



Does Organizational Structure Influence IT Investment and its Effects on Operational Capability?

Taeuk Kang¹, Hui-chuan Chen², Jonghak Sun³

¹The University of Tennessee at Martin, 7 Business Administration, Martin, TN 38238.

²The University of Tennessee at Martin, 18 Business Administration, Martin, TN 38238.

³Weber State University, 3802 University Circle, Ogden, UT 84408.

Abstract

The effects of IT (Information Technology) have been examined extensively through various theoretical foundations and distinct disciplines. Most of these studies suggest that IS (Information Systems) plays a critical role in operational activities and performance, whereas IT facilitates a firm's capability to deal with large amounts of information within and between organizations. It has been widely believed that IT enables an organization to improve its information capability, which in turn, enhances its operational efficiency and effectiveness. Prior research has assessed the effects of IT on operational performance. In order to provide an overview of how IT effects improve operational performance, we reviewed prior studies within the field of operations management including organizational factors such as organizational structure (centralization vs. decentralization) and business process. However, few studies have focused on the role of organizational structure in the relationship between IT investment and operational performance. Since organizational structure has been recognized as one of the key factors affecting operational improvement, this present research seeks to explore how organizational structure influences the relationship of IT investment on operational performance throughout IT capability at the organizational level.

Keywords: IT Investment; IT Capability; Operational Capability; Organizational Structure.

1. Introduction

As IS/IT evolves as a critical resource in improving operational performance, many scholars and practitioners have shown increasing interest in IT effects on firm performance. Previous studies have found that IT investment has a positive effect on firm performance; for instance, Bharadwaj et al. (1999) measured firms' tangible and intangible values through Tobin's q, showing that IT investment positively affects firm performance. Similarly, existing literature reveals that the use of IT could help firms improve performance in various aspects by improving product quality and customer service (Quinn and Baily, 1994; Jayaram et al., 2000), managing knowledge assets more effectively (Quinn, 1992), and creating synergy effects through information sharing within and between organizations (Ives et al., 1993). From these findings, IT has been viewed as one of the critical drivers providing potential competitive advantages to firms, especially when firms develop "specific and rare" managerial IT skills (Mata et al., 1995). Effective IT usage encourages firms to have better information sharing across different functional departments and helps efficiently coordinate business operations within and between firms. Such perceived usage leads IT in business settings to become a solution for a firm's information sharing deficiencies (Fawcett et al. 2007). In addition, such improved knowledge-sharing allows firms to effectively deal with rapidly changing external environments (Chien and Tsai, 2012). The effects of IT have been summarized as follows: shared information, implementation of routine processing, allowance of exploitation of opportunities for synergic effect, and rapid identification and development of important applications (Reed and Defillipi, 1990). IT investment is likely to lead to improvement in a firm's capability of managing IT resources such as IT infrastructure, IT skills and processes, etc. This improved IT capability assists a firm to enhance its operational activities such as lead-time, production costs, and customer service, by facilitating information flow in a timely, accurate and comprehensive manner.

However, investment in IT itself does not generate IT capability and operational capability. Other organizational resources can be complemented to maximize the effects of IT investment (Jayaram et al., 2000; Kim et al., 2006). In addition, organizational structure affects the performance of knowledge management differently (Pertusa-Ortega et al., 2010) since organizational structure affects the quality and speed of information sharing across an organization. Dewitt and Jones (2001) note that IT often diminishes any negative effects resulting from centralization and decentralization representing the extent to whether decision making authorization is dispersed or not.

The main purpose of this present study is to conceptualize how the IT resource affects operational performance throughout IT capability and organizational structure. To achieve this, we propose the following questions: (a) How does IT investment affect IT capability? (b) Does IT capability affect operational capability, and (c) How do organizational structures affect the relationship from IT investment to operational capability? Although IT as a competitive resource diminishes any possible negative effects from different organizational structures, very few studies have determined the relationship among IT investment and operational performance via both IT capability and organizational structure. As a firm establishes its unique organizational structure in order to respond to changing markets, it needs to know whether IT investment is economically viable to improve operational performance. Thus, this present study contributes to understanding the relationship between the IT resource and operational performance.

