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IT-Enabled Organizational Agility and Firms' Sustainable Competitive Advantage

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Abstract

By reflecting on the polymorphous aspects of firms' strategic responses to environmental dynamics, we differentiate two distinctive types of agility, namely, entrepreneurial agility (anticipating and proactive) and adaptive agility (sensing and reactive). In this light, we investigate how and why firms' IT and operational capabilities can enable these two types of agility, thereby leading to sustainable competitive advantage. To empirically validate the proposed model, we conducted a large-scale field survey with multiple respondents in China, an emerging economy with a large variance in market uncertainty and IT maturity among companies. The results indicate that specific complementary relationships between IT and operational capabilities are the significant driving forces of each type of agility. The two types of agility are also found to be significant in leading to sustainable competitive advantage while their impacts differ. This study provides a better understanding of the strategic role of IT in contemporary businesses.

Keywords: Agility, IT capability, operational innovation, complementary relationship, sustainable competitive advantage

Introduction

Since the competitive environment of contemporary business has become more intensive and the speed of environmental change has become faster, firms that possess the capability to respond to environmental dynamics, known as *organizational agility*, are likely to produce better outcomes (Sambamurthy et al. 2003). Given that organizational agility is vital in rapidly changing business environment, and information technology (IT) is a significant business platform for today's digitized economies, the role of IT in creating organizational agility has become a critical issue of interest to both academics and practitioners (Prewitt 2004; Sambamurthy et al. 2003).

While most prior studies on organizational agility have treated this concept uniformly, firms may in fact have diverse ways of responding to their environmental changes. For example, when anticipating the potential needs of an internationally mobile banking service, Skandia, one of the world's top 20 life and casualty insurance companies, rapidly implemented a novel business model and service system through the LEGO-like integration of pre-designed and existing third-party financial service components (Alexandersen et al. 2003). The Skandia case is an example of organizational capability to anticipate a new opportunity and move proactively to achieve it. On the other hand, Nokia's rapid recovery from a disruption in supply chain caused by a natural disaster is an example of organizational capability to sense an emerging threat and respond flexibly to be resilient to the threat (Sheffi and Rice Jr. 2005). As illustrated in the two cases, organizational agility may have polymorphous aspects that lead to distinctive ways of responding to different situations (Bharadwaj and Sambamurthy 2005).

When considering such distinctive ways of market response, a deeper understanding of how IT plays a role in creating the polymorphous aspects of organizational agility can be useful in planning and allocating organizational IT resources. In the literature, several researchers have pointed out that IT can enable organizational agility by helping firms undertake strategic changes when necessary (Bharadwaj 2000; Powell and Dent-Micallef 1997; Sambamurthy et al. 2003). In particular, Sambamurthy et al.'s (2003) seminal paper provides a theoretical foundation for understanding the nomological network of influence among organizational IT, agility, and competitive outcomes. While this body of literature provides a strong foundation for understanding the relationship between IT and organizational agility, how and why specific IT investments can enable organizational agility and thus provide firms' long-term advantage is still ill-researched. Hence, this study aims to theoretically develop a research framework to explain the underlying mechanisms of IT-enabled agility creation and its impact on firms' long-term advantage, such as *sustainable competitive advantage* (Chen and MacMillan 1992). Furthermore, this study empirically tests a set of hypotheses generated based on a theory-based model.

Literature Review

Over the last two decades, while some researchers have argued that IT does not matter (Carr 2003), other researchers have stated that it is not a matter of IT itself, but a matter of how IT is managed (Bharadwaj 2000; Devaraj and Kohli 2003; Ross et al. 1996). This study follows the latter perspective and highlights the organizational capability to manage IT resources, namely, *IT capability*, as an IT-based driving force of positive organizational outcomes. Specifically, the study focuses on IT-enabled organizational agility (Sambamurthy et al. 2003) as an IT-enabled intermediate driving force of a firm's competitive success. Drawing from the following three bodies of literature, (1) IT-enabled sustainable competitive advantage, (2) proactive versus reactive strategic movements, and (3) operational innovation versus operational excellence, we propose a theoretical perspective that augments the extant perspectives in organizational IT impact research.

IT-Enabled Sustainable Competitive Advantage

The impact of IT investments on a firm's sustainable competitive advantage[1] has been an important concern for both academics and practitioners in the information systems (IS) field (Feeny and Ives 1990; Ross et al. 1996; Wade and Hulland 2004). There are two major research streams within this area; one stream focuses on the long-term effects of specific IT investments while the other examines the organizational strategic movements that are enabled by IT resources. The latter stream of research highlights IT-enabled intermediate outcomes, such as firms' IT-enabled strategic movements and capabilities, which lead to the firms' sustainable competitiveness

[1] A firm's sustainable competitive advantage can be viewed as a condition where the firm's competitive advantage resists erosion by competitors' behavior (Porter 1985).

(Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003; Wheeler 2002). While the premise of the former stream of research is being challenged as organizational IT resources have been commoditized (Mata et al. 1995), the latter stream is receiving more attention due to today's dynamic business environment (Prewitt 2004; Sambamurthy et al. 2003). One of the IT-enabled intermediate outcomes, which has received much attention in the recent literature, is organizational agility (Sambamurthy et al. 2003).

As Sambamurthy et al. (2003) point out, digitized platforms of business processes and knowledge, such as Internet computing, enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM), allow firms to rapidly detect changes, flexibly alter their market strategies, and thus react more quickly to customers' changing requirements. Such digitized platforms also enable firms to form value-chain collaborations with partners to rapidly develop emerging and untapped market niches. Therefore, IT can create organizational agility not only through creating new options for information-based products and services, but also by streamlining work processes and building inter-organizational relationships (Agarwal and Sambamurthy 2002; Barua and Mukhopadhyay 2000).

It needs to be emphasized that while the existing studies on agility provide strong support for the relationship between IT and organizational agility, the internal mechanisms for deploying and utilizing IT resources to develop organizational agility and thus lead to IT-enabled sustainable competitive advantage are still under-researched. To address this gap, we draw from a recent perspective of IT-dependent strategic initiatives for firms' sustainable competitive advantage (Dehning and Stratopoulos 2003; Piccoli and Ives 2005).

According to Piccoli and Ives (2005), a response-lag[2] driven by the IT-dependent strategic initiatives of a firm can contribute to the development of barriers to erosion by competitors and thus create sustainable competitive advantage. In their theorizing, IT-dependent strategic initiatives are a firm's idiosyncratic competitive moves which depend on the use of IT to be enacted. Some examples include ERP-enabled business integration, electronic business, and electronic SCM (Ross et al. 1996). The concept of IT-dependent strategic initiatives is based on a perspective that views strategy as the configuration of interrelated and interlocking activities, not as the making a few discrete "one-time" decisions. This perspective appears to be consistent with the IT-enabled organizational agility view in which a firm needs to flexibly and continuously assemble requisite assets, knowledge, and relationships in order to rapidly respond to environmental dynamics (Sambamurthy et al. 2003). Therefore, this IT-enabled organizational agility is likely to be a vital intermediate driving force of sustainable competitive advantage. This stems from the fact that an agile firm can continuously create certain impediments to the replication of its strategy by competitors (Reed and DeFillippi 1990).

