cut-off value of 3. The scree plots indicated no concerns regarding outliers or influential data responses that may affect regression results.

We performed structural equation modelling (SEM) analysis using AMOS 23.0 to test our hypotheses. SEM seemed appropriate analysis approach because it reduces the biasing effects of random measurement errors and allows estimation of multiple associations of the variables through incorporating observed and latent constructs in the model simultaneously (Shook, Ketchen, Hult and Kacmar, 2004). The model fit of our structural model was achieved (χ^2/df=2.60, p<0.001; CFI=0.93; GFI=0.87; RMSEA=0.04; SRMR=0.03) before proceeding to hypothesis testing.

5.2 Hypothesis testing

Hypothesis 1a proposed that leadership DDM style supports higher levels of IT ambidexterity. The results show a significant positive relationship between leadership DDM style and IT ambidexterity (β=0.201, p<0.05). Thus, H1a is supported. Hypothesis 1b proposes that leadership PDM style enables higher levels of IT ambidexterity. The statistical analysis provides clear support for hypothesis 1b as well, IT ambidexterity increased significantly in leadership PDM style (β=0.369, p<0.001).

Hypothesis 2a predicts higher NPD team diversity to dampen the effect of leadership DDM style when enabling IT ambidexterity, whereas, hypothesis 2b proposes higher NPD team diversity to strengthen the effect of leadership PDM style when enabling IT ambidexterity. The interaction variable for NPD team diversity is negative for leadership DDM style (β = -0.166, p<0.05) and positive for leadership PDM style (β=0.121, p<0.001). Thus, H2a and H2b are supported.

Hypotheses 3a and 3b propose higher shared vision among employees to strengthen the ability of leadership DDM style and leadership PDM style respectively when enabling IT ambidexterity. The interaction variable for shared vision is positive for leadership DDM style (β=0.112, p<0.05) and non-significant for leadership PDM style (p>0.10). Thus, H3a is supported and H3b is not supported.

Consistent with Hypothesis 4, our results indicate that IT ambidexterity has a significant and positive impact on NPD performance (β=0.32, p<0.001). Table 3 presents the results of our analysis.

Dependent variables	Hypotheses		Independent variables	Estimate	S.E.	P
Antecedents						
IT Ambidexterity	<---	H1a	Directive decision-making (DDM)	0.201	0.056	0.002
IT Ambidexterity	<---	H1b	Participative decision-making (PDM)	0.369	0.068	***
IT Ambidexterity	<---		NPD team diversity	-0.054	0.071	0.457
IT Ambidexterity	<---		Shared vision	0.040	0.064	0.532
Moderations						
IT Ambidexterity	<---	H2a	DDM × NPD team diversity	-0.166	0.066	0.008
IT Ambidexterity	<---	H2b	PDM × NPD team diversity	0.121	0.064	***
IT Ambidexterity	<---	H3a	DDM × shared vision	0.112	0.066	0.014
IT Ambidexterity	<---	H3b	PDM × shared vision	0.083	0.068	0.585
Consequence						
NPD performance	<---	H4	IT Ambidexterity	0.429	0.044	***

*Table 3: SEM analysis results of the research model. ***p<0.01.*

6 Discussion

Although numerous studies highlight that firm leaders play a critical role in enabling ambidexterity capability (Raisch and Birkinshaw, 2008), the insights into how leaders actually manage the inevitable conflicts that arise when undertaking the contradicting activities of exploitation and exploration remains a fertile ground to explore (Jansen et al., 2008; O'Reilly and Tushman, 2008; Mom et al., 2009). Secondly, empirical research on ambidexterity dominantly focuses exclusively on the antecedents or the consequences of an ambidexterity posture, lacking an integrative model approach of jointly examining determinants and performance consequences(Simsek, 2009). Finally, limited research examines such competitive strategies in context of SMEs. In an attempt to address these research gaps, we examine the role of leadership decision-making styles in enacting IT ambidexterity and the impacts of IT ambidexterity on NPD success in SMEs.

