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IT-ENABLED STRATEGIC-LEVEL AGILITY AND FIRM PERFORMANCE: SERVICE VERSUS MANUFACTURING INDUSTRY

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Abstract

This study investigates the organizational value of IT-enabled strategic capabilities in specific industry settings. We propose a theory-based model of positive relationships among IT resources, strategic-level agility, and firm performance. The model also proposes the relative values of the strategic-level agility in service and manufacturing industries. Survey data of medium to large-size enterprises in the United States were used to validate the model. The results indicate that the role of strategic-level agility in leading to firm performance is more significant in manufacturing industry than in service industry. Also, the values of IT resources, i.e., IT infrastructure and IT strategic planning, vary under the different industries. Our findings, although significant, challenge the conventional perspective on the core competence of service and manufacturing industries and thus call for further investigations on the strategic role of IT in the two distinct industries.

Keywords: Strategic-level agility, IT resources, firm performance, service and manufacturing

1 Introduction

In today's unstable economy, companies must cope with complex situations that emerge rapidly and affect their performance. Global competition, consolidation, new technologies, shifting customer preferences, and outsourcing are just some examples of the dynamics that affect business environments in which contemporary firms are operating. It is more important than ever before to institute capabilities that enable firms to cope with such uncertain and fast-occurring changes (Bharadwaj, 2000). Business agility has captured the attention of scholars and business leaders as a main differentiator in today's rapidly changing business environment. It is the ability "to detect opportunities for innovation and seize those competitive market opportunities by assembling requisite assets, knowledge, and relationships with speed and surprise" (Sambamurthy et al., 2003, p. 245). Agility has been examined from various viewpoints in the literature, such as enterprise, business function, project, and system (e.g., Prewitt, 2004; Sambamurthy et al., 2003). In this study, we focus on business agility at strategic level.

Companies have long known that, to be competitive, they must develop a good and timely business strategy and then appropriately align the strategy and their business processes (Beer and Eisenstat, 2000). Information technologies (IT) will take a vital role in such strategic maneuvering (Sambamurthy et al., 2003). Using IT, firms have various ways to interact with their customers and business partners, thus attaining market intelligence (Menor et al., 2001). Firms also use IT as a digitized business platform to improve their use of critical data and other organizational resources, which enables firms to generate strategic movements to respond to market changes.

This study highlights IT-enabled business agility at strategic level, which enables firms to anticipate, coordinate, and integrate the activities of the participating individuals and functions to expedite strategic changes (Cravens, 1998). While operation-level capabilities deal with daily routines (Lee et al., 2009), this strategic-level agility copes with more complex moves that enable a firm to embark on a new venture, thus being critical for long-term business. According to Braganza and Korac-Kakabadse (2000), such a strategic-level capability can be realized when the firm is able to shift around long-range investments and resources to uphold changes as they occur. While the value of this strategic-level agility in service firms has been primitively recognized (e.g., Braganza et al., 2000), research on its value in manufacturing firms remains sparse (Miles and Snow, 2007).

The manufacturing industry is different from service industry in many ways. While the service firms primarily rely on market intelligence on the dynamics of customer preference and experience (Menor et al., 2001), manufacturing firms seek customer satisfaction mainly through their products which are usually physical goods (Roth and Menor, 2003). Hence, in the manufacturing settings, operation-level capabilities are usually highlighted as the most critical competence with which a firm can provide a better product than its competitors (Narasimhan et al., 2006). However, due to rapid changes in competition, customer preferences, and environmental factors, the pattern of responses to customers required in the manufacturing settings is getting broader and sometimes more unpredictable. Therefore, agile strategic movements are also becoming important to manufacturing as well as service firms, under the contemporary business environment. Yet, there has been little research to examine the relative roles of IT-enabled strategic-level agility in various industry settings.

In this study, we aim to answer the following research questions: 1) what is agility at the strategic level and what is its impact on firm performance?; 2) what are the relative values of strategic-level agility in different industry settings of service and manufacturing?; 3) what are the IT resources that support strategic-level agility?

