



Linking Information System Capabilities with Firm Performance: A Review of Theoretical Perspectives and New Research Agenda

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Abstract

Information systems and technologies have an influence on every aspect of companies' firm performance. Extensive studies have been conducted to determine the relationships between information system (IS) capabilities and firm performance. This study investigates and explores an extensive literature review to discover inconsistencies among past studies. The role of the resource-based view (RBV) is also examined on the subject. Assessing the relationship between these two concepts will shed highlight new research perspectives. The review will find out whether or not additional empirical investigation is necessary to gain a clearer understanding of IS capabilities and firm performance.

Key words: *Information system capabilities, Firm performance, Resource-based view*

JEL classification: *D83, L25, L86*

Introduction

Firm performance has been a constant major research interest since the Industrial Revolution began. During that time, the importance of information was realized, and the arrival of digital computers led to the beginning of the information age. Thus it is revealed that the crucial resource is no longer capital, but knowledge (Checkland & Holwell, 2005, p. 4).

During the early development of the IS/IT field, the concentration was only on technology. Even though there have been significant studies (Ravichandran & Lertwongsatien, 2005) on the relationship between IS

and firm performance, the cumulative results are varied (Ravichandran & Lertwongsatien, 2005). This study reviews the prior researches related to IS and firm performance to investigate these variations. At the same time, the resource-based view effect is evaluated in respect of IS capabilities and firm performance.

The paper is organized as follows. Firstly, theory types are explained in the IS literature; then resource-based view and IS capability relationships are discussed. Thirdly, the link between IS capabilities and firm performance is addressed. Lastly, new research agendas are introduced.

Theoretical Perspectives on IS

The characteristics of information systems are different from those in other fields. The IS field addresses the use of artefacts in the human-machine system. This means that IS examines not only the technological systems, but also the social systems and their integration. In order for IS to be understood, the field should be investigated within the natural world, the social world and the artificial world of human construction (Gregor, 2006). IS has also been defined as 'an integrated user-machine system' (Checkland & Holwell, 2005) to support the operations, management and decision making of an organization. Different combinations of systems have caused the IS field to be a 'fragmented adhocracy', making the field diverse and weakly coherent, as stated by Banville and Landry in 1989 (Checkland & Holwell, 2005, p. 54). Multiple elements of IS work provide the notion of organizational transformation (Checkland & Holwell, 2005).

Checkland and Holwell (2005) claim that the concepts in IS theory can be separated into two schools of thought: the hard approach and the soft approach. The former was built upon Simon's (1960) model of decision making. Simon's definition of and approach to the theory of problem solving mainly explained the management of complex systems. The main aim of Simon and his followers was to establish a true science of administrative behaviour and executive decision making, making it easier for firms to implement goal-seeking behaviour. Simon (1960) created three levels to establish the theory. The levels are described as problem identification and data collection; the definition of alternative solutions and their results; and choosing the right solution and following up on it. It is clear that the hard approach as discussed by Simon requires different types of information supported by information systems with different characteristics. This methodology excludes the effects of human and organizational behaviour. Even though this is a common approach to IS, alternative methods have been proposed, which are described as the soft approach (Checkland & Holwell, 2005).

The soft approach was proffered by Vickers (1974). He refuted the goal-seeking model of human behaviour. Vickers claimed that the goal-seeking approach narrowed the richness of the lives that we live. Therefore, instead of seeking goals, the maintenance of relationships was the basis of the system he proposed. In this approach, standards are set rather than goals, which is also called the interpretive approach. Vickers' theory has been used less frequently in the IS literature, but it is a process for understanding computers and cognition together. According to Checkland and Holwell (2005), Ciborra (1987) also defended the humanistic approach as an alternative to the conventional wisdom, the author stating that organizations should be accepted as networks of communicative exchanges. An information system is a tool that makes these exchanges easier. Ciborra (1987) clashed with the conventional approach, stating that:

Information systems either tend to a data view of organizations, or, in the case of those most influenced by business needs, to a decision making view. These two ways of looking at the problems of computerization are so widely accepted and have been so much taken for granted that they can be said to form the conventional wisdom of today. (Checkland & Holwell, 2005, p. 49)

There is still confusion in the IS field, and thus substantial theory, for the field has not yet been elaborated. Even the different schools of thought that have been defined do not provide a common perspective regarding IS. Therefore research in the IS field continues to be based on positivist, interpretative and integrated approaches.