Polymorphous Aspects of Organizational Agility

In the literature, the various strategic movements have been discussed in terms of organizational strategic modes (Evans 1991), innovations (Ireland et al. 2003), and strategic profiles (Miles and Snow 1978; Sabherwal and Chan 2001). Evans (1991) conceptualized different types of strategic modes by comparing the strategic tendency of offensive versus defensive response and *ex ante* versus *ex post* value proposition. Firms having a more offensive and *ex ante* value proposition may be more proactive in initiating their strategic movements to capture new market opportunities. On the other hand, firms having a more defensive and *ex post* value proposition tend to be reactive to market changes and their competitors' strategic movements. The purpose of this is to avoid risky decisions and maintain their market position. Similarly, some other researchers have distinguished organizational innovation types in terms of their strategic orientation as well as innovation outcomes, such as disruptive versus sustaining innovation (Ireland et al. 2003) and radical versus incremental innovation (Damanpour 1991). While a radical or disruptive innovation is an innovation that fundamentally changes the way a firm conducts its business, an incremental or sustaining innovation is an innovation that is used in its current way of doing business. In particular, Eisenhardt and Brown (1999) explained the concept of incremental or sustaining innovation using the concept of "patching". Patching is the strategic process by which corporate executives routinely remap their business based on changing market opportunities.

Organizational strategic movements have also been discussed in terms of firms' strategic profiles and viable strategic stances, such as prospector, analyzer, and defender (Miles and Snow 1978; Sabherwal and Chan 2001).

[2] Response-lag refers to "the time it takes competitors to respond aggressively enough to erode the competitive advantage" (MacMillan 1989, p.24).

According to Miles and Snow (1978), firms with a prospector's strategic stance tend to continuously seek new opportunities rather than focus on known opportunities. On the other hand, firms with an analyzer's strategic stance try to minimize risk while maximizing opportunities for growth. While they often follow the prospectors in their industry by quickly introducing competitive and occasionally better products, they attempt to maintain a stable domain of core products. Similar to the analyzer-type firms, firms with a defender's stance tend to focus on stable and predictable market opportunities in their industry by offering high-quality, but standard products or services at low prices. They put a strong emphasis on operational efficiency and economies of scale. As summarized by Sabherwal and Chan (2001), while prospector-type firms are more risk-taking, aggressive, and proactive in their strategic movements, analyzer- and defender-type firms are more defensive, risk aversive, and reactive.

Adopting an emerging perspective of entrepreneurial agility and adaptive agility from Bharadwaj and Sambamurthy (2005)[3], this study reconceptualizes organizational agility by defining two distinctive types of agility that postulate different ways of responding to market dynamics. One way of responding to market dynamics is to anticipate environmental changes and conduct strategic experiments with new business approaches and models. The purpose of this is to take the first-mover advantage by launching radical changes. The capability for such type of market response is named as *entrepreneurial agility* by adopting the concept of organizational entrepreneurship. This concept represents a firm's stance of seeking to create new resources, ideas, and their applications beyond the boundaries of the firm (Brown et al. 2001; Ireland et al. 2003). The other way of responding to market dynamics is to be resilient and adaptive to environmental change in order to maintain competitive parity and competitive leadership. This can be achieved by keeping with the industry's best practices[4] in facing emerging business opportunities and threats. The capability for such a type of market response is named as *adaptive agility* by adopting the concepts of organizational adaptability and resilience. It is also referred to as the capability to cope with uncertainty and recover rapidly from disruption, without fundamentally changing products or processes (McKee et al. 1989; Sheffi and Rice Jr. 2005). With this conceptualization of the two types of agility, this study aims to reveal the mechanisms by which organizational IT usage can lead to these two types of agility.

IT Complementarity View and Operational Capability

In examining organizational IT impact, researchers have investigated the strategic value of IT resources and their management capability by drawing from the tenets of resource-based view (RBV) (Bharadwaj 2000; Mata et al. 1995; Wade and Hulland 2004). While traditional RBV studies highlight the unique values of organizational IT factors, recent studies take into account the co-presence of other non-IT factors when evaluating the positive value of organizational IT (Barua and Mukhopadhyay 2000; Devaraj and Kohli 2000; Powell and Dent-Micallef 1997). These studies are based on the IT complementarity view, which proposes to investigate the synergetic interactions between IT factors and other non-IT factors when investigating the contribution of IT to organizational outcomes (Kohli et al. 2003). This view is based on the theory of complementarities (Milgrom and Roberts 1995; Tanriverdi 2006). According to this theory, a system of complementary resources leads to superior performance by creating super-additive value synergies and/or sub-additive cost synergies. Following this, we investigate the role of IT in creating organizational agility in conjunction with other non-IT factors.

According to Mahoney and Pandian (1992), the synergy effect would become stronger when the resources are idiosyncratic to a particular firm are used in combination with other resources. In line with this argument, we investigate organizational IT capability as a firm's idiosyncratic IT factor (Bharadwaj 2000). Organizational IT capability refers to *a firm's IT-specific functional capability to deliver IT services and products to the firm by deploying and utilizing IT resources.* In particularly, we adopt the concept of organizational *exploration* and *exploitation* (March 1991) in defining the different modes of organizational IT activities (Lee et al. 2006). In our conceptualization, *explorative IT capability* refers to a firm's IT-specific capability to deploy new IT resources, such as new technologies and new IS applications, for future exploration. On the other hand, *exploitative IT capability* refers to a firm's IT-specific capability to utilize existing IT resources for ongoing exploitation within the firm. While the former capability involves experimenting with new alternative IT resources in pursuit of new ways of

[3] The preliminary idea of these concepts has been appeared in an Advanced Practices Council (APC) report of Bharadwaj and Sambamurthy (2005).

[4] The best practices refer to good practices that have been determined to be the best approach for many organizations. They are based on the analysis of process performance data (Jarrar and Zairi 2000).

providing IT support, such as with organizational IT innovations, the latter capability involves using existing IT resources to refine and improve upon the current IT products and services.

For the complementary factor of IT capability, we focus on operational capability as the idiosyncratic non-IT factor of a firm. Operational capability can be defined as *a firm's operation-specific functional capability to achieve the operational goals using a collection of routines to execute and coordinate the variety of tasks required* (Hammer 2004). This capability may have a complementary relationship with IT capability because IT is a business platform in digitized economies (Sambamurthy et al. 2003). In such digitized economies, IT and operational activities are bonded in key business processes within a firm (Barua et al. 1995). According to prior studies on operational activities, there are two different modes in business operations; *operational innovation* and *operational excellence* (Hammer 2004). Operational innovation is the radical change of certain business operations to invent and deploy new ways of doing operational work by rethinking how to do the work in an industry. For example, Wal-Mart's cross-docking was a radical innovation in the retail industry when it was introduced. This radical innovation dramatically lowered Wal-Mart's inventory levels (Hammer 2004). On the other hand, operational excellence is the improvement of existing modes of operation which ensures that work is done as it ought to be done. The goal of this is to reduce errors, costs, and delays, but without fundamentally changing how that work gets accomplished (Bigelow 2002). Six Sigma and Total Quality Management (TQM) have been suggested as the internal efforts of firms to achieve operational excellence (Powell 1995). Based on these understandings, we specify two types of operational capability. One is operational innovation capability, *a firm's operation-specific capability to invent and deploy new ways of business operations by rethinking how to do the work in its industry*. The other is operational excellence capability, *a firm's operation-specific capability to provide high performance, i.e., effective and efficient, in business operations by improving its current modes of business operations in its industry*.

