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Building innovation capability: The role of top management innovativeness and relative-exploration orientation

Xinchun Wang [a], Mayukh Dass [b,*]

[a] Department of Marketing, College of Business and Public Administration, University of North Dakota, Grand Forks, ND 58202, United States
[b] Area of Marketing, Rawls College of Business, Texas Tech University, Lubbock, TX 79409, United States

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ABSTRACT

Firms strive to develop innovation capabilities that help them achieve competitive advantage in the marketplace. This paper shows that managers can contribute to firms' innovation capabilities by involving themselves directly. Based on a unique multi-source (shareholder letters, COMPUSTAT, and World Bank Database) dataset covering 335 firms over nine years, empirical analysis reveals that top managers' innovativeness makes them more likely to adopt exploration orientation over exploitation orientation in innovation. This relative-exploration orientation is a key mediator that can transform top managers' innovativeness into better financial performance, and the effectiveness of this mediating role is contingent on a firm's resources and the industry environment.

1. Introduction

Innovation capability, defined as a firm's ability to generate, accept, and implement new ideas, processes, products, or services, is one of the key resources that drive a firm's success in the marketplace (Calantone, Cavusgil, & Zhao, 2002; Ngo & O'Cass, 2013). In practice, firms strive to develop or improve their innovation capabilities. For example, according to the *PWC Global Innovation 1000* study, worldwide R&D spending has steadily increased over recent years, reaching $680B USD in 2016. On average, the top five most innovative companies (i.e., Apple Inc., Alphabet Inc., 3M Co., Tesla Motors Inc., and Amazon.com Inc.) spend over 12% of their overall sales revenue on R&D activities (PWC 2016). Accordingly, the Marketing Science Institute suggests that understanding the role of innovation on producing superior firm performance should be a top research priority (www.MSI.org).

Fortunately, many managers have realized the importance of innovation. Being innovative has therefore become a popular component in many firms' mission statements. Researchers have found that firms can develop their innovation capabilities in various ways, including investing in research and development (e.g., Laursen & Salter, 2006), obtaining knowledge from multiple stakeholders (e.g., Slotegraaf, 2012), developing a market/learning-oriented culture (e.g., Marinova, 2004), and encouraging knowledge sharing within the organization (e.g., Arnett & Wittmann, 2014). Though this body of literature has significantly enriched our understanding of how resources contribute to a firm's innovation capability, few studies have considered the manager's role in building a firm's innovation capability. In fact, some researchers have argued that managers' contributions to firms' innovation are limited because of the demanding nature of managers' jobs (Hambrick, Finkelstein, & Mooney, 2005). Thus, the underlying mechanism behind how a manager may contribute to a firm's innovation capability development is still not fully explored.

Researchers have investigated this issue from three perspectives. First, it has been suggested that variation in firms' innovation performance is an outcome of managers' background characteristics such as managers' demographic and cultural backgrounds (e.g., Barker & Mueller, 2002). In general, managers who are young (e.g., Barker & Mueller, 2002; Knight et al., 1999), have short tenures (e.g., Kor, 2006), have related industrial/marketing experience (e.g., Barker & Mueller, 2002), and have a social culture (e.g., Hoffman & Hegarty, 1993) are more likely to promote innovation activities. The second stream of research focuses on the composition of top management teams, exploring issues such as the diversity and heterogeneity of top management teams (e.g., Auh & Menguc, 2005; Kor, 2006; Talke, Salomo, & Kock, 2011). This stream of research suggests that diversity and heterogeneity in a firm's top management team can drive the firm to be more innovative. The third research stream focuses on the involvement of managers in the firm's innovation processes. Some authors suggest that a firm's success in innovation needs top managers' support (e.g., Smith & Tushman, 2005). Though the existing research provides insight into the manager's influence on a firm's innovation performance, few studies have investigated managers' direct roles in promoting firms' innovation capabilities.

* Corresponding author.
E-mail address: mayukh.dass@ttu.edu (M. Dass).

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When managers engage in innovation-related activities, they typically rely on two strategic orientations in organizational learning, namely exploration and exploitation (Levinthal & March, 1993; March, 1991). With an exploration orientation, managers actively seek to increase variations in managerial practice, foster the search for new ideas/technologies, encourage risk taking, and discover new opportunities (March, 1991). Exploitation orientation, on the other hand, tends to allow managers to discover opportunities using the available resources and focuses more on the innovation implementation process (Rosing, Frese, & Bausch, 2011).

In this study, we develop a comprehensive theoretical model (see Fig. 1), positing that managers contribute to a firm's innovation capability by facilitating innovativeness and by adopting a relative-exploration orientation. Innovativeness reflects the extent to which a manager is willing to invest in innovation-related activities, and relative-exploration orientation indicates the likelihood that a manager will choose exploration orientation over exploitation orientation. Specifically, our study addresses the following research questions:

1. Can a manager's innovativeness and relative-exploration orientation be a part of a firm's innovation capability?
2. If yes, how do the manager's innovativeness and relative-exploration orientation contribute to the firm's favorable financial performance?