Another theoretical perspective was envisioned by Shirley Gregor in 2006. During theory-building in the IS field, a mixed combination of systems created an iterative process for the theories regarding information systems. In her study, Gregor proposed that the classification of theories distinguishes their attributes.

During the theory-building process, the primary goals are discerned and, according to these primary goals, five theory types are established. The goal of the classification is to help IS research to identify the composition of a theory in a general sense and to compare the components of IS theories. In the literature, Gregor (2006) classifies IS research under five theory types: analysis, explanation, prediction, explanation and prediction, and design and action. Theory for explanation and prediction is widely used and implemented theory in the IS field (Grover & Lyytinen, 2015).

Explanation and prediction (EP) theory commonly shares a similar view with both natural and social sciences. The main theoretical questions in this approach are 'what is', 'how', 'why', 'where' and 'what will be'. EP theory indicates an understanding of underlying causes and predictions; in addition, it describes theoretical constructs and the relationships between them. Grand theories, such as the general system theory and the related information theory, are considered to be theories for explaining and predicting. General theory delivers a high level of thinking regarding open systems that of are interest in the IS field. Another example that can be given of this type of theory is representation theory, which establishes the intended properties of information systems. The technology acceptance model (TAM) and the dynamic model of information success also aim to explain and predict. The expectation-disconfirmation theory depends on causal thinking, using change, and determining and mentioning a process model (Gregor, 2006). The resource-based view (RBV) is most frequently seen in IS and firm performance literature (Bharadwaj, Sambamurthy, & Zmud, 1999; Karimi, Somers, & Bhattacharjee, 2007; Oh & Pinsonneault, 2007; Peppard, Lambert, & Edwards, 2000; Ray, Muhanna, & Barney, 2005; Wade & Hulland, 2004). It is observed that RBV falls within EP theory, because it consists of an explanation of resources and looks at the causal reasoning for IS properties during the relationship with firm performance literature.

Common implementation of RBV in IS and firm performance literature uses the EP approach with wide perspectives and research questions. Therefore, it combines both the process and variance aspects (Grover & Lyytinen, 2015).

Resource-Based View

RBV studies have been influenced by the seminal works of Coase (1937), Penrose (1959) and Wrigley (1970). Peppard and Ward (2004, p. 173) explain Penrose's definition of a firm as 'a collection of human and physical resources bound together in an administrative framework, the boundaries of which are determined by the administrative coordination and authoritative communication'. A different view is proposed by Hamel and Prahalad (1994), in which a firm is described as a 'portfolio of competencies' (p. 173). The 'good science is good conversation' approach adopted by McCloskey (Mahoney & Pandian, 1992) fits with the RBV in management science mentioned by Mahoney and Pandian (1992). RBV encourages dialogue between scholars. There are different perspectives regarding RBV in the management field. The first is incorporated in strategy research. From this perspective, RBV is concerned with rate, direction and performance implications, which are the focus of the strategy field. The second approach to RBV is organizational economics. RBV is considered the fifth branch of organizational economics, along with agency theory, property rights, transaction cost economics and evolutionary economics. The third view of RBV corresponds to industrial organizational analysis (Mahoney & Pandian, 1992).

According to RBV, firms possess resources in order to achieve a competitive advantage and better performance. Specific resources may give firms an advantage over their rivals as long as they protect their resources against imitation, transfer or substitution. According to the theory, a firm's resources are defined as its competencies, skills, strategic assets, assets and stocks. In short, they are capabilities that transform inputs into outputs. Therefore, these capabilities comprise skills, managerial abilities, processes, development, integration and infrastructure (Wade & Hulland, 2004). Capabilities can be viewed as the capacity of a set of resources to perform task and activities, and they are often developed in functional and sub-functional areas by combining physical, human and technological resources (Ravinchandran & Lertwongsatien, 2005, p. 240). Past studies (Bharadwaj et al., 1999; Peppard & Ward, 2004; Ray et al., 2005; Wade & Hulland, 2004) have shown that the theoretical approach of RBV provides an opportunity to see resources as a part of capabilities.