Research Model and Hypotheses

In prior section, we conceptualize the distinctive modes of firms' activities in terms of organizational agility, IT capability, and operational capability. Based on this, we propose our research model as shown in Figure 1.

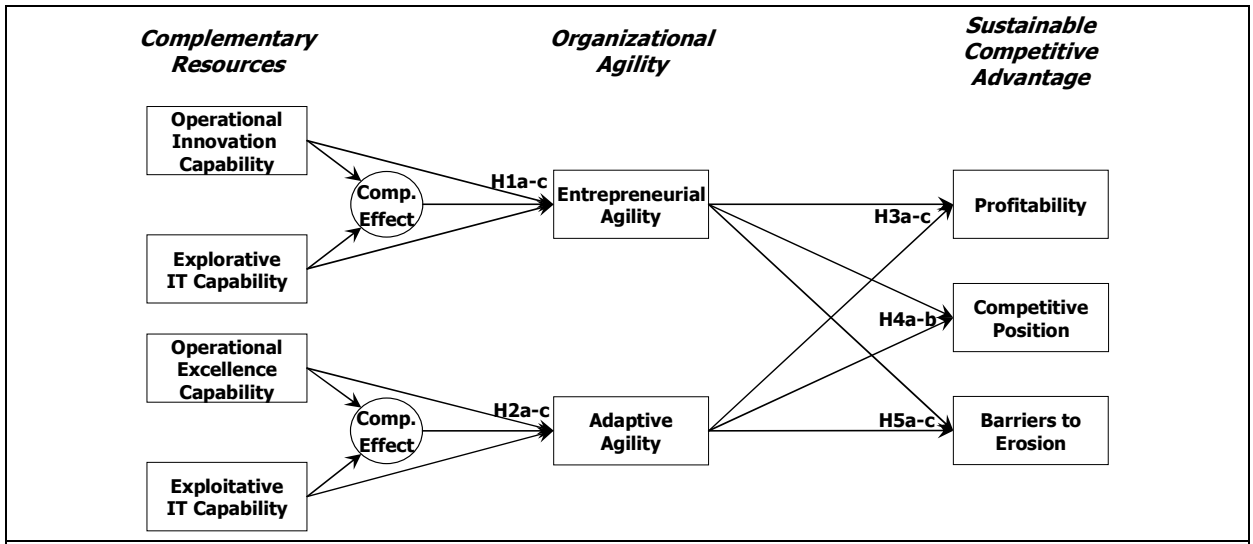

Figure 1. Research Model of the Study

Complementary Relationship between IT Capabilities and Operational Capabilities

Grounded in the perspective of IT complementarities, we posit that the synergetic combination of different IT capabilities and operational capabilities can create different types of organizational agility.

Operational Innovation Capability, Explorative IT Capability, and Entrepreneurial Agility (H1)

According to Hammer (2004), operational innovation capability is a driving force of a firm's radical movement. By virtue of this capability, a firm can penetrate new markets with greater agility and thus achieve competitive advantage with the lag effect of radical innovations in operations (MacMillan 1989; Miller and Friesen 1983). In particular, radical product and process innovations have been discussed as the driving forces of a firm's fast and flexible response to market dynamics. This is because these innovations enable the firms to launch new experimentations to achieve unforeseen opportunities (Teece et al. 1997). For example, Dell's built-to-order production model for direct sales can be considered to be an innovative departure from industry practices. This operational innovation is considered to supply Dell with the capability to flexibly respond to fast changing end-user preference and successfully compete with other firms in the highly competitive personal computer market. Based on these arguments, we formulate our first sub-hypothesis of H1 as follows:

- *H1a: A higher level of operational innovation capability will lead to a higher level of entrepreneurial agility.*

In addition to operational innovations, the radical and fast implementation of new IT products and services through deployment and utilization of new IT resources from external sources can enable a firm to capture emerging market opportunities. This is because such new IT explorations can promote the strategic experimentation with new business models to enter new markets or attract new customer segments. In particular, such radical IT-initiated strategic movement with emerging technologies or applications can reshape a firm's business scope (Venkatraman 1994), thus making the firm more capable and agile in turbulent environments (Lyytinen and Rose 2003; Sambamurthy et al. 2003). Based on these arguments, we formulate the second sub-hypothesis of H1 as follows:

- *H1b: A higher level of explorative IT capability will lead to a higher level of entrepreneurial agility.*

In addition to the individual effects of operational innovation capability and explorative IT capability, their synergetic combination will also lead to a higher level of entrepreneurial agility. Hammer (2004) points out that operational innovations require radical changes in various aspects of a firm. Since IT has become a digitized platform of business processes in contemporary organizations (Sambamurthy et al. 2003), a firm's operational innovations may require appropriate IT products and services to support new business practices which did not exist before within the firms or its industry (Lee et al. 2006). In other words, such operational innovations may require radical IT innovations rather than incremental modifications of existing IT products and services (Lyytinen and Rose 2003). For example, the Skandia case mentioned above shows the synergetic effect between operational innovation and disruptive IT innovation through external exploration. When Skandia started its radically innovative operational movements, this firm found that its internal exploitation of existing IT resources could not support this new operational innovation. Skandia decided to explore outside its boundaries and adopt a totally new approach in developing banking systems, thus achieving success. On the other hand, a firm's IT innovations may also require corresponding changes in its operations for their value to fully materialize (Piccoli and Ives 2005). For example, in many cases, the payoff of strategic IT adoption is dependent on the accompanying business process reengineering (Devaraj and Kohli 2000). Such a positive effect of the appropriate combination of IT capability and operational capability can be viewed as an enhancing complementary effect (Wade and Hulland 2004). Based on these arguments, we formulate our third sub-hypothesis of H1 as follows:

- *H1c: A higher level of complementary effect between operational innovation capability and explorative IT capability will lead to a higher level of entrepreneurial agility.*

Operational Excellence Capability, Exploitative IT Capability, and Adaptive Agility (H2)

According to Hammer (2004), operational excellence capability is a driving force for a firm's incremental improvements. While this capability mainly aims to eliminate disadvantages and not to actively create new advantages (Porter 1996), it can enable a firm to be resilient to emerging opportunities and threats (Sheffi and Rice Jr. 2005). For example, a firm with a capability for operational excellence tends to continuously improve its business operations and develop well-defined business procedures for exceptional situations, such as in the event of a natural disaster or a disruption in the supply chain (Sheffi and Rice Jr. 2005). This continuous process improvement, such as TQM, which enables firms to be efficient in its daily business operations, has also been discussed as a source of flexible market response (Davenport 1993). Based on these arguments, we formulate our first sub-hypothesis of H2 as follows:

