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One-Ki Lee
City University of Hong Kong

Kai Lim
City University of Hong Kong

Kwok-Kee Wei
City University of Hong Kong

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THE ROLES OF INFORMATION TECHNOLOGY IN ORGANIZATIONAL CAPABILITY BUILDING: AN IT CAPABILITY PERSPECTIVE

One-Ki Daniel Lee, Kai H. Lim, and Kwok Kee Wei
Department of Information Systems
City University of Hong Kong
Hong Kong SAR, China
is.daniellee@student.cityu.edu.hk   iskl@cityu.edu.hk
isweikk@cityu.edu.hk

Abstract

The objective of this study is to examine why and under what situations certain information technology resources can generate positive organizational outcomes. To achieve this, we adopt the organizational capability perspective. Based on this perspective, IT can be viewed as a functional capability that forms high-level dynamic capability in the copresence of other functional capabilities and resources. A process-oriented view is used to examine how this capability-formation process happens inside organizations. For the high-level dynamic capability, we focus on organizational agility by considering the contemporary business environment. We propose a conceptual framework regarding the roles of IT capabilities in organizational agility building. In our framework, IT capabilities can create organizational agility through two paths: (1) capability building through process improvement or innovation and (2) capability creation through innovative adoption of new IT capabilities. As part of the framework development, we suggest a method to define organizational IT capabilities in multiple levels of analysis, which allows us to evaluate IT capabilities at the information systems strategy level as well as the functional technology level. The proposed conceptual framework serves as a theoretical foundation of further empirical studies.

Keywords: IT capability, organizational agility, dynamic capability, IT impacts, IT payoff, resource-based view, process-oriented view, capability building

Introduction

The organizational impact of information technology has been a key issue for both academicians and practitioners. However, there has been an ongoing controversy regarding IT impacts on organizational performance, generally known as the *productivity paradox* (Brynjolfsson 1993). To overcome this issue, some researchers suggested a multistage approach to examine mediating impacts before examining organizational outcomes (e.g., performance, productivity, innovation, etc.) when investigating the value of IT resources (Barua et al. 1995; Mukhopadhyay and Cooper 1993).

Within the stream of research investigating the mediating impacts of IT, some researchers focus on organizational capability (Sambamurthy et al. 2003; Wade and Hulland 2004) while others have highlighted IT impacts on business process (Davenport and Short 1990; Dedrick et al. 2003). We believe that each of these perspectives has its own merits. The former perspective has the benefit of clearly illustrating the nomological network of influence among organizational resources, capabilities, and outcomes (Sambamurthy et al. 2003; Yeoh and Roth 1999). The latter perspective can show how certain impacts happen by investigating the occurring processes (Soh and Markus 1995). Since business process is a vehicle to build and materialize organizational capabilities (Helfat and Peteraf 2003; Teece et al. 1997), we believe that by combining the two theoretical lenses, one obtains the benefits of both perspectives. However, studies that investigating IT impacts on business process and organizational capability together are scarce in the literature.

By considering the two perspectives together, this research aims to develop a new conceptual framework regarding the roles of IT in organizations, which explains how and why specific IT resources generate certain positive outcomes, such as organizational competitiveness and innovation. To achieve our research objectives, we define the following three main research questions:

(1) What are the mediating impacts of IT in contemporary organizations? Specifically, do IT impacts exist on business processes and organizational capabilities?

(2) How do the impacts occur? Specifically, how do IT factors interact with other factors to improve business processes and organizational capabilities?

(3) How can we classify organizational IT to investigate the interaction effects?

Theoretical Base

This research draws on the multi-theoretical tenets of the resource-based view, complementarity theory, process-oriented view, dynamic capability theories, and organizational agility. They are described in the following sections.

Resource-Based View and Complementarity Theory for Organizational IT

Under the resource-based view (RBV), organizational resources and capabilities are seen as the potential sources of organizational competences (Barney 1991). According to Wernerfelt (1984), an organization's success is dependent on its ability to capitalize on its strategic resources. From this point of view, the utilization and the integration of existing resources and capabilities have been considered as critical management issues to maximize organizational value (Teece et al. 1997). By applying this view to the IT value within an organization, many researchers have defined organizational IT assets as important resources or capabilities, which influence the organization's competitiveness (Bharadwaj 2000; Davenport and Short 1990; Sambamurthy et al. 2003).