RBV has been implemented in the IS field since the 1990s. Since then, most studies have focused on either a single IS resource or a bundle of IS resources. Ross et al. (1996) separated IS into three categories, combined with IT assets and IT processes that contribute to business value. The study labelled IT assets as human, technological and relational. The IT processes were broken down into planning ability, cost effective operations, support and fast delivery. In Bharadwaj (2000), a modified perspective was defined as IT infrastructure, human IT resources and IT-enabled intangibles (Wade & Hulland, 2004).

IS resources cannot be considered only as technological assets. Technological assets are assets such as networks and databases which can easily be reached by all competitors. Instead of looking at assets individually, a combination of assets can create a sophisticated IT infrastructure, which generates the results necessary to meet the firm's needs and priorities. Moreover, skilled human resources, administrative knowledge of the IS, and the internal and external relationships of the IS department are posited as benefit and profit generators for firms (Ravichandran & Lertwongsatien, 2005). Additional works (Bharadwaj et al., 1999; Feeny & Willcocks, 1998; Wade & Hulland, 2004) address IS resource categorizations.

Extensive IS literature has indicated that two perspectives of IS can be defined. They are IS assets (technology-based) and IS capabilities (system-based). Nevertheless, from the RBV perspective, the development of capabilities establishes a broad perspective, at the same time covering IS assets, since IS assets represent a more fragile resource because of their stagnancy (Wade & Hulland, 2004). The resources are the raw materials for the development of capabilities. A deployed resource generates capabilities (Ravichandran & Lertwongsatien, 2005). Therefore, information system capabilities become a critical driver for firm performance under the RBV perspective (Wade & Hulland, 2004).

IS Capabilities and Firm Performance

Information system capabilities are a core element for business capacity to utilize and obtain IT successfully. A constituent of IS capabilities is the combination of a two-way strategy alignment between business and technology. Integrating these two areas may transform the marketing function from a market place to a market space (Feeny & Willcocks, 1998). One approach to IS capabilities is the execution of strategically aligned planning, rapid delivery, and cost-effective operations and support (Gu & Jung, 2013). Likewise, IS capabilities can be defined as a way of classifying and providing access to knowledge that is learned and successfully applied. Due to definitions of IS capabilities, it has been claimed that IS capabilities positively improve organizations' knowledge capacity (Cepeda-Carrion, Cegarra-Navarro, & Jimenez-Jimenez, 2012). Thus, every firm has IS capabilities in their business perspective. IS capabilities can be either weak or strong in organizations. If they are weak, then organizational abilities can be affected negatively. However, strong IS capabilities may create value in an organization (Peppard & Ward, 2004). IS capabilities are considered to be the routine processes for the deployment of IT services to organizations (Ravichandran & Lertwongsatien, 2005). Nevertheless, strong IS capabilities create advantages in business and quickly respond to changes in the business environment.

Information system capabilities include complex and multidimensional constructs. Different perspectives have been identified in the literature regarding IS capabilities. In their study, Feeny and Willcocks (1998) proposed three perspectives: the business and IT vision, the design of IT architecture, and the delivery of IS services. Within these perspectives, nine IS capabilities are defined: business system thinking, relationship building, architecture planning, leadership, informed buying, making technology work, contract facilitation, vendor development and contract monitoring (Feeny & Willcocks, 1998). The relevant IS capabilities are described in another study as operational efficiency, operational flexibility, planning, and internal and external analysis (McLaren, Head, Yuan, & Chan, 2011). Another approach to IT capabilities was presented by Bharadwaj et al. (1999), in which six dimensions were validated. These dimensions are the IT/business partnership, the external IT linkages, the business' IT strategic thinking, the IT business process integrations, IT management and IT infrastructure. Wade and Hulland (2004, p. 111) reference another study conducted by Powell and Dent-Micallef which sought to explain information system resources using three categories: human resources, business resources and technology resources. They specified that these categories affect firm performance (Wade & Hulland, 2004). Information system