- *H2a: A higher level of operational excellence capability will lead to a higher level of adaptive agility.*

While operational excellence capability may lead to adaptive agility, the role of IT in this type of agility may also be vital. IT affects the nature and pace of work by changing the boundaries of where tasks are accomplished and by removing constraints on when tasks are performed (Lucas Jr. and Olson 1994). Hence, the effective exploitation of IT resources can speed up a firm's information processing and thus enable the firm to quickly adapt to changing market conditions. In particularly, a firm's continuous exploitation of existing IT resources may help its incremental movements, but not radical movements. Moreover, a firm's successful exploitation of internal IT resources implies that its has a strong capability for delivering firm-specific IT services (Lee et al. 2006). By virtue of such firm-specific IT services, the firm may achieve an effective coordination of its current core business processes which are based on its particular business context (Barua et al. 1995). Hence, firms' exploitative IT capability may be positively associated with adaptive agility for incremental movements within its current business context. Based on these arguments, we formulate our second sub-hypothesis of H2 as follows:

- *H2b: A higher level of exploitative IT capability will lead to a higher level of adaptive agility.*

In addition to the individual effects of operational excellence capability and exploitative IT capability, their synergetic combination will also lead to a higher level of adaptive agility. The continuous improvements of a firm's business processes may require evolutionary changes in its business platform (Jarvenpaa and Stoddard 1998). This implies that to achieve a higher impact of operational improvement, a firm needs to flexibly adjust its IT infrastructure and common application platforms, such as network, database, management information systems (MIS), and ERP (Weill et al. 2002). This adjustment can be achieved through utilization and improvement of its internal IT resources, i.e., exploitative IT capability. For example, Wal-Mart is well known for its capability to lead the retail industry by using its retail link with suppliers. The driving forces behind its successful responses to the changes in its customer needs can be attributed to the combination of operational excellence in supplier management and the capability to adjust internal IT supports through non-disruptive exploitation of available IT resources. Such an appropriate alignment between operations and IT may enable a firm to seize emerging opportunities by improving its existing ways of doing business (Goldman et al. 1995). In contrast, a firm which continuously changes its business operations without changing its IT platform will suffer increased overhead costs caused by the mismatch between newly revised operations and its legacy IT platform (Henderson and Venkatraman 1993). Based on these arguments, we formulate our third sub-hypothesis of H2 as follows:

- *H2c: A higher level of complementary effect between operational excellence capability and exploitative IT capability will lead to a higher level of adaptive agility.*

Organizational Agility and Sustainable Competitive Advantage

To hypothesize the relationships between the two types of agility and sustainable competitive advantage, drawing from the literature, we define three aspects of sustainable competitive advantage. They are (1) profitability, (2) competitive position, and (3) barriers to erosion[5].

Profitability: Financial Performance (H3)

Sustainable competitive advantage can be considered as a firm's continuing condition of superior market advantage to other firms in its industry. Hence, it captures the provision of the firm's superior ability to supply value to the customer, resulting in a superior financial performance. Hence, many existing studies have used superior financial performance as an indicator of sustainable competitive advantage (e.g., Day and Wensley 1988; Weerawardena 2003). Following this, we focus on a firm's superior profitability as a significant financial aspect of its sustainable competitive advantage, because a firm's profitability can represent the degree to which it outperforms its competitors (Villalonga 2004). We believe that both types of organizational agility may have a positive impact on profitability. This is because entrepreneurial agility and adaptive agility are organizational dynamic capabilities which allow firms to respond to market opportunities through radical and incremental movements respectively. In particular, a firm having a high entrepreneurial agility may increase its revenue sources by entering new market

[5] These three aspects are thought to represent different dimensions of a firm's sustainable competitive advantage, such as financial performance, non-financial performance, and impediments to imitation respectively, thus having formative nature in shaping the concept of sustainable competitive advantage. In particular, to investigate specific impacts of the two types of agility on these three aspects, we model each of the three aspects as an individual dependent variable, not a formative factor of sustainable competitive advantage.

segments (Sabherwal and Chan 2001). On the other hand, a firm having a high adaptive agility may reduce its costs and ineffective business practices by continuously adjusting its business processes toward the industry best practices (Eisenhardt and Brown 1999; Rindova and Kotha 2001). Therefore, both types of organizational agility may allow firms to achieve outperforming financial outcomes, especially profitability, relative to their competitors. Based on these arguments, we formulate our first and second sub-hypotheses of H3 as follows:

- *H3a: A higher level of entrepreneurial agility will lead to a higher level of profitability.*
- *H3b: A higher level of adaptive agility will lead to a higher level of profitability.*

Furthermore, between the two types of organizational agility, adaptive agility may be a better determinant of profitability. This is mainly because a firm's incremental but continuous adaptation to market changes can make the firm adopt the best practices in its industry. In particular, a firm which keeps step with the industry best practices, by virtue of its adaptive agility, may show superior cost-benefit outcomes in responding to emerging market opportunities and threats (Jarrar and Zairi 2000). Thus, this firm can achieve a higher profitability relative to other companies. Based on these arguments, we formulate our third sub-hypothesis of H3 as follows:

- *H3c: Adaptive agility will better lead to profitability than entrepreneurial agility will.*

Competitive Position: Non-Financial Performance (H4)

In addition to superior financial performance, researchers also suggest investigating other non-financial aspects of sustainable competitive advantage, such as customer satisfaction (Chan et al. 1997), customer service quality (Ray et al. 2004), and market share (Weerawardena 2003). In the literature, these aspects have been conceptualized as a firm's competitive market position (Weerawardena 2003). According to Sambamurthy et al. (2003), organizational agility is a significant driving force of a firm's competitive position. This is achieved by enriching customer value, leveraging its partners' capability, and seamlessly integrating internal processes. In line with this argument, we believe that both types of organizational agility may also have a positive impact on this (non-financial) competitive position though their specific ways of building competitive position may differ. In particular, a firm having a high entrepreneurial agility may build its market share by entering new market and increase its customer value and sales volume by innovating products and services (Sabherwal and Chan 2001). On the other hand, a firm having a high adaptive agility may increase its market share, customer value, and sales volume by incrementally expanding its market boundaries. This is done by rapidly adapting to the changes in customers needs. Therefore, both types of organizational agility may allow firms to achieve a higher competitive position in the marketplace relative to competitors. Based on these arguments, we formulate our first and second sub-hypotheses of H4 as follows:

- *H4a: A higher level of entrepreneurial agility will lead to a higher competitive position.*
- *H4b: A higher level of adaptive agility will lead to a higher competitive position.*

Barriers to Erosion (H5)