While the early RBV studies tend to focus on the unique value of IT as scarce resources, the recent IT payoff studies take into account the copresence of other non-IT resources when they evaluate the positive impacts of IT (e.g., Barua and Mukhopadhyay 2000; Davern and Kauffman 2000; Wade and Hulland 2004). These studies are based on complementarity theory (Hitt and Brynjolfsson 1997). According to Milgrom and Roberts (1990), two activities (or factors) are complementary if performing one increases the benefits of performing the other. As the complementarities for IT resources, researchers have suggested many different organizational factors, such as incentive to use new systems (Barua and Mukhopadhyay 2000), human capital (Hitt and Brynjolfsson 1997), process reengineering (Devaraj and Kohli 2000), and senior leadership (Davern and Kauffman 2000). The studies under this stream have proposed to investigate the interactions between IT and its complementarities (Barua and Mukhopadhyay 2000).

Process-Oriented View for Organizational IT Impacts

While the resource-based view highlights the unique value of organizational IT, the process-oriented view (POV) focuses on IT use and IT impacts on business processes in order to explain an organization's competitiveness. This view has two important merits in explaining the roles of IT capabilities in organizations. First, by evaluating intermediate-level effects, the POV approach enables people to see the first-order impacts of IT instead of the aggregated impacts (Barua et al. 1995; Mooney et al. 1995; Soh and Markus 1995). The intermediate-level impacts include transformed business processes, enriched organizational intelligence, capacity utilization, dynamic organizational structure, new product, and improved product quality (e.g., Barua et al. 1995; Sambamurthy and Zmud 1994; Soh and Markus 1995). The second benefit is that it can explain how certain IT impacts occur by focusing on organizational process (e.g., Bharadwaj 2000; Grabowski and Lee 1993; Lucas 1993; Mooney et al. 1995). For example, Mooney et al. (1995) suggested automational, informational, and transformational changes on business processes as results of the utilization of organizational IT resources. Similarly, using POV, Davenport and Short (1990) illustrated how the use of IT can improve coordination and information access process. In addition to process improvement, process innovation or process redesign has been thought of as another type of IT impact on business processes (e.g., Davenport 1993; Keen 1991; Teo et al. 1997; Venkatraman 1994).

Besides the benefits, the POV approach has its inherent theoretical weaknesses. Since the POV approach tends to isolate a specific process from others to emphasize certain IT impacts on the process, it becomes difficult to explain interdependent processes (Barua and Mukhopadhyay 2000). In addition, as Barua and Mukhopadhyay pointed out, the linkage between IT impacts on business processes and organizational performance measures may be affected by other external factors.

Dynamic Capability View for Organizational Outcomes

In the literature, high-level organizational capabilities are believed to enable an organization to renew its competences by combining and assimilating internal and external resources (Teece et al. 1997) or operational-level capabilities (Helfat and Peteraf 2003). These high-level, combining capabilities are known as organizational dynamic capabilities (Eisenhardt and Martin 2000; Teece et al. 1997; Wade and Hulland 2004). According to Grant (1996) and Pisano (1994), organizational dynamic capabilities are the antecedents of organizational activities that alter the organizational resource base to generate new value-creating strategies. Moreover, since capability is considered as a intermediate-level effect to produce positive organizational outcomes (Amit and Schoemaker 1993), this organizational dynamic capability view (DCV) for IT payoff has the benefit of illustrating the nomological network of influence among organizational resources, capabilities, and outcomes (Sambamurthy et al. 2003; Yeoh and Roth 1999). However, by focusing on the strategic decision process for IT investment and IT utilization to build organizational capability (e.g., Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003; Teece et al. 1997), the DCV might have a theoretical weakness in explaining organizational capability building from general business processes, such as operational and management process (Mooney et al. 1995), even though these general processes are the actual activities combining IT resources and other resources.

In terms of the resource-combining nature of dynamic capabilities, some high-level capabilities can be considered as specific forms of dynamic capabilities, such as cross-functional capability (Grant 1991, 1996), combinative capability (Kogut and Zander 1992; Yeoh and Roth 1999), organizational learning capability (Cohen and Levinthal 1990; Tsai 2001), and organizational agility (Goldman et al. 1995; Sambamurthy et al. 2003). Among these, we focus on organizational agility when considering the keen competition of contemporary business environment (Brown and Eisenhardt 1997; Sambamurthy et al. 2003). Since agility is a dynamic capability to respond to unexpected change to create competitive market opportunities by assembling requisite assets, knowledge, and relationships (Goldman et al. 1995; Sambamurthy et al. 2003), it is a very important factor of contemporary organizations facing high pressure from their business environment (Brown and Eisenhardt 1997; Sambamurthy et al. 2003).