capabilities are composed of three interrelated attributes: the combination of business knowledge and IS knowledge; having a flexible IT infrastructure; and effective use of the process. Some studies have accepted that IS capabilities are related to resources and competencies. Resources are defined as the 'stocks of available factors that are owned or controlled by the firm' (Peppard & Ward, 2004, p. 175). On the other hand, there are two dimensions of IS competencies: transformational and operational (Wade & Hulland, 2004). It is claimed that they have a direct effect on firm performance. In some of the literature (Peppard & Ward, 2004), IS competencies are composed of six different attributes: formulating strategy, defining the IS contribution, defining the IT capability, exploitation, delivering solutions and supplying. Thus, IS capabilities become the source of a competitive paradigm that delivers knowledge to organizations to create better performance (Peppard & Ward, 2004). In line with these definitions, IS resources represent the IT infrastructure that is owned and controlled by the firm. The competencies are the firm's ability to organize, exploit and activate these resources.

The literature shows that past studies have created a scattered picture of the explanations of IS capabilities. Some of the constructs or elements continuously intersect with one another and share boundaries.

Fragmented and diffused approaches to IS capabilities have sought to explain the relationship between IS and firm performance. Information systems and information technology (IT) have been considered interchangeably and a direct link has been found between IT and firm performance. On the other hand, it is claimed that IT and firm performance relations have a managerial effect on firm productivity, profitability and consumer surpluses. Furthermore, internal factors have been studied using RBV to determine the relationship between IS capabilities and firm performance (Ravinchandran & Lertwongsatien, 2005), along with the structure. Therefore, firm performance-related studies have used RBV to differentiate the performance indicators. The effects of individual and firm-specific resources can play a significant role in firm performance.

In the management literature, a firm's performance metrics are commonly defined as share growth, return on investment, return on assets, market share, sales and profit (Wade & Hulland, 2004). Ravichandran and Lertwongsatien (2005) measured firm performance by distinguishing two dimensions one defined as operational performance and consisting of profitability, productivity and financial performance, the other defined as market-based performance, which assesses the success of the firm in entering new markets and creating new products and services.

Firm performance is a multi-dimensional approach that can have different aspects. For instance, customer-focused performance includes customer satisfaction. Financial and market performance deals with revenue, profits, market positions, cash-to-cash cycle time and earnings per share. Human resource performance, which covers employee satisfaction and organizational effectiveness, focuses on innovation and flexibility (Mithas, Ramasubbu, & Sambamurthy, 2011).

IS-related resources and competencies, called IS capabilities, can influence business value, and they construct the relationships between functions and departments. The result is that they generate a superior competitive position and firm performance. Previous studies have argued that considering IS by aggregating all of its dimensions with other firm resources provides strategic benefits. Powell and Dent-Micallef (1997) stated that the use of IS capabilities ultimately leads to superior firm performance. However, they claimed that IS capabilities are not able to contribute directly to sustaining firm performance. It is proposed that IS capabilities must interact with other organizational resources to achieve long-term firm performance. This approach may indicate that there should be an integration with other organizational resources influencing firm performance, including the commitment of top management, decision-making performance, corporate culture and business process performance. Hence, strong evidence has found that IS capabilities play an indirect role in firm performance (Wade & Hulland, 2004). In addition, success in firm performance requires paying attention to the integration of IS capabilities and business resources, along with the capabilities, strategies, decision making and actions in firms (Sambamurthy, Bharadwaj, & Grover, 2003). It is also found that there is no significant relationship between IS capabilities and firm performance. However, a combination of assets and structures is embedded into the IS capabilities in the products and

services, efficient business process performance, improved decision making performance, and dynamic organizational structure, which influences firm performance.