Using a multi-source (shareholder letters, COMPUSTAT, and World Bank Database) dataset collected from 335S&P 500 companies over nine years (2007–2015), we examined whether managers' innovativeness makes managers more focused on exploration orientation or exploitation orientation, and whether managers' innovativeness leads firms to perform well financially. We also examined whether the above relationship varies based on the firm's resources and the industry environment.

By addressing the proposed research questions, this paper contributes to the literature and managerial practice in several ways. First, the paper extends the literature by considering the role of the manager's resources in the firm's innovation capability. Managers' innovativeness and the adoption of relative-exploration orientation are expected to generate a stronger innovation capability, which results in better financial performance. Second, the research offers an alternative explanation as to why managers' different backgrounds can lead to different innovation outcomes. Specifically, relative-exploration orientation is proposed as a key mediator linking managers' innovation efforts to firm performance. Third, the paper presents both firm resources and industry competition as moderators that can influence the transformation of managers' innovativeness into relative-exploration orientation. Finally, this research provides insights into how managers should allocate their innovation efforts in less competitive environments such as new or emerging markets.

2. Theory and hypotheses

2.1. Top management innovativeness and firm performance

Top management innovativeness (TMI) refers to the extent to which a firm's top managers have favorable attitudes toward innovation and are willing to take risks to invest resources in innovation activities (Rodríguez, Pérez, & Gutiérrez, 2008). Accordingly, innovative managers (i.e., those with high TMI) are supportive of innovation activities (Lloréns Montes, Ruiz Moreno, & Miguel Molina Fernández, 2004). Nevertheless, researchers disagree on the extent to which executives can influence innovation processes and outcomes. For example, some researchers argue that top managers are barely relevant in driving innovation efforts because of the demanding nature of their jobs—they are simply unable to devote adequate time to the more creative components of marketing (Hambrick et al., 2005). Hegarty and Hoffman (1990) reach a different conclusion, suggesting that even though some managers are able to contribute to the innovation process, their contributions are limited to the project level rather than the firm level. Other researchers, however, suggest that top managers play a significant—and perhaps vital—role in firm innovation (e.g., O'Cass & Sok, 2013; Rosing et al., 2011). For example, in a study of bank CEOs, Yadav, Prabhu, and Chandy (2007) found that future-focused CEOs have positive, direct, long-term effects on how their firms develop and use new technologies. Steve Jobs, the former CEO of Apple, exemplified the latter perspective.

The literature (e.g., Amason, 1996; Hunt, 2010) suggests that top management is the central actor in strategic decision-making and can therefore guide a firm's strategic orientation (Smith & Tushman, 2005). Accordingly, top managers' innovativeness enables them to devote more efforts to facilitating innovative activities and adopting innovation-oriented strategies (Talke et al., 2011). Consequently, when making decisions regarding strategic resource allocations, managers tend to allocate a greater amount of valuable resources to innovation activities (e.g., new product development), which results in enhancing the firm's ability to compete with rivals (Hunt, 2010). Moreover, top management innovativeness facilitates innovation within the top management team (West & Anderson, 1996) and helps build a competitive advantage barrier that is difficult for rivals to replicate (Hamel, 2006).

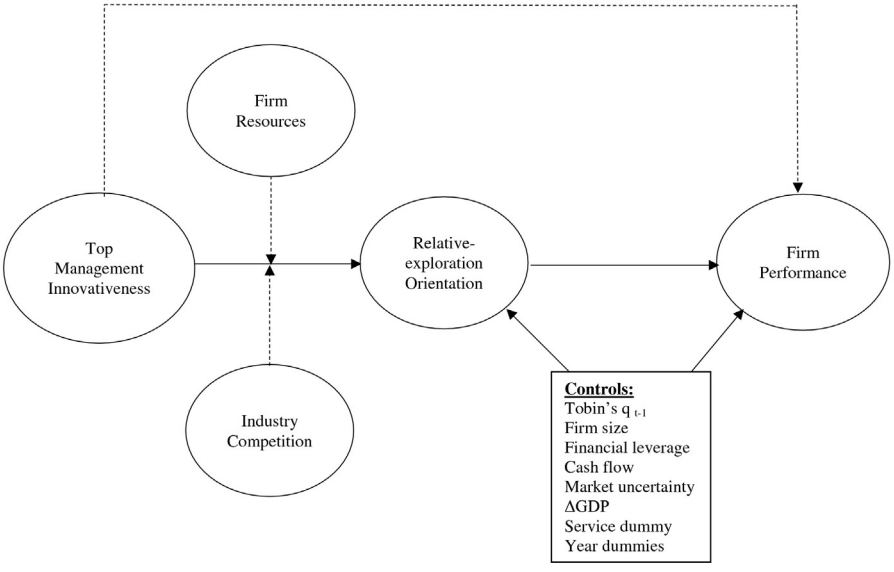


Fig. 1. Theoretical framework.

Finally, top management members driven by innovativeness are also willing to promote a variety of marketing activities, such as training for sales teams, marketing research, and customer information management (Auh & Menguc, 2005). Thus, top management innovativeness is expected to result in favorable financial performance because of its positive role in enhancing a firm's competitive advantage.

H1. Top management innovativeness is positively related to a firm's financial performance.

