IS Portfolio Characteristics and SCM Capabilities

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Abstract
Since the specific mechanisms of investing in IT to improve firm performance remain open research questions, this study, on the basis of the resource-based view (RBV) and dynamic capabilities (DV), aims to investigate the following research questions: (1) How are IS portfolios associated with SCM capabilities in improving manufacturing performance? (2) Do certain IS portfolios with any characteristics particularly fit with certain SCM capabilities? This study expects to contribute to the existing literature and practice by providing more comprehensive understanding of the linkages between IT investment, especially at the portfolio level of IS applications, and manufacturing performance, specifically in the focus of critical SCM capabilities.

Keywords
IS portfolio, IT investment, SCM, the resource-based view (RBV), dynamic capabilities (DV)

Introduction
For decades, the specific mechanisms of investing in IT to improve firm performance remain open research questions. In prior literature, streams of research attempted to address such questions from various aspects. In recent years, although their research results might still slightly vary with different research themes, considerable studies coincidentally indicate two very promising directions for untangling such complicated IT investment mechanisms.

The first one is based on the resource-based view (RBV). An important recent realization is that the aggregation of overall IT investments into one single factor, e.g., IT capital, would be inappropriate for investigating certain nuanced impacts of IT investment. Rather, the decomposition of the overall IT investments into the portfolio subsets, according to their characteristics, would be more appropriate, i.e., the portfolio-level analysis. From the monolithic view of IT capital, for instance, it is very hard to justify why, even though the impacts of IT are completely appreciated, many firms with the similar amount of IT spending will have very distinguishing performance. However, from the portfolio view of IT investment, the reasons would be very obvious. One very convincing reason is that those firms invest in different types of IT with distinctive purposes, so they have different performance. Moreover, another very promising direction is grounded on the dynamic capabilities (DC), since the ability to employ IT could also determine how IT investment associates with the outcome of business, thus in turn influencing firm performance, i.e., the capability-level analysis. For instance, without considering the effect of organizational capability, it might result in the very naïve conclusion that, as IT investment increases, firm performance will increase. Namely, it skips the premise that firm should be capable of translating the outcome of IT investment into facilitating business processes. In fact, it is very possible that the impact of IT investment might even dissipate without making any contribution, if firm lacks the capabilities of assimilating IT to improve and enable business processes. By the contrast, the sustainable advantages associated with many firms are very likely due to their IT-enabled business processes and the embedded complementarities that are hardly imitable by their competitors. Overall, although the potential synergy
between RBV and DC in theorizing IT investment mechanisms is very evident, the research that simultaneously incorporates the two is still very rare in literature.

Nowadays, the impact of IT investment is especially critical to manufacturing firms. For instances, almost all of their supply chain management (SCM) capabilities are dependent on capturing and analyzing the information from arrays of information systems (IS) in their plant processes. Therefore, this study proposes the following research questions to address:

(1) How are IS portfolios associated with SCM capabilities in improving manufacturing performance?
(2) Do certain IS portfolios with any characteristics particularly fit with certain SCM capabilities?

Theoretical Backgrounds

The Resource-Based View Theory (RBV) and IS Portfolios

The resource-based view theory (RBV) argued that competitive advantages of a firm results from specific resources and capabilities which are valuable, rare, inimitable, and non-substitutable (Barney 1991, Grant 1991). In particular, when these resources and their related activity systems have complementarities, their potential to create sustained competitive advantage is enhanced. A firm could appraise its potential of competitive advantages by means of identifying its internal resources and capabilities, and selecting a suitable strategy to reduce resource gaps (Grant 1991). Overall, Barney (1991) and Grant (1991) argue that, when these resources are valuable, rare, durable, and protecting against imitation, transferability, or substitution, they become the core competence that would sustain competitive advantages.