Scholars who have investigated the long-term advantage of firms argue that a continuity of the initial competitive advantage is important in evaluating a firm's sustainable competitive advantage (Dehning and Stratopoulos 2003; Porter 1985; Reed and DeFillippi 1990). According to Porter (1985), such continuity can be thought of as a condition in which a firm's competitive advantage resists erosion by its competitors' behavior. To achieve this, a firm should create some impediments or barriers that make the competitors' imitation of its strategy difficult (Reed and DeFillippi 1990). Hence, a firm needs to constantly seek successive strategic initiatives after its initial actions that provided the initial competitive advantage. Since organizational agility is the capability to make a firm continuously and flexibly respond to its environmental dynamics, we believe that both types of organizational agility may lead to barriers to erosion in a market competition though a firm's ways of building barriers may differ. In particular, a firm having a high entrepreneurial agility may focus on first-mover advantage which provides a response lag from its competitors (Dehning and Stratopoulos 2003; MacMillan 1989; Piccoli and Ives 2005). On the other hand, a firm having a high adaptive agility may try to keep up with industry best practices and stay resilient to changes. The continuous evolution of its business practices, involving its product and service strategies and organizational structure, may provide ambiguity and specificity of its business practices. This in turn will impede imitation by following firms (Reed and DeFillippi 1990). Therefore, both types of organizational agility may allow firms to achieve a higher level of barriers to erosion relative to their competitors. Based on these arguments, we formulate our first and second sub-hypotheses of H5 as follows:

- *H5a: A higher level of entrepreneurial agility will lead to a higher level of barriers to erosion.*
- *H5b: A higher level of adaptive agility will lead to a higher level of barriers to erosion.*

Furthermore, between the two types of agility, entrepreneurial agility may be a better determinant of barriers to erosion. This is mainly because a firm's innovative movements derived by its entrepreneurial agility can provide first-mover advantage to the firm. Such first-mover advantage can facilitate a pioneering firm to enjoy an initial period of monopoly that is not available to imitator firms (Lieberman and Montgomery 1988). Moreover, the high ambiguity of a firm's breakthrough innovations in product and services is likely to make its competitors' imitation more difficult than that of incremental innovations can (Reed and DeFillippi 1990). Based on these arguments, we formulate our third sub-hypothesis of H5 as follows:

- *H5c: Entrepreneurial agility will better lead to barriers to erosion than adaptive agility will.*

Research Method

We conducted a cross-sectional survey to collect firm-level data through a combination of questionnaires and secondary data sources. Multiple respondents within a firm who represent different areas of concern and expertise were used for the survey.

Measurement Development

Our measurement development process involved five stages: (1) operationalization of research constructs, (2) item development, (3) validity tests, (4) expert review, and (5) translation from English to Chinese. First, research constructs were operationalized based on the definition of each construct as well as of relevant constructs in the literature. Second, every attempt was made to make use of existing measurements, which have good psychometric properties, in order to ensure high measurement reliability. Modifications of the existing items were also made to suit the context of the study. However, in cases where there were no measurements appropriate to the context under study, new measurements were developed. In particular, some of the research constructs were defined using their sub-dimensions which can be operationalized more concretely. The purpose of this was to embrace the multiple facets of the highly conceptual research constructs. Table 1 shows the operationalization or selected sub-dimensions of the research constructs and their references for developing the measurement items.

Third, to ensure the construct validity of the modified and self-developed items, the conceptual validation procedure as described by Moore and Benbasat (1991) was carried out. We conducted structured sorting, in which the construct definitions were made known to the judges. Based on the sorting results, necessary changes were made to the survey instrument. Three to four judges consisting of academic staffs and Ph.D. students were employed from the IS and Management disciplines for each of the three rounds. The final item placement score (IPS) reached over 90%. Fourth, to ensure the face validity and construct validity of the instrument, the items were distributed to three well-known IS academics who have expertise on the specific research area of organizational IT impact. Finally, using a translation committee approach[6] (van de Vijver 2006; van de Vijver and Leung 1997), the original English instrument was translated to Chinese for data collection in China. According to Van de Vijver (2006), the committee approach for measurement translation is good for linguistic equivalence and psychological equivalence via the sense-making process between committee members. Four native Chinese speakers who are fluent in English were involved in the committee. All of them were IS major Ph.D. students who had diverse undergraduate backgrounds.

Table 1. Sub-Dimensions for Construct Operationalization

Research Constructs	Sub-Dimensions and References

[6] Instead of using this bilingual committee approach as a supplementary process of translation and back-translation method, we fully utilized this approach for our survey instrument translation in order to ensure the psychological equivalence for the concepts used in this study. After initial translations of the English instrument to Chinese, the translation results were discussed item by item. After this process, additional five Chinese academics were hired to review the translation results and evaluate their quality as suggested by van de Vijver and Leung (1997).

Sustainable Competitive Advantage	
Profitability	Profit Margin (Zhu and Kraemer 2002)
Competitive Position	Customer Satisfaction, Market Share, and Organizational Growth (Chan et al. 1997; Sarkar et al. 2001)
Barriers to Erosion*	Competitive Moves (Sambamurthy et al. 2003) and Barriers to imitation (Piccoli and Ives 2005)
Organizational Agility	
Entrepreneurial Agility	Proactiveness (Miller and Friesen 1983; Ramanujam and Venkatraman 1987) Preemptiveness (MacMillan 1983; Sethi and King 1994) Radical Innovation (Miller and Friesen 1983; Zahra and Covin 1995)
Adaptive Agility	Reactiveness (Hult et al. 2005; Tracey et al. 1999) Resilience (Mallak 1998; Sheffi and Rice Jr. 2005) Incremental Innovation (Skaggs and Huffman 2003; Subramani and Youndt 2005)
IT Capability	
Explorative IT Capability	Explorative IT Strategic Posture* (Brown et al. 2001; Karimi et al. 2001) New IT Resources Exploration (Nambisan et al. 1999)
Exploitative IT Capability	Exploitative IT Strategic Posture* (Atuahene-Gima 2005; Brown et al. 2001) Existing IT Resources Exploitation (Ravichandran and Lertwongsatien 2005)
Operational Capability	
Operational Innovation Capability	Innovations in New Product/Service Development Process, Production and Supply Chain Process, Customer Relationship Process, and Administrative Process (Weerawardena 2003)
Operational Excellence Capability	Improvements in New Product/Service Development Process, Production and Supply Chain Process, Customer Relationship Process, and Administrative Process (Chattopadhyay et al. 2001; Powell 1995)

Notes: * Self-developed based on relevant theoretical bases

Research Design

We conducted a large-scale cross-sectional survey in the People's Republic of China. China is an emerging marketplace with a large variance in market uncertainty and environmental dynamics. Moreover, firms in China also demonstrate a large variance in terms of their IT maturity. Hence, it is believed that China holds useful potential as an example for examining the research framework of this study.

Dealing with Common Method Variance

In the self-reported survey method, the potential of common method variance has been considered as a critical issue that may damage the validity of data (Podsakoff and Organ 1986). In particular, single respondent bias can generate common methods variance. To avoid this issue, we adopted a *triangulation* approach, in which data were gathered from multiple sources (Sarkar et al. 2001; Zhu and Kraemer 2005). Survey questionnaires were sent separately to multiple key informants within a firm who represent different areas of concern and expertise. While the questionnaire for examining a firm's IT capabilities was sent to IT executives, such as the chief information officer (CIO), chief technical officer (CTO), and MIS manager, the questionnaire designed to study business-related capabilities, i.e., organizational agility, operational capability, and some of the firm-level outcomes, was sent to business executives, such as the chief executive officer (CEO), chief operating officer (COO), and sales/marketing manager. In addition, secondary data were also collected for the objective measure of a dimension of firm-level outcomes, such as profitability (please refer to Table 3 for the specific respondent group for each construct).