In addition to the importance of agility in the current business environment, there are two advantages when focusing on organizational agility for our conceptual framework. First, because it is an ability combining various resources and capabilities (Goldman et al. 1995; March 1991; Sambamurthy et al. 2003; Teece et al. 1997), it is a general capability that can be applied to different levels and tasks within an organization. Second, it is believed that an organization needs to utilize IT capabilities for agility building (Sambamurthy et al. 2003).

Conceptual Framework Development

The objective of this research is to develop a comprehensive conceptual framework by integrating different theoretical views, specifically the dynamic capability view and the process-oriented view.

Theoretical Distances between Capability View and Process View

Three theoretical issues arise when we integrate capability view and process-oriented view. First, each perspective may have a different focus and interest. Capability studies tend to focus on strategic decision processes (e.g., Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003; Teece et al. 1997). On the other hand, process-oriented studies emphasize the improvement or innovation of processes that are involved in business operations and management (e.g., Davenport 1993; Mooney et al. 1995). Second, each view focuses on different levels of analysis for organizational IT. To avoid the aggregation issue of IT impacts, POV suggests a specific application or technology level of investigation (e.g., Barua et al. 1995; Grover et al. 1998) while capability studies focus on integrated form of IT from a strategic resource perspective (e.g., Sambamurthy et al. 2003; Wade and Hulland 2004). Third, there are two different perspectives regarding the relationship between capability and process: (1) capability is built through process (Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003) and (2) capability characterizes and defines process (Eisenhardt and Martin 2000; Teece et al. 1997). In spite of the above issues between the two theoretical lenses, we believe that they can be combined in a manner such that each complements the other.

Supplementing Perspectives for Framework Development

In our proposed combinative framework, we adopt three theoretical perspectives. As will be illustrated below, through combining these three perspectives, our framework is able to address the three issues mentioned above. They are the hierarchical perspective of organizational capabilities and resources, the multilevel perspective for IT typologies, and the multipath perspective for organizational agility creation.

First, for the hierarchical perspective of organizational capabilities and resources, Grant's (1996) capability hierarchy theory was adopted to identify organizational IT and its impacts. According to this theory, some functional (low-level) capabilities, such as marketing capability and manufacturing capability, are combined to form cross-functional (high-level) capabilities, such as new product development capability. Likewise, specific resources can be thought of as lower-level sources of functional capabilities and cross-functional capabilities (Grant 1991, 1996). This theory provides a perspective to understand organizational IT as a functional capability to build organizational dynamic (high-level) capability. Based on this perspective, the building of organizational dynamic capability can be explained by the interactions between IT capabilities and other functional capabilities and resources (Barua and Mukhopadhyay 2000). Since the interactions are considered as IT use processes (Devaraj and Kohli 2003; Lucas 1993; Soh and Markus 1995), dynamic capability building (capability view) can be investigated through organizational operations and management processes that usually involve IT in contemporary business (process view). This perspective, therefore, addresses the first theoretical issue in the previous section.

To address the second theoretical issue between the capability view and the process view, a multilevel perspective is suggested for the analysis of organizational IT capabilities. The multiple levels refer to the functional technology level as low level (e.g., Barua et al. 1995) and the IS strategy level as high level (e.g., Sambamurthy et al. 2003). We provide a mechanism to link the different levels of analysis for IT capabilities. Through this perspective, not only can one analyze the values of specific IT capabilities at the organizational strategy level, but one can also investigate the interactions between IT capabilities and other factors at the IT component level to explain how a specific IT affects a specific business process.

Third, we propose a multipath perspective for organizational dynamic capability creation. To be more specific, we adopted Makadok's (2001) organizational rent creation mechanisms, capability building and resource picking. Based on this perspective, an organization can be thought to build its capability through business processes integrating IT capabilities and other functional capabilities and resources. In addition, the organization can create its capability by innovative adoption of new IT capabilities regardless of current business process. By taking into account these two paths for organizational dynamic capability creation, the two different perspectives regarding the relationship between capability and process in the previous section can be integrated in our conceptual framework without conflict.