2. Research Background

2.1. IT Investment and IT Capability

Information Technology (IT) provides more information and helps to control and monitor remote information while allowing decision makers to achieve better output in a holistic perspective (Malone and Team, 2013). Firms showing better performance tend to focus more on accuracy, timeless, availability, sharing of information, and internal connectivity by using IT from available information (Closs et al. 1997). Furthermore, the use of IT helps to improve efficiency of firm's decision-making and the effective implementation of strategies pursued by the firm (Benitez-Amado and Walczuch, 2012). The use of IT encourages collaboration between the focal company and its partners along with improved connectivity and visibility (Lai et al., 2008). These effects on IT investment include reduced costs, improved quality, higher customer satisfaction, increased flexibility, and higher productivity. These positive outcomes allow companies to have higher financial performance (Harris and Katz, 1991; Weill and Olson, 1989; Byrd & Marshall, 1997).

However, investment in IT does not always lead to improved performance. Melville et al. (2004) maintain that although IT is a valuable resource, its effects depend on internal and external factors of the focal company. For example, the manner in which the company possesses complementary resources and the relationship between the focal company and its partners in the macro environments must be considered. Over-investment in IT may lead to some problems such as resource waste causing the shortage of resources for innovative changes (Weill et al. 2002). Obviously, merely investing in IT resources does not contribute to the improvement of a firm's performance since other firms may easily obtain the same IT resources; as such, this does not give a firm a competitive advantage (Powell and Dent-Micallef, 1997). Regarding the effects of IT resources on firm performance, many scholars note that for the effects of IT resource to be shown, other resources must be supported as Coronado et al. (2004) argue. In fact, the relationship between IT investment and a firm's performance depends on how wisely the firm invests in supportive resources (Dos santos et al. 1993; Powell and Dent-Micallef, 1997; Coronado et al. 2004). One study (Karimi et al., 2007) showed that other resources such as knowledge resource should be mutually supported, although the IT resource is required for performance improvement throughout ERP implementation. In a similar vein, Lai et al. (2007) noted that the overall strategy of the focal company needs to be aligned with an IT strategy for a company to have positive results from IT investment.

IT capability has been considered as a competitive resource, which refers to the firm's ability to effectively assemble, integrate, and deploy IT related resources (Bharadwaj, 2000). Furthermore, IT capability can support and improve the business strategies and work processes of firms by obtaining, organizing, combining, and reconfiguring IT resources (Mithas et al. 2011). Lu and Ramamurthy (2011) conceptualized three different dimensions of IT capabilities: IT infrastructure capability, IT business spanning capability, and IT proactive stance. Specifically, IT infrastructure capability is the firm's ability to share and manage data, services, network, and applications. IT business spanning capability is the firm's ability to maintain and advance business objective by foreseeing and exploiting IT resources. Lastly, IT proactive stance is the firm's ability to develop IT innovation and seek new opportunities to enhance IT effectiveness. The authors further stated that IT capability provides a joint effect on spending resources regarding operational adjustment agility. In other words, more IT spending or investment on operational agility typically enhances and fosters IT capabilities. The study of Lai et al. (2008) shows that IT capability in third party logistics (3PL) plays a mediating role between a strategic focus on technological orientation and positive performance, including cost reduction and the improvement of quality in service quality and service variety to 3PL users. The capability of IT to leverage resources can contribute to superior performance by playing a mediator role between IT resources and performance (Santhanam and Hartono, 2003; Benitez-Amado and Walczuch, 2012). Similarly, Lu and Ramamurthy (2011) argue that

investment in IT may hinder organizational performance and that IT capability requires support in order to avoid such negative effects. They argued that significant investment in IT may not necessarily improve agility, especially when such investments are not focused on fostering and increasing the IT capability. However, their research reveals that wise IT investment successfully improves and strengthens critical IT capabilities. Thus, we propose:

H-1: A positive relationship exists between IT investment and IT capability.