2.2. The role of relative-exploration orientation

Sustainable innovation requires firms to constantly develop new knowledge and expertise. Though there are many ways to obtain knowledge, managers often focus on two strategic orientations in organizational learning: exploration and exploitation (Levinthal & March, 1993; March, 1991). Some researchers suggest that firms may need to find a balance between exploration and exploitation to achieve optimal performance (e.g., Uotila, Maula, Keil, & Zahra, 2009). Recent studies, however, have found that pursuing exploration and exploitation simultaneously may hurt a firm's performance in the long run (e.g., Ho & Lu, 2015). In this paper, it is suggested that exploration is a more effective strategic orientation than exploitation in developing new knowledge. Consistent with previous studies (e.g., Auh & Menguc, 2005; Uotila et al., 2009), relative-exploration orientation is defined as the extent to which top managers are more willing to adopt exploration orientation than exploitation orientation.

Exploration involves more risks than exploitation (March, 1991; O'Reilly & Tushman, 2013). Undoubtedly, not all managers are interested in taking risks. For example, Mizik and Jacobson (2007) suggest that when managers face incentives of favorable short-term returns or pressures from unfavorable financial performance, they tend to get involved in "Myopic Marketing Management," a situation in which managers reduce their long-term investments (e.g., marketing and innovation resources) to seek short-term returns. Under uncertainty, however, top managers' innovativeness reduces concerns about unclear outcomes, and managers are thus more willing to take risks in exploratory learning.

H2. Top management innovativeness is positively related to managers' relative-exploration orientation.

Greater relative-exploration orientation enables firms to develop competitive advantages over rivals by leading the market trends (Uotila et al., 2009). Since such exploration requires more resource commitment, it involves greater uncertainty and risk than exploitation does (Andriopoulos & Lewis, 2009). Exploration enables firms to develop more strategic flexibilities (March, 1991) and often results in radical innovations (Lavie, Stettner, & Tushman, 2010). In addition, although exploitation can help firms use existing resources, the rapidly changing market environment forces firms to constantly provide new solutions to meet customer needs (Garrett, Covin, & Slevin, 2009). Accordingly, firms require more exploration in innovation. It is expected that relative-exploration orientation can generate favorable financial outcomes for firms by enhancing their ability to constantly develop new market offerings and building stronger innovation capabilities.

H3. Managers' relative-exploration orientation is positively related to firms' financial performance.

2.3. The moderating role of firm resources

According to Hunt (2010), p. 381), resources refer to "the tangible and intangible entities available to the firm that enable it to produce efficiently and/or effectively a market offering that has value for some market segment(s)." Tangible and intangible resources form the fundamental assets that enable firms to develop firm-level capabilities (Srivastava, Shervani, & Fahey, 1998). Thus, firms strive to develop and maintain comparative advantages in terms of various resources (Morgan & Hunt, 1999). For example, in the smartphone market, Apple and Samsung can maintain their leading market positions because they own the majority of the key smartphone patents (Duhigg & Lohr, 2012). Firm resources might not only influence a firm's performance, but also affect managers' strategic decision-making (Robert Baum & Wally, 2003). For example, Lee and Grewal (2004) suggest that firms with higher levels of slack resources are more likely to respond to new technologies than firms without. Because of the scarce nature of firm resources (Peteraf, 1993), however, managers often have to make rational decisions in resource allocations to choose the best alternative (Eisenhardt & Zbaracki, 1992). Thus, when a firm lacks organizational resources, managers have more constraints in making proper strategic decisions (Sanchez, 1995) and are less willing to take risks (Wiklund & Shepherd, 2003). Consequently, less aggressive innovation strategies, such as exploitation, may be preferred. On the other hand, with richer resources, managers have more flexibility in allocating resources to long-term innovation strategies (e.g., R&D or new product development) (Chandy & Tellis, 2000) and are more likely to employ aggressive innovation strategies such as exploration.

H4. The relationship between top management innovativeness and relative-exploration orientation is stronger when the firm has more resources.

2.4. The moderating role of industry competition

The industry environment influences managers' strategic decision-making in innovation strategies (e.g., Calantone, Garcia, & Dröge, 2003). Although the literature suggests that competitive environments may require firms to be more innovative to compete with rivals (e.g., Drechsler & Natter, 2012; Weerawardena, O'Cass, & Julian, 2006), intense competition makes it more challenging for firms to "find unique opportunities to act and, as a consequence, effective search, action, and learning become more costly" (Derfus, Maggitti, Grimm, & Smith, 2008, p. 65). In addition, in a more competitive environment, managers are likely to be constrained in their strategic choices (George, 2005), and the higher risk associated with greater competition may reduce firms' innovation activity (Jiménez-Jiménez & Sanz-Valle, 2011; March, 1991). As a result, firms tend to focus on improving performance by enhancing their competitive advantage in established markets and maintaining the current market share (Christensen, 1997). Consequently, managers are more likely to promote a temporal separation, a situation in which firms continually shift between exploration and exploitation (Lavie et al., 2010). Hence, managers with higher levels of innovativeness are expected to be more likely to engage in exploratory learning than in exploitative learning when there is less industry competition.