This paper is organized as follows: Section 2 defines the key constructs and develops the hypotheses and research model; Section 3 discusses research methodology followed by the discussion on data analysis in Section 4. The paper is concluded with implications of our findings and contributions of the study.

2 Research Model and Hypotheses

Drawing upon the organizational capability building (Makadok, 2001) and IT-enabled business agility perspectives (Overby et al., 2006; Sambamurthy et al., 2003), we propose that business agility leads to superior firm performance in contemporary business environment as an intermediating factor between organizational IT resources and firm performance. Adopting the environmental contingency perspective (Frohlich and Westbrook, 2002; Venkatraman, 1989), we further posit that this IT-enabled agility building mechanism is influenced by an environmental contingency factor, i.e., industry type. Figure 1 shows the research model of the study.

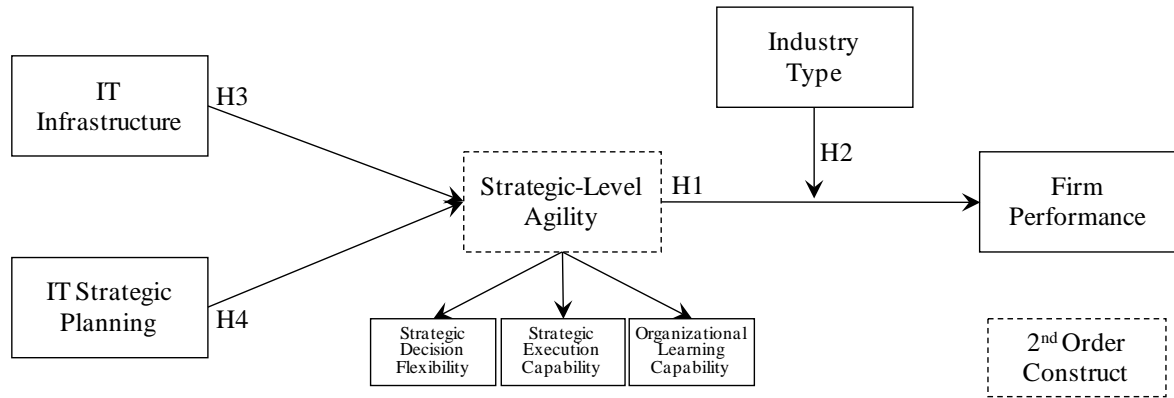


Figure 1. Research Model

2.1 Strategic-Level Agility and Firm Performance

The notion of agility as an essential element of a firm's long-term success and survival has been discussed extensively in the literature (Lee et al., 2009; Narasimhan et al., 2006; Overby et al., 2006). Agility as a multidimensional concept includes the ability to detect, anticipate, and sense market opportunities, evolving conditions, and other environmental changes. At the same time, it includes the ability to seize the opportunity with speed and implement new solutions. Therefore, agility applies to both strategic and operational levels within a firm.

In this study, we focus on agility at the strategic level, namely *strategic-level agility*, which is defined as the ability of a firm to define long-range investment decisions and implement them to accommodate future strategic moves and business initiatives. It emphasizes a firm's capability to create a learning environment that expedites sensing and responding to predictable and unpredictable changes effectively (Overby et al., 2006). Business opportunities challenge firms in different ways. Some just requires improvement on current business operations, while others ask for more dramatic overhaul of a firm's business strategy. Strategic-level agility includes a range of strategic capabilities that enable firms to respond to long-range changes (Weill et al., 2002). For the purpose of this study, we define strategic-level agility as a composite of three interrelated capabilities: strategic decision flexibility, strategic execution capability, and organizational learning capability. We argue that these capabilities combined would enable a firm to seize strategic opportunities, respond to internal and external long-term changes, and sustain its competitive advantage.

Strategic decision flexibility refers to a firm's ability to develop strategic decision choices and switch from one strategy to another. This is the ability of the firm to manipulate or juggle decision choices regarding the investment of organizational resources (Weill et al., 2002). Strategic decision flexibility is also known as the "capability of the firm to pro-act or respond quickly to changing competitive conditions and thereby develop and/or maintain competitive advantage" (Hitt et al., 1998, p. 26). Strategies, as opposed to operational plans, involve committing to long-term paths or trajectories of

competence development. Strategic decision flexibility enables organizations to modify their course of actions when encountering erratic and unanticipated situations (Hitt et al., 1998). Therefore, the capability to endorse strategic maneuvering in response to changes in the environment is an important basis for a long-term competitive advantage.