2.2. IT Capability and Operational Capability

Information technology capability and IT infrastructure support other capabilities required for firm performance to improve without directly affecting a firm's performance (Zhao et al. 2001; Liu et al., 2013). Operational capability is "the integration and coordination of a complex set of tasks" (Dutta et al., 1999), involving "the ability to use inputs and resources such as raw materials, labor, and technology efficiency in generating products and services" (Ahmed et al., 2014). Firms with higher operational capability have the ability to effectively execute various tasks to perform operational activities in an efficient manner (Liu et al., 2013); furthermore, capability including flexible IT infrastructure and IT assimilation positively affects a firm's absorptive capacity which is the ability to recognize new external knowledge and assimilate and commercialize it. IT capability plays a role to shape higher capability such as operational capability and absorptive capacity (Rai et al., 2006; Liu et al., 2013). Kim (2006) studied the supply chain operational capability's emphasis on sourcing products, capacity planning, demand management, distribution, and delivery; in fact, these are the key business processes that support producing products or services. As such, a firm must develop an adequate operational capability for each process within its supply chain in order to be competitive. In addition, operational capability helps different business processes to efficiently cope with changing market demand and improve the effectiveness of processes within a firm and across firms (Cepeda and Vera, 2007). Thus, firms with better operational capability achieve improved performance through cost efficiency, quality and timeliness via the conversion of inputs to outputs.

Timely information sharing among business units leads to efficient decision-making and short lead-times (Devaraj et al. 2007) by allowing firms to have better customer-focused performance, such as response to customer demands (Zhao et al., 2001). Information management with accurate and timely information sharing plays a critical role for management in firm performance, customer relationships, and overall processes (Mithas et al. 2011). In order to improve operational performance, both proper measurement and information capabilities are needed to effectively correspond with a firm's strategic intention (Fawcett et al. 1997).

Firms' IT capability positively affects both internal and external collaboration, which facilitates information sharing (Sanders and Premus, 2005). Therefore, improving IT capability by enhancing information technology facilitates operational capability via integration with supply chain partners; moreover, firms can obtain timely information throughout such integration. Hence, a well-established IT capability can facilitate the business processes of operational capability by integrating supply chain coordination among suppliers and customers.

In addition, IT capability allows information obtained from various sources to be effectively and efficiently handled, thus allowing firms to enhance organizational agility (Coronado et al. 2004; Lu and Ramamurthy, 2011). Occasionally, IT investment may interrupt the improvement of flexibility. Typically, this is due to the lack of slack caused by difficulties in switching to another supplier due to transaction cost economy. However, integration with supplier's information system is a key driver for better agility when both partners can efficiently handle market demand (White et al. 2005). This perspective of integrating supplier's information systems to improve agility is a form of operational capability associated with sufficient IT capability. In addition, Hsu et al. (2008) argue that information sharing capability with suppliers positively affects the relationship with suppliers leading to better performance. Thus, we propose:

H2: There is a Positive Relationship between IT capability and Operational Capability.

2.3. Organizational Structure from IT Investment to Operational Capability

One of the main reasons for selection of organizational structure would be a suitable market condition. Traditionally, the organizational structure can be classified as having either centralized or decentralized structure. The strategic focus of a firm with centralized structure involves cost minimization by maximizing process efficiency; conversely, a firm with decentralized structure concentrates on higher flexibility in order to maximize the responsiveness to the demand of local market (Bowersox and Daugherty, 1995). Compared to a firm with decentralized structure, a centralized-structured firm has fewer managers and these managers have most of the decision-making authority. In an early study, Sah and Stiglitz (1991) stated that highly capable decision-makers provide greater beneficial effects in a more centralized organization due to the steady-state quality of managers. In a stable market in which local demands are relatively stable, firms may prefer centralized structure due to the ease of management control. Nevertheless, as a market becomes volatile, firms typically prefer a decentralized structure to obtain better organizational flexibility which is required to effectively respond the demand of local market. Siggelkow and Levinthal (2003) provided some examples of firms using centralized efforts in which the company combines its e-commerce business seamlessly into the existing information technology.

For example, Dell and The Gap utilized existing infrastructure to develop online distribution channels which appear to be one centralized service within its organization.