The Research Constructs

We define four research constructs for our conceptual framework development. They are IT capabilities, other functional capabilities and resources, organizational agility, and organizational competitive outcomes. IT capabilities and other functional capabilities and resources are parts of the functional capabilities within an organization's capability hierarchy that we mentioned earlier (Grant 1996). Specifically, based on Bharadwaj's (2000) IT capability and Sambamurthy et al.'s (2003) digital options, IT capabilities can be defined as *organizational functional capabilities to support organizational activities and work processes by deploying IT-based resources in combination or copresence with other resources and capabilities*. The scope of IT, here, refers to organizational supportive technologies (e.g., office systems, CAD) rather than direct technologies (e.g., image processing technology for digital camera) that are embedded in organizational products and services (Schumann et al. 1994). Organizational agility is considered as an ability to respond to unexpected change to create competitive market opportunities by assembling requisite assets, knowledge, and relationships. Organizational competitive outcomes are the organizational-level outcomes of specific business processes to provide organizations competitive advantages (Atuahene-Gima 2003). These specific outcomes can be defined by the level and scope of research interests. Figure 1 shows our conceptual framework to explain the roles of IT in organizational agility building and in organizational outcome creation.

Multilevel Approach for Organizational IT Capabilities

To understand our conceptual framework in Figure 1, a clear picture of IT capabilities is required as a window to view the relationships among organizational resources, capabilities, and outcomes. Since process view and capability view each has its
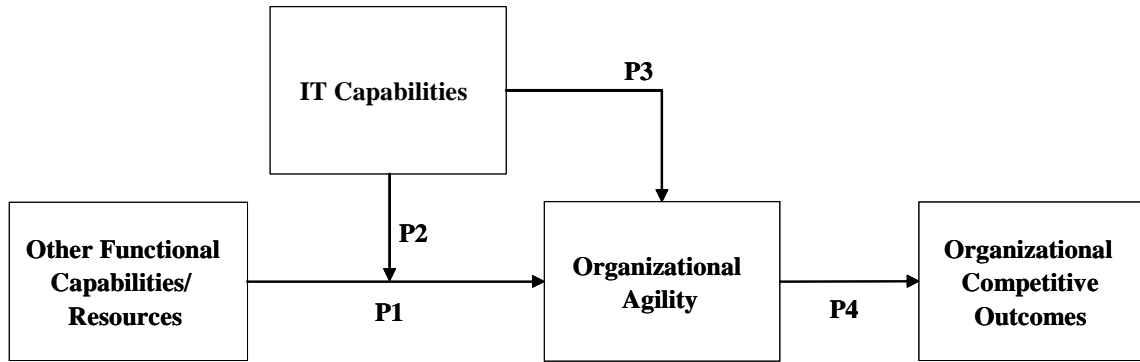
Figure 1. Conceptual Framework for the Role of IT in Organizations

own benefits by focusing on a different level of IT, we take into account the different levels of IT capability to complete our combinative framework so as to maximize the explanatory power of our model. To achieve this, we first need to clarify what the different levels of analysis are. We then propose a mechanism to combine these different levels.

Many typologies and classifications have been suggested to denote the IT-related capabilities in organizations (e.g., Davenport and Short 1990; Mulligan 2002; Nambisan 2003; Sambamurthy et al. 2003). We reviewed the existing organizational IT typologies from two different levels of analysis, low and high levels. The typologies at the low level of analysis tend to define IT capabilities based on technology or application features. At this level, IT capability can be examined in terms of how IT is used in business processes (Barua et al. 1995). We name this level the *functional technology* level. On the other hand, the typologies at the high level of analysis tend to classify IT capabilities based on their specific goals of business supports. IT capability typologies at this level can be seen as the result of strategic investments (Sambamurthy et al. 2003). We label this level the *IS strategy* level. Table 1 summarizes the characteristics of the two levels for IT capability analysis.

By investigating the functional technology level (low level), we expect to solve the aggregation issue of IT impacts (Barua et al. 1995). On the other hand, we need to consider the IS strategy level (high level) analysis in order to evaluate the business values that can be achieved from specific IT capabilities (Tallon et al. 2000). Table 2 shows some examples for each level.[1]

Table 1. The Two Levels of Analysis for IT Capability Typology

Level	Purpose	Pros	Cons
Functional Technology Level (Low-Level)	To define the functional abilities of specific IT components, based on their technology features	• Distinctive impacts of technology components on organizational process with detail explanation of their use processes • No aggregation issue • Generalization of specific IT's influence	Difficult to explain the value of IT at business level
IS Strategy Level (High-Level)	To define the combinative abilities of organizational IT, supporting specific business goals	• Investigation of the strategic value of IT in business supports • Managerial perspective • Context-based value of specific IT	Difficult to analyze the process effect of specific IT

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[1]The categorization was done by comparing the definitions and purposes of existing typologies with the definitions of two analysis levels in Table 1.

