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Research Article

Improving strategic flexibility with information technologies: insights for firm performance in an emerging economy

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Abstract

As the business environment becomes more turbulent, firms ponder how to become more flexible in reallocating or reconfiguring resources, processes, and strategies to respond more efficiently and effectively. In this context, the question of whether and how information technology (IT) can support strategic flexibility remains unresolved. This paper theorizes that firms that use IT to support core competencies will experience improved strategic flexibility, which may enhance their performance. It further theorizes that these effects are contingent on the form and nature of the firm's IT infrastructure, as well as its type of ownership – state-owned or private. Using data from a matched survey of IT and business executives in 148 Chinese manufacturing firms, we reveal positive, significant links between IT support for core competencies and strategic flexibility, and between strategic flexibility and firm performance. The findings further show that the effect of IT support for core competencies on performance is partially mediated by strategic flexibility, and that IT infrastructure positively moderates the link between IT support for core competencies and strategic flexibility. We also demonstrate that state-owned firms are less likely to apply IT applications to collect and analyse market information and thus surrender opportunities for achieving strategic flexibility and stronger firm performance.

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Introduction

With increasingly uncertain and volatile business environments, strategic flexibility, which refers to firms' ability to reallocate and reconfigure their organizational resources, processes, and strategies to deal with environmental changes (Zhou and Wu, 2010), is a key business imperative (Sambamurthy *et al.*, 2003; Chen *et al.*, 2014). Firms' chances of survival in volatile marketplaces, global competition, shortened product life cycles, and customer pressures for tailored offerings depend largely on their ability to adapt rapidly to environmental changes (Nadkarni and Herrmann, 2010; Zhou and Wu, 2010). Faced with these challenging external demands, firms' adaptability seems to hinge on their strategic flexibility (Drnevich and Croson, 2013).

Information technology (IT) is a key enabler of strategic flexibility, and firms reply on it for automation, cost reduction, and improvement of operational efficiency (Duncan, 1995; Bhatt and Grover, 2005). Beyond supporting tactical and operational impacts, IT is instrumental in helping firms support or transform strategies, business models, and relationships between companies and their partners and customers (Bharadwaj *et al.*, 2013). IT provides companies with

advanced computing capacity, information processing and analytic abilities, and stronger empowering capabilities, helping them enter new markets and launch new ways to conduct business. For example, the Chinese mobile-device maker Xiaomi has built a community of fans to collect feedback and recommendations for product designs (McKinsey, 2015). Chemical manufacturers use big data to help farmers monitor crop conditions in real time and customize their offerings to increase farm yields (McKinsey, 2015).

IT is needed to support firms' rapid product development, and collection and dissemination of market, product and process information to respond effectively to unanticipated changes in the business environment. Recent studies posit that IT capabilities (e.g., IT management and IT competencies) help firms to exploit opportunities and reconfigure IT resources to avoid disadvantageous outcomes, demonstrating IT's key role in attaining and deploying strategic flexibility.[1] Extant conceptual frameworks propose several relationships involving IT capabilities, flexibility and firm performance, and recent papers have examined the proposed relationships empirically. For example, Lu and Ramamurthy (2011) provide evidence of the links between IT capabilities and operational and marketing flexibility. Tallon and Pinsonneault (2011) consider the relations between the combination of customer, partnering and operational flexibility, and organizational performance as moderated by environmental volatility. Chen *et al.* (2014) show that IT capability can improve firm performance by means of process flexibility.

This study aims to extend these conceptual and empirical insights in three ways. First, studies (e.g., Ravichandran and Lertwongsatien, 2005) have argued that focusing on existing IT capabilities provides limited insights and that focusing on core competencies supported by IT is more suitable for understanding the impact of IT on strategic flexibility (we elaborate on this in the next section). Adopting the concept of *IT support for core competencies* from Ravichandran and Lertwongsatien (2005), we propose that IT-enabled strategic flexibility is primarily revealed through IT support for core competencies, defined as the extent to which IT is used to support and enhance a firm's market access (e.g., providing necessary information to customers) and functionality-related competencies (e.g., accelerating product development). IT support for core competencies is the extent to which IT is used to support and facilitate a firm's specific strategic activities and combination of IT and business strategy. Rather than investigating IT's direct effect on firm performance, our study adopts a broader perspective, using IT support for core competencies to examine how IT contributes to a firm's strategic flexibility. This important contribution helps to identify new roles for IT and to improve scholars' understanding of how firms use IT to enable strategic flexibility.

Second, research to date linking IT to flexibility (e.g., Lu and Ramamurthy, 2011; Tallon and Pinsonneault, 2011) has focused more on operational and functional concerns than on strategic issues. For example, Sambamurthy *et al.* (2003) posit that IT investment and IT capabilities can improve various dimensions of flexibility, such as customer, partnering, and operational flexibility. Since firm strategy directs both resource allocation and coordination, and operational and functional issues, our study advances knowledge by linking IT to flexibility by focusing on its strategic role, where strategic flexibility indicates firms' ability to manage economic and political risks by responding promptly to changes in the business environment (Overby *et al.*, 2006). Strategic flexibility allows firms to change and adapt their use of organizational resources to create portfolios of strategic options, enabling them to respond, even proactively, to the changing environment.

Third, we consider the conditions under which IT support for core competencies impacts strategic flexibility and firm performance by examining both technological and organizational factors. Among technological factors, we analyse the moderating effect of IT infrastructure, defined as a set of shared, tangible IT resources that provide a foundation for enabling present and future business applications (Duncan, 1995). IT infrastructure – including hardware, software, and networks – plays a vital role in helping firms to accelerate the pace with which they can effect desired changes (Tallon and Pinsonneault, 2011). Whereas past studies propose IT infrastructure as an ability to influence flexibility directly (e.g., Kohli and Grover, 2008), we argue that heavy investment in IT infrastructure may not foster strategic flexibility, particularly when it is not channelled into developing IT support for core competencies. More specifically, we propose that IT support for core competencies is needed to leverage IT infrastructure to support strategic flexibility. Firms may be able to develop IT infrastructure more appropriately to fulfil its business value. A second potential moderating factor is firm ownership structure, a key feature of emerging economics (Freeman, 1984). State-owned enterprises – that is, those controlled by the government – may be less motivated to leverage resources to pursue superior performance (Peng *et al.*, 2004). Despite the seeming importance of ownership structure to realization of organizational strategy and performance, literature on the business value of IT pays limited attention to state ownership. We argue that state-owned firms, which have fewer incentives to leverage IT-enabled core competencies to achieve strategic flexibility, may forfeit additional benefits. To the best of our knowledge, this is the first study to incorporate state ownership, central to emerging markets, into the relationship between IT support for core competencies, strategic flexibility, and firm performance.

In sum, this study aims to advance understanding IT business value through a more inclusive approach motivated by the following insights: (1) Focus on existing IT capabilities limits understanding, and analysing the IT-flexibility linkage from a strategic perspective is likely to provide new insights. (2) IT infrastructure could be treated as a complement to IT's effect on firm performance. (3) Firms' ownership structure, a critical element in emerging markets with greater government control (e.g., China), should be considered. To address these knowledge gaps, the study seeks to determine whether IT-enabled core competencies enhance a firm's strategic flexibility. Further, by identifying strategic flexibility as a dynamic capability, we integrate both constructs in a single model that explains firm performance. In addition to allowing us to investigate the direct relationship between IT support for core competencies and strategic flexibility, this perspective permits us to evaluate whether strategic flexibility mediates the relationship between IT support for core competencies and firm performance. Insights obtained from the study can show whether the total effect of IT support for core competencies on firm performance increases, decreases, or is unaffected by empirically determining the strength of the links between IT

support for core competencies and strategic flexibility and between strategic flexibility and firm performance.

