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# 高階團隊異質性、策略意圖積極性、與創新能耐

**Top Management Team Heterogeneity, Strategic Intent Aggressiveness, and Innovative Capabilities**

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## 摘要

高階管理團隊組成的異質性以及其積極的策略意圖對於組織的創新能耐的發展，包括行政創新能耐以及產品創新能耐，都有顯著的貢獻。本研究提出一個整合了策略意圖積極性、高階團隊異質性、行政創新能耐、與產品創新能耐的架構。根據對於中國大陸 84 家製造公司的資料所做的分析，本研究對此架構進行了實際地驗證。在結構方程模式分析之後，結果顯示出對於上述結構關係，除了高階團隊異質性對於行政創新能耐以外，都有直接或間接影響關係存在的支持。此外，兩個控制變數，包括公司規模以及研究發展投資，也顯示出對於高階團隊的異質性與產品創新能耐之間的關係起到顯著的干擾作用。這些發現拓展了我們對於組織的創新能耐之前提與脈絡的了解，而組織的創新能耐實為動態能耐的重要元素。

**關鍵詞：**高階管理團隊異質性、策略意圖積極性、創新能耐、動態能耐

## Abstract

Both aggressive strategic intent and heterogeneity of top management team (TMT) contribute to the development of organizational innovative capabilities, including those of administrative innovation and product innovation. This article presents a framework integrating strategic intent aggressiveness, TMT heterogeneity, administrative innovation capability, and product innovation capability. Based on the data of 84 manufacturers in People Republic of China (PRC), this study empirically examines the framework. The results after structural equation modeling show a significant support for the preceding relationships either directly or indirectly, except the enhancement of TMT heterogeneity on administrative innovation capability. In addition, two control variables of firm size and R&D investment also prove to moderate significantly the relationship between

TMT heterogeneity and product innovation capability. These findings expand the understanding on the antecedents and contexts of organizational innovative capability that is an important component of dynamic capabilities.

**Keywords:** top management team heterogeneity, strategic intent aggressiveness, innovative capabilities, dynamic capabilities

## INTRODUCTION

Dynamic capabilities have been attached great importance in academic and practical areas since its proposal (Teece et al., 1997), related researches exploding as well. After all, the pursuit of persistent success and competitive advantages makes ascertainment on their origins uninterrupted so that theories committed to interpret the basis of competitive advantage thus also never discontinue, from the resource based view through competence view to dynamic capability approach. In spite of criticisms about it such as tautological definition and contradictory arguments in the literature (Wang & Ahmed, 2007), dynamic capability approach as a conceptual guideline still has profound implication for strategic management, because capabilities appears to be the most directly traceable and crucial determinants of firm's competitive advantage while capability evolution to environmental dynamics is a definitely indispensable element of survival. As such, organizational accumulation of human, physical, financial, and intangible resources is becoming oriented by the strategic capability deployment.

In the light of empirical advancement, Wang & Ahmed (2007) further identify three primary components of dynamic capabilities that include adaptive capability, absorptive capability, and innovative capability. Among such three capabilities, innovative capability has been drawing much attention because innovations not only regularly bring organizations competitive advantage but also substantially lead to economic growth for countries. Although its importance has been so widely

recognized, the academic to date still capture limited knowledge about it. For the operationalization of innovative capability, it can be seen in literature to represent it with innovative outcome, such as Sher & Yang (2005), Dunphy & Herbig (1994), Persaud (2005), and Hagedoorn & Duysters (2002). Such a practice makes sense since outcomes reflects capability significantly, if not fully. Though difference actually exists between innovative outcome and capability, it won't make trouble like over-high correlations between constructs due to common method variance where the research model addresses only one construct of them. Damanpour & Evan (1984) contend that most studies address only one category of innovation, i.e., technical innovations. All too often, studies neglect administrative innovations, which are equally essential to the growth and effective operation of an organization. While several empirical studies have distinguished between administrative and technical innovations, none has examined whether the determinants of different innovation are the same or not. Still, whereas researchers have proposed a range of frameworks and empirical evidences interpreting its antecedent, disturbing, and outcome variables, the whole picture remains missing a number of key linkages, such as the composition and intent of top managers. TMTs dominate the process of strategy formulation (Mintzberg et al., 1998) and in turn exert a significant influence on the evolution of organizational capabilities, including innovative capability (Athanassiou & Nigh, 2000; Romijn & Albaladejo, 2002). The composition and strategic intent of TMT are thus important for exploring determinants of innovative capability.

This study aims to examine the antecedents and contexts of such two innovative capabilities as administrative and product innovation. Administrative innovation represents a firm's attempt to encourage innovation through various organizational systems and product innovation are otherwise focused on extending or revising the product or service line the firm presently offers in an effort to meet certain market needs (Huse et al., 2005). For the selection of an appropriate research object, China is on a quick rise with its influences increasingly expanding everywhere in global economy, politics, and technologies. From the perspective of business management research, Chinese enterprises have their unique and distinct economic and political backgrounds, i.e. the Chinese claim they are communists

and socialists but they are deeply involved in the capitalist system (Adekola & Sergi, 2007), which are becoming an interesting area for further exploration. This study hence chooses them as the research population.

Top Management Team is a group composed of highest level managers in an organization which actually dominates the process of formulating organizational ultimate strategies. TMT thus is the steersman of organization, governing the directions and pathways of future development (Naranjo-Gil & Hartmann, 2007; Nath & Mahajan, 2008). TMT influences attitudes, motives, and behaviors of their subordinates and contributes to organizational performance based on their knowledge, experiences, orders, intent, determination, and behavioral demonstration. Nonetheless, in an increasingly complex competitive environment, given the required abilities to monitor, detect, and interpret changes of markets, competitors, general environments, and technologies are increasingly getting beyond what an individual manager can handle, the role of TMT heterogeneity is thus getting increasing attention. Heterogeneous TMTs provides organizations with extensive views and perspectives based on their various knowledge and experiences (Carpenter, 2002; Naranjo-Gil et al., 2008) that enable organizations to appreciate multiple information and intelligences, to acquire and assimilate broader technologies, and to facilitate their innovative capabilities.

Strategic intent is another attribute of TMT that significantly dominates organizational innovative capability. A company's strategic intent is a long-term goal that is ambitious, builds upon and stretches the firm's existing core competencies, and draw from all levels of the organization (Schilling, 2005). Hamel & Prahalad (1989) create the term 'strategic intent' and contrast their strategic-intent approach with the traditional concept of "strategic fit" between resources and opportunities—a concept they believe has "often abetted the process of competitive decline". Strategic intent is based on an ambitious dream, fueling organizations energy, getting them rid of overly reasonable calculation so as to pursue seemingly unattainable aspirations. Often the strategic intent exhibited by TMT is more likely to directly affect the input and behaviors of organizational members, than any superficial, ambiguous organizational policies or oral declarations. That is, organizational members will not actually believe TMT's

public announcements or rhetoric, they tend to observe TMT's delicate behaviors and genuine intent and then formulate the guideline for their actions. Accordingly, what TMT really wants, the strength, scope, depth, length of its aspirations, will exert a determinant influence on the behavioral orientation of organizational members and the development of the entire organization. This study hence follows the examples of the multidimensional approach (Sharfman & Dean, 1991; Waddock & Graves, 1997; Koka & Prescott, 2002) and formulates the construct of strategic intent aggressiveness by integrating four dimensions of concept, which are activeness, broadness, depth, and length of strategic intent. Aggressive strategic intent will drive organizations to improve their administration and products and in turn implement organizational visions.