Sample Selection

We attempted to include a broad group of firms and industries to maximize the variation of the variables and increase the generalizability of the findings. Nonetheless, a series of criteria in selecting the target samples were applied because the suggested model may not apply to all kinds of industries and firms. This is due to the model's specific context of IT-enabled organizational agility. First, since the proposed model is based on the assumption of environmental dynamism, we targeted the industries which have market uncertainty and competition to an extent. Second, since some industries in China are highly labor-intensive, e.g., toy industry and agricultural industry, it may

be difficult to investigate the value of IT in such kinds of industries. Therefore, we focused on industries which require IT support to a significant extent for their business operations. Third, we limited our target sample firm size to medium to large, because medium- to large-size firms are considered to be more appropriate in investigating the capabilities in their operations, IT support, and strategic movements.

Survey Procedure

After the instrument had been developed, we conducted a pre-test for the survey in order to ensure the clarity of the questions and to ensure the measurements captured the desired information. A total of 10 data samples were collected in the pre-test. Some necessary modifications of the instrument and the criteria in the industry and sample selection were made on the basis of the pre-test. After the pre-test, the main survey had been conducted for total 7 months, from May 2006 to December 2006. In particular, in order to increase the response rate and the respondents' understanding of the survey concepts, the main survey was conducted using both telephone interview and direct interview. Around 1,000 firms near three major cities in China, including Beijing, Shanghai, and Guangzhou, were targeted by referring to industry directories within these regions. After initial contacts through mail and telephone, interviews with 290 firms were arranged. Finally, a total of 178 complete data samples were achieved after removing incomplete data, outliers, and inappropriate industries. The final data represents 22 China industry codes at two-digit level. The respondents' company sizes varied from 120 to 21,500 employees. The type of the sample firms varies among state-owned enterprise (11), foreign-invested enterprise (43), private enterprise (20), and shareholding enterprise (104). Table 2 summarizes the demographic information of the final samples.

Table 2. Demographics of Final Samples

Industry Name	N	%	Average Employees	Average of Total Assets	Average of Total Sales (2003-2005)
Machinery	37	20.8	2,577	1,563M	1,656M
IT product and service	33	18.5	1,315	1,582M	1,782M
Electronics	25	14.1	1,652	1,150M	886M
Chemical products	14	7.9	2,260	2,085M	1,624M
Medicine and biological products	13	7.3	1,843	2,222M	2,062M
Metal and non-metal	10	5.6	3,001	9,711M	8,395M
Textile and apparel	10	5.6	1,951	1,185M	1,169M
Wholesale	5	2.8	755	233M	1,107M
Conglomerate	5	2.8	1,615	2,844M	6,813M
Others	26	14.6	1,767	2,366M	1,888M
Total or Average (Sample-level)	178	100	1,927	2,150M	2,113M
STD (Sample-level)			2,869	7,060M	6,461M
Average (Industry-level)			1,874	2,494M	2,738M
STD (Industry-level)			633	2,641M	2,618M

When considering the constraints that we imposed on the target samples, i.e., medium- to large-size firms, operating in fairly dynamic business environment, using IT intensively, multiple-respondents willing to answer the questionnaires, combining subjective and objective data, and that this is a firm-level study, our sample size (n = 178) is arguably a respectable one.

Results

This study used structural equation modeling technique to test the proposed model and hypotheses, particularly with EQS (version 6.1) using maximum likelihood estimates (Bentler 2004).

Measurement Model Evaluation

In developing the measurement model, we adopted a single-item approach. In this method, the scores of multiple items under the same latent construct were averaged to generate a single score. This approach was applied to obtain a single indicator for each sub-dimension of the high-level latent constructs. According to Yuan et al. (1997), this approach is recommended for solving the practical difficulty of analyzing high dimensional data. When considering

the complexity of the proposed model in which most constructs use multiple sub-dimensions with multiple items, the data of this study is thought to be highly dimensional. By using a single indicator for each dimension, we could dramatically reduce the number of parameters to be estimated. Furthermore, adopting this approach, the number of items for the interaction terms in the proposed research model, i.e., complementary effects between IT capabilities and operational capabilities, can be reduced. In reducing the number of items in this way, it has been argued that it will generate better outcomes in analyzing interaction terms (Yuan et al. 1997).

Three stages were conducted in developing the measurement model. First, following the suggestions of Yuan et al.'s (1997), we conducted a preliminary data analysis before averaging the original items. The purpose of this is to investigate whether or not they have a similar factor structure as the proposed model. Item loadings on the expected latent constructs and construct reliability were also tested. This is to ensure that the items had small relative errors and thus averaging these items can result in more accurate estimates. Table 3 summarizes the average variances extracted, the construct reliabilities, and the factor loadings of the sub-dimensions of major research constructs before averaging the items of each sub-dimension.

Table 3. Summary of Measurement Properties before Averaging Multiple Items

Construct Name (Respondents)	Sub-Dimensions (The Number of Items)	Cronbach's Alpha	Range of Factor Loadings	AVE
Profitability (Secondary Data)	(1)			
Competitive Position (Business Executives)	(3)	.849	.815 - .921	.77
Barriers to Erosion (Business Executives)	(6)	.844	.578 -.835	.58
Entrepreneurial Agility (Business Executives)	Proactiveness (3)	.886	.863 - .932	.82
	Preemptiveness (3)	803	.777 - .886	.72
	Radical Innovativeness (4)	.880	.787 - .879	.74
Adaptive Agility (Business Executives)	Reactiveness (3)	.893	.867 - .931	.83
	Resilience (3)	.680	.720 - .837	.61
	Incremental Innovativeness (3)	.873	.829 - .935	.80
Explorative IT Capability (IT Executives)	Explorative IT Strategies (3)	.894	.894 - .930	.83
	New IT Resources Exploration (3)	.798	.810 - .911	.73
Exploitative IT Capability (IT Executives)	Exploitative IT Strategies (3)	.898	.868 - .941	.83
	Existing IT Resources Exploitation (3)	.868	.859 - .919	.79
Operational Innovation Capability (Business Executives)	(3)	.870	.877 - .924	.81
Operational Excellence Capability (Business Executives)	(3)	.871	.853 - .911	.79

As shown in Table 3, the final instrument possessed good measurement properties in terms of average variances extracted, construct reliabilities, and factor loadings to each of the sub-dimensions. Second, we calculated the average scores of the sub-dimensions and loaded the calculated scores to the higher-level constructs as their new indicators. Third, the averaged indicators were rescaled to standardize different scale items, such as the 7-point Likert scale and percentage scale. In addition, to avoid potential multicollinearity problem by interaction term (Venkatraman 1989), the items were rescaled to center on their means (Chin et al. 2003).