Strategic execution capability refers to a firm's ability to realize its business strategies through long-range investments on organizational competences and resources. This capability allows a firm "to coordinate and integrate the activities of the participating individuals and functions" (Cravens, 1998, p. 238). Strategic-level agility needs to not only define new strategic goals but also be able to implement new business options (Johnson et al., 2003). While strategic decision flexibility emphasizes the ability to develop and alter strategic decisions, strategic execution capability enables a firm to act in its functional and cross-functional dimensions at the same time to realize its new strategic decisions (Braganza et al., 2000). This capability enables a firm to identify its current and future competences, obtain the requisite resources either through internal development or external sources, and deploy these resources to implement the new strategies (Johnson et al., 2003). Therefore, this capability is a significant component of organizational capability for long-term strategic movements.

Organizational learning capability refers to a firm's ability to assimilate, share, and apply knowledge so that the organization can build and renew organizational competences. The ever changing environment requires a continuous rethinking of current strategic plan, resource deployment, and process efficiency (Hitt et al., 1998). Strategies involve committing to long-term paths or trajectories of competence development. To achieve strategic-level agility, firms need to continue to rethink current strategic plan, re-deploy resources, engage in new technologies, build new competences, and adopt new strategies to gain advantages over their competitors (Hitt et al., 1998). Organizational learning plays a crucial role in this process because it deals with the process of developing new organizational capabilities necessary for future opportunities rather than just focusing on current competences (Tippins and Sohi, 2003). Through organizational learning, firms can develop new competences necessary for strategic decision flexibility and strategic execution capability to embrace changes in the long run. Therefore, this capability is a significant component of organizational capability for long-term strategic movements.

In all, we argue that strategic-level agility which is made up of (a) strategy decision flexibility, (b) strategic execution capability, and (c) organizational learning capability is critical to firms' performance. In today's highly volatile and competitive business landscape, many industries are experiencing disruptive departure from the traditional rules of market competition (Kim and Mauborgne, 2005). Under such conditions, strategic-level agility will be a critical organizational capability that enables firms to achieve and maintain competitive advantage and superior performance by enabling their competitive strategic movements (Hitt et al., 1998; Sambamurthy et al., 2003). Winners in the global marketplace have been the firms that focus on the long-term and enterprise-wide health of their business, which requires organizational flexibility in making strategic decisions, the ability to implement their strategic decisions by developing means of change across the range of options, and the dynamic capability of continuous learning (Sushil, 2001). Based on these arguments, we propose our first hypothesis as follows:

Hypothesis 1. A higher level of strategic-level agility will lead to a higher level of firm performance in general.

We further argue that the value of this strategic-level agility in manufacturing setting is not lower than its value in service setting. Service firms have traditionally focused on achieving superior strategic capabilities in developing and delivering new services to meet the emerging customer needs and broad range of services to meet the diverse customer preferences (Braganza et al., 2000). On the other hand, manufacturing firms have experienced a great pressure for operational optimization, such as cost reduction, productivity improvement, and quality products, using many techniques of operational leanness and flexibility, such as just-in-time manufacturing (JIT), total quality management (TQM), and lean manufacturing (Llorénsa et al., 2005). Due to these different traditions in business orientation