In the following sections, we first provide theoretical background and develop our hypotheses about the relationships between IT support for core competencies, strategic flexibility, IT infrastructure, and firm performance. Next, we hypothesize the moderating role of ownership structure on the relationships between IT support for core competencies, strategic flexibility, and firm performance. We then describe the methodology and present our results, ending with a discussion of our findings and the limitations of this study.

IT support for core competencies

Information Systems (ISs) research frequently draws on the resource-based view of firms to explain why IT can be a source of competitive advantage (e.g., Mata *et al.*, 1995; Bharadwaj, 2000; Wade and Hulland, 2004; Bhatt *et al.*, 2010). Within this stream, research on business value of IT has focused on the impact of *IT capabilities* (e.g., IT management and IT technical skills) and *IT support for core competencies* on firm performance (e.g., Bharadwaj, 2000; Wade and Hulland, 2004; Bhatt and Grover, 2005; Ravichandran and Lertwongsatien, 2005).

The difference between these concepts is significant to our argument. First, IT capabilities and IT support for core competencies have different relationships to firm strategy. IT capabilities are abilities to mobilize and deploy IT-based resources in combination with other organizational resources and capabilities using organizational processes (Chen *et al.*, 2014). IT support for core competencies is defined as the extent to which ISs are used to enhance and develop firms' core competencies (Wang *et al.*, 2012). Thus, IT capabilities are not always linked to a firm's strategy, whereas IT support for core competencies is closely related to development, selection, and implementation of organizational strategy (Wang *et al.*, 2012). Second, IT capabilities are often developed in functional and sub-functional areas by combining physical, human, and technological resources (Amit and Zott, 2001). IT support for core competencies is conceptualized as a mechanism to achieve mutual coherence between IT activities and firm priorities (Ravichandran and Lertwongsatien, 2005). Accordingly, IT capabilities reside in organizational functions, whereas IT support for core competency manifests in firm-wide capabilities for achieving cross-function integration and coordination of capabilities (Ravichandran and Lertwongsatien, 2005). Last, the impacts of IT capabilities and IT support for core competencies on final firm performance follow different patterns. Researchers generally agree that, unlike IT support for core competencies, IT capabilities do not create business value alone but must interact and be integrated with other IS and organizational factors in a mutually reinforcing way to influence performance (e.g., Nevo and Wade, 2010; Chen *et al.*, 2014).

Prior research (e.g., Rivard *et al.*, 2006; Doherty and Terry, 2009) argues that focusing on existing IT capabilities may limit analysis and suggests several reasons that IT support for core competencies may be a more promising focus from which to gain important insights into the business value of IT. First, researchers aiming to study IT resources/capabilities face the dilemma of which resources and capabilities to include in their studies (e.g., Bhatt and Grover, 2005). Several attempts to develop exhaustive lists of IT resources/capabilities have failed to provide comprehensive coverage (Doherty and Terry, 2009). Second, according to the strategic necessity perspective (Clemons and Row, 1991), obtaining critical IT capabilities provides no guarantee that benefits will be achieved, as superior outcomes involving investments in IT can only be obtained via their support for organizational competencies (Clemons and Row, 1991; Rivard *et al.*, 2006). Firms whose IS initiatives focus on enhancing core competencies are thus likely to derive greater value from IT investment than firms that focus less on integrating their IT deployment and core competencies. Third, some researchers suggest that IT capabilities cannot contribute directly to firm performance and that these capabilities create strategic value only when their use is aligned appropriately with strategic purposes (Chan *et al.*, 1997). Several studies (e.g., Bergeron *et al.*, 2001; Tallon and Pinsonneault, 2011) highlight the significant role of fit between IT and business in explaining firm performance, arguing that strategic fit – the extent to which IS priorities, decisions, and actions support business strategies and behaviours – is required to increase firm performance. As introducing IT support for core competencies enables focus on a firm's ability to use IT to enhance core competencies, our study investigates IT business value by focusing on how IT is used to support and enhance a firm's core competencies.

IT support for core competencies may contribute to firm performance directly. Such support would reflect the extent to which a firm's IT investment and deployment are embedded in its core competencies. Unlike relatively uniform IT assets – such as hardware, software, and applications readily available on the external market – IT support for core competencies is heterogeneous among firms. Its heterogeneity is tied to the firm's unique core competencies and distinctive ways of using IT to build and enhance these competencies. Firms must spend time and effort to develop their core competencies to compete in the marketplace. One firm's decisions about embedding IT in areas of critical importance to the organization differ from those of its competitors. Further, IT support for core competencies is difficult to imitate because of the invisibility of the process and the underlying mechanism of the embeddedness of IT and core competencies. Wal-Mart, for example, used various ITs (e.g., RetailLink, satellite communication systems, RFID) successfully to build its core competencies in supply chain management, making them a source of competitive advantage not easily imitated by competitors (Bharadwaj, 2000; Hardgrave *et al.*, 2008; Mithas *et al.*, 2012). Although competitors had the ability to obtain central databases, point-of-sale systems, satellite networks, and other readily available technologies, they could not understand and copy the core competencies that Wal-Mart had embedded in complex, path-dependent processes to integrate resources, skills, and knowledge related to both IT and business areas (Day, 1994). In 2000, for example, Kmart, one of Wal-Mart's main competitors, tried to compete with Wal-Mart by launching a US$1.4 billion IT modernization effort to link sales, marketing, supply and logistics systems, but the effort ended in failure (Nelson, 2007).

Theoretical background and hypothesis development

This study proposes that IT support for core competencies has direct and indirect impacts on firm performance and that strategic flexibility serves as a partial mediator of this relationship. Furthermore, IT infrastructure moderates the effect of IT

support for core competencies on strategic flexibility, and ownership structure moderates the effect of IT support for core competencies on strategic flexibility as well as the effect of strategic flexibility on firm performance. Figure 1 illustrates our research model.

IT support for core competencies, strategic flexibility, and firm performance

IT support for core competencies may contribute indirectly to firm performance (e.g., Kohli and Grover, 2008; Pavlou and El Sawy, 2010; Rai and Tang, 2010). By viewing IT-enabled performance as mediated rather than direct, scholars posit that the impact of IT support for core competencies in improving firm performance could be mediated by various organizational resources. This paper proposes that strategic flexibility mediates the impact of IT support for core competencies on firm performance. The following section elaborates how IT support for core competencies influences firm performance through strategic flexibility.

Ravichandran and Lertwongsatien (2005) argue that IT support for core competencies should be treated as a higher-order resource composed of two dimensions: IT support for market-access competency and IT support for functionality-related competency. We adopt this perspective to develop how these two underlying dimensions of IT support for core competencies impact strategic flexibility.