H5. The relationship between top management innovativeness and relative-exploration orientation is stronger when industry competition is lower.

3. Method

3.1. Sample

To test our hypotheses, we collected data from multiple sources for the years 2007 to 2015 for S&P 500 firms. The initial sample frame included all the companies listed in the S&P 500 in 2015. The shareholder letters were then manually downloaded and collected from the annual reports for each company. To account for time dynamics, we traced back to 2007 to obtain a longitudinal dataset. Next, these data were merged with financial data from the COMPUSTAT database and

macroeconomic data from the World Bank Database. Though every effort was made to locate all available information, a portion of the sample was nonetheless lost due to unavailable financial documents and shareholder letters. The final dataset consisted of 2043 usable firm-year observations for 335 firms from 51 different Standard Industrial Classification (SIC) two-digit industries.

3.2. Measures and data sources

3.2.1. Top management innovativeness and relative-exploration orientation

Top management innovativeness (TMI) and relative-exploration orientation (REO) were measured at the individual level; that is, from the manager's perspective. Specifically, content analysis was used to analyze firms' shareholder letters. In the literature, primary data (e.g., survey data) is a popular source to measure firm-level and individual-level constructs. However, researchers often have to contend with common source bias and low response rates in survey research. Following previous studies (e.g., Uotila et al., 2009; Zachary, McKenny, Short, Davis, & Wu, 2011), we employed content analysis to address the above concerns. This technique has been widely used in both marketing and management research (e.g., Allison, McKenny, & Short, 2013; Yadav et al., 2007; Zachary et al., 2011). As Uotila et al. (2009) suggest, content analysis is beneficial when a study needs to (1) cover a variety of firm-level activities, (2) examine a large number of companies longitudinally, and (3) assure research findings are applicable across different industries. In the literature, many text-based materials have been used for content analysis (e.g., media, newspapers, and annual reports), and shareholder letters are cited as a reliable source for measuring constructs from the manager's perspective (Short, Christian Broberg, Cogliser, & Brigham, 2010).

To ensure accurate measurement, we adopted dictionaries from existing studies. Specifically, top management innovativeness was measured using a dictionary developed by Short et al. (2010). Relative-exploration orientation was measured using a dictionary adopted from Uotila et al. (2009). The validity of this technique has been well examined in previous studies (e.g., McKenny, Aguinis, Short, & Anglin, 2016; McKenny, Short, & Payne, 2013; Pollach, 2012). Following Zachary et al. (2011), we operationalized each variable as the ratio of words reflecting each concept to total words in the shareholder letters.

3.2.2. Firm performance

In this study, Tobin's *q* was used as a measure of firm performance. As the literature suggests, market-value-based measures such as Tobin's *q* can capture both short-term performance and long-term prospects (e.g., Uotila et al., 2009). Tobin's *q* was operationalized as the ratio of a firm's market value to its total assets (Luo & Bhattacharya, 2006).

3.2.3. Firm resources

Hunt (2010) suggests that firm resources should include all tangible and intangible entities that enable firms to develop a competitive advantage. Accordingly, the measurement for firm resources included both working capital and intangible assets. Firm resources were operationalized as the ratio of working capital plus intangible assets to total assets (Lee & Grewal, 2004).

3.2.4. Industry competition

Following previous studies (e.g., Morgan & Rego, 2009), industry competition was measured using the Hirschman–Herfindahl index (HHI). The HHI reflects the intensity of competition within an industry. Industries were first identified based on the two-digit SIC code. The HHI was then computed as the sum of the squares of all suppliers' market shares in the industry (Morgan & Rego, 2009). For better exposition, we reverse coded the HHI by multiplying by minus one. Accordingly, higher values in our data indicated higher competition intensity.

3.2.5. Control variables

To capture observable heterogeneity, a set of control variables were included. The firm-level control variables were firm size (e.g., Beck, Demirgüç-Kunt, & Maksimovic, 2005), financial leverage (e.g., Mishra & Modi, 2013), cash flow (e.g., Gruca & Rego, 2005), and a dummy variable where 1 = service firms and 0 = non-service firms. In addition to including industry competition, market uncertainty was added to control for the potential influence of risk associated with different industry environments (e.g., Disatnik & Steinhart, 2015). To capture the economic-level effect, the yearly GDP change was included in the model (Antia, Zheng, & Frazier, 2013). The yearly GDP growth rate from the World Bank Database was used as an indicator of the economic environment. Finally, year dummies were also included in the model to capture observable time effects (Cui & Wu, 2016). All measures and data sources appear in Table 1.