of service and manufacturing industries, the value of strategic capabilities in manufacturing firms has not gotten the same attention as in service firms. Contemporary manufacturing firms, however, are experiencing new business challenges in both productions and sales mainly due to business globalization, diverse and complex customer preferences, and the cultural and regulation differences among their global sites and/or global partners. The recent trend of adopting e-commerce is another challenge to manufacturing firms which has transformed their business nature. E-commerce allows manufacturing firms to directly connect with their customers without the intermediaries, such as wholesalers and retailers, thus requiring additional service features to manufacturing firms (Andal-Ancion et al., 2003). In confronting these emerging environmental challenges, many manufacturing firms have failed to sustain their market competitiveness due to their inability of strategic maneuvering (Hammer, 2004; Kim et al., 2005). On the other hand, the manufacturing firms having the capability of agile movements at strategic level, e.g., the solution selling (ready-to-pour concrete as opposed to cement bags) model pioneered by Cemex, have achieved or sustained their market competitiveness (Lumpkin and Dess, 1996). In contemporary business environment, therefore, strategic-level agility of manufacturing firms is getting more critical for their business success as in service firms. Based on these arguments, contrary to the conventional perspective, we propose our next hypothesis as follows:

Hypothesis 2. The value of strategic-level agility in leading to firm performance will not be lower in manufacturing industry than in service industry.

2.2 IT Resources and Strategic-Level Agility

IT has the potential to provide competitive advantages for businesses because IT resources are fundamental to the growth of a business (Ravichandran and Lertwongsatien, 2005). Recent studies argue that the relationship between these organizational IT resources and business performance can be deconstructed through the presence of business competences. For example, Ravichandran and Lertwongsatien (2005) argue that IT resources support core competences of a firm, such as market access competence, integrity-related competence, and functional-related competence, and thus contribute to better performance of the firm. Tippins and Sohi (2003) also confirm that business competences, such as organizational learning capability, mediates the relationship between IT investment and performance. These studies emphasize the importance of understanding how IT resources influence business performance via business competence. In this study, we argue that organizational IT resources, such as IT infrastructure and IT human skills for IT strategic planning, play an important role in enhancing business performance by improving strategic-level agility.

IT infrastructure is the sharable technical and common enterprise-wide platform, such as networking, database services, and standardized operation support, which enables initiatives, such as cycle time improvement and cross functional processes (Bharadwaj, 2000). As the foundation of shared IT capabilities upon which the entire business depends, IT infrastructure is crucial to business agility (Weill et al., 2002). It links business units and allows them to quickly access and share business data and knowledge across the firm, thus creating synergies across business units and functions (Bharadwaj, 2000; Ravichandran et al., 2005). In addition, by providing standardized technical specifications, interfaces, and criteria, it makes it easier to strategically integrate new IT components. On the other hand, a non-integrated IT infrastructure can severely restricts an organization's business choices and slow down business processes, thus hindering strategic-level agility. Based on these arguments, we propose our third hypothesis as follows:

Hypothesis 3. A better IT infrastructure will lead to a higher level of strategic-level agility.

IT strategic planning refers to the skill sets of IT human resources to develop IT strategic plan for long-term organizational IT services. This is a vital resource for creating blueprints for the firm's technical platforms, strategic applications, and their implementation plan (Feeny and Willcocks, 1998). In particular, this skill set involves the skills for designing and managing appropriate technology architectures and standards. Such strategic development of organizational IT platform is

vital for a firm's strategic movement when considering the importance of business-IT strategic alignment (Henderson and Venkatraman, 1993). IT strategic planning also involves the skills to prioritize a firm's various IT deployment activities, including both internal system development projects and IT outsourcing projects (Powell and Dent-Micallef, 1997). A firm possessing a good planning skill set can arrange and prioritize its current and future IT support (Feeny et al., 1998). Therefore, this skill set is essential for firms to implement their strategic plan. Based on these arguments, we propose our final hypothesis as follows:

Hypothesis 4. A better IT strategic planning will lead to a higher level of strategic-level agility.

3 Research Method

A large-scale field survey to collect firm-level data was conducted in the United States.

3.1 Measurement Development

The measurement development process involved three stages: (1) operationalization of research constructs, (2) item development, and (3) validity tests. 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. Modifications of the existing items were also made to suit the context of the study. All questions were asked using 7 Likert scale (1= Strongly disagree, 7 = Strongly agree). Table 1 provides a summary of the measurement items used in this study and their sources.