Table 2. The Existing Typologies for Organizational IT Capabilities

Level	Perspective	Components
Functional Technology Level	IT Capabilities for Process Redesign	Transactional, geographical, automational, analytical, informational, sequential, knowledge management, tracking, disintermediation (Davenport and Short 1990)
	Technological Capability	Application development, communication technology, database and security, technical support services, Web technology (Born 2002)
	IT Infusion in NPD	Process Management, project management, information/knowledge management, collaboration and communication (Nambisan 2003)
	Capability-based IT Classification	Integration (intra- and interdepartmental), scale (transaction flow and storage), technology focus (production, work flow, management and communication), accessibility (owners, participants and open) (Mulligan 2002)
IS Strategy Level	Business Design	Competitive positioning, geographic positioning, redesigning organization, redeploying human capital (Keen 1991)
	IT Business Value	Customer relations, Supplier relations, sales and marketing support, production and operations, product and service enhancement, process planning and support (Tallon et al. 2000)
	Digital Options	Digitized Process Capital (Process Reach and Richness) and Digitized Knowledge Capital (Knowledge Reach and Richness) (Sambamurthy et al. 2003)
	IT for Organizational Design	Value innovation, knowledge work leverage, IT-enabled business platform, operational excellence, value-chain extension, solutions delivery (Sambamurthy and Zmud 2000)

From the existing typologies, as shown in Table 2, we highlight the typology of Davenport and Short (1990) and the typology of Sambamurthy et al. (2003), for the low level and for the high level, respectively. Whereas Davenport and Short classified IT capabilities in the functional technology level to show specific IT impacts on business process redesign, Sambamurthy et al. classified IT capabilities from the strategic resource perspective, namely process capital and knowledge capital, to denote the organization's strategic IT investments.

Even though the two typologies have different purposes and scopes of consideration, they can be examined at the same time when evaluating IT impacts on business. By matching the low-level IT capabilities to the high-level IT capabilities based on their definitions and example applications, a multilevel typology of IT capabilities can be defined. For example, Davenport and Short's automational, geographical, disintermediation, and sequential capabilities may correspond to Sambamurthy et al.'s digitized process reach, because the digitized process reach refers to the ability of firm's deployment of integrated IT-enabled process across different units. Similarly, Davenport and Short's transactional, analytical, informational and tracking capabilities may equivalent to Sambamurthy et al.'s digitized process richness, because digitized process richness refers to the quality of information over process and the transparency of that information to other processes and systems. Therefore, by combining the IT capabilities at the functional technology and IS strategy levels, the roles of IT capabilities can be investigated and interpreted at the strategic management level with high-level typology as well a detailed, operational-process level.

Research Propositions

As a starting point of our combinative view, the RBV provides our understanding of organizational IT as a firm-specific strategic resource to produce organizational outcomes. To supplement the limitation of the early RBV studies, which isolate IT resources from other organizational resources when investigating IT impacts (Barua and Mukhopadhyay 2000), we adopt the complementarity perspective that provides the insights to consider other organizational factors together with IT to show why certain IT impacts occur (e.g., Davern and Kauffman 2000; Wade and Hulland 2004). However, taking other factors into account may not be sufficient to explain the payoff of certain IT capabilities (Devaraj and Kohli 2003). To address this, some researchers suggested investigating the actual utilizations of specific technologies instead of the aggregated examination of IT and non-IT

factors (Devaraj and Kohli 2003; Grover et al. 1998). Furthermore, the appropriate use of IT (Lucas 1993; Soh and Markus 1995) and the strategic fit between IT and other organizational factors (Grabowski and Lee 1993) have been thought as important necessary conditions of organizational IT payoff. Therefore, an IT resource that is not properly utilized in conjunction with other functional capabilities and resources may not create any real value. This is because the integration occurs through the business process and IT capabilities are not likely to have uniform effectiveness across all business processes (Barua et al. 1995); specific IT capabilities can only be realized when they are applied to specific business processes. These arguments are formulated as proposition 1.