3.2.6. Empirical approach

The context of our analysis presents two modeling challenges: simultaneity and endogeneity. First, REO is proposed as a means of potentially mediating the relationship between TMI and firm performance. Accordingly, REO was examined as a dependent variable of TMI and an explanatory variable of firm performance in different models. Thus, any potential simultaneity bias may have resulted in inaccurate estimates. Second, endogeneity may be a concern because the errors of the simultaneous equations for modeling firm performance and REO may be correlated. To account for these challenges, following previous studies (e.g., Orr, Bush, & Vorhies, 2011), the seemingly unrelated regressions (SUR) method was used to test our hypotheses. The models used to test the hypotheses were as follows:

$$FP_{it} = \beta_{10} + \beta_{11} \times TMI_{it} + \beta_{12} \times FR_{it} + \beta_{13} \times IC_{it} + \beta_{14} \times FP_{it\text{-}1} + \beta_{15} \times Size_{it} + \beta_{16} \times Lev_{it} + \beta_{17} \times Cash_{it} + \beta_{18} \times MU_{it} + \beta_{19} \times \Delta GDP_t + \beta_{110} \times Service_i + \beta_{111} \times Year_t + \varepsilon_1 \quad (1)$$

$$FP_{it} = \beta_{20} + \beta_{21} \times TMI_{it} + \beta_{22} \times REO_{it} + \beta_{23} \times FR_{it} + \beta_{24} \times IC_{it} + \beta_{25} \times FP_{it-1} + \beta_{26} \times Size_{it} + \beta_{27} \times Lev_{it} + \beta_{28} \times Cash_{it} + \beta_{29} \times MU_{it} + \beta_{210} \times \Delta GDP_t + \beta_{211} \times Service_i + \beta_{212} \times Year_t + \varepsilon_2 \quad (2)$$

$$REO_{it} = \beta_{30} + \beta_{31} \times TMI_{it} + \beta_{32} \times FR_{it} + \beta_{33} \times IC_{it} + \beta_{34} \times TMI_{it} \times FR_{it} + \beta_{35} \times TMI_{it} \times IC_{it} + \beta_{36} \times FP_{it-1} + \beta_{37} \times Size_{it} + \beta_{38} \times Lev_{it} + \beta_{39} \times Cash_{it} + \beta_{310} \times MU_{it} + \beta_{311} \times \Delta GDP_t + \beta_{312} \times Service_i + \beta_{313} \times Year_t + \mu \quad (3)$$

where FP = firm performance; TMI = top management innovativeness; REO = relative-exploration orientation; FR = firm resources; IC = industry competition; Size = firm size; Lev = financial leverage; Cash = cash flow; MU = market uncertainty; ΔGDP = yearly US GDP growth rate; service is a dummy variable where 1 = service oriented companies and 0 = non-service oriented companies; Year = year dummies; and ε_1, ε_2, and μ are error terms.

Eqs. (1) and (2) (Models 1 and 2) were used to explore the relationships among TMI, REO, and firm performance (i.e., testing H1 and H2). To determine the existence of any mediating effect, we followed Luo, Wang, Raithel, and Zheng's (2015) indications to first examine the direct impact of TMI on firm performance and then add REO to the model to check whether the direct influence of TMI on firm performance decreased. Eq. (3) (Model 3) was used to explore the relationship between TMI and REO (i.e., testing H3) and the moderating effects of firm resources (i.e., testing H4) and industry competition (i.e., testing H5). To account for the potentially correlated error terms, Eqs. (1) and (3), and then Eqs. (2) and (3) were run simultaneously.

4. Results

Table 2 presents the correlation matrix and results of the descriptive analysis. Table 3 presents the results from the data analysis. Fig. 2a and b

Table 1
Measures and data source.

Variable	Measure	Data source
Top management innovativeness	$TMI_{it} = \frac{TMI_{it}\ words}{Total\ words_{it}}$	Shareholder letters
Relative-exploration orientation	$REO_{it} = \frac{REO_{it}\ words}{Total\ words_{it}}$	Shareholder letters
Firm performance	Tobin's $q_{it} = \frac{(Market\ value_{it})}{(Total\ assets_{it})}$	COMPUSTAT
Firm resources	$FR_{it} = \frac{WC_{it}+IA_{it}}{AT_{it}}$	COMPUSTAT
Industry competition	$HHI = \sum_i^I S_{ij}2$, reverse coded	COMPUSTAT
Firm size	Log of number of employees	COMPUSTAT
Financial leverage	$LEV_{it} = \frac{DLTT+DCT_{it}}{SEQ_{it}}$	COMPUSTAT
Cash flow	Sum of income before extraordinary items	COMPUSTAT
Market uncertainty	MU_t = *Market volitity index*$_t$	COMPUSTAT
ΔGDP	$\Delta GDP_t = \frac{GDP_t - GDP_t - 1}{GDP_t - 1}$	World bank

Note: i = firm, t = time, j = industry, S_{ij} = ratio of the sales of firm i to the total sales of industry j, AT = total assets, WC = working capital, IA = intangible assets, DLTT = total long-term debt, DLC = debt in current liabilities, SEQ = stockholders' equity.

graphically present the moderating effects of firm resources and industry competition on the relationship between TMI and REO.

4.1. The effect of TMI on firm performance

H1 predicts that TMI has a positive impact on firm performance. The estimates from Eq. (1) in Table 3 show that the relationship between TMI and firm performance is positive and significant ($\beta = 0.034$, $p = 0.036$). The estimates from Eq. (2), however, suggest that the positive relationship becomes non-significant ($\beta = 0.026$, $p = 0.117$) after adding relative-exploration orientation to the model. This result implies that TMI influences firm performance but that this relationship is mediated by relative-exploration orientation. H1 is thus conditionally supported.