Constructs	Summary of Measurement Items	Sources
Firm Performance	This construct was measured with the competitive business outcomes of sample firms, in terms of their customer retention rate, sales growth rate, profitability, and return on investment rate, e.g., by asking "Our customer ... is high relative to their all other direct competitors."	Adopted from Tippins and Sohi (2003)
Strategic Decision Flexibility	This construct was measured with the sample firms' capability of developing strategic choices and changing their strategies to keep up or cope with business opportunities, e.g., by asking "Our organization is capable of ..." Their flexibility in making strategic choices was also asked.	Adopted from Beer and Eisenstat (2000)
Strategic Execution Capability	This construct was measured with the sample firms' capability of making strategic investments based on their strategic decisions, effectively leveraging resources to execute new strategies, realizing strategic changes, and realizing new capabilities to fulfill their strategic goals, e.g., by asking "Our organization is capable of ..."	Adopted Weill et al. (2002)
Organizational Learning Capability	This construct was measured with the sample firms' capability of searching relevant knowledge, acquiring, assimilating, and applying new knowledge, e.g., by asking "Our organization is able to ..."	Adopted from Bhatt and Grover (2005)
IT Infrastructure	This construct was measured with the presence and quality (i.e., capacity and speed) of technology infrastructure electronically linking the business units of sample firms and their partners and expediting business processes with corporate data access and communications, e.g., by asking "The technology infrastructure ... is present and in place today" and "... meets our current business needs."	Adopted from Ravichandran and Lertwongsatien (2005)
IT Strategic Planning	This construct was measured with IT manager's skills to align IT planning with the business objectives, develop long-term picture of IT service, and examine strategic IT opportunities, e.g., by asking "Our IT manager can ..." IT manager's access to adequate information for the strategic use of potential IT was also asked.	Adopted from Karimi et al. (2001)

Table 1. Measurement Sources and Summary for Research Constructs

3.2 Research Design

We conducted a large-scale field survey with firms in both service and manufacturing industries in the United States. We applied a series of criteria congruent with the context of the study for the selection of the target samples. First, we focused on service and manufacturing industries which to a significant extent require IT support for their business. Second, we excluded companies with fewer than ten employees from our target sample because such small companies do not provide a background appropriate for investigating capabilities in their strategic movements and IT supports.

After the target samples were defined, a field survey was conducted using a web-based tool. Survey invitations were sent to business executives (e.g., president, chief executive officer, chief operating officer, business director) of the sample firms in the target industries. Around 1000 executives in an industrial respondent pool were invited to voluntarily participate in this survey. In addition to our initial screening, respondents' fitness to our survey was verified using their demographic data, such as position, employment type, industry, and company size. A total of 195 complete samples were achieved after removing small companies, incomplete data, and other unsuitable data, e.g., from non-full-time employees, non-managerial positions, and different managerial positions (e.g., CIO).

Following the manufacturing and service categorization scheme suggested by Frohlich and Westbrook (2002), we identified the industry type of each of the final samples. The final samples represent six manufacturing industry types (n = 79), i.e., consumer products (47), communications equipment (12), chemicals (8), computers/hi-tech (7), automotive (3), and biological product (2), and five service industry types (n = 116), i.e., healthcare services (59), banking/insurance (38), consulting (16), marketing (2), and accounting (1). The firm size varies; less than 250 (84), between 251 and 1000 (22), more than 1000 (89).

4 Results and Analyses

Partial least squares (PLS), a structural equation modeling technique, was used to analyze the data. Given that this study is an early attempt to develop a theoretical model explaining the contingent values of IT-enabled strategic-level agility in leading to firm performance in manufacturing and service settings, PLS was considered to be appropriate for this study (Howell and Higgins, 1990). In addition, PLS does not require a large sample size (Chin, 1998), which is particularly good for our sub-group analysis approach with small sample sizes (n=79 for manufacturing and n=116 for service).

4.1 Measurement Model Evaluation

The validity of the measurement model was established prior to testing the structural model. The convergent validity of the reflective measures is determined in the following three ways: (1) the item reliability of each item, (2) the composite reliability of the construct, and (3) the average variance extracted (AVE) by the construct. Table 2 shows the three validity test results. Based on the results, it was concluded that all the items demonstrated adequate convergent validity.