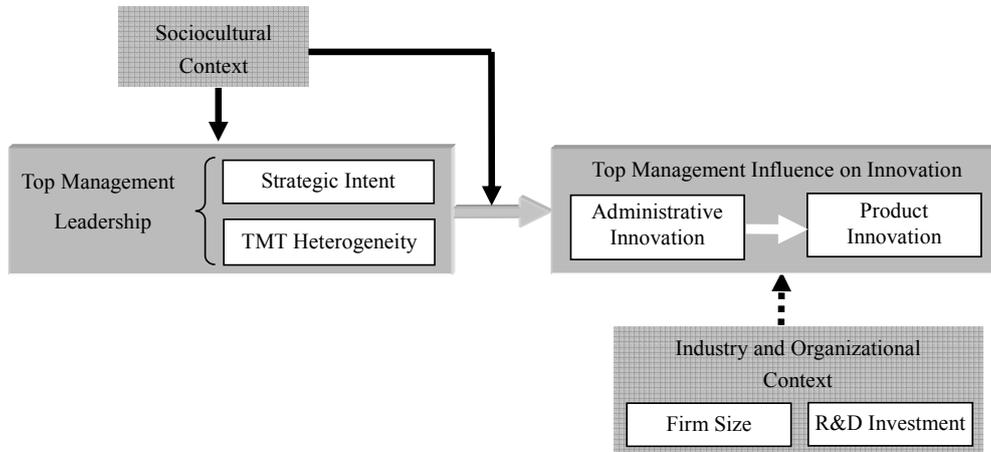
According to the contingent theory, though a multitude of factors may facilitate the success of product innovation, related contingent moderators however can not be overlooked, such as those of organizations themselves, specific environments, and general environments. This study is also devoted to examining the moderating effects of such two variables as firm size and R&D investment, of which, Seaden et al. (2003) argue firm size is important in shaping organizational capabilities, while numerous studies also have shown that R&D expenditures constitute the most influential variable in a firm's capability to innovate (Freeman & Soete, 1997). Empirically examining the common antecedents and related contexts of innovative capabilities across organizations is imperative, which will contribute to the theoretical development and to establish an integrated framework. In addition, the results of such a task are helpful for the references and applications of practitioners. Besides, identifying the concrete paths among various antecedents of innovative capabilities also admits no delay, the results of which enable not only the cross comparison among research but also the development of detailed contexts and the proposal of substantial practices.

The present study makes three contributions to the literature and practical. First, this study confirms both strategic intent aggressiveness and TMT heterogeneity are significant inducements for innovative capabilities. Such a finding not only expands innovation theories and even the dynamic capability approach, but also has a profound implication for building TMT for practitioners.

Secondly, this study identifies the specific paths from strategic intent aggressiveness through administrative innovation towards product innovation, namely, from the intentional through practical to performance aspects. Such path confirmation likewise substantiates theoretical content to a greater degree, providing a viable framework for future research and a model of predicting potential effects for developing practices. Finally, this study also verifies the moderating effect of two variables, including firm size and R&D investment, on the relationship between TMT heterogeneity and product innovation, further enriching the substance of the framework.

## **THEORETICAL BACKGROUND AND HYPOTHESES**

Innovative capability in three of dynamic capabilities appears to be the factor with the most direct impact on organizational competitive advantage. Innovation has long been recognized as a key to survival and a main source of sustained growth for firms (Jeremy & Michael, 2005). According to the upper echelon perspective, top management teams provide the impetus for innovative change (Seigyoung & Bulent, 2005). Detelin & Ivan (2005) have proposed a framework (Figure 1) integrating constructs about top management leadership and influence on innovation, along with contextual factors. The present study is based on such a framework, meant to examine whether two important constructs of top management leadership, including strategic intent and TMT heterogeneity, affect significantly innovation, beyond those of leadership styles in most empirical studies (cf. Maier, 1970; Mumford & Gustafson, 1988; Redmond et al., 1993; Scott & Bruce, 1994; Jung et al., 2003; Lian & Webber, 2006; Gumusluoglu & İlsev, 2009). Furthermore, efforts are also focused on such aspects of innovation as those for administrative systems and new products, with organizational contextual factors of firm size and R&D investment included in the model.



**Figure 1 the Conceptual Model of Top Management Leadership and Influence on Innovation**

Source: modified from Detelin & Ivan (2005) in which the boxes of white color are inserted additionally by the present paper.

Strategic intent is an important construct of top management leadership. Schilling & Hill (1998) claimed a firm's ability to innovate hinges on its ability to match its strategic intent with its existing resources and competencies. TMT heterogeneity is yet another attribute concerning top management leadership that is likely associated with organizational innovation. An array of works (cf. Eisenhardt & Martin, 2000; Abhishek & Hun, 2005; Seigyoung & Bulent, 2005; Keith & Michael, 2007; Alexander et al., 2010) has mentioned the possible positive relation between TMT heterogeneity and organizational innovation. Still, innovation projects also require administrative structures and processes appropriate to its development stage and multifunctional teams should be put in place early on for each innovation (Derorah & Cynthia, 1996).

As for organizational contextual factors, both firm size and R&D investment are often considered in building the whole picture about organizational innovation (cf. Wesley & Daniel, 1990; Daniel & Amnon, 2005; Bronwyn et al., 2009). The effects of sociocultural context in the framework of Detelin & Ivan (2005), in the other hand, can be diluted to a degree as samples are drawn from a single country.

Moreover, with the research objects being centered on the manufacturing sector, the disturbance of this factor should be freed further. In the following section, literatures and relevant arguments that inspired the present study to develop related hypotheses are elaborated.

## **1 Innovative Capability**

After proposing the term “dynamic capability” in 1994, Teece et al. (1997) then present its concrete framework in 1997, which consists of three components, including processes, positions, and paths. They argue dynamic capabilities are embedded in firm’s distinctive processes and conditioned by its asset positions and evolutionary paths. Among various organizational dynamic capabilities, adaptive, absorptive, and innovative capabilities are the most important component factors of dynamic capabilities and underpin a firm’s ability to integrate, reconfigure, renew and recreate its resources and capabilities in line with environmental changes (Wang & Ahmed, 2007). In particular, innovation capability has obtained longest yet broadest exploration and generally refers to the skills and knowledge needed to effectively absorb, master, and improve existing technologies, and to create new ones (Romijn & Albaladejo, 2002) while it is often observable through operationalized innovation performance.

Dynamic capabilities theory is not primarily concerned with fixed assets, but rather aims to explain the way in which a firm allocates resources for innovation over time, how it generates and deploys its existing resources, and where it obtains new resources (Cetindamar et al., 2009). Therefore, new product development is one prototypical dynamic capability while innovation is actually the cornerstone of dynamic capabilities (McKelvie & Davidsson, 2009). Lawson & Samson (2001) apply a dynamic capabilities approach to the investigation of innovation, suggesting that to succeed in turbulent markets organizations must develop an innovation capability that allows activities of mainstream and newstream in organization to be closely coupled (Wilson & Daniel, 2007). “Winners in the global marketplace have been firms that can demonstrate timely responsiveness

and rapid flexible product innovation, coupled with the management capability to effectively coordinate and re-deploy internal and external competencies” (Teece et al., 1997).

From the perspective of organizational evolution, innovative capabilities associate with organizational metabolism, persistent advances, breakthrough, and even survival. It is also an ability of organization to continue their self-surpass and a process to keep learning and evolving. Generally, the adoption of innovation is meant to promote the performance or effectiveness of the adopting organization. Especially under a volatile circumstance characterized by significant economic structure changes, innovative capabilities emerge as the determinants of competitive positions (Marques & Ferreira, 2009), since each of enterprise has to manage to innovate its output to guarantee perpetual existence while anyone fails to do so will definitely be taken over. Yet although such challenge poses in front of for-profit enterprises, non-for-profit enterprises may not elude its compelling pressure. Actually, innovation has also been widely recognized to have positive effects on such desired outcomes as organizational performance, market sensibility, and adaptability. Numerous studies empirically supporting the positive relationship between innovative capabilities and organizational performance can be found in literature, such as Mone et al. (1998), Garcia-Morales et al. (2007), and Subramanian & Nilakanta (1996), just name a little.

To develop organizational innovative capability, researchers present a host of noteworthy premises through empirical examination, for example, empowerment culture, transformational leadership, staff creativity (O'Regan et al., 2006), proactive strategic posture (Ozsomer et al., 1997), internationalization (Huse et al., 2005), employee willingness to both donate and collect knowledge (Lin, 2007), strategic orientation, market orientation (Laforet, 2008), and so forth. Though these factors may contribute to growing organizational innovative capabilities, contingent conditions however can not be left out. Not only varied environmental and organizational conditions may have different effects on the adoption of innovation, but excellent organizational performance also needs a fit between external and internal conditions (Tornatzky & Fleisher, 1990).