4.2. The role of relative-exploration orientation

H2 predicts that TMI has a positive influence on relative-exploration orientation. Estimates of Eq. (3) indicate that the relationship between TMI and relative-exploration orientation is positive and significant ($\beta = 0.199$, $p < 0.001$). H2 is thus supported. The results of Eq. (2) imply that relative-exploration orientation positively affects firm performance ($\beta = 0.038$, $p = 0.035$). H3 is thus supported. In addition, estimates of Eqs. (1)–(3) suggest that relative-exploration orientation mediates the relationship between TMI and firm performance.

4.3. The moderating effect of firm resources

H4 predicts that firm resources strengthen the positive relationship between TMI and relative-exploration orientation. The results in Table 3 and Fig. 2a imply that the moderating effect is positive and significant ($\beta = 0.095$, $p < 0.001$). H4 is thus supported. Hence, when firms have greater resources, top management teams driven by innovativeness are more likely to adopt exploration over exploitation strategies to promote innovation.

4.4. The moderating effect of industry competition

H5 predicts that the when industry competition is lower, the relationship between TMI and relative-exploration orientation is stronger. The results in Table 3 and Fig. 2b support this hypothesis ($\beta = -0.058$, $p = 0.029$). This evidence suggests that top management teams who are risk averse in strategic decision-making are less likely to employ exploration over exploitation in competitive industry environments.

4.5. Analyses of robustness

Several additional analyses were performed to check the robustness of the results. First, because interaction terms were included to test for the moderating effects of firm resources and industry competition, there was a risk of multicollinearity leading to inaccurate estimation. To control for potential multicollinearity threats, the predictors (i.e., TMI, firm resources, and industry competition) were centralized before the interaction term was computed. Doing so prevented any potential multicollinearity (Grewal, Cote, & Baumgartner, 2004). In addition, the variance inflation factor (VIF) was computed for each independent variable in the model. No value was >3.5, indicating that multicollinearity was not a concern in this study (Maruyama, 1998). Second, to rule out reverse causality between financial performance and REO/TMI, following the process outlined by Luo et al. (2015), we performed the Granger causality test (Granger, 1969) with two lags. The results confirm the direction of the influence from REO and TMI to financial performance ($F_1 = 84.891$, $p < 0.001$; $F_2 = 170.162$, $p < 0.001$). Third, when examining the relationships among TMI, REO, and firm performance, both TMI and REO can be theoretically explained by factors not included in the model but present in the error term, which can result in an additional endogeneity problem. To control for this bias, TMI and REO were set as endogenous variables, and industry and the year dummy variables were used as instruments to account for unobservable heterogeneity (Uotila et al., 2009). The results imply that none of the hypotheses was violated.

Table 2
Correlation and descriptive summary.

	N	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Firm performance	2186	1.298	1.237	1.000									
2. TMI	2228	0.007	0.005	0.078	1.000								
3. REO	2169	1.271	2.284	0.034	0.264	1.000							
4. Firm resources	2160	0.436	0.628	0.189	0.036	0.053	1.000						
5. Industry competition	2228	−0.087	0.075	−0.081	−0.072	0.028	−0.024	1.000					
6. Firm size	2204	2.892	1.541	−0.053	0.113	0.015	−0.073	−0.231	1.000				
7. Financial leverage	2209	0.865	13.675	−0.020	0.013	0.034	−0.026	0.013	0.021	1.000			
8. Cash flow	2213	6.939	1.920	−0.142	0.020	0.181	0.019	0.038	0.455	0.019	1.000		
9. Market uncertainty	2228	21.350	6.545	−0.113	−0.028	0.017	0.001	0.015	0.015	−0.040	−0.051	1.000	
10. ΔGDP	2228	2.952	1.853	0.112	0.036	−0.031	−0.002	−0.002	−0.005	0.031	0.045	−0.835	1.000

Note: correlations that have an absolute value >0.044 are significant at <0.05 level, SD = standard deviation.

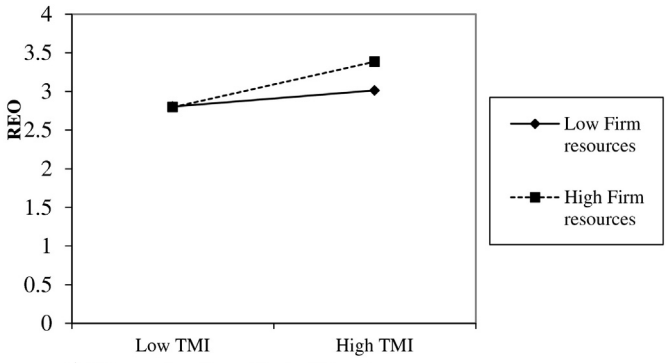
Table 3
Data analysis results.