Construct	Number of Items	Item Reliability	Composite Reliability	AVE
Firm Performance (FPER)	4	.729 ~ .859	.880	.649
Strategic Decision Flexibility (SDFX)	4	.792 ~ .936	.932	.776
Strategic Execution Capability (STEX)	4	.861 ~ .905	.931	.770
Organizational Learning Capability (ORLC)	4	.871 ~ .917	.940	.797
IT Infrastructure (ITIF)	4	.868 ~ .903	.938	.790
IT Strategic Planning (ITSP)	4	.886 ~ .922	.950	.825

Table 2. Results of Convergent Validity Test

Table 3 shows that the square root of the AVE for each construct was larger than the correlations between itself and the other constructs. This implies that each construct shared greater variance with its own block of measures than with other constructs representing a different block of measures (Chin, 1998). The results demonstrate that there is good discriminant validity for the items used in this study.

	FPER	SDFX	STEX	OLRC	ITIF	ITSP
FPER	0.806					
SDFX	0.505	0.881				
STEX	0.500	0.777	0.877			
OPLC	0.355	0.662	0.684	0.893		
ITIF	0.189	0.326	0.384	0.428	0.889	
ITSP	0.260	0.262	0.347	0.405	0.451	0.908

Table 3. Results of Discriminant Validity Test

4.2 Structural Model Analyses

The estimated path effects and the associated t-values were calculated using the Bootstrapping routine in SmartPLS 2.0 (Ringle et al., 2005). Since the strategic-level agility was formulated as a second-order construct, the latent scores for each of the first-order constructs were calculated and used as measures for each construct. Figure 2 shows the results of the model analysis.

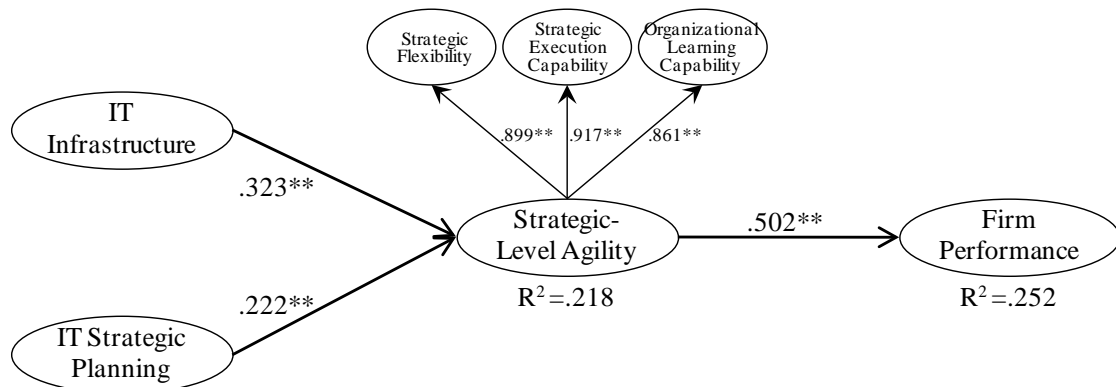


Figure 2. Results of Model Test (* $p < .05$, ** $p < .01$)

As shown in Figure 2, all paths were significant. The strategic-level agility ($t = 11.013$) was found to be a significant determinant of firm performance at the .01 level. It explained 25.2% of the variances of firm performance. On the other hand, the two types of IT resources, i.e., IT infrastructure ($t = 3.224$) and IT strategic planning ($t = 2.807$), were found to be significant in determining the strategic-level agility at the .01 level. They explained 21.8% of the variances of strategic-level agility. All second-order loadings to the latent construct of strategic-level agility were highly significant. Therefore, hypotheses H1, H3, and H4 are supported.

To test the contingent values of strategic-level agility in leading to firm performance, we conducted a sub-group analysis by following Venkatraman (1989). The full dataset was separated into two groups based on the types of industry: service ($n = 116$) and manufacturing ($n = 79$). Table 4 shows the results of the sub-group analysis with service and manufacturing industry datasets respectively. The results in Table 4 indicate that the value of strategic-level agility, in terms of both path strength and explanation power, were higher in the manufacturing industry than in the service industry. Adopting a statistical formula for comparing path coefficients between independent samples (Chin, 2003), the relative impacts of strategic-level agility on firm performance were examined. The result (in the fourth column of Table 4) indicates that strategic-level agility is significantly stronger in leading to firm performance

in the manufacturing industry group than in the service industry group. This finding appears to be consistent with our expectation regarding the value of strategic-level agility under the different industry settings. Therefore, our hypothesis H2 is supported.