A frequent problem in literature is most studies of organizational innovation

usually include all innovations in one category, innovations do vary, however, and each type of innovation has its own attributes that influence its rate of adoption (Damanpour & Evan, 1984). Nonetheless, there still are researchers classifying innovations in terms of different dimensions due to different research contexts. Some of them are based on the innovation objects, such as technical innovation and administrative innovation (Daft, 1978); some on the levels of innovation to include radical and incremental innovation (Ettlie, 1983; Dewar & Dutton, 1986); still others from the perspective of stages to characterize innovations, such as diffusion and adoption of innovation (cf. Damanpour & Evan, 1984). In consideration of the shortage in literature noted by Damanpour & Evan (1984), this study directs attention on capabilities pertaining to both product and administrative innovation, attempting to investigate their possible antecedents and related contexts.

### **1.1 Product Innovation Capability**

Product innovation can be described as the development of a physical item that is completely new in the world or may refer to the modification of a single attribute of an existing product to satisfy some user's needs (Romano, 1990). Also, product innovation is often characterized as a process by which a firm transforms knowledge embedded in cross-functional teams into new products (De Luca & Atuahene-Gima, 2007). In general, the focus of product innovation are placed on extending or revising the product or service line the firm presently offers in an effort to meet certain market needs (Huse et al., 2005). Capability to innovate product therefore reflects an ability of organization to effectively integrate market trends of preference and technological evolution. Besides, product innovation also has been recognized as a primary means of corporate renewal and as an 'engine of renewal' (Danneels, 2002). That means such a capability to renew organization enables them to adapt agilely to changes in markets and environments.

The development of capability to innovate product requires an organization a sharp sensibility to market trends and ability to absorb, synthesize, and transform current technological knowledge. As a consequence, market knowledge and cross-functional collaboration turn out to be two fundamental resources for

successful product innovation (De Luca & Atuahene-Gima, 2007). In addition, owner's innovativeness also has a positive influence on innovation and performance (Verhees & Meulenbergh, 2004). These inducements for product innovation however still depend on a range of contingent conditions. As argued by Verhees & Meulenbergh (2004), customer market intelligence influences product innovation positively or negatively, depending on whether the innovativeness of the owner in the new product domain is weak or strong. Further, new products with a closer fit to firm competences tend to be more successful (Danneels, 2002). On the aspect of outcomes, product innovation capability serves to renew and reconfigure organizational resources (Danneels, 2002), contributes directly to organizational performance since it well aligns the organization with its environments, and is a central path by which they adapt and sometimes even transform themselves in changing environments (Eisenhardt & Tabrizi, 1995).

## **1.2 Administrative Innovation Capability**

Administrative innovation involves making changes on organizational structure, authority patterns, reward systems, and decision-making processes. In general, administrative innovation is meant to streamline administrative procedures, stimulate organizational innovativeness, promote members' morale, improve decision processes, and allocate resources more effectively. However, the drivers and the underlying processes of administrative innovations could be quite different from those of technological innovations, and that findings about technology adoption cannot be easily generalized to administrative innovations (Ravichandran, 2000).

Administrative innovation is characterized with features that are different from those of product innovation. First, administrative innovations are difficult, if not impossible, to protect by patent. Hence, imitation can not be dodged by legal barriers, as is often the case with product innovations (Teece, 1980). In spite of such a drawback, administrative innovation also poses a certain degree of context specificity that usually gives the organization a unique edge. For example, a decision information system that considers distinctive decision elements and

weights may be grasped in the hands of top managers and thus is characterized by properties of secrecy and appropriability. Besides, though it often involves significant "set up" costs and organizational disruption (Teece, 1980), administrative innovation sometimes associates with simple improvements in administrative processes that may incur relatively little cost but bring enormous efficacy. The disseminating mechanism of information about customer complaint is an example that as reached to appropriate persons can inspire more creative solutions.

Administrative innovation needs supports from organizational culture, leadership, and strategic orientation, and adapts to conditions of industry, competition, and government. Gabris et al. (2000) present a higher level of leadership credibility is associated with a stronger perceived administrative innovation. Ravichandran (2000) reports that size, functional differentiation, structural complexity, and management support are important antecedents for successful administrative innovation. As for the outcome of administrative innovation, Teece (1980) argues administrative innovation will yield opportunities for profit for early adopters; conversely, in a competitive market environment non-adopters will be penalized by inferior performance and in the long run their very survival may be challenged.

### **1.3 Administrative Innovation and Product Innovation**

Fast product development emphasizes the importance of cross-functional, customer, and supplier involvement in the process and visible top management support, more resources, and better teamwork (Gupta & Wilemon, 1990). Cross-functional coordination is believed to enhance the communication and exchange among all organizational functions and to give these functions greater proximity to the latest market trends. This is likely to foster both trust and dependence among the separate functional units, which, in turn, provides an environment that is more receptive to truly new products (Lukas & Ferrell, 2000). Eisenhardt & Tabrizi (1995) likewise assert that supplier involvement, powerful project leaders, and multifunctional teams can quicken the pace of product

development. However such coordinative activities among suppliers and among functional departments require organizations to develop nimble but efficient mechanisms, namely, a series of administrative innovation. As a result, the stronger the capability to innovate administrative system, the easier the product innovation will be successful.

***Hypothesis 1: administrative innovation capabilities affect product innovation capabilities positively.***

## **2 Strategic Intent**

Focusing the genesis of strategy formulation on top managers and emphasizing their substantial effect on the entire organization can be traced back to the notion of strategic intent presented by Hamel & Prahalad (1989). Strategic intent actually resides in subconsciousness of top managers that governs the directions, pathways, and visions of organizational development and is indeed an invisible burst of driver behind organizational actions and decisions. Though Mintzberg et al. (1998) somehow categorize the notion of strategic intent into the learning school of strategic management; it in fact likes the entrepreneurship school giving organizational leaders a significant role in strategy formulation. That means even though piecemeal events and all sorts of members in organization may contribute to the process of strategy formulation, the final strategic decision nevertheless is guided by strategic intent buried deeply in subconsciousness of top managers.

Strategic intent is a long-term goal that is ambitious, builds upon and stretches the firm's existing core competencies, and draws from all levels of the organizations. Typically a strategic intent would look ten to twenty years ahead and set up specific goals and their milestones for employees (Schilling, 2005). Whereas traditional strategic planning models often suggest setting goals or intentions based upon the organization's resources and an understanding of the constraints of the environment, using strategic intent suggests setting goals based upon the

organization's commitment and aspirations even though it may be very unreasonable to think the goals could be accomplished—based on resources and the environment (Schilling & Hill, 1998).

Nevertheless, strategic intent is still concerned with the ends and purposes of the enterprise and combines a vision of the future to make that vision a reality. A vision is a picture in the mind. The vision must go beyond defining the future products or services which the enterprise will offer and must also conceive how the enterprise will operate as an entity, what its values will be, and what it will be like to work in (Macmillan & Tampoe, 2000). In the light of that most large organizations struggle to translate their strategic intent into operational reality with pace and vigor, Meekings et al. (1994) present what they typically lack is a systematic framework for identifying, cascading and delivering their strategic objectives. That is to say an effective business management process will help leaders to make their strategic intent come true.

## **2.1 TMT Strategic Intent Aggressiveness**

Within our surroundings, we can often find out various types of managers or top management team, some of them negative, easy to be satisfied, passive, especially who are not adequately motivated and who are characterized by serious agent problem. Most of this type do what they are asked and even pay discounted efforts, avoiding trouble whenever possible, having low level of internal drive. On the other hand, other managers have high level of internal drive, self requirement, active, positive, set up internal goals, caring people around.

Strategic intent and its aggressiveness of TMT play an important role in organizational future development. Andrews (1971) saw the creation of clear purposes and objectives as central to strategy and a clear responsibility of top management team (Macmillan & Tampoe, 2000). In addition, Hamel & Prahalad (1989) also view it as the heart of strategy and as providing in dynamic dream for the future, providing a sense of direction, discovery, and destiny for everyone in the organization. Macmillan & Tampoe (2000) argued that it is clearly a prime responsibility of top management to generate such strategic intent and to ensure

that it is compelling.