In a survey-based study of 292 high-tech British SMEs, our results demonstrate that leadership DDM style has a significant positive impact in enabling IT ambidexterity, in contrast to pervading assumptions that DDM is a behavioural limiting capability. Leadership PDM style also assists high-tech SMEs in enabling a simultaneous pursuit of IT exploitation and IT exploration activities. This finding provides further credence to the theoretical arguments that employee participation and empowerment in decision-making can enhance their motivation, which helps to implement operational objectives in a systematic and efficient way (Raes, Heijltjes, Glunk and Roe, 2011; Mihalache et al., 2014).

To aid the interpretation of the influence of our moderating variables, we followed procedures by Aiken and West (1991) to plot the significant interactions in figure 1 (Appendix). Figure 1(a) indicates that high levels of NPD team diversity dampens the positive influence of leadership DDM style on IT ambidexterity. Whereas, figure 1(b) shows that high levels of NPD team diversity strengthen the positive relationship between leadership PDM style and IT ambidexterity. Figure 1(c) shows that shared vision strengthens the relationship with leadership DDM style and IT ambidexterity. Thus providing evidence to the theoretical arguments that high levels of a shared vision among employees contributes to resolving conflicts, effective decision outcomes, and to achieving organizational ambidexterity (Jansen et al., 2008; Wang and Rafiq, 2009). On the other hand, the effect of shared vision was insignificant on the relationship between leadership PDM style and IT ambidexterity. The possible explanation for the non-significant finding could be due to the fact that leadership PDM style itself necessitates mutual discussions among firm employees, sets a common strategic direction and ameliorates conflicts and disagreements (Sagie et al., 2002). Therefore, the influence of shared vision seems to have already been incorporated through leadership PDM style, resulting in an insignificant moderating effect.

Finally, our results show that IT ambidexterity significantly enhances the NPD performance in high-tech SMEs. This finding demonstrates the significance of IT ambidexterity as an IT construct that can ensure business value of IT resources in high-tech SMEs.

6.1 Implications for Theory

This study contributes to IS, NPD and leadership literature by highlighting the importance of leadership decision-making styles in managing IT resources for effective NPD outcomes. In response to calls for the need to identify how leaders manage ambidexterity (Carmeli and Halevi, 2009; O'Reilly and Tushman, 2013), this study identifies that both leadership DDM and leadership PDM styles enable IT ambidexterity. Although the two leadership styles may achieve the same end, the mechanisms or ways are quite different. Leadership DDM style operates on providing firm members with guidance regarding goals, means of achieving goals, performance standards, monitoring and providing appropriate feedback. While leadership PDM style operates on the principles of developing a firm member's sense of autonomy and responsibility. These insights extend our understanding of the nature of mechanisms that facilitate these decision-making styles to enable an ambidextrous orientation.

We contribute to IS literature by highlighting the significance of IT ambidexterity through theoretical extension and empirical evidence. Considering the embryonic stage of literature on IT ambidexterity, we explain mechanisms through which IT executives can enact IT ambidexterity in SMEs. Our study validates the conceptual arguments that IT ambidexterity ensures a strategic implementation of IT resources in order to achieve a business benefit (Gregory et al., 2015; Mithas and Rust, 2016). Moreover, we contribute to the on-going research in order to enhance the effectiveness of IT resources in high-tech

SMEs (Alegre, Sengupta and Lapiedra, 2013). IT ambidexterity can be a strategic solution to compete successfully in the frequently changing products and process technologies environments. Furthermore, this study broadens the scope for researchers and practitioners to comprehend IT ambidexterity further as a source of competitive advantage and long-term survival.