IT support for market-access competency refers to firms' use of IT to improve responsiveness to customer inquiries, analyse customer information, identify unmet customer needs, and determine customer requirements (Ravichandran and Lertwongsatien, 2005). Firms rely on IT applications to provide seamless and consistent access to their customer, production, order and market data, and use those data to sense and analyse the customers' existing and latent needs quickly (Bhatt *et al.*, 2010). In attempting to survive in the changing business environment, firms tend to reallocate resources, redesign products, and reconfigure manufacturing processes to satisfy customers' needs. One example is Westpac, a South Pacific financial service conglomerate that designed an IT system to improve its knowledge and expertise on how to develop new financial products into a set of highly flexible software modules. This system enabled Westpac to handle a greater variety and range of customer and marketplace needs and to tailor its product assortments to satisfy those needs (Boynton *et al.*, 1993).

IT support for functionality-related competency refers to firms' use of IT to develop new products and services, improve speed of key business activities, identify new markets, redefine the scope of business, and enter new markets (Ravichandran and Lertwongsatien, 2005). A high level of IT support for functionality-related competency could improve a firm's ability to respond to environmental changes (Celuch *et al.*, 2007). For example, by using sophisticated computing capabilities in research and development, Celera (a company investigating the human genome) developed a decoding process radically more innovative than that used by researchers in the Human Genome Project. With the decoding process, Celera was able to redesign its production process to support a broad range of potential product applications (Regalado, 2000). We can thus hypothesize:

Hypothesis 1: IT support for core competencies has a positive impact on strategic flexibility.

Strategic flexibility is a firm's ability to initiate strategic changes and adjust to unexpected consequences of predictable changes (Nadkarni and Herrmann, 2010). The value of strategic flexibility lies in its ability to enhance the firm's adaptability and responsiveness in addressing challenges from changing external environments. Some studies posit strategic flexibility as a combinative capability that enables firms to synthesize and apply current and newly acquired external knowledge in their operations (e.g., Kogut and Zander, 1992; Kristal *et al.*, 2010). Building on the closeness of the terms combinative capabilities and dynamic capabilities (Teece *et al.*, 1997; Eisenhardt and Martin, 2000), we argue that strategic flexibility can be treated as a dynamic capability that helps firms to better reallocate resources and break down existing operation routines (Zhou and Wu, 2010). Other reasons for considering strategic flexibility as a dynamic capability are the following. First, strategic flexibility reflects a firm's ability to alter its resources to adapt to environmental changes. The critical role of strategic flexibility is thus to help firms survive and grow in a changing environment. A company may need strategic flexibility to deal with unpredictable changes in customer preferences, competitors' actions, and other

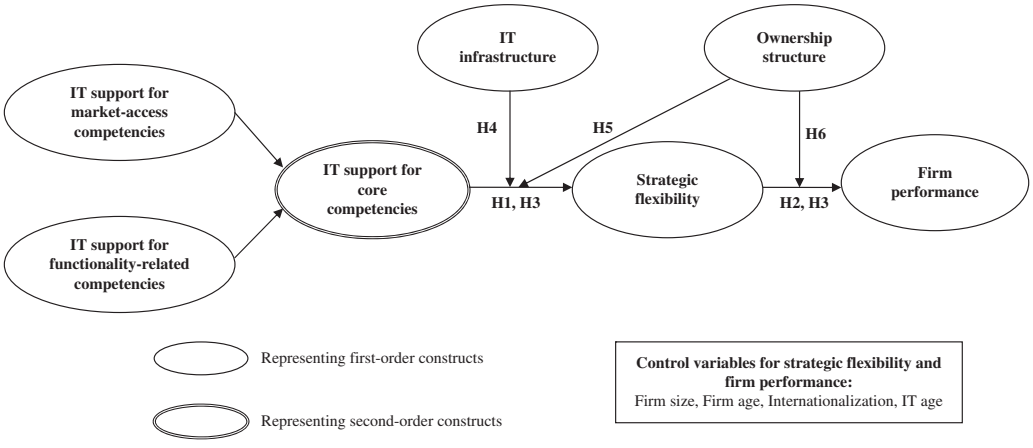

Figure 1 Proposed research model.

market factors. For example, companies rely on strategic flexibility when creating new products and production processes, designing new business models, entering new markets, and extending old businesses through internal growth, acquisitions, and strategic alliances. Second, the fundamental role of strategic flexibility is to reconfigure and combine firms' resources to adapt to the environment (Zhou and Wu, 2010). Moreover, with strategic flexibility, firms can seek and select appropriate resources, extend and modify them to new forms, and exploit them to respond to environmental changes. Firms with strategic flexibility can restructure existing resources and acquire additional resources to support competitive actions. These characteristics suggest that strategic flexibility is embedded in processes or routines for manipulating resources. Finally, strategic flexibility is generated internally, inside the boundaries of the firm. Its intangible nature suggests that strategic flexibility is dynamic and firm-specific because related managerial and problem-solving skills are intrinsic to firms and emerge within them. To conclude, strategic flexibility is an important dynamic capability that enables firms to achieve competitive advantage in turbulent markets (Teece *et al.*, 1997; Zhou and Wu, 2010).[2]

In dynamic business environments with intense competition and changing technologies, strategic flexibility is needed to increase effectiveness of communications, plans and strategies, potentially enhancing firm performance (Grewal and Tansuhaj, 2001). For example, Toyota has responded to increased dynamism by prioritizing modular designs in its production system and just-in-time delivery system to incorporate greater flexibility and improve capabilities to achieve economies of scope and enhance customer responsiveness (Anand and Ward, 2004).

Evidence supports a relationship between strategic flexibility and firm performance. Nadkarni and Herrmann (2010) argue that strategic flexibility provides firms with the ability to take advantage of market opportunities and achieve improved performance. Anand and Ward (2004) show that high strategic flexibility can increase product customization, improve delivery performance and reduce reaction time. Finally, Zhou and Wu (2010) argue that strategic flexibility enables firms to address discontinuities in the environment. We therefore hypothesize that:

Hypothesis 2: Strategic flexibility has a positive impact on firm performance.

By combining Hypotheses 1 and 2, we can infer that strategic flexibility mediates the relationship between IT support for core competencies and firm performance. High levels of strategic flexibility may be achieved when firms leverage ITs successfully. Together, these arguments suggest that strategic flexibility mediates the relationship between a firm's IT support for core competencies and firm performance. Firms with high levels of IT support for core competencies could employ strategic flexibility to recalibrate their strategies and refocus resources on successive decision points. High levels of strategic flexibility provide opportunities for firms to achieve superior performance.

We conceptualize strategic flexibility as a partial mediator of the path from IT support for core competencies to firm performance. We base this conceptualization on the observed direct impact of IT support for core competencies on firm-level outcomes, the expected direct link between strategic flexibility and outcomes, and the hypothesized link between IT support for core competencies and strategic flexibility activities.

Hypothesis 3: Strategic flexibility partially mediates the relationship between IT support for core competencies and firm performance.

The moderating effect of IT infrastructure

Past literature (e.g., Melville *et al.*, 2007; Kohli and Grover, 2008) on IT impacts implies that IT-enabled competencies contribute to firm performance through a complex interaction mechanism. IS scholars argue that performance explained by IT depends on differences in other IT resources (Wade and Hulland, 2004; Ray *et al.*, 2005), and recent empirical studies focus on the critical role of IT infrastructure in moderating the effects of IT-related capabilities and firm performance. For example, Tallon and Pinsonneault (2011) conclude that the impact of IT-business alignment on organizational agility varies with firms' IT infrastructure flexibility.