However, there are scarce studies involving with the definition and measurement of strategic intent aggressiveness. According to prior researches, such as those of Ferrier & Lee (2002) and Grimm & Smith (1997), one could find that there are typical dimensions to be applied to measure strategic aggressiveness, including strategic intensity, complexity, unpredictability, and heterogeneity...etc. Therefore, this study follows the practice of measuring multidimensional construct of Waddock & Graves (1997) and defines strategic intent aggressiveness as the activity, broadness, depth, and length exposed by the strategic actions of TMT.

### ***Strategic Intent Activeness***

Strategic intent activeness refers to the degree to which the actions and decisions of TMT are largely based on active desires and attempts. TMT with high strategic intent aggressiveness tends to actively initiate strategic actions instead of passively waiting for rivals' steps. Hamel & Prahalad (1989) note that the concept of strategic intent also consists of a management process which is active.

### ***Strategic Intent Broadness***

Strategic intent broadness refers to the scope of which TMT cares about their stakeholders. This construct is concerned if TMTs just care about themselves, or they also care about their shareholders, employees, debt owners, even communities. Schilling (2005) suggested that firm's objective is to create value, not only improving operation and reducing cost, but also leveraging resources to create superior performance for clients, better life for employees, and higher returns for shareholders.

### ***Strategic Intent Depth***

Strategic intent depth refers to the extent to which TMT cares about their stakeholders' welfare. TMT could just be responsible for what they are required by stakeholders but they could also actively envision future welfare in detail for them, such as personal health care of employees and the living quality of organizational nearby communities. The degree to which TMT cares about details of stakeholders'

welfare would be reflected in their speech and behaviors, being a key dimension of strategic intent aggressiveness.

### ***Strategic Intent Length***

Strategic intent length refers to the time span over which TMT considers their decision effects. TMT with aggressive strategic intent would prospect future with a long term vision instead of rushing to short term performance. They set up ambitious goals and plan permanent strategies for those.

## **2.2 Strategic Intent Aggressiveness and Product Innovation Capability**

Product innovation undergoes a wide range of hardships during its journey so that feature its uniqueness, preciousness, and appropriability perhaps. Such a hard process, leaving along those of unexpected serendipity, needs the support from strong and progressive strategic intent of TMT, or else it will be simply given up halfway. Nevertheless, successful innovation requires an active and highly sophisticated coordination of the efforts of a number of key participants: idea generators, gatekeepers, innovators, intrapreneurs, project leaders, and innovation champions. Although top managers play many of these roles, they get engaged most often as innovation champions (Elenkov & Manev, 2005). Briefly, top management support is an important internal organization factor that contributes to product success (Gupta & Wilemon, 1990; Brown & Eisenhardt, 1995).

***Hypothesis 2: strategic intent aggressiveness affects product innovation capability positively.***

## **2.3 Strategic Intent Aggressiveness and Administrative Innovation Capability**

In this article strategic intent aggressiveness refers to the positive attitude and actions of TMT that are based on broad aspirations, deliberate considerations, and profound attempts. Such a positive intent will exert a positive influence on administrative innovation capability because TMTs embracing long and broad

visions tend to pay efforts to get rid of obsolete practices and systems during their aggressive implementation of strategic intent. In a study on the adoption of administrative innovation in information system department, Ravichandran (2000) notes top management support is the most important driver of quality initiatives, a kind of administrative innovation, in organizations. The business literature likewise embraces the need for a robust, energetic, mission-driven leadership as central to organizational success and change (Gabris et al., 2000).

***Hypothesis 3: strategic intent aggressiveness affects administrative innovation capability positively.***

### **3 Heterogeneity of Top Management Team**

Top management team refers to a group composed of the Chairperson of the Board, Vice-Chairperson, Chief Executive Officer, Chief Operating Officer, President, Senior Vice-President, and Executive Vice-Presidents (Tihanyi et al., 2000). Since titles of executives in various organizations are different in terms of organizational size and nationality, this study refers top management team to a set of managers in an organization who are regularly involved in strategic decision-making. Therefore, TMT's members are people who occupy highest positions, in charge of the organizing and coordination of the entire organization, in possession of significant decision and controlling power in business administration. Compared with ordinary work teams, TMT exerts a powerful influence on decision and thus dictates the fate of the organization.

Prior studies on TMTs are nearly all focused on the CEO herself/himself or individual leaders, placing great emphasis on the impact of individual leader's characteristics on organizational choices. Later on, as noted by Tihanyi et al. (2000), there is increasing research effort devoted to better understanding the role of the whole top management team and most of them are mainly concerned with the relationship between top management team and organizational performance. However, verification on the impact of TMT heterogeneity on organizational

innovative capabilities is a missing link.

Since TMT affects the strategic direction of organizations through strategic decisions, TMT's operation has a great impact on organizational performance and future development, whatever positively or negatively. Nevertheless, the composition of TMT likewise has a certain effect on its operation, the ultimate decision, and in turn on organizational outcomes. Following such a vein, the composition of TMT and its heterogeneity become key issues for probing the drivers behind organizational capability development. Tihanyi et al. (2000) also note that there is a stream of research concerned about the effects of TMT heterogeneity, identifying significant relationship between a variety of measures of heterogeneity and organizational strategic outcomes. Furthermore, researchers have also established the linkage between TMT heterogeneity and firm performance (Murray, 1989).

Before advancing the research, what TMT heterogeneity is needs to be clarified. According to Finkelstein & Hambrick (1996), TMT heterogeneity refers to the diversity of demographical characteristics and important cognition, concept of value, and experiences among members; relatively, homogeneity refers to the similarity of the above characteristics of members. TMT heterogeneity however has a couple of dimensions, including age, tenure, education level and professions, occupational experiences, culture, sex, nationality...etc (Finkelstein & Hambrick, 1996). Yet as for its operationalization, in light of existing literature, the most popular used measures on heterogeneity among demographical variables are education level, tenure, age, and functional background (Carpenter, 2002), which are also employed in this study.

Compared with teams whose members are more homogeneous, diversity is likely to provide the TMT with more information sources (Carpenter, 2002). Senior managers coming from different backgrounds and having varieties of professional experiences are likely to put up a higher cognitive and information processing capacity as well as to create a broader knowledge base (Nielsen, 2009). Such views are also supported by studies that show heterogeneity cultivates greater knowledge, creativity and innovation among the team members (Marimuthu et al., 2009).

### **3.1 TMT Heterogeneity and Product Innovation Capability**

To develop innovation, a firm must search, identify, and evaluate alternative knowledge from different sources (Zhou & Wu, 2010). Members of heterogeneous TMTs possess varied knowledge backgrounds that facilitate appreciation of a wide range of information, reducing the likelihood of overlooking critical knowledge to their organizations. On the other hand, cognitive processes of TMT members will influence innovation search while strategic choices are also impacted by a 'dominant logic' that makes it difficult for firms to undertake strategic change. Specific cognitive biases affect managerial decision-making and cause managers to rely on information with which they are most familiar. Empirical results suggest that broader horizons with respect to knowledge sources are associated with successful innovation (Leiponen & Helfat, 2010).

***Hypothesis 4: TMT heterogeneity affects organizational product innovation capabilities positively.***

### **3.2 TMT Heterogeneity and Administrative Innovation Capability**

In the course of innovation adoption, the role of senior management is not futile but rather decisive, which have been claimed by many studies (Ravichandran, 2000). The mechanisms which drive heterogeneous TMT to enhance administrative innovation capability lie in two aspects. The first is TMT heterogeneity enhances organizational detective and absorptive capability and the second is TMT heterogeneity also facilitates the generation of organizational innovativeness. For the first mechanism, heterogeneous TMT is widely viewed as a proxy for more divergent cognitions (Ferrier, 2001), which enable organizations to appreciate various knowledge and exploit them. Heterogeneous TMT hence promotes administrative innovation, since its process is commonly equated with an ongoing pursuit of harnessing new and unique knowledge (Subramanian & Youndt, 2005). Secondly, as for the inspired organizational innovativeness by TMT heterogeneity, the driver comes from the increased divergence of cognitive sources that prevents them from being constrained by selective awareness (Heiner, 1983) and from

commitment to the behavioral status quo (Miller & Chen, 1994; Ferrier, 2001).