The extent to which a firm has exclusive knowledge about particular markets affects the decision of organizational structure. In the case of centralized structure, few managers control all decision-making processes; moreover, those managers may have limited or incorrect information for local markets due to limited information-processing capabilities. As such, a limiting effect of decision-making may occur as costs to handle received information increases. On the other hand, if knowledge of the local market is sufficiently accurate in a volatile market with the varying demands of local markets, a decentralized structure may lead to better performance compared to a centralized structure (Anand and Mendelson, 1997).

Organizational structure depends on information costs. When more specific knowledge or information is costly to transfer among agents, firms often utilize decision-making in a decentralized format. Moreover, Malone and Team (2013) argue that as the costs of information decrease over time, the organizational structure changes from centralized to decentralized structure. Under a decentralized structure, each agency might have its own objective which differs from the firm's objective, thereby causing agency problem. As information costs have decreased, however, the differences in objectives between each agency and the firm is reduced. Thus, business units with decentralized structures are able to share necessary knowledge with others without the "agency problem." In addition, when information is not easily verified by other agencies, a decentralized structure is appropriate since such information is difficult to accurately transfer to other partners (Stein, 2002).

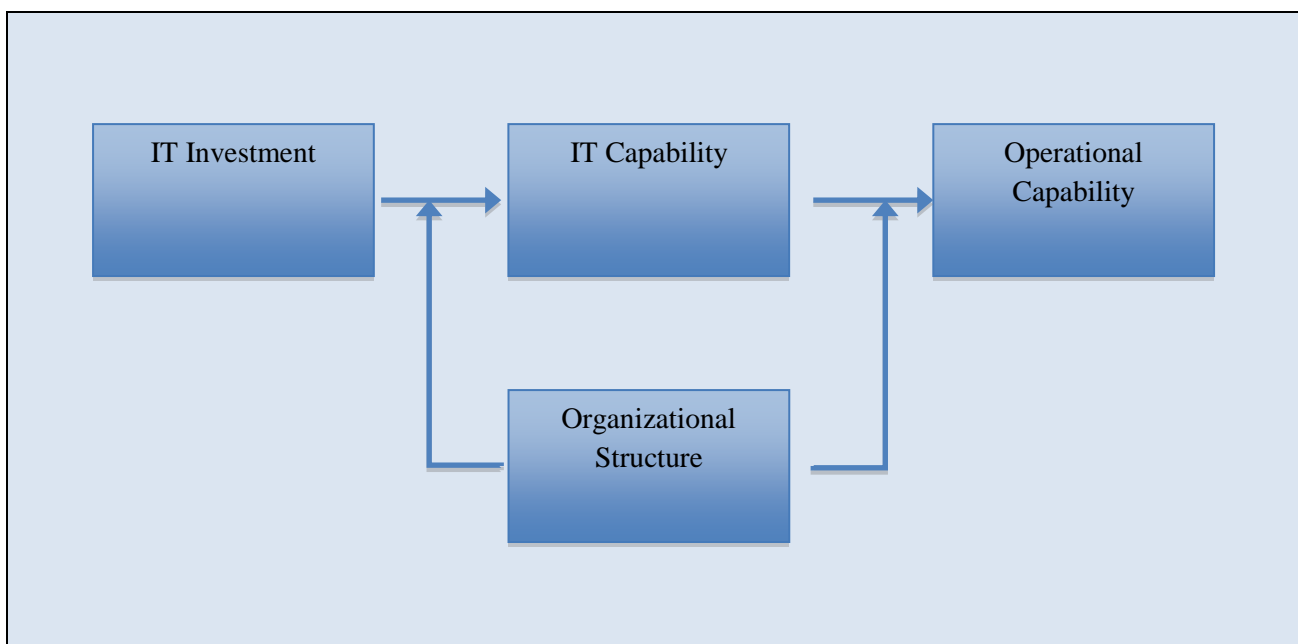
Both centralized and decentralized organizational structures have dual impacts on information processing (Anand and Mendelson, 1997; Malone and Team, 2013). Centralized structure contributes to the integration of diverse kinds of information to be effective, whereas individual decision-makers may have difficulties assimilating local information. Also, as a centralized structure requires stringent decision-making authority, business units may have less autonomy resulting in motivation to seek better solutions. As such, business units may not be interested in information sharing with other units (Tsai, 2002) in the centralization structured environment.