IT infrastructure – which includes hardware and operating systems, network and telecommunication technologies, data and core information-processing applications – is a critical IT resource because it enables the firm to share information across departments, supporting daily business processes and activities (Weill *et al.*, 2002). The basic business function of IT infrastructure is to enable information to be shared seamlessly and automatically across systems, services, and processes (Bharadwaj, 2000). It will also contribute to a firm's responsiveness to business opportunities, when the firm decides to deploy these IT resources in launching innovative initiatives.

Because the presence of a strong, flexible IT infrastructure determines a firm's ability to leverage information and data, this infrastructure can have a positive moderating effect on the link between IT support for core competencies and strategic flexibility (Byrd and Turner, 2001). That is, IT infrastructure can increase the influence of IT support for core competencies on organizational ability to respond to environmental changes. For example, Capital One leveraged a large Oracle database that contained detailed customer data and supported analytics. Capital One was thus able to predict individual customers' risk patterns and use them continually to develop new marketing opportunities by leveraging an enormous database of current and potential customers and data-mining techniques (Clemons and Thatcher, 1998).

Researchers find that IT applications such as computer-aided design, computer-integrated manufacturing, and electronic data interchange can grant companies speed, greater variety, and valuable new knowledge to respond to customers' needs and new market opportunities (e.g., Pine and Victor, 1993; Amit and Zott, 2001). In other words, a firm with a high level of IT infrastructure can integrate and connect IT-supported processes and seamlessly link activities, enabling greater flexibility (Tallon and Pinsonneault, 2011). If two firms obtain the same level of IT support for core competencies but different levels of IT infrastructure, the firm with the higher level of IT infrastructure will enjoy more options among digital tools and is thus likely to attain a higher level of strategic flexibility (Sambamurthy *et al.*, 2003; Tallon and Pinsonneault, 2011). Similarly, if two firms have the same level of IT infrastructure but different levels of IT support for core competencies, we expect the firm with weaker IT support for

core competencies to achieve lower levels of flexibility (Sabherwal and Chan, 2001). Accordingly, we propose the following hypothesis.

Hypothesis 4: IT infrastructure positively moderates the impact of IT support for core competencies on strategic flexibility.

The moderating effect of ownership structure

As business environments become more dynamic throughout emerging economies, researchers are beginning to examine whether firms have different strategy processes, leading to implementation of different strategies and thus different outcomes. Peng *et al.* (2004) suggest that ownership structure is a parsimonious and important variable that can be used to classify firms into different groups. Strategic choices adopted by firms depend on both institutional pressures and the influence of important stakeholders, which can differ in firms with different ownership types (e.g., Oliver, 1991; Darnall and Edwards, 2006; Menguc *et al.*, 2010). Managers' evaluation of environmental forces and firms' strategic orientation, as well as their ability to adapt to environmental changes, may also vary according to ownership structure (Tan and Li, 1996; Tan and Tan, 2005). The critical role of ownership structure leads us to extend this line of enquiry into the IS domain by considering ownership structure as an institutional factor (Freeman, 1984) that can impact the mechanism by which firms apply IT support for core competencies to improve their strategic flexibility and final performance.

In emerging economies, economic activities are structured by institutional regulation, which establishes a framework for production, exchange, and distribution (Aldrich and Fiol, 1994). Organizational activities take place within this institutional framework, which places formal and informal constraints on firms' formulation and implementation of strategy (Peng and Luo, 2000). A few studies (e.g., Tan, 2002; Peng *et al.*, 2004) document differences in strategies and performance between state-owned and non-state-owned firms. Closely controlled by the central government (Peng and Luo, 2000), state-owned firms have the legitimacy and political backing to secure access to resources and political privileges. They do not, therefore, concentrate on profit maximization and may be less motivated to leverage their resources to pursue superior performance (Peng *et al.*, 2004). In contrast, non-state-owned firms (whether locally or foreign-owned) may lack legitimacy, institutional support, and high operation costs (Tan, 2002). Top executives from these firms thus have strong incentives to increase firm profits through activities such as building firm reputation, attracting customers, and using resources efficiently to compensate for lack of political capital or legitimacy (Luo *et al.*, 2005).

Past studies (e.g., Tan and Li, 1996; Tan and Tan, 2005) suggest that ownership structure moderates environment-strategy configurations, especially in contexts where it figures prominently in the institutional environment. Our study builds on this logic to propose that state ownership diminishes firms' efforts to leverage their IT and use it to improve performance.

Research shows that state-owned firms have poorer corporate governance structures than their counterparts (Estrin and Perotin, 1991). With better corporate governance, non-state-owned firms tend to optimize decision-making processes across corporate and local business and IT decision-making units (Bushman and Smith, 2003; Raghupathi, 2007), which is important in developing strategic flexibility to sustain competitive advantage. Further, to maximize profit, non-state-owned firms tend to invest in and apply IT to search, process, and propagate customer demand throughout their value chain, increase speed of product development and delivery, and enter new markets. Strategic flexibility can thus be achieved more easily in terms of increased product customization, improved delivery performance, and reduced reaction time, which may in turn produce better performance. We therefore expect non-state-owned firms to be strategically motivated and have more incentives to leverage IT-enabled core competences to achieve strategic flexibility and firm performance than state-owned firms. Accordingly, we hypothesize the following.

Hypothesis 5: The positive relationship between IT support for core competencies and strategic flexibility will be stronger for non-state-owned firms than for state-owned firms.

Hypothesis 6: The positive relationship between strategic flexibility and firm performance will be stronger for non-state-owned firms than for state-owned firms.

Research methodology and analysis

Data collection

We collected data from firms in Northern China during the period 2011–2012 for two reasons: (1) This region has the largest number of manufacturing firms in the world, but little research has been conducted on Chinese firms (Li *et al.*, 2012). (2) While IT deployment has increased greatly in China, we lack knowledge of various issues related to IT business value. Empirical studies of these issues in China are needed to gather knowledge about how Chinese companies leverage IT to create value (Chen, 2010). The data were collected through a large sample field survey that tapped responses from (1) senior IT executives, such as Chief Information Officers, IT directors, and IT managers, and (2) business executives, that is, CEOs. Separate questionnaires were developed for the IT executive and CEO in each firm. Well versed in the core competencies pertaining to IT and the strategic management of their organizations, senior IT executives and CEOs are the appropriate participants for our study. Such multiple-source design can also reduce systematic measurement error, such as common method variance (Zhou *et al.*, 2008).

Chinese firms often depend on local government agencies for support and are more likely to acquiesce to the agencies' requests (Davies and Walters, 2004). To enhance response rate, we established personal contact with the local government to collect data. Using the list of manufacturing firms under the jurisdiction of these agencies, we employed probability sampling to obtain a sample representative of local conditions (Davies and Walters, 2004). With the help of local government agencies, we identified 212 firms whose age, size, ownership structure, and industry affiliation seemed representative of the target population – predominantly small- to medium-sized and state-owned firms. All 212 firms agreed to participate in our study.