***Hypothesis 5: TMT heterogeneity affects organizational administrative innovation capabilities positively.***

#### **4 Firm Size**

Past studies on firm attributes that influence a firm's innovation efforts often include market extension, firm size, capital assets, age and history (Cohen, 1995). Firm size, measured by the number of employees in the present study, implies the richness of available resources to a degree, including humane, physical, and financial resources. Consequently, since the importance of size in shaping organizational capabilities, it is natural to expect that smaller firms will be less likely to innovate than large firms (Seaden et al., 2003). Yet no conclusive results on the relationship between firm size and product innovation have been established either by empirical findings or by analytical models (Yin & Zuscovitch, 1998). Yin & Zuscovitch (1998) noted that varied innovation incentives prompt the larger firm to put in more in process (cost-reducing) innovations and the small one to deploy more resources to develop new products.

Firm size may exert a moderating effect on the relationship between TMT heterogeneity and organizational outcomes (Miller, 1991; Carpenter, 2002), such as product innovation. The moderation actually comes from the information processing requirements. Firm size and organizational structure represent two such potential moderators. As firms grow, the information-processing requirements may necessitate various types of TMTs (Certo et al., 2006).

***Hypothesis 6: Firm size moderates the relationship between TMT heterogeneity and product innovation capability.***

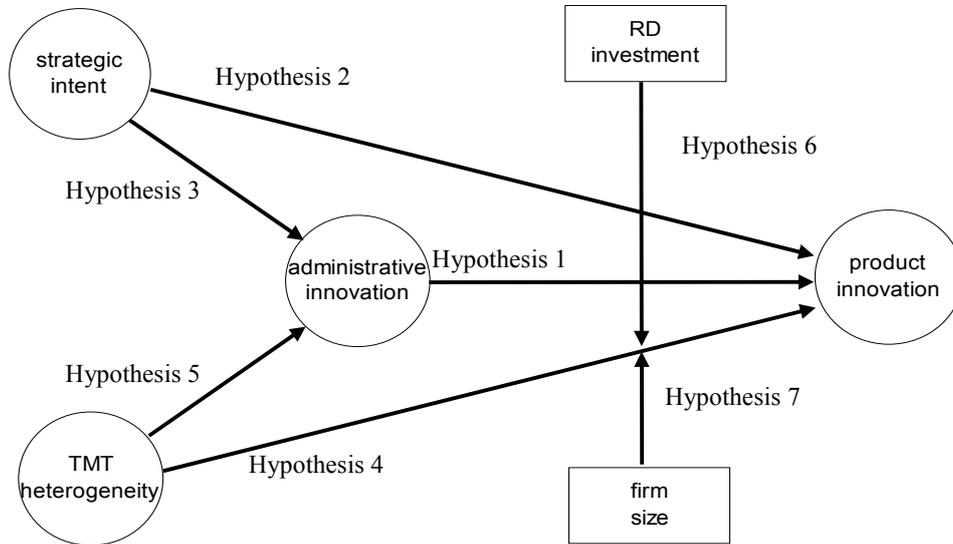
## **5 R&D Investment**

Investment in R&D spawns innovations. R&D expenditure represents the level of a firm's commitment to research and development and its decisive effects on innovative capabilities have been supported by numerous studies (Freeman & Soete, 1997). R&D investment typically aims to inspire more intense innovation so that it directly impacts innovative capability. Meanwhile, in empirical studies, an array of evidences also showed confirmation for R&D expenditure among the factors that have substantial effects on a firm's level of innovation activities (Shefer & Frenkel, 2005). However, if we look a little harder, as claimed by Yin & Zuscovitch (1998), the allocation of R&D investment may sway the direction of a firm's innovative capabilities, either process innovation or product innovation. Moreover, R&D investment, measured by R&D spending divided by sales in the present study, known for R&D intensity, and TMT heterogeneity share much comparable characteristic of scale. Based on the fact, though TMT heterogeneity may enhance product innovation capability, R&D investment may mitigate or augment its inducement.

***Hypothesis 7: R&D investment moderates the relationship between TMT heterogeneity and product innovation capability.***

## **6 Research Model**

The research model of this study is depicted as Figure 2. There are two predictive variables, including TMT heterogeneity and strategic intent aggressiveness, one mediating variable as administrative innovation, and one criterion variable as product innovation. In addition, this study also examines the moderating effects of both firm size and R&D investment. Note that this research model does not exclude the possibility of the existence of reverse relationship between variables, such as the impact of administrative innovation on the composition of the TMT.



**Figure 2 Research Model and Hypothesized causal relationship**

## METHODOLOGY

### 1 Measurement

This study adopts measures from the literature if possible, but scale development for constructs that we create is inevitable. The principles suggested by Churchill (1979) are employed for scale development. First, the domain of each construct is defined in terms of what will be included or excluded. Second, the literature is searched to find out any relevant scales. If none is available or appropriate for application, new measures are developed and multiple items are used for each construct to increase reliability of measured constructs.

#### 1.1 TMT Heterogeneity

In the research of Tihanyi et al. (2000), they adopt five variables to measure

TMT heterogeneity, including age and tenure, elite education, international background, educational background, and functional background. This study combines elite education and educational background as one question item, totally with four items to measure TMT heterogeneity. These question items are: 1, TMT has great age heterogeneity; 2, TMT has great educational background heterogeneity; 3, TMT has great functional background heterogeneity; 4, TMT has great international experience heterogeneity. The four items are proposed to ask informants to pick up a most match-up degree in a seven-point disagree/agree scale with which they think corresponding to their organizational situations. The past research involving TMT heterogeneity mostly employ a calculated index such as Blau's heterogeneity measure  $1 - \sum(\pi_i)^2$  where  $i$  is the proportion in different educational or functional category (Blau, 1977). The authors try another way to extract the construct of TMT heterogeneity, which is based on respondents' perception on the composite attributes of their organizational top management team.

## **1.2 Strategic Intent Aggressiveness**

Four dimensions are used to measure strategic intent aggressiveness, including activeness, broadness, depth, and length of strategic intent. All of them also are measured with seven-point disagree/agree scale.

Strategic intent activeness encompasses two question items. Firstly we ask informants if the decisions and actions of their TMTs are largely based on aggressive intentions. And secondly we ask them if the decision and actions of their TMTs are much active.

Strategic intent broadness has four items, including asking informants about if their TMTs care only themselves, or they also care shareholders and debtholders, or they even consider the nearby communities in their decisions and actions. The addition of different populations into TMT's usual decision consideration forms a continuum which we labeled as strategic intent broadness.

Strategic intent depth has two items, asking respondents if their TMTs are considerate of employee right down to the most trivial detail and if their TMTs

lavish every care on community inhabitant.

Strategic intent length also includes two items, firstly asking respondents the degree to which their TMTs are shortsighted in their decisions and actions and secondly the degree to which their TMTs are farsighted in their decisions and actions.

There are ten items in total to measure the construct of strategic intent aggressiveness. The following lists all of the ten questions.

1. TMT makes its actions and decisions based on an aggressive attitude. (Strategic intent activeness)
2. TMT makes its actions and decisions actively. (Strategic intent activeness)
3. Decisions of TMT just care about its own benefits. (Strategic intent broadness)(Reverse coded)
4. Decisions of TMT care not only itself but also employees. (Strategic intent broadness)
5. Decisions of TMT take the benefits of both shareholders and debtholders into consideration. (Strategic intent broadness)
6. Decisions of TMT take the benefits of local communities into consideration. (Strategic intent broadness)
7. TMT takes care of trifling matters of local residents in every possible way. (Strategic intent depth)
8. TMT takes care of trifling matters of employees in every possible way. (Strategic intent depth)
9. TMT is myopic and focuses on short term benefits. (Strategic intent length) (Reverse coded)
10. TMT has clear visions and focuses on long term benefits. (Strategic intent length)

### **1.3 Product Innovation Capability**

In the way of product innovation capability, this study adopts the measurement scale presented by Huse et al. (2005), which consists of the following items: “To develop new products,” “To introduce radically new products in the

company's existing markets," "To offer improvements or modifications of existing products," "To develop new products for fast (one to two years) market introduction," "To develop new products for existing markets," "To increase profitability through products that did not exist three years ago," and "To provide new variants for existing product lines."