> **P1. *The potential capability of a certain IT resource can only be transformed into real capability when the specific IT capability is properly utilized in conjunction with specific business processes that involve other functional capabilities/resources.***

However, the appropriate application of IT may not be sufficient to explain what the direct outcomes are and how these outcomes happen. As POV suggests, some mediating-level impacts need to be examined regarding IT payoff (Barua et al. 1995; Soh and Markus 1995). There are two competing perspectives for the first-order effect of organizational IT capabilities: IT impacts on business process and organizational high-level capability. The former perspective highlights business process improvement (Davenport and Short 1990; Dedrick et al. 2003; Mooney et al. 1995) or process innovation (Davenport 1993; Venkatraman 1994) as a result of appropriate application of specific IT capabilities to organizational processes. The latter perspective emphasizes organizational dynamic capabilities, such as organizational agility, as the outcomes of capability building process (Sambamurthy et al. 2003).

Since organizational capability is built through organizational process (Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003) and business process is a vehicle to build and materialize organizational capabilities (Helfat and Peteraf 2003; Teece et al. 1997), business process and organizational capability have a very close relationship. From this, we believe that one can both get the benefits and solve the weaknesses from combining the two theoretical lenses. The process-oriented view and dynamic capability view can supplement each other by seeing IT impacts on business process as the organizational agility building process. Therefore, the role of organizational IT capabilities can be explained in terms of organizational capability building through the interactions between IT capabilities and other functional capabilities and resources, which result in business process improvement or innovation.

From the interacting relationship between IT factors and other factors, we can define the moderating roles of IT capabilities in business processes because the business processes of companies that have proper IT supports are different from companies that do not (Barua et al. 1995). Proposition 2 is established based on the moderating roles of IT capabilities.

> **P2. *Organizational IT capabilities moderate the relationship between other functional capabilities and resources and organizational agility through business process improvement or process innovation.***

There have been two different perspectives regarding the causal relationship between capability and process. Some researchers highlight the role of process to build organizational capability (Barua and Mukhopadhyay 2000; Sambamurthy et al. 2003) while others highlight the role of organizational capability to characterize and define business process (Eisenhardt and Martin 2000; Teece et al. 1997). Specifically, the second perspective can denote another way of organizational capability creation regardless of IT impacts on business process. Based on the second perspective, we argue that organizational agility can be created by strategic adoption of IT capabilities without the preceding process enhancement or innovation.

Makadok (2001) suggests two mechanisms, namely capability building and resource-picking, through which an organization can generate additional business values. The capability building mechanism is the organizational process by which resources are deployed more effectively than rivals to create organizational economic rent. This mechanism has been explained in the development of P2. The other mechanism to create organizational rent is by strategically selecting resources that can give additional value to the organization. We adopt this view for the cases where innovative adoption of specific IT capabilities radically creates organizational agility (e.g., Damanpour 1991). For this additional path of organizational agility creation, proposition 3 is formulated.

> **P3. *Innovative adoptions of new IT capabilities with strategic goals can directly enhance organizational agility, even without process improvement or process innovation.***
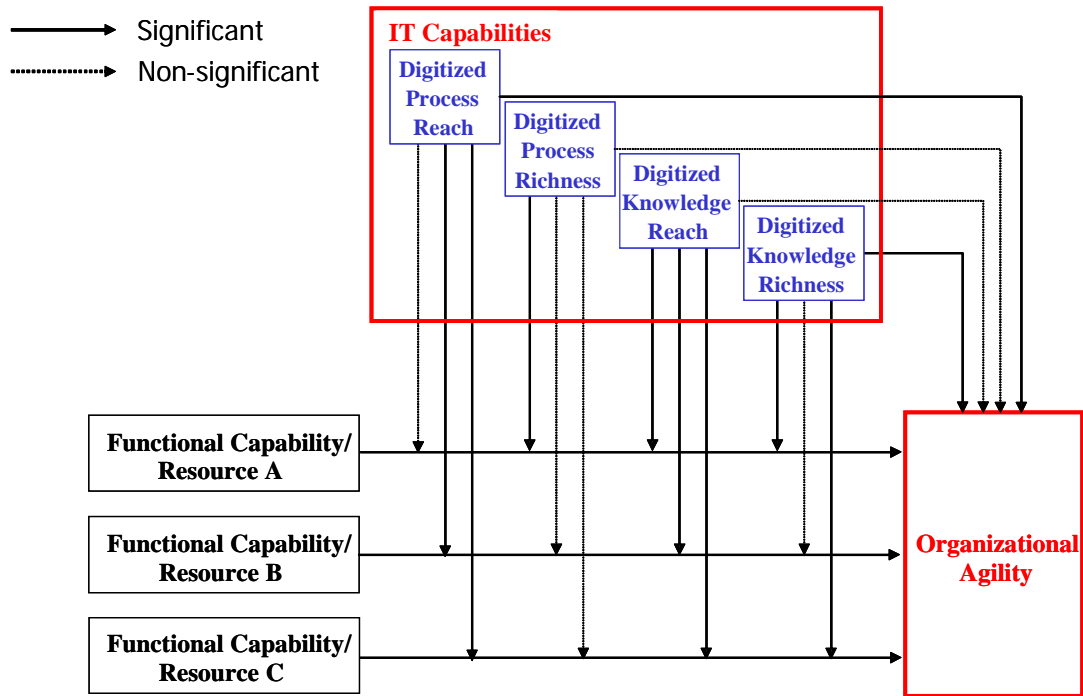
Figure 2. Application of High-Level IT Capabilities to Conceptual Framework