Paths	Service Industry Samples		Manufacturing Industry Samples		Path Comparison Results	
	β	R ²	β	R ²	$ \Delta\beta $	$ \Delta R^2 $
Strategic-Level Agility → Firm Performance	.428** (t = 6.461)	.183	.655** (t = 10.595)	.429	.227** (t = 24.122)	.246
IT Infrastructure → Strategic-Level Agility	.354** (t = 3.882)	.265	.276* (t = 2.096)	.178	.078** (t = 5.041)	.087
IT Strategic Planning → Strategic-Level Agility	.254** (t = 2.889)		.206* (t = 2.047)		.045** (t = 3.611)	

Table 4. Results of Sub-Group Analysis (* $p < .05$, ** $p < .01$)

Interestingly, the results in Table 4 also indicate that the role of IT resources in supporting strategic-level agility varied in the different industry settings. In particular, the impacts of both types of IT resources on strategic-level agility were significantly stronger in service industry than in manufacturing industry.

5 Implications

The results indicate that specific IT resources support firm's strategic-level agility and in turn this high-level strategic capability positively influences firm performance. Our study shows that a firm's IT infrastructure and IT strategic planning skills are the significant driving force of the firm's agile strategic movements which are represented by its flexibility in developing and juggling strategic choices, its capability to implement and materialize its strategic decisions, and its learning capability to continuously modify and improve its strategic movements. In particular, the results suggest that in manufacturing industry as well as in service industry, strategic-level agility is a critical driving force of superior firm performance. The findings are consistent with Sambamurthy et al.'s (2003) perspective on the capability-building process in which a firm's IT resources as a digitized platform of contemporary business processes are the sources of its high-level dynamic capability, particularly agility, and thus lead to the firm's competitive performance (Bharadwaj, 2000; Overby et al., 2006).

Our further investigation of the value of strategic-level agility under different industry settings, i.e., service and manufacturing, reveals that its value in leading to firm performance (in terms of both the path strength and explained variance) is not less significant (even more significant) in manufacturing industry ($\beta = .655$, 42.9%) than in service industry ($\beta = .428$, 18.3%). This finding challenges the conventional perspective on strategic capabilities in both industries. In manufacturing industry, conventionally, operation-based capabilities have been more valued (Llorénsa et al., 2005). However, when considering recent difficulties in the manufacturing firms in the United States, our findings are likely to provide an intuitive explanation to the role of strategic-level agility in manufacturing industry. For example, GM's inability to change its strategy in an environment with upward and fluctuating gas prices and the urgent need for gas-efficient or even gas-independent cars leads to their demise in 2009. Our findings call for the immediate attention on strategic-level agility in such manufacturing firms where operational capabilities once plays dominant role.

Our comparison between service and manufacturing industries also shows an interesting finding with regard to the roles of IT resource in the different industry settings. Our results suggest that both IT infrastructure and IT strategic planning have more significant value in service setting than in manufacturing setting. In our sub-group model analysis, these IT resources explained only 17.8% of the variance of strategic-level agility in manufacturing setting while they explained 26.5% of the variance in service setting. While this interesting finding immediately calls for further investigation of

the strategic roles of IT resources under the different industry settings, we can find possible counter-explanations for this finding from the literature. First, a firm's IT infrastructure allows its business units to quickly access and share critical business data and knowledge and thus facilitates its information processing processes, such as new information creation and knowledge assimilation. Service firms has been discussed to be more complex in their customer preferences and service mix than manufacturing industry (Menor et al., 2001). Therefore, service firms would require more information processing power with better IT infrastructure. Second, the main skill set in IT strategic planning involves designing enterprise standards of IT platform and architecture and prioritizing various IT activities within a firm. Thus this skill set will be critical in managing a variety of IT activities which correspond to emerging business needs. This industry difference between service and manufacturing aforementioned might cause certain industry-wise distinctive perspectives on the value of this IT resource, i.e., more value of IT strategic planning skills in service industry. However, when considering the more significant role of strategic-level agility in leading to firm performance in manufacturing setting, the current findings are likely to recommend that manufacturing firms should put more efforts in deploying their IT resources. Therefore, our findings immediately call for significant attention of manufacturing firms on their strategic investment in IT resources.

