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The effects of IS resources, capabilities, and qualities on organizational performance: An integrated approach

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ABSTRACT

Several theories, such as the resource-based view (RBV) and the information systems (IS) success model (ISSM), have provided inconclusive results on the impacts of IS on business processes and organizational performance. The current study reviews the effects of these theories in terms of IS resources, capabilities and qualities, and further proposes an integrated approach for examining organizational performance. Our integrated model was statistically tested by using a structural equation modeling (SEM) method. Our results provide an integrated view of the associations among theories and enhance the understanding of IS contributions to organizational performance.

1. Introduction

Investment in information systems (IS) has grown significantly under the widely held belief that IS are essential to a firm's competitive survival. In 2006, American businesses spent an estimated $1.8 trillion on IS hardware, software, and telecommunications equipment [55]. Between 1980 and 2004, private business investment in IS grew from 34% to 50% of all invested capital [55]. The impact of IS investment on performance (IS business value) has become a matter of interest to both academics and practitioners alike [64]. A significant amount of research in this area focuses on IS investments and their impact on bottom line metrics where performance includes business process performance (i.e., operational efficiency within specific business processes) and organizational performance (i.e., bottom-line impacts measured in revenue or competitiveness) to explain the so-called "productivity paradox" [16]. While heavy investment in IS continues, past studies report mixed findings on the effect of expenditures on organizational performance [16,17,42,90,92].

"Attributing the inconclusiveness to conceptual limitations" [10] motivated the development of new approaches for connecting the path from IS investments to business value [33,63,67]. Some studies have drawn on theories, such as the resource-based view (RBV) [6], to investigate IS business value [69,78]. In the RBV, IS resources are a source of competitive advantage and organizational performance [10,78], and the capabilities of the IS process influence both performance and quality [32,45,89]. Others have adopted a process theory that investigates the effects of IS on intermediate business process levels and explains how IS spending improves organizational performance [7,91]. In the IS success model (ISSM) [26,86], IS qualities affect user satisfaction and use/usefulness, which in turn have an impact on business processes and organizational performance [26,86].

To synthesize what is already known about IT business value and to guide future research by developing propositions, Melville et al. [69] integrated various strands of research into a single framework, which is an integrative model of IS business value drawing on the RBV, as the primary theory, and on microeconomics and industrial organization literature, as secondary theories. However, their theoretical model was not empirically tested.

The objective of this study is to integrate two theories (RBV and ISSM) of IS business value into an integrated model that provides a comprehensive view of the associations among these theories and enhances our understanding of IS contribution. Our integrated model utilizes some key IS constructs, such as IS resources, capabilities, and qualities, provided by Benbasat and Zmud [8]. Our model was statistically tested using a structural equation modeling (SEM) method with responses from 196 firms. We also compared our integrated model with individual models to identify the usefulness of our integrated model.

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Our results show that IS capabilities and qualities have an important effect on firm performance. Such an effect differs from previous study findings. Therefore, the proposed integrative approach model increases our understanding of the IS impact on business processes and organizational performance. Furthermore, the model provides CEOs and IS managers with insights into managing IS processes and qualities. For example, if firms want to increase the value of their IS business, they should do more than just merely invest in IS but also focus on the improvements of IS processes and qualities in their organizations.

2. Conceptual background

This section addresses three key conceptual backgrounds of our integrated model: RBV, process capabilities, and ISSM. Our integrated model, derived from the three conceptual models, is provided in Section 3.

2.1. Resource-based view

Rooted in management strategy literature, the RBV argues that unique resources are the main sources of competitive advantage and organizational performance. Unique resources must have four attributes: valuable, rare, imperfectly imitable, and not substitutable [6]. Researchers have identified various resources. For instance, Barney [6] suggests that resources include assets, knowledge, capabilities, and organizational processes whereas Amit and Schoemaker [1] and Grant [34] distinguish resources from capabilities, similar to our study. Resources are stocks of available factors that are owned or controlled by the firm. Capabilities, in contrast, refer to a firm's capacity to deploy resources using organizational processes to a desired end [34].

As part of our integrated model in Fig. 3, Fig. 1 illustrates a model of RBV and performance based on Melville et al. [69] (IS Resources, Complementary Organizational Resources, and Business Process Performance) and Ravichandran and Lertwongsatien [78] (IS Resources, IS Capabilities, and Organizational Performance). The constructs in Fig. 1 are summarized below. Note that the relationships among the constructs are explained in Section 3.1.