Figure 2 shows the above propositions (1, 2, and 3) in a graphical manner based on Sambamurthy et al.'s concept of digital options for high level IT capability typology. The figure illustrates that some specific IT capabilities have significant moderating effects on specific relationships between other functional capabilities and resources and organizational agility (solid lines in Figure 2) while others do not (dotted lines in Figure 2). In addition, some innovative adoption of specific IT capabilities can have direct effects on organizational agility.

Our last proposition is related to organizational outcome production as a result of IT-enabled organizational capability creation. This represents the direct effects of organizational agility on certain organizational outcomes. Organizational innovation has been recognized as the significant result of organizational dynamic, combining capability (Grant 1996; Kogut and Zander 1992; Sambamurthy et al. 2003). Similarly, organizational agility, as a high-level dynamic capability, is believed to lead to certain organizational outcomes, such as a firm's competitive actions (Sambamurthy et al. 2003), new opportunities, and a source of differentiation in a firm's performance (Kogut and Zander 1992), innovation (Hage 1998), new product development (Atuahene-Gima 2003), etc. Proposition 4 is thus generated.

> **P4. IT-enabled organizational agility will generate competitive organizational outcomes.**

Evidence from Existing Studies

Our conceptual framework can be illustrated briefly by some evidence in the literature. The first potential evidence is Baxter Healthcare's ASAP system (Venkatraman and Short 1992). As an automatic purchasing system based on tracking customer's inventory, this system has automational, geographical, disintermediation, analytical, and tracking capabilities. At the IS strategy level, ASAP can be classified as having digitized process reach and digitized process richness capabilities. This system is believed to increase organizational competitiveness by enhancing Baxter's dynamic capability to manage customer order, needs, and inventory, namely customer agility.[2] This capability was enhanced through the improvement and redesign of the ordering and

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[2]Sambamurthy et al. (2003) define customer agility as organizational ability to leverage the voice of the customer for gaining market intelligence and detecting competitive action opportunities.

procurement process (Teo et al. 1997; Venkatraman and Short 1992). Therefore, the relationship between the company's customer-base resource and organizational customer agility can be interpreted as reinforced by IT capabilities (moderating effect). Moreover, by continuing system capability enhancements including network connection for document management with vendors (e.g., EDI), ASAP is believed to enhance partnering agility[3] through vendor management process redesign (moderating effect). At the same time, the IT capabilities of the ASAP system are believed to increase the organizational capability regardless of the existing business process (direct effect) by enabling the company to generate new business value from a new business area, material management consultation (Teo et al. 1997; Venkatraman 1994).

American Airline's SABRE is another case that provides support to the direct and the moderating effects of IT capabilities in our model. As a ticket reservation system that is operated through a network, SABRE can be classified as having digitized process reach capability at the IS strategy level and having automational, geographical, and disintermediation capabilities at the functional technology level. It is believed that this system increased organizational dynamic capability to respond to market situations, namely organizational agility, by redesigning the customer management process (Hopper 1990; Teo et al. 1997). In this case, American Airline's flight service quality can be interpreted as moderated by new IT capabilities to build the organizational agility (moderating effect). Moreover, since SABRE created new revenue sources by collecting fees from other companies, this system is believed to enhance organizational agility with financial flexibility (direct effect).