	Dependent variable: Firm performance						Dependent variable: REO		
	Model 1			Model 2			Model 3		
	β	SE	*p*	β	SE	*p*	β	SE	*p*
Main effects									
TMI	0.034	0.016	0.036[a] (H1)	0.026	0.017	0.117	0.199	0.020	<0.0001[b] (H2)
REO				0.038	0.018	0.035[a] (H3)			
Firm resources	0.084	0.017	<0.0001[b]	0.085	0.017	<0.0001[b]	0.091	0.026	0.001[a]
Industry competition	−0.042	0.017	0.013[a]	−0.042	0.017	0.0128[a]	−0.007	0.022	0.774
Interactions									
TMI × firm resources							0.095	0.026	0.000[b] (H4)
TMI × industry competition							−0.058	0.026	0.029[a] (H5)
Controls									
Q_{t-1}	0.643	0.016	<0.0001[b]	0.637	0.016	<0.0001[b]	0.028	0.020	0.167
Firm size	−0.006	0.018	0.748	−0.002	0.018	0.920	−0.097	0.022	<0.0001[b]
Financial leverage	−0.015	0.015	0.346	−0.015	0.015	0.302	0.036	0.018	0.047[a]
Cash flow	−0.064	0.018	0.001[b]	−0.071	0.019	0.000[b]	0.209	0.022	<0.0001[b]
Market uncertainty	0.493	0.819	0.563	0.461	0.818	0.573	0.323	1.001	0.748
ΔGDP	0.657	0.463	0.173	0.626	0.462	0.176	0.130	0.566	0.818
Service dummy	0.053	0.016	0.001[b]	0.051	0.016	0.002[b]	0.043	0.020	0.030[a]
Year dummies included	Yes			Yes			Yes		
N	2043			2043			2043		
Adjusted R^2	0.487			0.488			0.100		
System weighted R^2	0.352			0.353			N.A.		

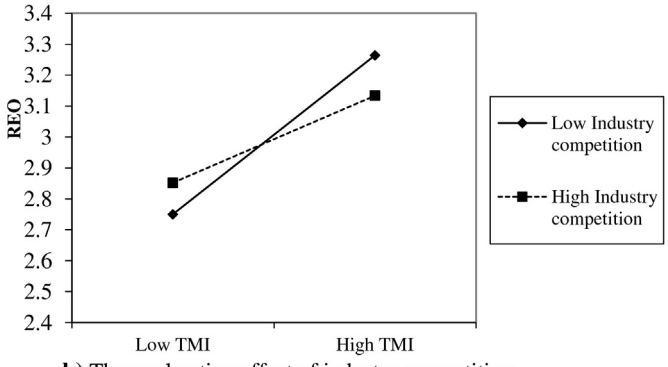
Note: All coefficients are standardized. TMI = top management innovativeness, REO = relative-exploration orientation, Q = Tobin's q; SE = standard error.
[a] 95% C.I.
[b] 99% C.I.

5. Discussion

A comparison of our findings with those from the literature appears in Table 4. The findings of this study provide insights into how top management contributes to a firm's innovation processes, which ultimately improve financial performance. The first finding of this study is that top management innovativeness positively affects firms' financial performance. Hence, if a manager is more committed to innovation, the firm can financially benefit from the manager's efforts in innovative activities. This finding also provides an alternative explanation to that of Barker and Mueller (2002) and Knight et al. (1999) as to why certain managerial characteristics (e.g., younger or more industrial experience) can result in better financial performance. Our findings suggest that managers with these characteristics are more likely to develop innovativeness, which ultimately leads to a better financial outcome for the firm.



a) The moderating effect of firm resources



b) The moderating effect of industry competition

Fig. 2. a. The moderating effect of firm resources. b. The moderating effect of industry competition.

The second finding is that the relationship between TMI and firm financial performance is mediated by managers' relative-exploration orientation. The analysis shows that without the mediating effect of relative-exploration orientation, managers' innovativeness cannot generate a direct effect on firm performance. This finding suggests that after developing a commitment to innovation, managers tend to focus more on exploratory strategies than on exploitative strategies. Research suggests that innovative managers are more willing to take risks and are more likely to explore new opportunities in the market (Baker & Sinkula, 2009). This willingness is more important if the firm competes in a new market lacking an established market structure and must meet new needs rather than those met by traditional marketing offerings (London & Hart, 2004). For example, when a firm enters an emerging market, it may need to adjust its product strategies (e.g., product design or functional adaption) to meet customers' needs in the emerging market. To make these changes, managers need risk introducing new product lines in the emerging market, which requires innovativeness and exploratory marketing strategies.

Finally, the results reveal that the influence of TMI on relative-exploration orientation is contingent on firm resources and industry environment. Specifically, the effect of TMI on the relative-exploration orientation is stronger when the firm has more resource slack and when the industry environment is less competitive. Rational managers tend to make the best decisions, implying managers should avoid uncertainty and risk (Ansoff, 1965). The findings of this study indicate that although managers may already be interested in improving firms' innovation capabilities, they are not motivated to implement these

Table 4
Comparing our findings with those of selected previous studies.