We recruited three trained interviewers to conduct onsite interviews on respondents' companies, an efficient method for

gathering valid information in China (Zhou *et al.*, 2008). During the data collection process, we informed participants of the survey objectives, explained that participation was voluntary, and assured anonymity of responses. Respondents returned the completed questionnaires to the interviewers, who then paired the questionnaires of respondents from the same firms. We received responses from 198 CEOs and 212 IT executives. Fourteen questionnaires completed by IT executives were not used because they had no matching CEO questionnaires. We also excluded 47 matched questionnaires because the number of missing values exceeded 15% of the questions (Hair *et al.*, 2014) or because all items had the same rating (Wang *et al.*, 2012). For the questionnaires with a percentage of missing values much fewer than 15%, we followed up with a personal phone call to ask the respondents to complete the survey. According to Hair *et al.* (2014), researchers should examine and address the issue of outliers before conducting statistical analyses. Following Field's (2013) method, we calculated the *z*-scores of items for each construct. Field (2013) suggests that, in normal distributions, less than 5% of *z*-scores can be greater than 1.96, less than 1% can be greater than 2.58, and none should be greater than 3.29. Our results show that all *z*-scores satisfied these standards, with the exception of three cases whose *z*-scores were greater than 3.29. Hair *et al.* (2014) suggest removing such cases from the data set when a few outliers have been identified. We excluded a total of three cases. The final sample thus consists of 148 matched questionnaires, with a response rate of 74.7% (=148/198) and an average organizational tenure of 12.24 years (SD=9.00) for CEOs, and a response rate of 69.8% (=148/212) and an average organizational tenure of 9.57 years (SD=7.73) for IT executives. Table 1 summarizes our final sample.

Table 1 Sample characteristics ($N=148$)

	Frequency	*Percentage*
Firm size (no. of employees)		
Less than 100	63	42.6
100–1000	65	43.9
More than 1000	20	13.5
Ownership structure		
State owned	94	63.5
Non-state owned	54	36.5
Firm age (in years)		
Less than or equal to 5	57	38.5
6–10	55	37.2
More than 10	36	24.3
Internationalization		
Export	71	48
Non-export	77	52
Respondents (matched surveys)		
IT Executive survey		
IT Director	52	35.1
Chief Information Officer	51	34.5
IT Manager	40	27
Other Executives	5	3.4
Business Executive survey		
CEO/General Manager	148	100

Measurement items

We adopted measurement items from prior studies and modified them to fit our study context. Appendix lists the measurement items. We formulated the questions in English, translated them into Chinese, and checked the accuracy of the translation using back-translation techniques.

To operationalize the construct IT support for core competencies, we followed Ravichandran and Lertwongsatien (2005), treating the construct as a formative second-order construct composed of IT support for market-access competencies and IT support for functionality-related competencies. We asked senior IT executives to evaluate IT support for core competencies of their firms. A 5-point Likert-type scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree).

For the reflective construct of strategic flexibility, we adopted six measurements from Zhou and Wu (2010). We asked CEOs to evaluate the flexibility of their firm's strategic management. A 5-point Likert-type scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree).

For the reflective construct of IT infrastructure, we adopted three measurements from Bhatt *et al.* (2010). We asked the senior IT executives to evaluate the extent to which they agreed or disagreed that their firms apply flexible IT infrastructure in business operations. A 5-point Likert-type scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree).

Past research argues that subjective measures of firm performance correlate highly with objective measures or information released by firms or governments (e.g., Dess and Robinson, 1984; Venkatraman and Ramanujam, 1986). We thus adopted four reflective measurements from Zaheer *et al.* (1998) to measure firm performance. We followed Wade and Hulland (2004) in incorporating a competitive assessment element in firm performance and addressing the notion of performance over time. Our study employed absolute and relative assessments of performance *vis-à-vis* competition over a period of 2–3 years. A 5-point Likert-type scale was used, ranging from 1 (far below average) to 5 (far above average).

We also followed past studies to identify firm size, firm age, IT age, ownership structure, and internationalization as five relevant control variables due to their potential effects on strategic flexibility and firm performance (e.g., Broadbent *et al.*, 1999; Autio *et al.*, 2000; Darnall and Edwards, 2006; Rueda-Manzanares *et al.*, 2008). Specifically, we used a categorical description of firm size based on Judge and Elenkov (2005). We defined firms with less than 100 employees as small and assigned them a value of a '1'. Firms with 100–1000 employees were considered 'medium-sized' and coded as '2'. Firms with over 1000 employees were 'large' and coded as '3'. We measured firm age by asking how many years the respondents' firms had been in existence and IT age by asking the number of years the firms had applied IT for business purposes. We coded ownership structure as 1 for state owned and 0 for non-state owned. Internationalization was coded as 1 for firms engaging in export business and 0 for firms not engaging in export business.

Data analysis and results

Before testing our hypotheses using structural equation modelling (SEM), we performed the following procedures to verify the psychometric validity of our constructs: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Churchill, 1979). We used SPSS 16.0 to test EFA and SmartPLS 2.0 to analyse CFA and the research model. We chose PLS in this study for the following reasons. First, PLS is a variance-based SEM technique widely used in prior IS research (Pavlou and El Sawy, 2006; Schlosser *et al.*, 2015). Second, PLS works better than covariance-based SEM techniques for small data samples like those employed in this study. In fact, it has been suggested that PLS should be the technique of choice for all situations with fewer than 250 observations (Reinartz *et al.*, 2009). Finally, our model includes a formative first-order construct and an aggregate second-order construct. PLS is more appropriate for estimating this type of model than are covariance-based SEM techniques, as the latter have been shown to cause identification problems (Chin, 1998).

Exploratory factor analysis

To ensure that all measurement items load onto their respective constructs only, we first applied EFA to investigate the dimensionality of the constructs in our study. Specifically, we performed principal component analysis with Varimax rotation using SPSS 16.0. Three commonly used decision rules identified the number of factors underlying the construct (Hair *et al.*, 2010). We excluded the items with less than a 0.40 loading and/or cross-loading on two or more factors at 0.40 or higher and removed item ITSMC 4 because its cross-loadings on the constructs of ITSMC and ITSFC were higher than 0.40. An eigenvalue of 1 was the cut-off value for extraction. A 5-factor structure with the extracted factors explained 66.88% of total variance. The reliability analysis should indicate an item-to-total correlation of over 0.40. Table 2 summarizes the factor loadings for the constructs. The significant loading of all items on the single factor indicates one-dimensionality. That no item had multiple cross-loadings supports preliminary discriminant validity of the scale.

Confirmatory factor analysis

The analytical framework of CFA is an appropriate way to assess soundness of a measurement model for the theoretical construct space (Chin and Todd, 1995). The measurement model consists of the relationships between the observed items and the construct they measure. In this study, we applied specific CFA techniques (convergent validity, construct reliability, and discriminant validity) using SmartPLS 2.0 software.

We assessed convergent validity of each factor first by conducting within-scale factor analysis and then by comparing the item loadings with the recommended minimum value of 0.60 (Chin *et al.*, 1997). Table 3 shows the weights and loadings. As expected, all measures are significant on their path loadings, indicating acceptable on convergent validity.