One of most valuable, as well as complicated, resources is IT. Hence, Aral and Weill (2007) categorize firms’ investments in IT resources into the portfolios of four types with different goals: infrastructural, transactional, informational, and strategic. First, according to their definition, infrastructural IT investments are made to provide the foundation of shared IT services, a flexible base for capturing future business opportunities. The investment in IT infrastructure could include servers, telecommunication facilities, computers, databases, and the related software applications. Second, transactional IT investments are made to streamline business processes. Such investments’ focuses are mainly on improving efficiency and decreasing cost, such as the increase of the production volume per unit cost. Transactional IT could relate to the IT for improving repetitive routines and processing functions, such as order processing, sales processing, billing statement generation, insurance renewal, etc. Third, informational IT investments are made to generate information for responsive planning, decisions, communications, and coordination. Such investments’ focuses are mainly on improving reporting, control functions, and data quality. Informational IT could relate to sales analysis, orders planning, law-compliance systems, report applications, product pricing optimization, the data mining program for untangling customer relationships, etc. Fourth, strategic IT investments are made to enable the entry into new profit sources including new markets, new services, new products, and new processes. Such investments’ focuses are mainly on changing the business competition status quo. For example, the introduction of ATMs once changed considerable business models in the banking industry, although they soon became nonstrategic and transactional when they were universally adopted. Namely, strategic IT should be able to transform the nature of business value creation or realization.

IS represents a majority of applications to IT resources (Karhade et al. 2015). This study thus defines IS portfolios as the important factors in manufacturing firm performance (Table 1).

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<th>Constructs</th>
<th>Definitions</th>
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<td>Strategic IS portfolio</td>
<td>The set of software applications that can support the entry into new markets, services, products, etc.</td>
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Informational IS portfolio  The set of software applications that can facilitate the internal processes in accounting, human resource, operations, finance, etc.

Transactional IS portfolio  The set of software applications that can facilitate the external processes with vendors, customers, partners, etc.

Infrastructural IS portfolio  The set of software applications that can enable flexible and shared platform for facilitating future business processes.

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<th>Constructs</th>
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<td>Resourcefulness</td>
<td>The organizational skills and routines that pertain to improving the efficiency of resource utilization for reducing cost in supply chain</td>
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<tr>
<td>Responsiveness</td>
<td>The organizational skills and routines that pertain to improving the effectiveness of resource utilization for adding value in supply chain</td>
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<tr>
<td>Pro-activeness</td>
<td>The organizational skills and routines that pertain to mitigating the uncertainty of resource utilization for balancing the risk and return in supply chain</td>
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Table 2. Definitions of SCM Capability Constructs
(The constructs and definitions are based on the extension of the related research in literature including Barratt et al. (2007), Chang (2011), and Brandon-Jones et al. (2014))

Research Model

Synthesizing the theories and definitions aforementioned, this study posits that the fit between IS portfolios and SCM capabilities will cast strong impact on manufacturing firm performance (Figure 1).

Figure 1. The Conceptual Research Model

First, when a firm emphasizes resourcefulness, it aims to acquire all the required resources to fulfill tasks. How to attain the complementary resources from supply chain partners becomes the main purpose of the firm. Since an interoperable IT infrastructure is the basis for supply chain collaboration, this study hypothesizes that,

**H1. Firms investing greater amount in infrastructural IS portfolio and involving greater SCM capabilities in resourcefulness are associated with greater manufacturing performance.**

Second, when a firm emphasizes responsiveness, it aims to reconfigure and adapt its resource base, in a timely fashion, to respond to changing needs of customers. In other words, to meet a customer’s demand is a key factor of a firm’s success. The IT investment should focus on the collection of information on customers and markets, especially information regarding with past transactions. Appropriate use of information is fundamental to the ability to sense market requirements. This study hypothesizes that:

**H2. Firms investing greater amount in transactional/informational IS portfolio and involving greater SCM capabilities in responsiveness are associated with greater manufacturing performance.**

Third, when a firm focuses on pro-activeness, it aims to foresee a latent or future customer needs and proactively develop a strategy with unique customer value. Thus, the IT portfolio should help firms to gather industrial information, scan the business environment to identify new opportunities, and acquire external knowledge resources. This study hypothesizes that:
H3. Firms investing greater amount in strategic IS portfolio and involving greater SCM capabilities in pro-activeness are associated with greater manufacturing performance.

Expected Contributions and Concluding Remarks

This study contributes to the existing body of knowledge by providing more comprehensive understanding of the critical SCM capabilities and their linkages to IT investment, especially at the portfolio level of IS applications. More importantly, for those firms transforming themselves to the proactive supply chain partners, this study will develop effective metrics for assessing their capabilities and suggest appropriate IS portfolios for the transformation.

Notably, this study remains under development. Future research should continue to examine the preliminary findings or investigate the related topics of this study, which will make considerable contributions to both literature and practice.

REFERENCES

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