#### **1.4 Administrative Innovation Capability**

Administrative innovation capability is also measured with items adapted to Huse et al. (2005), which include five questions as: "To train employees in creativity and innovation techniques", "To develop new structures to encourage innovation in the company", "To use groups from various departments to develop new products", "To develop procedures to develop innovation techniques", and "To appoint champions for innovations and new business ideas".

## **2 Questionnaire Design and Sampling**

The questionnaire of this study is written in Chinese, using members in a couple of Chinese internet forums (cf. <http://www.3dportal.cn/> and <http://www.jxcad.com.cn/>) as the subjects. The authors posted messages inviting enthusiasts who had been long serving as executives to fill up the questionnaire. After receiving their responses, those of non-executive were abandoned, with 84 valid firm respondents in total. Among them, 19 were senior executives, 38 middle executives, and 27 supervisors. These forums are platforms pertaining to mechanical professions, allowing engineers to exchange their ideas and problems with one another. Given well-established systems of reward and reprimand, members who linger there are mostly based on the motive of technological studies and in possession of a certain degree of professional accomplishment and integrity that guarantees the survey a level of reliability. Nonetheless their members come from everywhere in China that also secures the randomness of sampling. The authors make a post in these forums, describe research topic, background, and qualification of respondents, and upload our questionnaire allowing members to

download freely. After receiving their email responses, a quick check is conducted and reward is given to respondents who carefully did the survey.

In recent years, the Internet has become a useful new medium for recruiting research participants and administering surveys (Wright, 2005). Advantages of using Internet as a participant recruiting mechanism include more varied audiences (Stanton & Weiss, 2002), access to unique populations, time saving (Wright, 2005), low cost, and ample time available for respondents. In contrast, pitfalls lie in differential access to the Internet for different demographic groups (Stanton & Weiss, 2002), less information about the characteristics of members, multiple responses from participants, self-selection bias (Wright, 2005). Although some of those concerns are independent of our research topic and somewhat diminished by our active screening, the questionnaire arranges items within the same construct in different section purposely in order to verify the reliability of individual respondents. The preliminary comparison and screening are performed in terms of sectors, capital amounts, sales, employees in order to remove possibly repeated data resources and invalid questionnaire. Totally this study got 84 valid respondents.

### **3 Methods**

Given the lack of established dataset of strategic intent, cross-sectional study comes to be an inevitably statistical research method. Peil et al. (1982) stated that a cross-sectional study is designed to explore a new area, or at least one about which little is known. The 84 questionnaires after preliminary comparison and screening are then put into reliability analysis. Thereafter, it is widely suggested to perform confirmatory factor analysis (CFA) before the structural equation modeling to examine the appropriateness of measurement of constructs, which include the assessment of convergent validity, discriminant validity, and composite reliability for the developed model beside the examination on the fit of the overall model. Namely, the hypothesized structural equation model is examined after the confirmation of the appropriateness of the measurement model may derive a more

robust conclusion. For the overall fit of the model,  $\chi^2$ , p value,  $\chi^2/df$ , NFI (Normed Fit Index), CFI (comparative fit index), and RMSEA (root mean square of approximation) are available for the determination of the entire model. Next, descriptively statistical analysis on each construct is carried out and then followed by SEM to examine the hypothesized causal model as well as to obtain the regressive coefficients among predictive and criteria variables.

## RESEARCH RESULTS

### 1 Reliability Analysis and Confirmatory Factor Analysis

The following Table 1 gives the results of reliability test. DeVellis (1991) argued that the reliability value of 0.60~0.65 is unacceptable, 0.65~0.70 the minimum acceptable scope, 0.70~0.80 good, and 0.80~0.90 great. According to his opinion, the reliability of a good survey or questionnaire should be above 0.70. Therefore the reliabilities of constructs in this study are good except TMT heterogeneity exhibits the minimum acceptable reliability after deleting the item of age heterogeneity.

Regarding the assessment of measures, confirmatory factor analysis (CFA) is conducted as part of a two-step approach (Anderson & Gerbing, 1988) to investigate the validity of each construct. In the purification process, some items with low factor loading are removed (see Table 1), while at least three items are retained for each construct to be examined in the CFA model (Churchill, 1979). The model after purification is then retested with CFA and the result is good ( $\chi^2 = 100.532$  on 98 df, CMIN/DF= 1.026, Probability level = .410, Normed Fit Index [NFI] = 0.900, Comparative Fit Index [CFI] = .997, and Root Mean Square Error of Approximation [RMSEA] = .018), indicating a statistically significant fit between the theoretical model and the sample data.

**Table 1 the reliability test results**

Constructs & dimensions	Cronbach's Alpha	Cronbach's Alpha if Item Deleted	Constructs & dimensions	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
<i>TMT heterogeneity</i>	.590		<i>Strategic intent aggressiveness</i>	.789	
Age heterogeneity		.662 <sup>a</sup>	Activeness		.793
Function heterogeneity		.450	Broadness		.667
Education heterogeneity		.365	Depth		.738
International experience		.550	Length		.746
<i>Product innovation</i>	.903		<i>Administrative innovation</i>	.909	
Many new products		.878	Training		.898
New to existing market		.883	New structure		.877
Many improvements		.899 <sup>a</sup>	Cross unit team		.881
Quick lunch		.884	New process		.885
Product extension		.869	Innovation champion		.903
Profits by new products		.916 <sup>a</sup>			
Increase product series		.885			

Note: a. the item is deleted due to low factor loading.

Furthermore, convergent validity is examined by the significance of factor loading and individual item reliability  $R^2$  which is suggested to be .3 at least (Hair et al., 1998). The estimations of relevant values are listed in Table 2 of which factor loadings of all measures are significant and  $R^2$  are also bigger than .3 except the item of TMT international experiences, indicating convergent validity is roughly established. We do not drop TMT international experiences in measuring TMT heterogeneity for preserving its theoretical implications and at least three measuring items (Churchill, 1979)

For discriminant validity, it is allowed to be tested using average variance extracted (AVE) and squared correlations between constructs. Fornell & Larcker (1981) suggest researchers to examine if AVE within construct is bigger than determinant coefficient  $r^2$  between constructs so as to confirm discriminant validity. If determinant coefficient  $r^2$  between constructs is smaller than AVE of a single construct, variance extracted by a construct is bigger than shared variance between constructs. In other word, when the correlations within a construct are bigger than the determinant coefficients  $r^2$  or correlations between constructs, discrimination between constructs is thus established. The values after CFA are

listed in Table 3 and 4 where shows all four AVEs of constructs are bigger than the squared correlations between construct so that the discriminant validity is also confirmed.

**Table 2 estimates of the measurement model**

Constructs & dimensions	Factor loading	Standardized factor loading	S.E.	C.R.	R <sup>2</sup> (item reliability)
<i>TMT heterogeneity</i>					
function	.702	.650***	.175	4.019	.423
education	1.000 <sup>a</sup>	.793***	—	—	.629
International experiences	.620	.454***	.185	3.358	<b>.206<sup>b</sup></b>
<i>Strategic intent aggressiveness</i>					
Activeness	.665	.623***	.126	5.265	.388
Broadness	.836	.857***	.115	7.263	.734
Depth	.970	.757***	.155	6.252	.573
length	1.000 <sup>a</sup>	.693***	—	—	.480
<i>Product innovation</i>					
Many new products	.923	.856***	.077	11.953	.733
New to existing market	.931	.818***	.086	10.792	.669
Quick lunch	.952	.826***	.087	10.987	.682
Product extension	1.000 <sup>a</sup>	.930***	—	—	.865
Increase product series	.702	.728***	.079	8.896	.530
<i>Administrative innovation</i>					
Training	.944	.821***	.095	9.935	.674
New structure	1.000 <sup>a</sup>	.918***	—	—	.843
Cross unit team	.945	.775***	.106	8.929	.601
New process	.868	.801***	.091	9.569	.642
Innovation champion	.789	.702***	.100	7.851	.493

Note: a. the value is set up as 1 in the measurement model and therefore S.E. as well as C.R. are also absent.

b. the value is lower than .3 which is unqualified for the threshold of Hair et al. (1998).

c. \* denotes p < .05; \*\* denotes p < .005; \*\*\* denotes p < .001.