Study	Research question	Data source	Top managers' role	Mediators	Moderators	Major findings
Rodríguez et al. (2008)	Can top management commitment to innovation result in better NPD performance?	Survey	Fostering cross-functional communication	No	Top management support, top management risk aversion	Top management innovation commitment can enhance the importance of effective cross-functional communication flows for new product performance.
O'Cass and Sok (2013)	What are the roles of managers in innovation driven value creation?	Survey	Promoting transformational leadership	No	Transformation leadership, marketing capability	Transformational leadership can moderate the relationship between innovation capability and firm value creation.
Talke, Salomo, and Rost (2010)	How top management team diversity affects innovativeness and performance?	Survey	Top management team diversity increases a firm's strategic focus on innovation	A firm's strategic choice to focus on innovation fields, new product innovativeness	No	Top management team diversity affects innovativeness and performance via the strategic choice to focus on innovation fields.
Ensley and Pearce (2001)	How shared cognition in top management team influence new venture performance?	Survey	Promoting shared strategic cognition	No	No	Shared strategic cognition, including innovativeness, within the top management team leads to superior firm performance
Hoffman and Hegarty (1993)	How top management influence innovations?	Survey and secondary data	Executive characteristics	No	No	Different executive characteristics explain the influence of top management on different types of innovations.
This study	How top management contributes to a firm's innovation capability and performance	Content analysis and secondary data	Developing innovativeness	Relative-exploration orientation	Firm resources, industry dynamism	Top management innovativeness results in superior firm performance by employing relative-exploration orientation. Firm resources and industry competition influence top managers' transformation of innovativeness into innovation strategies.

strategies until they have determined that other options will not result in better outcomes. If a firm has more resources to spend and/or does not need to compete with many rivals, however, managers tend to focus less on the opportunity costs and potential risks.

5.1. Managerial implications

Our results provide insights into how managers can contribute to firms' financial performance by becoming involved in innovation. Though many managers acknowledge the importance of innovation, few managers are really committed to innovation-related strategies such as long-term R&D investment and the adoption of cutting-edge technologies. Such decisions are usually affected by the choice between trade-offs (Goll & Rasheed, 1997). First, our results suggest that if a manager is more committed to innovation, she or he can contribute more to firm performance. For example, while many established companies are often found to lack motivation in innovation because of the richness of firm resources (Eshima & Anderson, 2017), managers should promote a more entrepreneurial-oriented management culture to foster firm growth (Huarng & Ribeiro-Soriano, 2014). In addition, managers need to promote an innovation-driven leadership style (e.g., transformational leadership) to use the firm's innovation capability more efficiently and enhance firm value creation (O'Cass & Sok, 2013). Moreover, managers should devote more effort to promoting an open-innovation climate (Janeiro, Proença, & da Conceição Gonçalves, 2013) and providing more support (Swink, 2000) for innovation activities within the organization's innovation processes.

Second, our results reveal that relative-exploration orientation can result in better financial performance by mediating the relationship between top management innovativeness and firm performance. This finding implies that managers should seek new opportunities and improve their capabilities in learning from the market when they want to increase the efficiency with which they transform innovativeness into better financial performance.

Third, the results show that the presence of resource slack can strengthen the effects of TMI on relative-exploration orientation. Thus, managers should view resource development as an important strategic activity. Moreover, they need to allocate both tangible and intangible assets to the resource development process. Finally, when a firm wants to enter a new market or compete with rivals in a less competitive market, their innovativeness may contribute more to firm performance because a less competitive environment helps managers transform their innovativeness into relative-exploration marketing strategies.

5.2. Limitations and future research

This study has some limitations that can be addressed by future studies. First, the study used the manager's perspective to explain how a manager's innovativeness and relative-exploration orientation contribute to a firm's financial performance. Future studies can examine this issue at the firm level to compare any differences in research findings. Second, content analysis was used to measure top management innovativeness and relative-exploration orientation. Despite being widely used in both the management literature (e.g., Short et al., 2010; Uotila et al., 2009) and the marketing literature (e.g., Yadav et al., 2007; Zachary et al., 2011), content analysis is still an imperfect measure of the constructs under study. Thus, future studies could measure these concepts using different techniques (e.g., surveys or secondary databases) to check the validity of our findings. Third, although we examined the moderating roles of firm resources and industry competition on the relationship between TMI and relative-exploration orientation, managers' decision-making is a complex process that involves many influential factors. Future studies can benefit from examining other potential variables that may influence this process.

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Xinchun Wang is an Assistant Professor of Marketing at the College of Business and Public Administration, University of North Dakota. His current research interests include firm innovation, manager's role in the innovation process, and new product development. He holds a B. Mgmt. and MS in Management from East China University of Science and Technology, Shanghai, China and a PhD. in Business Administration from the Texas Tech University. Xinchun Wang (Ph.D. Texas Tech University).

Mayukh Dass is a Professor of Marketing and J.B. Hoskins Professor at the Rawls College of Business, Texas Tech University. He is also the Program Director of the Rawls Business Leadership Program and the Marketing Ph.D. Advisor at Rawls College of Business, Texas Tech University. His areas of expertise include networks, dynamic economies, analytical and mathematical models. He holds a B. Eng. in Electronics and Power Engineering from Nagpur University, an M.S. in Artificial Intelligence from University of Georgia, an M.S. in Statistics from University of Georgia and a PhD. in Business Administration from University of Georgia. Mayukh Dass (Ph.D., University of Georgia).