Using EQS (version 6.1), we conducted a confirmatory factor analysis (CFA) of the new measurement model. The CFA results suggested that our measurement model provided a moderate fit for the data. Specifically, the model had chi-squares less than three times its degrees of freedom (χ^2 = 170.28, d.f. = 90, ratio = 1.89). Other CFA fit indexes exceeded the levels suggested by Bentler and Bonnett (1980); non-normed fit index (NNFI) = .901, comparative fit index (CFI) = .949, incremental fit index (IFI) = .952, goodness-of-fit index (GFI) = .913, standardized root mean-square residual (SRMR) = .045, and root mean-square error of approximation (RMSEA) = .071. Moreover, the standardized loadings of all the measurement items on their respective constructs were significant ($p < .05$), demonstrating that the scales for the constructs had convergent validity. Furthermore, this constrained model was compared with an unconstrained model. The results showed superiority of the constrained model over the

unconstrained model, which indicates that pairs of correlations among the constructs were significantly different from zero (Tanriverdi 2006). Also, the correlations were below the cut-off value of .90 (Bagozzi et al. 1991). This implies distinctiveness of theoretical content captured by the individual constructs. Since measurement items converge on their respective constructs and the constructs are distinct from each other, the constructs are considered to satisfy discriminant validity (Tanriverdi 2006). We also assessed construct reliability by calculating the Cronbach's alpha coefficients for each of the constructs which had more than two indicators. All of the indicators were above the suggested value of .70. Thus, we concluded that the measures utilized in the study were valid and internally consistent.

Structural Model Analysis

The estimations of our structural model were calculated using the Bootstrapping routine in EQS (version 6.1). According to Bollen and Stine (1992), the bootstrap method can correct for standard error and fit statistic bias that occurs in structural equation modeling applications due to non-normal data[7].

The complementary effects between IT capabilities and operational capabilities were tested through interaction term analysis. Interaction term analyses are customarily used to test the joint effect of two factors on a criterion variable (Venkatraman 1989). In order to validate the proposed roles of complementary relationships between IT and operational capabilities in creating organizational agilities, we investigated the significance of main effects of the two complementary factors and their interaction terms. Figure 2 reports the results of our analysis. The model statistics indicated good fit (χ^2 = 183.928, d.f. = 135, NNFI = 0.952, CFI = 0.962, IFI = 0.963, GFI = 0.911, SRMR = 0.060, RMSEA = 0.045).

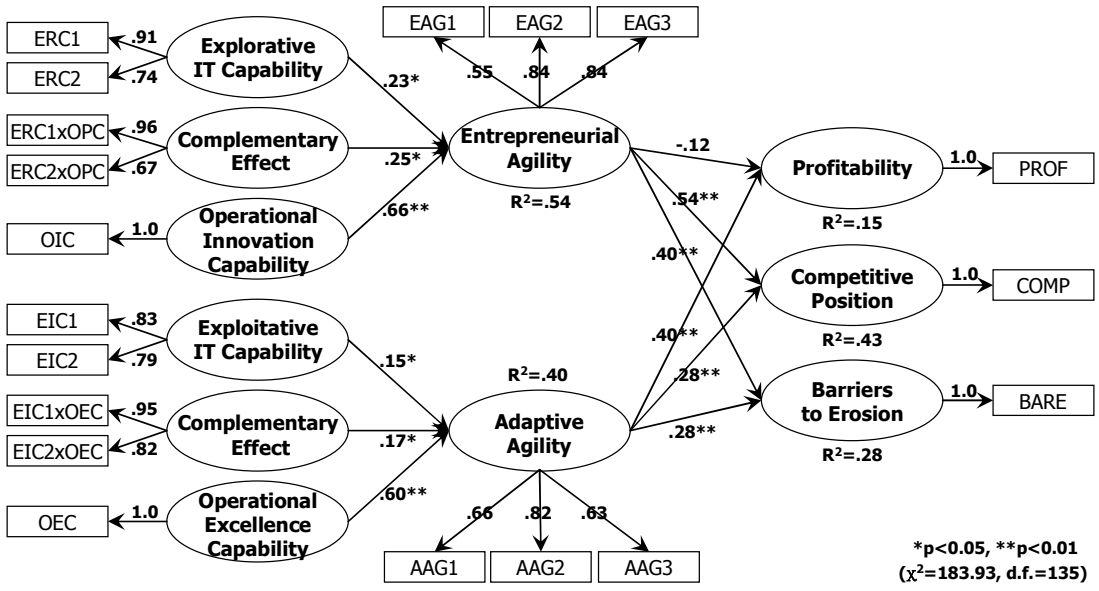

Figure 2. Structural Model Test Results

Figure 2 indicates that the complementary relationship between operational innovation capability and explorative IT capability was significant in determining entrepreneurial agility. In particular, operational innovation capability, explorative IT capability, and their complementary effect explained 54.4% of the variance of entrepreneurial agility. Their paths were significant: operational innovation capability (β = 0.655, t = 7.126, $p < 0.01$), explorative IT capability (β = 0.233, t = 3.374, $p < 0.01$), and their complementary effect (β = 0.247, t = 2.737, $p < 0.05$) were found to be significant determinants of entrepreneurial agility. Therefore, hypotheses H1a, H1b, and H1c are

[7] The Mardia's normalized estimate of the data set of this study was 20.9. Since the data set does not meet the assumption of multivariate normality (Bollen 1989), the Bootstrapping technique is likely to eliminate the possible errors in investigating the underlying relationships among the constructs.

supported. Figure 2 also indicates that the complementary relationship between operational excellence capability and exploitative IT capability was significant in determining adaptive agility. In particular, operational excellence capability, exploitative IT capability, and their complementary effect explained 40.4% of the variance of adaptive agility. Their paths were significant: operational excellence capability ($\beta = 0.596$, $t = 7.241$, $p < 0.01$), exploitative IT capability ($\beta = 0.149$, $t = 2.006$, $p < 0.05$), and their complementary effect ($\beta = 0.165$, $t = 2.050$, $p < 0.05$) were found to be significant determinants of adaptive agility. Therefore, hypotheses H2a, H2b, and H2c are supported.

All, except one, of the proposed relationships between the two types of organizational agility and the three aspects of firms' sustainable competitive advantage were also supported. Specifically, adaptive agility ($\beta = 0.395$, $t = 4.662$, $p < 0.01$) was found to be a significant determinant of firms' profitability; entrepreneurial agility ($\beta = 0.541$, $t = 5.942$, $p < 0.01$) and adaptive agility ($\beta = 0.279$, $t = 3.938$, $p < 0.01$) were found to be significant determinants of firms' competitive position; entrepreneurial agility ($\beta = 0.398$, $t = 4.625$, $p < 0.01$) and adaptive agility ($\beta = 0.276$, $t = 3.604$, $p < 0.01$) were found to be significant determinants of firms' barriers to erosion. However, entrepreneurial agility ($\beta = -0.119$, $t = 1.554$) was not a significant determinant of firms' profitability. The results also indicate that while adaptive agility ($\beta = 0.395$) was better in determining firms' profitability than entrepreneurial agility ($\beta = -0.119$), entrepreneurial agility ($\beta = 0.398$) was better in determining firms' barriers to erosion than adaptive agility ($\beta = 0.276$). Therefore, while hypothesis H3a is not supported, all other sub-hypotheses of H3, H4, and H5 are supported. Interestingly, the path coefficient of the relationship between entrepreneurial agility ($\beta = 0.541$) and firms' competitive position was higher, almost twofold, than that of adaptive agility ($\beta = 0.279$).