Unidimensionality alone is not sufficient to make sure the robustness of a scale. In the light of the scale evaluation paradigm proposed by Koufteros (1999), the reliability of the composite score shall be evaluated after unidimensionality has been acceptably established. Composite reliability implies the degree to which a set of latent construct indicators are consistent in their measurement, for which scholars suggest it should be at least bigger than .6 (Fornell & Larcker, 1981). This

study shows all composite reliabilities are well above .6 as indicated in Table 3. As such, the composite reliability is also established. In brief summary, after confirmatory factor analysis, the measurement model in this study is warranted, exhibiting acceptable convergent validity, discriminant validity, and composite reliability, suitable to proceed with the following causal analysis.

**Table 3 estimates of AVEs, composite reliabilities, and squared correlations between constructs**

Variable	AVE	Composite reliability
TMT heterogeneity	.419	.674
Strategic intent aggressiveness	.544	.825
Product innovation	.696	.919
Administrative innovation	.650	.902

## 2 Descriptive Statistics

Table 4 lists the means, standard deviations, and squared correlations of constructs in this study.

**Table 4 Descriptive statistics and square correlations for variables**

	Mean <sup>1</sup>	Standard Deviation	TMT heterogeneity	Strategic intent aggressiveness	Product innovation	Administrative innovation
TMT heterogeneity	7.818	1.013	—	.004	.052	.012
Strategic intent aggressiveness	12.356	.804	.004	—	.098	.454
Product innovation	18.407	1.047	.052	.098	—	.311
Administrative innovation	17.054	.931	.012	.454	.311	—

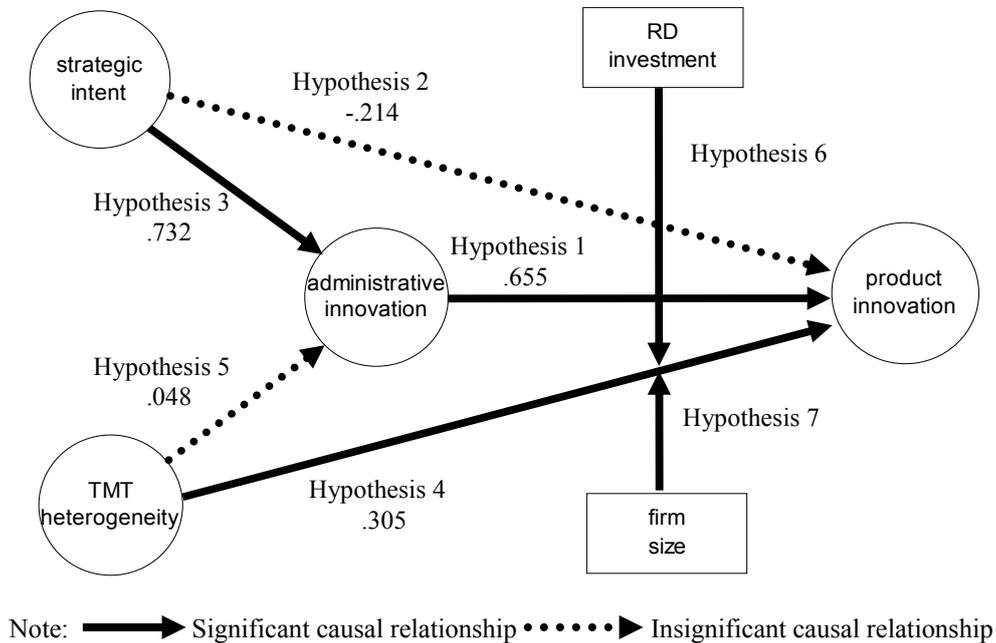
Note: 1. the mean values were calculated by averaging 84 of respondent's score that was =  $0.65 * \text{function} + 0.793 * \text{education} + 0.454 * \text{international experience}$ . These weights were derived from standardized factor loadings.

### 3 Results of SEM Analysis

After confirmation of the direct effect of two independent variables, the examination on the structural relationship of the proposed model proceeds. A full latent variable model with items screened with the overall CFA model is estimated (Anderson & Gerbing, 1988), as structural equation modeling (SEM) will yield severer testing results. The results exhibit a good fit between the theoretical model and the sample data ( $\chi^2 = 93.304$  on 97 df, CMIN/DF= .962, Probability level = .587, CFI = .906, NFI = 1.000, and RMSEA = .000), so that it can be concluded that hypothesis testing based on this model is reliable.

According to the results, administrative innovation capability positively affects product innovation capability, as stated Hypothesis 1, while strategic intent aggressiveness also exerts a positive influence on administrative innovation capability that is posited in Hypothesis 3. But unlike the claim of Hypothesis 2, strategic intent aggressiveness does not directly enhance product innovation capability. Besides, the SEM results likewise reveal that TMT heterogeneity has a positive effect on product innovation, as stated in Hypothesis 4. However, Hypothesis 5 postulating that TMT heterogeneity has a positive effect on administrative innovation capability is not supported.

Since strategic intent aggressiveness appears an insignificant direct effect on product innovation capability, the evidence of significant indirect effects is sought to support the argument. To verify such mediating effect, this study conducts another structural relation model analysis with the bootstrapping approach which is preferred over methods that assume symmetry or normality of the sampling distribution of the indirect effect (Preacher & Hayes, 2008). The results show a significant indirect effect of strategic intent aggressiveness on product innovation capability ( $p$  value = .004). The total effect by definition is equal to direct effect plus indirect effect. Given the direct effect is not statistically significant, the total effect of strategic intent aggressiveness on product innovation capability is just the indirect effect =  $.732 \times .655 = .479$ .



**Figure 3 the structurally causal relationship model**

#### 4 Moderating Effects of Firm Size and R&D Investment

This study proceeds to use firm size as a control variable, investigating the moderating effect on the relationship between TMT heterogeneity and product innovation. The authors divide all samples into two groups of small and big sized manufacturers and then apply the group analysis function of Amos 7.0<sup>®</sup> to examine if there is a significant distinction between structural relationships of two groups. The distribution of firm age, capital, and sale of the two groups are presented in Table 6, where shows 46 firms of small size and 38 firms of big size. The result shows *p* value as .032, indicating firm size actually exerts a significant moderating effect on the enhancement of TMT heterogeneity on product innovation. Especially in case of big sized manufacturers, TMT heterogeneity has a greater impact on the performance of product innovation (see Table 5).

Next, the above approach is repeated to deal with the moderating effect of

R&D investment on the relationship between TMT heterogeneity and product innovation, dividing all samples into two groups of less and more R&D investment. The distribution of firm age, capital, and sale of the two groups are presented in Table 6, where shows 39 firms of more R&D investment and 45 firms of less R&D investment. The result after group analysis by Amos 7.0<sup>©</sup> reveals a significant moderating effect of R&D investment, *p* value as .029. In case of more R&D investment, TMT heterogeneity has a more significant enhancement on product innovation (see Table 5), supporting the argument that, as R&D investment increase, heterogeneous TMT exerts more influences on the performance of product innovation.

**Table 5 Maximum Likelihood Estimates, Regression Weights**

	Regression Weights Estimate	rdized Regression Weights	S.E.	C.R.	P
Small size	.067	.096	.099	.677	.499
Big size	1.105	.476	.515	2.146	<b>.032</b>
Less RD investment	.051	.057	.109	.467	.641
More RD investment	.603	.446	.224	2.689	<b>.007</b>

**Table 6 distribution of firm age, capital, and sale of two groups divided by firm size and RD investment separately**

<b>Firm age</b>	<b>&lt;5 years</b>	<b>6~10 years</b>	<b>11~15 years</b>	<b>16~20years</b>	<b>&gt;20years</b>	<b>Total</b>	
Small size	13	15	11	3	4	46	
Big size	0	9	3	9	17	38	
More RD	7	7	11	4	10	39	
Less RD	6	17	5	3	14	45	
<b>Capital</b>	<b>&lt;1m</b>	<b>1m~10m</b>	<b>10m~100m</b>	<b>500m~1b</b>	<b>1b~2b</b>	<b>&gt;2b</b>	<b>Total</b>
Small size	19	24	2	1	0	0	46
Big size	0	9	8	10	7	4	38
More RD	1	13	12	4	3	6	39
Less RD	1	17	11	9	2	5	45
<b>Sales</b>	<b>&lt;100m</b>	<b>100m~1b</b>	<b>1b~5b</b>	<b>5b~10b</b>	<b>&gt;10b</b>	<b>Total</b>	
Small size	22	12	7	2	3	46	
Big size	3	17	4	3	11	38	
More RD	17	14	2	2	4	39	
Less RD	20	17	3	2	3	45	

Note: capital and sales were measured by RMB.