As another example, we can find theoretical and empirical support from the product development area. The cross-functional team has been considered to be an important factor in the product development process (Brown and Eisenhardt 1995). According to Atuahene-Gima (2003), it is thought to be an important antecedent for organizational problem solving capability, which leads successful product development. Problem solving capability can be thought of as a dynamic capability to exploit existing resources (Cohen and Levinthal 1990). The established relationship between the cross-functional team and organizational problem solving capability can be enhanced by IT capabilities such as process management, schedule management, knowledge management, and collaboration and communication capability (moderating effect) (Nambisan 2003). These low-level capabilities are thought of as parts of digitized knowledge reach,[4] digitized knowledge richness,[5] and digitized process reach capabilities at the IS strategy level. However, digitized process richness does not seem to have an effect on this process (nonuniform effect). Knowledge creation capability is related to organization's exploration and exploitation capabilities that form organizational agility (March 1991; Sambamurthy et al. 2003). Hence apart from the moderating effect, digitized knowledge reach (e.g., data mining system) is believed to also directly increase organizational agility (direct effect) (Alavi and Leidner 2001).

Discussion and Conclusion

Overall, we have extended the literature in four significant ways. First, we have proposed a theoretical framework combining resource view, process view, and capability view to explain the role of organizational IT. The existing issues among the different views (different type of process, different level of IT analysis, and different perspective for the relationship between capability and process) have been solved through our supplementing perspectives (capability hierarchy perspective, multilevel perspective for IT capability definition, and multipath perspective for agility creation). From our combinative view, the nomological network among diverse organizational factors can be illustrated clearly to show the roles of IT capabilities in organizational outcome creation. At the same time, our combinative view can explain how these processes happen. Second, we have delineated the different levels of organizational capabilities to explain the roles of IT resources in organizations. Based on the capability hierarchy perspective, our research framework suggests an additional support for the resource-based view and the complementarity perspective by not isolating IT capabilities from other functional capabilities and resources. Moreover, the capability hierarchy perspective supplements the existing organizational dynamic capability theories. Third, we have provided a possibility to combine the different levels of analysis for IT capabilities so that one can investigate the value of IT capabilities at the organizational IS strategy level as well as at the functional technology level to examine their interactions with other functional capabilities and resources. Fourth, by applying an organizational rent creation mechanism to our conceptual framework, we have illustrated the

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[3]Sambamurthy et al. (2003) define partnering agility as organizational ability to leverage the assets, knowledge, and competencies of business partners, such as suppliers, distributors, etc., through alliances, partnerships, and joint ventures.

[4]According to Sambamurthy et al. (2003), digitized knowledge reach refers to the quality and accessibility of organizational knowledge codified in the organizational knowledge base and networked systems.

[5]According to Sambamurthy et al. (2003), digitized knowledge richness refers to the interaction capability of organizational IT to enable organizational members to share and develop their knowledge which cannot be easily codified.

multipath to create organizational agility. This multipath perspective could provide a theoretical base to understand why the different causal relationships exist between capabilities and processes. We believe that this conceptual framework can be applied to a specific business unit or business process in different organizations for further empirical studies.

As a conceptual research in an organizational context, this research has some potential theoretical and practical limitations. First of all, organizations may have the capability to learn capabilities (Winter 2000). However, in order to focus more on the roles of IT regarding organizational capability, our research framework does not include the self-learning or feedback loop between capabilities and outcomes. Another issue is the dynamic nature of IT capability. Although we highlighted previous typologies for high and low levels, IT typologies need to be extended as organizations have adopted new technologies. In future studies, each level of organizational IT capabilities need to be defined through the review of contemporary technologies, and matching between the different levels of IT capabilities needs to be provided for the empirical application of our conceptual framework to specific organizational areas.

In spite of the limitations of this research, we believe that our research can be extended in many ways under different organizational contexts such as tasks in traditional industries (e.g., product development, production) and some recently emerging business processes (e.g., knowledge management, e-business). As Grant (1991) pointed out, for example, product development capability can be defined as a cross-functional capability involving many other functional capabilities and resources. Successful new product development will be an outcome of this high-level dynamic capability (Kimberly 1986). If we apply our conceptual framework to the product development process, we can explain how an organization increases its agility for new product development by utilizing IT capabilities. Similarly, by applying our conceptual framework to various organizational processes of different business units, the degrees of specific organizational agilities or dynamic capabilities in the units can be explained as the impacts of organizational IT.

Acknowledgement

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