On the other hand, a decentralized structure gives local decision-makers autonomy for better motivation and responsibility, thereby facilitating the sharing of information for the achievement of better solutions. Thus, local and changing demand can be effectively met, although the agency problem among decision makers may exist. Some studies, including Schraagen et al. (2010) and Tsai (2002), show that business units with a decentralized structure have benefits in information sharing rather than ones based on a centralized structure. Thus, we propose:

H-3a: As an organizational structure becomes centralized, the positive relationship between IT investment and IT capability becomes weaker.

H-3b: As an organizational structure becomes centralized, the positive relationship between IT investment and Operational capability becomes weaker.

Figure 1: Conceptual Model



These propositions are presented in Figure 1. As mentioned above, investment in IT alone does not impact the firm's performance. The result of investment in IT is dependent on how effectively a firm uses obtained information. In such settings, IT capability plays a critical role in the effective and efficient use of obtained information. Specifically, a firm's structure affects how well information is shared with other business units. Such processes from IT investment to IT capability through a firm's structure affects its operational capability by wisely managing information and improving processes among business units.

3. Discussions and Conclusions

Regarding IT, extensive research has been conducted as firms have invested substantially in the implementation of advanced IT. The purpose of this study is to understand how IT investment can improve operational capability as one of the key factors to measure a firm's performance. By assessing the relationship between IT investment and operational capability throughout IT capability, we attempt to argue that firm's structure may impact the effect of IT on operational capability.

Rabinovich et al. (2003) argue that firms need to use efficient and effective operational processes (i.e., Just-in-time) rather than solely relying on information system technology such as ERP. This may imply that information system infrastructure and IT capability are supportive resources to produce other resources such as operational capability for improved firm performance. Chen and Huang (2007) found that a firm's structure is one of the ways to establish the firm's climate of favorable social interaction, thereby resulting in the improvement of knowledge sharing. The improvement of informational capability and operational capability depends on how well a firm maintains its knowledge resources by offering a favorable climate within a firm.

In this article, we argue that IT investment does not directly affect the improvement of operational capability. For operational capability to be improved, firms must possess better IT capability thereby enhancing the use of obtained. Also, a firm's structure affects the process from IT investment to operational capability. As a firm's structure become centralized, the necessary control among business units is facilitated. However, a centralized structure negatively affects information sharing and the improvement of knowledge.

Our propositions have some limitations. As mentioned earlier, the market condition is a key factor affecting the decisions regarding a firm's structure. Thus, stable vs. volatile market conditions would affect the propositions in this paper in various ways. Also, a firm's culture can be one of the key factors affecting the management of information which affects knowledge sharing (Chen and Huang, 2007).

For a firm to justify investment in IT and maximize the effect, it is essential to assess how investment in IT affects the firm's performance. This research contributes to understanding the process from investment in IT to operational capability. Furthermore, firm's structure has been confirmed as one of the key factors influencing the effects of IT investment on operational capability.

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Authors' information

Taek Kang, Ph.D. :- Taek Kang is an assistant professor of The University of Tennessee at Martin and earned his Ph.D. degree from The University of Texas at Arlington. His research interests include Remanufacturing, Corporate Social Responsibility, and Supply chain Management.

Hui-chuan Chen, Ph.D. :- Hus-chuan Chen is an assistant professor of The University of Tennessee at Martin and earned her Ph.D. degree from The University of Texas at Arlington. Her research interests include Information Systems, Operational Efficiency, Health Care Management, and Big Data Analysis.

Jonghak Sun, Ph.D. :- Jonghak Sun is a visiting scholar of Weber State University and earned his Ph.D. degree from the University of Texas, Arlington. His current research interests include IS Strategy, E-business, and the impact of IS at the firm level and individual level.