6 Conclusion

In this study, we proposed a positive relationship among IT resources, strategic-level agility, and firm performance. To capture the combinative value of strategic capabilities, the second-order approach was adopted in conceptualizing the core research construct of strategic-level agility. We further investigated the relative value of strategic-level agility in different industry settings, i.e., service and manufacturing. Survey data of medium- to large-size enterprises in both service and manufacturing industries of the United States were used to validate the proposed model. The results indicate that strategic-level agility, consisting of strategic decision flexibility, strategic execution capability, and organizational learning capability, is a significant driving force of firm performance in the aggregated industry dataset analysis. The results also indicate that IT infrastructure and IT strategic planning skills serve as the IT-based organizational resources for the strategic-level agility. Furthermore, the subgroup analysis results indicate that the role of strategic-level agility in leading to firm performance is stronger in manufacturing industry than in service industry.

This study has some limitations. First, we used a cross-sectional research design. Such a snap-shot approach may have limitations in examining the proposed causal relationships in which time effects, such as the lead-time of IT impact (Bharadwaj, 2000), may play a role. Second, the single-respondent survey method of the study¹ may not be the best approach to ask different areas or levels of organizational functions, i.e., IT resources vs. business strategic agility. Third, our binary approach to segregate the samples into service and manufacturing can oversimplify the industry differences while each category may have a wide range of variances in business processes and strategies and moreover manufacturing firms are increasingly moving to service domain (Bessant and Davies, 2007).

Regardless of these limitations, this study makes several contributions to the literature. First, this study, both theoretically and empirically, reveals how firms can develop their strategic-level agility. The findings of the study indicate the significant role of specific types of IT resources, i.e., IT infrastructure and IT strategic planning, in achieving this specific type of agility. Since prior studies in IT-enabled agility have seldom provided empirical evidence, the theory-based models and the empirical findings of the study are both interesting and useful to academics in this research area. Second, this study has a potential to make a contribution to the existing literature on agility by

¹ We conducted a supplemental analysis to address a potential concern of multicollinearity using the variance inflation factor (VIF). As a rule of thumb, higher than 10 for the VIF score has been considered that multicollinearity exists (Thatcher and Perrewe 2002). In our test, the VIF scores of all the first-order constructs were between 1.363 and 3.009. Therefore, we conclude that our model is free from the multicollinearity concern.

comparing the role of strategic capabilities in service and manufacturing industries. Since most of prior studies in the context of manufacturing industry have focused on operational capabilities, the organizational value of strategic capabilities in manufacturing industry has seldom been discussed. Therefore, our findings may open a new area of discussion among academics and practitioners. This study also has some practical contributions by providing guidance for practitioners to strategically invest their IT resources to achieve their agility at the strategic level. In particular, our findings indicate that firms in both service and manufacturing industries need to invest in various IT resources, including IT infrastructure and IT human resources, to create strategic-level agility. Our findings particularly recommend manufacturing firms to put more efforts in deploying and utilizing their IT resources to achieve better strategic-level agility.

This study can be extended in several directions. First, future study can extend our theoretical model to include operation-level agility. Second, this study investigates only two types of IT resources. Future research can consider other types of IT resources, such as IT-enabled intangibles. Furthermore, with more specific levels of IT resource definitions, e.g., service-oriented IT architecture and integrative IT architecture, future research can examine both the positive and negative impacts of IT on agility. Third, the unit of analysis of this study is the organization and thus study evaluates overall agility and its impact on the firm performance. However, in some large organizations, some divisions may be more agile than others. Future study can explore the topic at department or team levels.

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