



Examining how firms leverage IT to achieve firm productivity: RBV and dynamic capabilities perspectives



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ABSTRACT

Firm productivity is one of the major drivers of firm's growth. Information Technology (IT) has the potential to be a key enabler of firm productivity. IS researchers have suggested strong association between investments in IT and firm productivity. Yet, uncertainty and concern about the actual impact of IT on firm productivity remain. This calls for an urgent need for research on how firms can leverage IT for productivity gains. Through a case study, this research aims to answer the above question by developing a process model that explicates the roles of firm capabilities in driving IT-enabled productivity.

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1. Introduction

Information technology (IT) enabled firm productivity refers to the influence of IT in facilitating firm performance at organization-wide levels, comprising both efficiency and competitive impacts [35]. IT can enhance operational efficiency and make new products and services available for organizations [24]. Stiroh [54] suggests that there is a strong association between investments in IT and firm productivity, at both the macroeconomic and microeconomic levels. Both Brynjolfsson [10] and Anderson [2] report evidence of statistical correlations between IT and firm productivity. While these prior studies agree that IT affects firm productivity, others contend that investments in IT have not yielded significant productivity gains [5,11]. This is supported by Sambamurthy et al. [51], who note that how and why IT investments affect firm performance remains ambiguous. In essence, whether a firm is able to enhance its productivity depends on its available resources and capabilities and how it mobilizes these resources and capabilities [4]. This is because the mastery of mobilization may require a knowledge discovery process that involves 'learning and unlearning' the resources and capabilities and how they are synchronized.

Capabilities may be enriched by learning new skills that extend the repertoire of current skills or by adding a complementary resource from the resource portfolio to the current bundle. An additional resource may have been in the resource portfolio for some time, or it may have been developed or acquired recently with the purpose of enriching a particular capability. An interesting question that remains unanswered in the IS literature is the following: by complementing IT assets with other resources, are firms better equipped to leverage their IT investments to improve performance [29,58]?

Accordingly, our research question is twofold: (1) what information systems (IS) and other complimentary non-IS resources and capabilities are valuable in enabling firm productivity? (2) How do firms organize their IS and non-IS resources and leverage IT capabilities in enabling firm productivity? Our research culminates in a framework that explicates the role of capabilities across the IT adoption process and extends our conceptual understanding in this area. Drawing upon concepts from a resource-based view of firms (RBV) and dynamic capabilities, we employ a case study of Batamindo Shipping & Warehouse Pte Ltd's (BSW) IT capability development process to analyze how firms may assemble, integrate and deploy their resources and capabilities to leverage IT for firm productivity. Our result enables organizations to decide how much to invest in IT, how to leverage IT capabilities and whether complementary assets are needed. We inductively derived a process framework that identifies nine

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capabilities and offered actionable prescriptions on how these capabilities may be developed to improve IT-enabled firm productivity.

In this paper, we employed the RBV as a theoretical lens for the following reasons: (1) it enables us to uncover those aspects of IS that are central resources in enhancing firm productivity, (2) it enables us to consider IS in the context of the other central resources needed to effectively uncover the complementarities necessary for IS to allow firm productivity to be enhanced and (3) it provides us a with framework within which we can examine the role of IS in coordinating the deployment of the entire bundle of resources to improve firm productivity.

In addition, we employed dynamic capabilities as another theoretical lens to understand how firms may maintain competitiveness through enhancing, combining, protecting, and when necessary, reconfiguring the firm's resources and capabilities. Whereas the RBV focuses on strategically exploiting existing capabilities and assets in stable market environments, dynamic capabilities refer to a firm's ability to respond to and even create market change through integrating, reconfiguring, gaining and releasing resources in changing market situations. Such an understanding is important, as rapidly changing markets require the ability to reconfigure the firm's asset structure and accomplish the necessary internal and external transformation.

Our paper is organized as follows. We begin with a review of the RBV and dynamic capabilities in the IS literature. We then present our research methodology and case narrative. This is followed by case analysis and findings, implications, future research and conclusion.