Second, we used the PLS internal consistency measure to assess construct reliability and average variance extracted

Table 2 EFA for study constructs

Model construct	*Measurement item*	*Varimax-rotated loadings factor*				
		1	*2*	*3*	*4*	*5*
IT support for market-access competencies	ITSMC 2	0.84				
	ITSMC 3	0.77				
	ITSMC 1	0.74				
IT support for functionality-related competencies	ITSFC 3		0.83			
	ITSFC 5		0.80			
	ITSFC 4		0.71			
	ITSFC 2		0.69			
	ITSFC 7		0.64			
	ITSFC 1		0.62			
	ITSFC 6		0.58			
Strategic flexibility	SF 2			0.83		
	SF 4			0.81		
	SF 6			0.80		
	SF 3			0.78		
	SF 5			0.77		
	SF 1			0.72		
IT infrastructure	ITI 2				0.85	
	ITI 3				0.83	
	ITI 1				0.71	
Firm performance	FP 3					0.85
	FP 2					0.83
	FP 4					0.82
	FP 1					0.80
Sum of squares (eigenvalue)		6.88	3.21	2.38	1.67	1.26
Cumulative variance explained (%)		29.89	43.83	54.16	61.41	66.88

Note: ITSMC 4 was removed due to cross-loading.

Table 3 Factor loadings, weights, and *t*-values

Model construct	*Measures*	*Factor loading*	*Weights of the measures*	*t-value*
IT support for market-access competencies	ITSMC 2	0.89	0.38	41.14
	ITSMC 1	0.88	0.39	46.91
	ITSMC 3	0.85	0.38	26.90
IT support for functionality-related competencies	ITSFC 3	0.80	0.20	25.20
	ITSFC 2	0.79	0.21	23.23
	ITSFC 5	0.77	0.20	18.75
	ITSFC 4	0.77	0.20	19.93
	ITSFC 6	0.73	0.19	17.26
	ITSFC 1	0.71	0.18	15.49
	ITSFC 7	0.64	0.16	10.07
Strategic flexibility	SF 6	0.84	0.23	29.56
	SF 2	0.83	0.21	27.83
	SF 4	0.80	0.18	18.71
	SF 5	0.79	0.22	21.59
	SF 1	0.78	0.24	17.38
	SF 3	0.76	0.17	15.48
IT infrastructure	ITI 1	0.87	0.58	6.03
	ITI 2	0.79	0.27	4.12
	ITI 3	0.78	0.36	4.27
Firm performance	FP 4	0.91	0.38	60.13
	FP 3	0.89	0.29	42.65
	FP 2	0.82	0.26	13.86
	FP 1	0.81	0.23	18.39

Note: ITSMC 4 was removed because of cross-loading.

(AVE), which demonstrate the internal consistency of the indicators measuring a given construct (Fornell and Larcker, 1981). Table 4 shows that all values for composite reliability are above 0.70, indicating adequate reliability (Nunnally and Bernstein, 1994). The table also presents the AVE values, which range from 0.56 to 0.76, above the acceptable minimum of 0.50 (Fornell and Larcker, 1981).

Finally, we tested discriminant validity of all measures, which can be inferred when the measures of each construct converge on their respective true scores and are different from the scores of the other constructs (Churchill, 1979). We analysed discriminant validity using the guidelines in Gefen *et al.* (2000), examining whether the square root of the AVE for each construct was larger than its correlation with other factors. Table 5 summarizes the major descriptive statistics and the correlations derived from the sample. All constructs display adequate discriminant validity.

Table 4 Results of CFA

Measures	*Items*[a]	*Composite reliability*	*Average variance extracted*
IT support for market-access competencies	3 (4)	0.91	0.76
IT support for functionality-related competencies	7 (7)	0.90	0.56
Strategic flexibility	6 (6)	0.91	0.64
IT infrastructure	3 (3)	0.86	0.67
Firm performance	4 (4)	0.92	0.74

[a]Final measurements (proposed measurements).

Structural equation modelling

After demonstrating adequacy of the measurement model, we tested the proposed hypotheses with SmartPLS 2.0. Table 6 presents the results of the analysis. First, Table 6 (Model 1) shows that IT support for core competencies has a positive and direct impact on firm performance (path coefficient is 0.34 at $P<0.01$). Model 2 in Table 6 shows that the findings support Hypothesis 1 (path coefficient is 0.30 at $P<0.01$). The results demonstrate that IT support for core competencies improves a firm's strategic flexibility in aspects such as flexible allocation of market resources and reconfiguration of chains of resources. The data also support Hypothesis 2 (path coefficient is 0.38 at $P<0.01$), that strategic flexibility allows firms to be more effective and efficient by enabling them to achieve return on financial investment based on flexible strategic management.

Following the recommendations of Zhao *et al.* (2010) and MacKinnon *et al.* (2002), we adopted standards recommended by Baron and Kenny (1986), Sobel tests (Sobel, 1982), and the bootstrapping mediation test (Preacher and Hayes, 2008) to further examine Hypothesis 3, which proposes that strategic flexibility partially mediates the effect of IT support for core competencies on firm performance. Since the path from IT support for core competencies to firm performance is still significant and other two paths are significant (Table 6, Model 3), we conclude that Hypothesis 3 is supported. Further, the Sobel test results indicate a significant indirect effect of IT support for core competencies on firm performance through strategic flexibility ($Z = 2.56$, $P<0.01$).

Table 5 Correlation between constructs

	1	2	3	4	5	6	7	8	9	10
1. IT support for market-access competencies	**0.87**									
2. IT support for functionality-related competencies	0.59**	**0.75**								
3. Strategic flexibility	0.19*	0.27**	**0.80**							
4. IT infrastructure	0.22**	0.23**	0.16*	**0.82**						
5. Firm performance	0.24**	0.33**	0.32**	0.32**	**0.87**					
6. Firm size	−0.05	−0.07	−0.01	0.20*	0.13	—				
7. Firm age	0.17*	0.02	−0.11	0.12	0.08	0.05	—			
8. IT age	0.17*	0.05	−0.18*	0.07	0.19*	0.18*	0.76**	—		
9. Ownership structure	0.11	−0.07	−0.07	0.11	0.03	0.15	0.23**	0.35**	—	
10. Internationalization	−0.00	0.07	0.08	0.02	0.05	0.17*	−0.18*	−0.08	0.03	—
Mean	3.64	3.65	3.77	4.02	3.75	1.71	8.57	6.74	0.64	0.48
SD	0.67	0.57	0.66	0.58	0.79	0.69	5.03	3.99	0.48	0.50

Note: Diagonal elements are the square roots of Average Variance Extracted; **$P<0.01$, *$P<0.05$ (two-tailed).

Recent work (e.g., Preacher and Hayes, 2008; Zhao *et al.*, 2010) questions the use of the mediation tests proposed by Baron and Kenny (1986), emphasizing the superiority of bootstrapping procedures for statistical tests (for a useful review, see Zhao *et al.*, 2010). To test our mediation relationship more thoroughly, we drew on Preacher and Hayes (2008) and applied bootstrapping. Using the SPSS macro from Preacher and Hayes (2008) with 5000 bootstrapped samples revealed an indirect-only mediation effect (Zhao *et al.*, 2010; Spiller, 2011). The indirect path ($\beta = 0.13$) has a 95% confidence interval that does not include zero (0.03, 0.26).

Hypothesis 4 predicts the positive moderating effect of IT infrastructure in the relationship between IT support for core competencies and strategic flexibility. Table 6 (Model 4) presents the significant moderating effect (path coefficient is 0.25 at $P<0.05$). We conclude that the evidence supports Hypothesis 4 and that IT infrastructure positively moderates the relationship between IT support for core competencies and strategic flexibility.[3] Figure 2 illustrates the results obtained for Hypotheses 1–4.