2.1.1. IS resources

Researchers in the IS field have identified several IS resources as potential sources of competitive advantage and performance. For example, Mata et al. [68] identified four attributes as resources: access to capital, proprietary technology, technical skills, and managerial skills. Ross et al. [81] addressed three IT assets: human resources (technical skills, business understanding, and problem-solving orientation), technology resources (sharable technical platforms and databases), and relationship resources (shared risk and responsibility). Bharadwaj [10] classified IS resources as human resources, including technical IS skills and managerial IS skills, IT infrastructure, and IS-enabled intangibles. Ravichandran and Lertwongsatien [78] identified three IS resources: human capital (technical and business skills and firm-specific knowledge), infrastructure sophistication, and partnership. As this review illustrates, there are no significant differences among these previous studies.

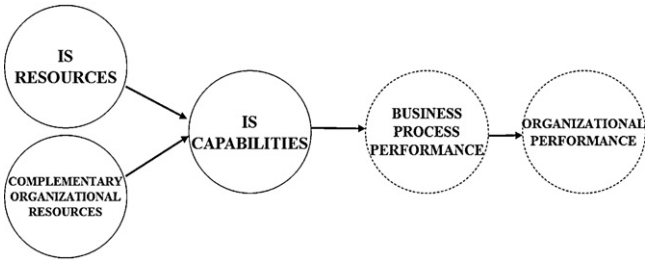

Fig. 1. RBV and performance.

Based on these previous studies, IS Resources in this study are defined as a multidimensional construct that "consists of a number of interrelated attributes or dimensions and exists in multidimensional domains" (Law et al. [56] p. 741). This construct includes business expertise (understanding and knowledge of their firm's business), internal and external relationships between the IS unit and the business units/IS providers, technical skills (ability to adopt new technology, develop, and operate IS) of the IS function staff, and IS infrastructure (application, data, server, and network). Please refer to Appendix A for details about those constructs.

2.1.2. Complementary organizational resources

When synergies between IS and other resources exist, the latter are referred to as complementary organizational resources [69]. Prior studies have shown that an IS advantage depends on utilizing relationships among complementary organizational resources [77]. Powell and Dent-Micallef [77] identified complementary human resources (open organization, CEO commitment, and organizational flexibility) and complementary organizational resources (business process design). Melville et al. [69] showed that complementary organizational resources are non-IS physical resources, non-IS human resources, and organizational resources, as originally defined in Barney's [6] classification of firm resources.

Based on these previous studies, complementary organizational resources in this study are defined as a multidimensional construct consisting of other firm resources, such as organizational openness and flexibility, CEO commitment, and business processes. Appendix A provides operational definitions of those constructs.

2.1.3. IS capabilities

The IS literature on RBV has viewed IS capabilities as a complex and multidimensional construct [74]. Ross et al. [81] viewed IS capabilities as abilities to perform strategically aligned planning, fast delivery, and cost-effective operation and support. Feeny and Willcocks [29] identified nine IS capabilities from three areas: business and IS vision, design of IS architecture, and delivery of IS services. Bharadwaj [10] defined IS capabilities as the firm's abilities to acquire, deploy, and leverage IS resources to shape and support business strategies and value chain activities. Ravichandran and Lertwongsatien [78] defined IS capabilities as four constructs: IS planning sophistication, systems development capability, IS support maturity, and IS operations capability.

In practice, IS capabilities have been intensively developed in process assessment models, such as the Software Process Improvement and Capability Determination (SPICE[1]) model developed by the ISO and the Capability Maturity Model Integration (CMMI) developed by the Software Engineering Institute (SEI) at Carnegie Mellon University [89]. These models defined process capability as a characterization of the ability of a process to meet current or projected business goals [44].

Consistent with previous studies, we define IS Capabilities as the firm's abilities to perform routines within the IS department, enabling delivery of IS services to the organization. IS Capabilities include six IS processes: IS planning [78], business process change [35], acquisition, development, operation, and support [45]. Appendix A provides operational definitions of these dimensions.

2.2. IS success model

The concepts of IS qualities, satisfaction, and usefulness were investigated in the studies on ISSM [25,26,86,87]. Following these

[1] In this study, the SPICE assessment model implies ISO/IEC 15504-5 [45].