## 5 Summary of Hypothesis Test

There are three sets of hypothesis included in the study which are TMT heterogeneity has positive effects on three types of innovative capabilities, TMT strategic intent aggressiveness also exerts positive influence on three types of innovative capabilities, and TMT heterogeneity and strategic intent aggressiveness has significant interaction on three types of innovative capabilities. After performing structural equation modeling analysis, the findings are summarized in the following Table 7:

**Table 7 Proposed Hypotheses and Test Results**

<i>Hypothesis</i>	<i>Standardized Parameter Estimate</i>	<i>Results</i>
Hypothesis 1: Administrative innovation capability affects product innovation capability positively.	.655***	<i>Supported</i>
Hypothesis 2: Strategic intent aggressiveness affects product innovation capability positively.	-.214 <sup>a</sup> .479** <sup>b</sup>	<b><i>Unsupported</i></b>
Hypothesis 3: Strategic intent aggressiveness affects administrative innovation capability positively.	.732***	<i>Supported</i>
Hypothesis 4: TMT heterogeneity affects product innovation capability positively.	.305*	<i>Supported</i>
Hypothesis 5: TMT heterogeneity affects administrative innovation capability positively.	.048 <sup>a</sup>	<b><i>Unsupported</i></b>
Hypothesis 6: Firm size moderates the relationship between TMT heterogeneity and product innovation capability.		<i>Supported</i>
Hypothesis 7: R&D investment moderates the relationship between TMT heterogeneity and product innovation capability.		<i>Supported</i>

NOTE: a. the value represents an insignificant direct effect.

b. the value shows a significant indirect effect.

c. \* denotes  $p < .05$ ; \*\* denotes  $p < .005$ ; \*\*\* denotes  $p < .001$ .

## CONCLUSIONS AND DISCUSSION

Top management team plays a steering role in an organization and therefore predominantly determines organizational performance and future development. The results of this study reveal that TMT heterogeneity impacts significantly on product innovation capability but insignificantly on administrative innovation capability. After all, administrative innovation pertains to a disciplined and profession-needed innovation that is often achieved by professional personnel. In contrast, product innovation has to pass the test of utilities of various users so that it needs compromising multiple aesthetics and perception in an organization that gives heterogeneous TMT an advantage. Such relationship can be observed frequently from many practices in Chinese firms where product development often involves cross-functional cooperation among business, quality assurance, engineering, R&D, and purchasing departments, while administrative innovation is always engaged in with relatively fewer departments, typically by the administrative department alone. The results are the same with the notion that the predictor variables for different types of innovations are not necessarily the same (Damanpour & Evan, 1984).

Besides, administrative innovation shows an enhancement on product innovation. Product innovation often requires the leverage of innovativeness, instant information, smooth communication, and close cooperation among organizational members, all of which then needs organizational structures, systems, processes, and resource allocations to be adjusted correspondently, namely, the support of administrative innovation. The phrase of administrative innovation seems to be official and heavy. In the practical, however, a range of nimble measures can be observed regularly such as temporary project teams, committees, special budgets, and so forth, which indeed lays the foundation for successful product innovation.

Moreover, this study also reveals that strategic intent aggressiveness of TMT does not affect product innovation directly but indirectly through administrative innovation, meaning administrative innovation plays a role of mediator between strategic intent aggressiveness of TMT and product innovation. The results suggest

TMTs with more aggressive strategic intent make their organizations adopt or devise new administrative systems more frequently and then have more prominent performance of product innovation than their counterpart. The effects highlight the clout exercised by the invisible strategic intent of top management team. Namely, even though intent by itself is a latent thought, it will penetrate into each of decisions and movements of organization, substantially be embodied in activeness, aggressiveness, intensity, broadness, time span of behaviors. Besides, intent is also conveyed to their receptors through delicate expressions and behaviors that in turn dictate the orientation of organizational capability development. The finding implies that top management team of different levels of aggressiveness will nurture different levels of organizational capabilities, proving the motto that there's no free lunch.

Yet in this study strategic intent aggressiveness refers to comprehensive carefulness and consideration on organizational stakeholders that compels TMT to pursue organizational advancement, to develop relevant and complementary resources, processes, structures, technologies, and competencies so that enable the organization to have stronger innovative and survival capabilities. On the contrary, paying no attention on surrounding stakeholders seems getting rid of much trouble, enjoining their carefree and leisure, but adversely making the organization idle and slacken with the obsolescent resources, processes, structures, technologies, and competencies that ultimately cause the organization be eliminated by competitive selection.

In addition, the moderating effect of firm size on the relationship between TMT heterogeneity and product innovation is also significantly supported in terms of the results. Particularly in case of large-sized firms, TMT heterogeneity is more likely to have a substantial impact on the performance of product innovation, implying that large-sized firms need emphasize more on a varied composition of top management team, multiple information channels, and creative decisions evaluation from different perspectives. Another control variable of R&D investment likewise shows a significant moderating effect on the enhancement of TMT heterogeneity on product innovation too, and firms that invest more on R&D proves a stronger linkage between them. This has a profound implication for

R&D-committed firms that spending a lot in R&D in the hope of great harvest in product innovation likewise can not leave out the facilitation of more intense knowledge network, various sources of information, and multiple judgment angles derived from heterogeneous TMT.

Although the centrality of strategic intent has been widely recognized by academicians and practitioners in management field, empirical study and operational model are missing in literatures by far. Our contribution lies in the successful operationalization of strategic intent aggressiveness, which lays the foundation for future studies. In this study we define strategic intent aggressiveness as an active motive, broad solicitude, detailed carefulness, and long term vision. Such a definition combined with its resultant stronger innovative capability poses a challenge for a prevailing argument in Economic and Management literatures that the only responsibility of managers is to maximize profit for their shareholders (Reich, 1998). Although seeking nothing but profits seems in accordance with the proposition in Economics that self-interest facilitates the most efficient distribution, it appears to be limited for the formulation of strategic intent, which will not only impose restriction on organization themselves but also impede the development of organizational capabilities. The finding in this study on the other hand contributes to the theoretical basis of supporting corporate social responsibility.

The results in this study also have a certain practical implication for human resource management, which means the selection and promotion of top managers need pay more attention on the evaluation of candidates on their behavioral intention, such as if they broadly take care of surrounding stakeholders, deeply understand the living concerns of others, continuously following up their projects, and/or actively initiating aggressive actions. As a result, through observation on such dimensions, the quality of prediction on the strategic intent aggressiveness of management candidates may be refined, which will have a far-reaching influence on organizational environmental scanning, learning activities, and even the development of absorptive capability.

## LIMITATIONS AND FUTURE RESEARCHES

There are limitations in this study needed to be presented. Firstly, this study uses a single source of perceptual data from the subject manufacturers, which could result in possible bias, such as representativeness bias and simplification bias. That is human cognition may tend to use representatives to quickly organize and deal with a large number of information, assuming things sharing similar qualities are alike (Baker & Nofsinger, 2002). Besides, the perceptual nature of the data may also have inflated the reported results. It is recommended that multiple sources of a single subject firm are applied and at best objective outcome performances such as the number of new products within a certain period are surveyed as the criterion variables. Furthermore, the data quality of online survey using some Chinese forums in the study is still questionable. The data and results should be read and applied more carefully.

In addition, the construct of TMT heterogeneity shows a poor convergent validity. Though perceptive measurement on it seems to be viable, it is recommended to increase survey items of each dimension to prevent from possible problem about convergent validity. On the other hand, actual behaviors and actions driven by aggressive strategic intent such as more supply chain collaboration, more intense interpersonal exchange, broader information networks, more investment and venturing, are all intriguing topics worth to be explored. Following researches are recommended to probe these relationships and more detailed contexts.

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