To examine the differences caused by ownership structure (Hypotheses 5 and 6), we used the method of sub-group analysis (Keil *et al.*, 2000; Ahuja and Thatcher, 2005). We obtained the standard error of each significant path and the corresponding standard path coefficient from the PLS results and then calculated the differences of each path between state-owned and non-stated-owned groups using the formula proposed by Chin and colleagues (Chin, 1998; Chin *et al.*, 2003). Table 7 shows the results of the sub-group analysis and of Hypotheses 5 and 6, which support Hypotheses 5 and 6.

Discussion and conclusions

Theoretical implications

The IS and management literature stress IT support for core competencies and strategic flexibility as two concurrent goals for firms. The literature lacks a good understanding, however, of whether and how IT support for core competencies impacts strategic flexibility and contributes to firm performance. To address this gap, our study uses responses from 148 manufacturing firms in China to examine whether IT support for core competencies can impact firm performance through strategic flexibility, advancing our understanding of the business value of IT. Our results show that strategic flexibility partially mediates IT support for core competencies and firm performance linkage and that IT infrastructure moderates the linkage between IT support for core competencies and strategic flexibility. Our results also show that state ownership moderates the relationships between IT support for core competencies and strategic flexibility and between strategic flexibility and firm performance. These findings contribute to the literature on business value of IT and the implications of strategic flexibility for performance. The following discusses these implications in greater detail.

First, whereas previous studies tend to investigate IT business value by exploring the impact of various IT capabilities on firm outcomes, our study conceptualizes the holistic role of IT in terms of its support for core competencies. This conceptualization is in line with Ravichandran and Lertwongsatien (2005), who affirm that IT can play an important role in creating competitive value if it is deployed in a way that leverages a firm's core competencies. Firm competencies reflect the firm's decisions on how to acquire and deploy its resources. Our study shows that embedding IT in core competencies can create competitive advantage for a firm and improve its performance. This result suggests that investigating IT business value in terms of IT support for core competencies is a promising research direction.

Second, identifying strategic flexibility as a mediator of the linkage between IT support for core competencies and firm performance is an important contribution, especially when researchers are trying to discover new organizational roles of IT and to understand its business value (Sambamurthy *et al.*, 2003). Whereas previous studies envision IT support for core competencies as having a direct impact on firm performance, we find that strategic flexibility partially mediates this relationship. This result shows that the ultimate value of IT support for core competencies lies in how the construct enables firms to adapt and change. In other words, in addition to determining better performance, IT support for core competencies can also enable firms to obtain and analyse more useful information, which can benefit strategic flexibility. If IT support for core competencies can help firms to create dynamic capabilities for adapting to the changing environment, IT support for core competencies should be seen as a critical resource of

Table 6 Results of mediation and moderation analysis

Relationships	*Model 1*	*Model 2*	*Model 3*	*Model 4*
IT support for core competencies → strategic flexibility	—	0.30**	0.30**	0.21*
Market-access competencies → IT support for core competencies	0.36**	0.36**	0.36**	0.36**
Functionality-related competencies → IT support for core competencies	0.74**	0.74**	0.74**	0.74**
Control variables for strategic flexibility				
Firm size	—	0.05^{ns}	0.05^{ns}	0.05^{ns}
Firm age	—	0.07^{ns}	0.07^{ns}	0.06^{ns}
IT age	—	-0.26^{ns}	-0.26^{ns}	-0.24^{ns}
Ownership structure	—	-0.00^{ns}	-0.00^{ns}	-0.00^{ns}
Internationalization	—	0.05^{ns}	0.04^{ns}	0.06^{ns}
R^2	—	0.12	0.12	0.19
Strategic flexibility → firm performance	—	0.38**	0.31**	0.31**
IT support for core competencies → firm performance	0.34**	—	0.25**	0.25**
IT support for core competencies*IT infrastructure → Strategic flexibility	—	—	—	0.25*
Control variables for firm performance				
Firm size	0.12^{ns}	0.08^{ns}	0.11^{ns}	0.11^{ns}
Firm age	-0.11^{ns}	-0.14^{ns}	-0.13^{ns}	-0.13^{ns}
IT age	0.24^{ns}	0.37**	0.31**	0.31**
Ownership structure	-0.04^{ns}	-0.05^{ns}	-0.04^{ns}	-0.04^{ns}
Internationalization	0.01^{ns}	0.01^{ns}	0.00^{ns}	-0.00^{ns}
R^2	0.17	0.19	0.25	0.25

*P<0.05; **P<0.01; ns: not significant.

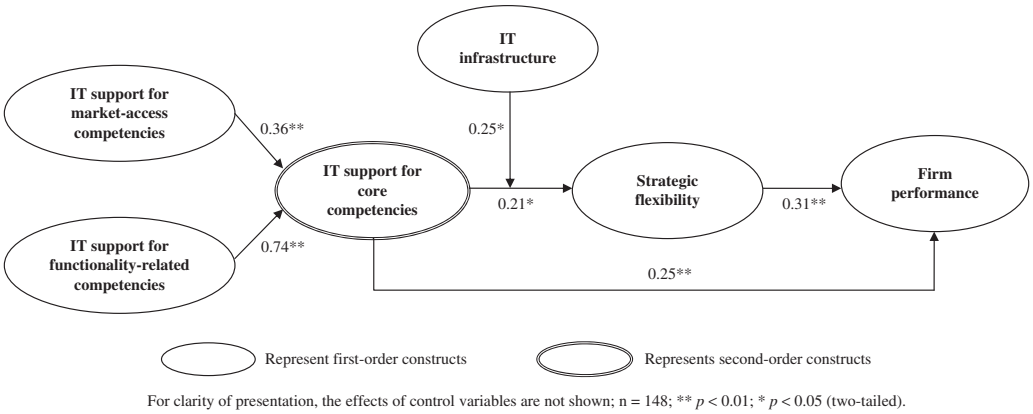

Figure 2 Results of the research model without moderating effect of ownership structure.

competitive advantage. Our study findings suggest that strategic flexibility can be treated as a key dynamic capability for reallocating and reconfiguring organizational resources to respond to environmental demands. Strategic flexibility is essential for firms operating in volatile environments, and IT support for core competencies is essential for firms that aim to maintain flexibility in the market.

Third, this study demonstrates the moderating role of IT infrastructure, which sheds light on prior findings. The results of the data analysis reveal that IT infrastructure augments the positive influence of IT support for core competencies and strategic flexibility. Previous studies (e.g., Bhatt, 2000; Chen *et al.*, 2014) often treat IT infrastructure as a predictor of firm performance. Our findings extend this body of research by demonstrating that IT infrastructure plays a more nuanced role, moderating the link between IT support for core competencies and strategic flexibility. This result also suggests that IT support for core competencies and IT infrastructure act, at least in part, as complementary resources for achieving strategic flexibility. Specifically, IT support for core competencies helps firms to gather and disseminate market information and revise their strategic goals. IT support for core competencies can thus be treated as a sensing resource. As IT infrastructure provides firms with hardware, software, and a network that further help them to implement strategies to pursue their goals, it can also be seen as a supporting resource (Tallon and Pinsonneault, 2011).