Our study contributes to NPD and leadership literature by highlighting the significant influence that NPD team values and norms may have on leadership decision-making styles. By doing so, we go beyond just focusing on whether leadership DDM style or leadership PDM style is beneficial; instead, we inquire when these decision-making styles might be more or least effective. This also responds to the call for further research on contextual factors that may effect leadership interaction with team members (i.e., Havermans et al., 2015). Our findings show that depending upon the diversity in the composition of the NPD teams, the effectiveness of decision-making style may vary. In other words, these findings complement the leadership situational theory that the appropriate leadership style depends upon the situation of contextual factors (Sims et al., 2009). These insights underline the significance of taking into account NPD team factors when examining performance implications.

6.2 Implications for practice

By examining the effects of leadership decision-making styles, our results provide an understanding of how leadership decision styles matter, especially, in developing IT capability for NPD success. Instead of depicting leadership capabilities, skills, and traits, this study highlights practices for enabling IT ambidexterity. Leaders need to realize that the decision-making styles can effect the level of employees' commitment i.e., social exchange theory (Blau, 1964) and cognitive evaluation theory (Deci and Ryan, 1985) discussed in hypotheses section. Moreover, our findings highlight that in order to enhance the effectiveness of their decisions; leaders should consider adopting decision-making styles to synergize with the levels of NPD team characteristics. Leadership PDM style should be preferred in highly diverse or heterogeneous NPD team compositions and if shared vision is a dominant factor among NPD team members, adopting leadership DDM style can be more effective. Finally, firm leaders in high-tech SMEs should take advantage of IT ambidexterity in order to realize and sustain NPD success.

6.3 Limitations and future research

The limitation of this study provides a gateway for future research. The findings and the contribution of the current investigation can be further evaluated, taking into account the potential limitations of the research design i.e., sample size, context of high-tech industry, adopting objective performance measures, and longitudinal designs in which both predictor and criterion variables are measured over time might particularly be useful extensions of the current study. Moreover, given the call for research on competitive IT capabilities that enhance NPD performance (Nambisan, 2013), our findings highlight IT ambidexterity capability and the emergent stage of literature on IT ambidexterity provides a fertile ground for research in this area. Furthermore, our research includes NPD team contextual factors of diversity and shared vision and demonstrates that team diveristy effect the significance of distinct leadership decision making style. Future research can further develop a more comprehensive understating of team diversity factors taking into account various typologies i.e., functional, conginitive and demographic (Van et al., 2007).

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Appendix

Table A1: Psychometric properties of measuring scales

IT exploitation (CA[1]=0.89, , CR[2]=0.92, AVE[3]=0.68, MSV[4]=0.05)	**Factor loadings**
Our firm frequently refines the existing level of IT components, such as hardware and network resources	0.80
Our firm reuses existing IT skills	0.83
Our firm improves existing IT applications and services	0.94
Our firm continually expands existing IT services for existing clients	0.81
IT exploration (CA=0.94, CR=0.95, AVE=0.66, MSV=0.09)	
Our firm pursues innovative applications of IT	0.83
Our firm experiments and develops unique IT applications	0.84
Our firm accepts demands that go beyond the existing level of information services	0.87
Our firm regularly searches for and acquires new IT resources (e.g., a new generation of IT architecture, potential IT applications, and critical IT skills)	0.86
Our firm experiments with new IT management practices	0.87
Directive decision-making (CA=0.94, CR=0.94, AVE=0.71, MSV=0.07)	
Our leader provides schedules for the work to be done	0.77
Our leader maintains definite standards of performance	0.93
Our leader encourages the use of uniform procedures	0.84
Our leader makes his attitudes clear to the group	0.94
Participative decision-making (CA=0.89, CR=0.89, AVE=0.73, MSV=0.13)	
Our leader asks for suggestions before taking actions	0.84
Our leader consults us when faced with project problems	0.95
Our leader advise us on our assignments	0.82
NPD team diversity (CA=0.81, CR=0.81, AVE=0.69, MSV=0.06)	
The members of my project team vary widely in their areas of expertise	0.89
The members of my project team have a variety of different backgrounds and experiences	0.96
The members of my project team have skills and abilities that complement each other	0.78
Shared vision (CA=0.88, CR=0.88, AVE=0.71, MSV=0.03)	
The future direction of this business unit is clearly communicated to everyone	0.87
There is a strong sense of where this business unit is going	0.85
Everyone who works here is well aware of the long-term plans and direction of this business unit	0.81
NPD performance (CA=0.92, CR=0.91, AVE=0.69, MSV=0.07)	
Adherence to schedule	0.78
Adherence to budget	0.85
Adherence to quality	0.85
Technical performance	0.82