2. Resource-based view in IS research

The resource-based view of firms describes a firm as a specific collection of resources and capabilities that can be deployed to achieve competitive advantage [4]. Firm resources are defined as all assets (tangible or intangible) and capabilities belonging to or controlled by a firm that can be used to implement competitive strategies [60]. A firm's combination of resources forms the basis of competitive heterogeneity, where the scarcity of resources results in maximum rent generation [18]. Firm-specific resources and capabilities must be protected and made difficult to transfer, imitate or replicate [4]. By protecting their valuable resources against imitation or substitution, firms can sustain existing advantages. As resources drive and constrain the growth of the firm, these resources play a major role in the firm's process of capability development. It is therefore important for firms to acquire, accumulate and divest resources to assemble an effective resource portfolio, thereby ensuring that they are capable of reacting, adapting and responding to changes in volatile environments.

IS research using the RBV has largely focused on classifying information-based resources along the attributes of resources – value, rarity, appropriability, imitability, substitutability, mobility – posited by the RBV with a view towards understanding which IS resources are most likely to contribute to competitive advantage [62]. Wade and Hulland [62] also propose that outside-in (external relationship management and market responsiveness) and spanning (IS-business partnerships and IS planning and change management) approaches will have a greater impact on the short- and long-term competitive position than will inside-out approaches (IS infrastructure, IS technical skills, IS development, and cost-effective IS operations). While the IS literature employing the RBV has largely focused on identifying specific IS resources, it is recognized that the value of IS resources might have less to do with the particular IS resource per se than with the interaction, or bundling, of IS resources with other non-IS

resources [47,62]. A resource may influence other resources in one of the three ways: (1) compensatory—a change in the level of one resource might offset a change in the level of another resource; (2) enhancing—a change in the level of a resource may magnify the impact of another resource; (3) suppressing—the presence of a particular resource might lessen the impact of another resource [62]. Nevo and Wade [38] suggest that IT assets can play a strategic and synergistic role when they are combined with organizational resources to create IT-enabled resources. Oh and Pinsonneault [39] indicate that the resource-centered perspective has a strong predictive ability for the impact of IT on firm revenue and profitability. They also argue that investments in IT applications may directly and positively impact firm productivity. This leads to our first research question: *what IS resources (assets and capabilities) are valuable in enabling firm productivity?*

3. Dynamic capabilities in IS research

Early applications of RBV theory were criticized for having limited application to hyper-competitive environments in which rapid and sudden changes are common [60]. To address this issue, the theory of dynamic capability emerged to explain how firms react, adapt and respond to changes in volatile environments. In essence, the dynamic capabilities perspective suggests that new forms of competitive advantage are achieved by creating new resources to obtain congruence with the changing environment. It also emphasizes understanding how organizations develop new resources and capabilities to support business strategy in rapidly changing environments. Teece et al. [60] characterize organizational capabilities as depending on three factors: (1) coordination/integration, learning and reconfiguration of organizational and managerial processes/routines; (2) firm-specific strategic position as defined by the firm's asset structure and resource configurations; and (3) firm history, which accounts for the path-dependent nature of capabilities. In general, capabilities and resources evolve over time as organizations learn and adapt to change. The evolution consists of three stages that begin with the founding stage, followed by the development stage and finally the maturity stage, where capabilities become more embedded within organizational routines. Interestingly, research suggests that the type of capabilities a firm develops depends on the level of market dynamism within the external environment. For instance, capabilities developed in high-velocity markets, in which uncertainty and unpredictability abound, are based on simple processes developed through rapid, iterative and experience-based learning. An organization's strategic approach is crucial to the development of capabilities that would best enhance the organization's competitive status. Therefore, studying organizational learning mechanisms that relate organizational knowledge to capability development is crucial for understanding how dynamic capabilities evolve in response to feedback and stimuli from the external environment. The path-dependent nature of dynamic capabilities suggests that repeated practice and incremental learning from small mistakes will ultimately lead to capabilities that are complex, difficult to imitate, and responsive to change.

In recent years, we have witnessed increasing research interest in dynamic capabilities in the IS area. For example, Rui et al. [49] suggest that organizations with greater investment in IT capability tend to be more agile in response to environmental changes. Bharadwaj et al. [7] argue that a firm's IS capability and the complementary effects of IS capability in conjunction with interfunctional and interorganizational coordination mechanisms are significant predictors of firm performance. Nazir and

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