Finally, this study contributes to the literature on IT business value and strategic flexibility by providing evidence that type of ownership is an important determinant of the IT

Table 7 Results of sub-group analysis

Relationships	*State-owned companies (N = 94)*	*Non-state-owned companies (N = 54)*	*Comparison between state-owned and non-state-owned companies*
IT support for core competencies → Strategic flexibility	0.28**	0.42**	−6.02**
R^2	0.13	0.17	
Strategic flexibility → Firm performance			
	0.37**	0.46**	−4.47**
R^2	0.18	0.29	

*$P<0.05$; **$P<0.01$.

support for core competencies – strategic flexibility linkage. To the best of our knowledge, this is the first study to investigate the relationship between firm characteristics, IT support for core competencies, and strategic flexibility in an emerging market. Our results show that non-state-owned Chinese enterprises (such as private firms) tend to employ their IT tools to collect and analyse market information to respond to the changing environment and achieve better performance. As state-owned Chinese enterprises do not perceive profit maximization as a top priority, they are less motivated to apply IT tools to achieve strategic flexibility and pursue superior performance.

Managerial implications

This study also has a number of implications for management. First, our results suggest that the value of IT is not determined by IT alone but depends largely on improved strategic flexibility. This finding helps to resolve the conundrum facing CEOs who find their return on IT investment to be vague and inconsistent. Managers should strive to channel IT support for core competencies towards important areas of the firm (such as strategic design and implementation). To achieve this, IT managers should interact closely with the business executives making strategic decisions to ensure the firm's survival in the market environment. Second, this study reveals that IT infrastructure strengthens the positive influence of IT support for core competencies on strategic flexibility. The results suggest that firms should focus their efforts on development of IT support for core competencies and its coordination with IT investment to maximize the return on IT investment. Managers should thus apply IT investment more efficiently and effectively to support core competencies (such as total quality management and market capability) in order to adapt to the dynamic environment. Third, our results suggest that the approach of non-stated-owned Chinese firms to IT applications is strategically and economically driven. The findings indicate that the Chinese government should instil market-oriented thinking in its firms to guide both daily and long-term operations. It is important for the Chinese government to help its state-owned firms build mechanisms such as corporate governance to ensure that these firms make strategic decisions in the best interests of their stakeholders.

Limitations and future research

We acknowledge several limitations in our study. First, the study uses subjective measures of firm performance. Even though prior research has concluded that subjective measures of firm performance correlate to a high degree of reliability with objective measures (e.g., Dess and Beard, 1984; Venkatraman and Ramanujam, 1986), gaps may exist between subjective measures and the financial information firms release. Future research could build on our study by employing objective measures of firm performance. Second, our data sources focus on manufacturers. Although flexible activities play a more salient role in manufacturing firms (Zhang, 2005), we do not examine the effect of IT support for core competencies on strategic flexibility in other industry types, such as the service industry, thus limiting generalizability of our findings. We recommend that future studies be conducted in other industries, including those with different perceptions of IT. Third, this study applies a matched sample approach by asking key informants to provide data for each of the main constructs in our model. On the basis of established guidelines, we believe our informants are appropriate and capable of providing valid and reliable data, as they are the most knowledgeable informants working in the corresponding positions (Armstrong and Sambamurthy, 1999; Slater and Olson, 2001). However, future studies could confirm our findings using multi-informant designs (Saraf *et al.*, 2007). Finally, although our use of the term 'effects' implies causal relationships, we acknowledge the need for more evidence based on longitudinal or experimental research to confirm the pattern of causation proposed.

Conclusion

This paper finds that IT support for core competencies can influence a firm's strategic flexibility, leading to superior firm performance. The findings provide firms with insights into the value of IT support for core competencies for flexible activities and performance. The SEM approach further reveals that IT infrastructure positively moderates the relationship between IT support for core competencies and strategic flexibility. Sub-group analysis shows that ownership structure (state owned *vs* non-state owned) moderates the IT support for the core competencies – strategic flexibility – firm performance linkage. In sum, this paper contributes to the development of more robust theories that use IT support for core competencies, IT infrastructure, and ownership structure to gain a better understanding of strategic flexibility and firm performance.

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Notes

1 The majority of recent IS studies use the terms flexibility and agility synonymously and treat them interchangeably.
2 We thank one of the anonymous reviewers for this suggestion.
3 As additional robustness checks, we also followed Tiwana and Konsynski's (2010) method to retest the model using formative specification of all constructs in our model. The result obtained using SmartPLS software shows that the relationship between IT support for core competencies and firm performance is still significant ($\beta = 0.31$, $P<0.01$) when strategic flexibility is added. The moderating effect of IT infrastructure on the relationship between IT support for core competencies and firm performance is also significant ($\beta = 0.23$, $P<0.05$). This test yielded patterns of relationships consistent with our reflective specification of constructs.

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Appendix

Table A1 Senior IT Executive and CEO questionnaires

Senior IT Executive questionnaire		
IT support for core competencies	IT support for market-access competencies (Ravichandran and Lertwongsatien, 2005)	To what extent do you agree with the following statements? (1 = 'Strongly disagree' to 5 = 'Strongly agree') ITSMC 1: Our IT helps to provide necessary information to customers ITSMC 2: Our IT helps to identify groups of customers whose needs are not being met ITSMC 3: Our IT supports analysing customer needs (i.e., products, preferences, pricing, and quality) ITSMC 4: Our IT helps to tailor the products/services to match customers' needs
	IT support for functionality-related competencies (Ravichandran and Lertwongsatien, 2005)	To what extent do you agree with the following statements? (1 = 'Strongly disagree' to 5 = 'Strongly agree') ITSFC 1: Our IT helps to develop new products/services ITSFC 2: Our IT helps to increase the speed of product development ITSFC 3: Our IT helps to increase the speed of product/service delivery ITSFC 4: Our IT helps to increase the speed of responding to business opportunities/threats ITSFC 5: Our IT supports identifying new market segments ITSFC 6: Our IT supports redefining the scope of our business ITSFC 7: Our IT supports entering new markets
IT infrastructure (Bhatt *et al.*, 2010)		ITI 1: Our firm provides a good telecommunication infrastructure ITI 2: There are integrated IS applications encompassing different functional areas ITI 3: We use database-oriented applications regularly in daily operations
CEO Questionnaire		
Strategic flexibility (Zhou and Wu, 2010)		To what extent do you agree with the following statements? (1 = 'Strongly disagree' to 5 = 'Strongly agree') SF 1: Our firm could allocate marketing resources (including advertising, promotion, and distribution resources) flexibly to market a diverse line of products SF 2: Our firm could allocate production resources flexibly to manufacture a broad range of product variations SF 3: Our firm could design products flexibly (such as modular product design) to support a broad range of potential product applications SF 4: Our firm is redefining product strategies in terms of which products it intends to offer and which market segment it will target SF5: Our firm is reconfiguring chains of resources the firm can use in developing, manufacturing, and delivering its intended products to targeted markets SF 6: Our firm is redeploying organizational resources effectively to support the firm's intended product strategies
Firm performance (Zaheer *et al.*, 1998)		Indicate your firm's performance during the last 2 or 3 years relative to all other competitors (1 = 'Far below the average' to 5 = 'Far above the average') FP1: Competitive price FP2: Timeliness of delivery FP3: High-quality supply FP4: Response time