[1] Cronbach's alpha
[2] Composite reliability
[3] Average variance explained
[4] Mean shared variance

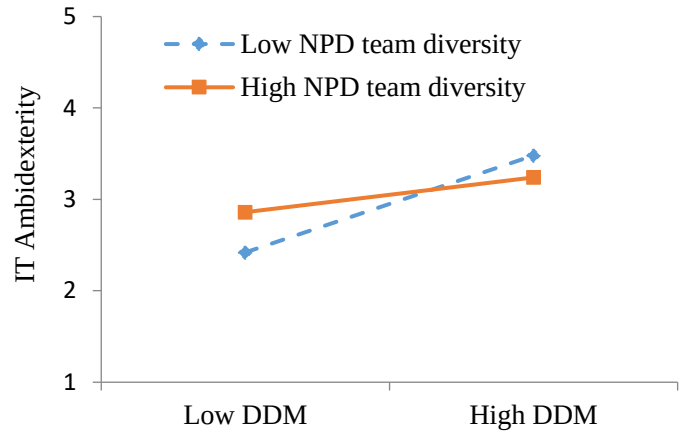

Figure 1(a). Moderating effect of NPD team diversity on directive decision-making (DDM)

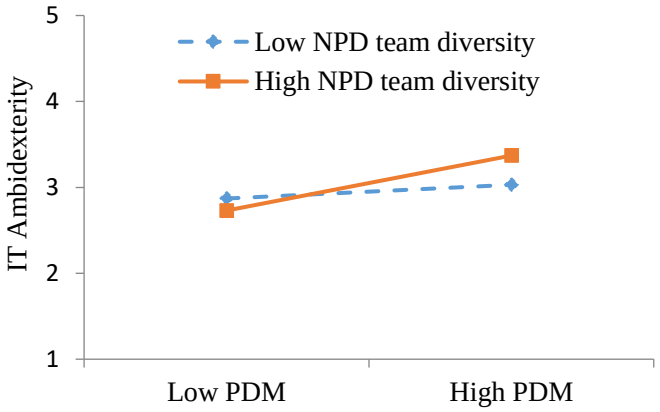

Figure 1(b). Moderating effect of NPD team diversity on participative decision-making (PDM)

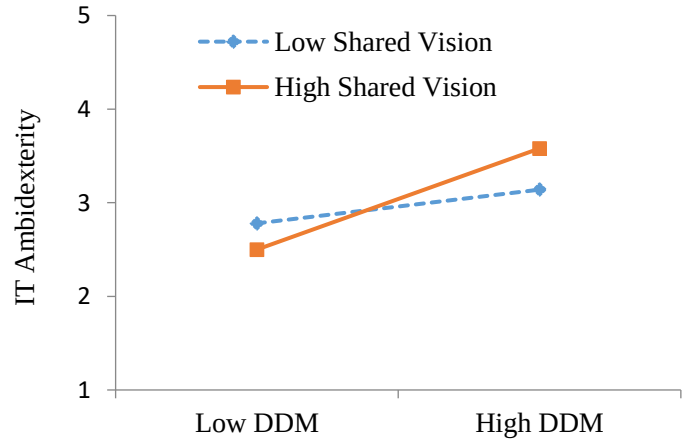

Figure 1(c). Moderating effect of shared vision on directive decision-making (DDM)