Discussion

In this study, we theoretically propose the roles of specific complementary relationships between IT capabilities and operational capabilities in creating two distinctive types of organizational agility. We also propose the distinctive effects of the two types of IT-enabled organizational agility on generating sustainable competitive advantage. Multi-respondents survey data and the secondary data of medium- and large-size enterprises in China were used to validate the proposed model. The results indicate that each of the IT capabilities, operational capabilities, and their complementary effects are the significant driving forces of the two types of organizational agility. In particular, explorative IT capability, operational innovation capability, and their complementary effect significantly lead to entrepreneurial agility. On the other hand, exploitative IT capability, operational excellence capability, and their complementary effect significantly lead to adaptive agility. In order to confirm the significance of the two complementary effects and to test an extra synergetic effect by each complementary effect, i.e., super modular return, we further compared multiple nested models (Tanriverdi 2006). The significance of complementary effects was assessed in terms of model improvement ($\Delta\chi^2$), the increase in explanatory power (ΔR^2), and effect size (f^2). The results indicate that both complementary effects significantly enhanced the main effect model. The complementary effect of explorative IT capability and operational innovation capability ($\Delta\chi^2 = 3.693$, Δd.f. $= 1$, $p = .054$) significantly enhanced the main effect model at the .10 level. Explanatory power of entrepreneurial agility was also increased by 5.7%. This increase corresponds to .94 effect size. On the other hand, the complementary effect of exploitative IT capability and operational excellence capability ($\Delta\chi^2 = 4.895$, Δd.f. $= 1$, $p = .027$) significantly enhanced the main effect model at the .05 level. Explanatory power of adaptive agility was increased by 6.2%. This increase corresponds to .104 effect size. When adding both complementary effects to the main effect model, model significantly improved ($\Delta\chi^2 = 8.528$, Δd.f. $= 2$, $p = .014$) at the .05 level. Based on these improvements of model fit and explanatory power, the hypotheses with regard to the complementary effects of IT capabilities and operational capabilities find additional support.

The results of the study also indicate that both types of the IT-enabled organizational agility significantly lead to sustainable competitive advantage in terms of competitive position and barriers to erosion. Furthermore, the results suggest that the two types of IT-enabled agility have different roles in generating sustainable competitive advantage. In particular, entrepreneurial agility leads to a higher level of barriers to erosion than adaptive agility, and adaptive agility leads to a higher level of profitability than entrepreneurial agility. However, the results are found to be slightly different from our proposed hypotheses. Specifically, while adaptive agility significantly leads to firms' profitability, entrepreneurial agility does not. Moreover, although both entrepreneurial agility and adaptive agility are significant determinants of competitive position, entrepreneurial agility leads to a higher, almost twofold, competitive position than adaptive agility.

Those findings which are not consistent with our hypotheses may require alternative perspectives to explain. We find several potential counter-perspectives that can support the current inconsistent findings. First, in strategic

management literature, besides first-mover advantage, *first-mover disadvantage* has been discussed as a potential risk of a firm's radically innovative movements (Feeny and Ives 1990; Lieberman and Montgomery 1988). According to Lieberman and Montgomery (1988), a firm's innovation costs are usually higher than the imitation costs of its competitors. This implies that a firm with entrepreneurial agility may not achieve high profitability because the firm may suffer from the high cost of frequent innovations (Feeny and Ives 1990). Second, a firm's strategic focus on expanding its market share can also be an alternative perspective of the insignificant (positive) impact of entrepreneurial agility on profitability. This is because firms may use a price-cutting strategy to increase their market share and thus sacrifice their profitability under turbulent business environment (Sabherwal and Chan 2001). This argument can also explain the dominance of entrepreneurial agility with regard to a firm's competitive position. In addition, third, the first-mover advantage achieved by entrepreneurial agility may also provide a higher competitive position for the firms. According to Lieberman and Montgomery (1988), potential sources of a firm's first-mover advantage include technological leadership, preemption of business assets, and/or buyer switching costs. From lock-in to these incentives, a firm may retain its customers and thus maintain its initial market share (Piccoli and Ives 2005). These counter-arguments also imply that first-mover advantage and disadvantage from a firm's radical movements may coexist with regard to barriers to erosion, competitive position, and profitability.

Conclusion

Through a theory-based model development and a rigorous empirical investigation of the proposed model, this study has revealed the specific complementary relationships between IT capabilities and operational capabilities in building two distinctive types of organizational agility: (1) the complementary relationship between explorative IT capability and operational innovation capability in building entrepreneurial agility and (2) the complementary relationship between exploitative IT capability and operational excellence capability in building adaptive agility. The significant and distinctive impacts of the two types of agility on sustainable competitive advantage have also been examined. Moreover, several plausible counter-arguments have confirmed our inconsistent findings; (1) entrepreneurial agility does not produce profitability; and (2) entrepreneurial agility is superior to adaptive agility in leading to competitive position.

This study has some limitations. First, this study used a cross-sectional research design. Such a snap-shot approach may have limitations in terms of studying the causal relationships or time effects between research constructs. Moreover, this cross-sectional study may have limitations in terms of studying the sustainability of competitive advantage. This is because sustainability refers to the persistence of superior condition over a long period. Hence, the longitudinal study setting may provide a more accurate investigation of a firm's IT-enabled sustainable competitive advantage. Second, the data used in this study were collected within a geographical boundary, i.e., China. Therefore, the findings of the study can be subjected to certain characteristics of this specific economy, e.g., developing economy. With more data set across regional and cultural boundaries, the generalizability of the study can be enhanced. Third, while this study attempts to differentiate explorative IT capability and exploitative IT capability as firms' two distinctive strategic modes in IT activities, they may coexist within a firm. In fact, according to our samples, while 27 firms (15.17%) and 20 firms (11.24%) showed high scores only on explorative IT capability or exploitative IT capability respectively, 59 firms (33.15%) showed high scores on both types of IT capability. These results may suggest that a firm can develop or focus on both types of IT capability simultaneously. This issue prompts for further investigation and a deeper level of theorizing in this area of inquiry.

Regardless of these limitations, this study has several contributions. First, this study theoretically and empirically reveals the internal mechanisms by which IT can create a firm's sustainable competitive advantage through organizational agility. Second, this study extends the literature by conceptualizing two distinctive types of agility, i.e., entrepreneurial agility and adaptive agility, and two distinctive types of IT capability, i.e., explorative IT capability and exploitative IT capability. Lastly, we develop new measurements having good psychometric properties for the research constructs used in our research model. Moreover, our operationalization of the research constructs and measurement development using their sub-dimensions can serve as bases for further empirical studies in this stream of research. It can also stimulate future research to investigate more detailed levels of IT impacts. In addition to these theoretical contributions to the literature, this study also have some practical significance by enabling practitioners to strategically focus on a specific IT component or capability to create agility that suits their firm's strategic needs under specific situation.

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