Feeny and Willcocks (1998) claimed that the IS capabilities directly affect firm performance (Ravinchandran & Lertwongsatien, 2005). Although IS capabilities have a significant direct effect on firm performance, the underlying mechanisms are unknown: thus additional research into the direct effect claim is required (Bharadwaj, 2000).

Limited work has so far been done on the indirect impact of IS capabilities on firm performance through the core business capabilities. It is found that tangible and intangible IS resources, which can be modelled as IS capabilities, are an important factor for firm performance (Ravinchandran & Lertwongsatien, 2005). Furthermore, IS and firm performance can only be measured by investigating the indirect effect on some intervening organizational capabilities (Tippins & Sohi, 2003).

The review confirms that IS capabilities have a sustained impact on firm performance, and the RBV framework approach is theoretically robust in the IS literature. Correspondingly, a firm's financial performance is improved as a result of this impact (Radhika & Hartono, 2003). Nevertheless, there is still a need to conduct research on the issue to determine the underlying mechanisms that define the relations because of the conflicting approaches to the method of linkage between IS capabilities and firm performance. It should be noted that a summary of the existing studies reviewed in this research is provided in the Appendix.

New Research Findings and Final Remarks

The field of information systems is a hybrid that impacts all organizational approaches and even cultural perspectives. The field is defined not only by technology, but also by management and organization theory, sociology, system thinking, and so on (Checkland & Holwell, 2005). In this complex environment, there is a need for a methodological approach to understand how RBV, which is outside the IS discipline, is borrowed and implemented. Therefore, in the IS context, the mid-range theory approach signifies a research model that borrows abstract reference theories through concentrating and conveying them into the IS field (Grover & Lyytinen, 2015). Using the mid-range theory approach allows us to explain borrowing and domesticating the process of RBV. Thus, the IS field can build a theoretical foundation by designing the steps according to this approach. During the theory-building process, this suggested mid-range theory approach has to be tested and implemented in empirical research.

It is observed that using RBV helps to distinguish between resources and capabilities. Tangible and intangible resources are combined as capabilities in the IS field— a firm's capacity to extensively deploy resources. Capabilities are seen as the capacity of human and technological resources and the performance of tasks or activities (Ravinchandran & Lertwongsatien, 2005). The review indicates that IS capabilities can be narrowed down by combining all the methods in the literature with common attributes. An aggregation of competencies and resources can be integrated under sub-constructs of IS capabilities. This linkage thereby creates a new research opportunity to check whether IS capabilities contain more effectively defined characteristics.

It has been suggested that RBV-based research needs to exhibit an assessment of performance, integrate competitive assessment, and define the notion of performance over time. Statistically measured IS capabilities are the critical factor in firm performance, but they may not affect performance directly (Ravichandran & Lertwongsatien, 2005). On the other hand, the relationship between IS capabilities and firm performance is addressed with only one mediator variable. Therefore, other research avenues appear to encourage the implementation of more than one mediator effect in order to investigate the claim of a strong indirect relationship between IS/IT and firm performance (Wade & Hulland, 2004). The most critical point is that researchers must decide whether IS capabilities' impact on firm performance constitutes a direct or an indirect relationship. Against this controversial literature background, we suggest that additional empirical evidence needs to be obtained to clear this dilemma from the IS field.

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Appendix: Literature Review Article List

Author(s)	Source	Study Constructs	Methodology	Main Findings
Feeny & Willcocks (1998)	<i>Sloan Management Review</i>	Core IS capabilities; business and IT vision; design of IT architecture; delivery of IS services	Conceptual	Organizations benefit from relating a core IS capabilities model to their own particular circumstances, priorities and plans. Implementing core IS capabilities help firms to achieve business advantage through IT.
Bharadwaj (2000)	<i>MIS Quarterly</i>	IT infrastructure (tangible); human IT resources; IT-enabled intangibles; firm performance	Matched sample comparison group; t-test; Wilcoxon rank sum test	IT infrastructure, human IT resources and IT-enabled intangibles develop the notion of IT resources. IT capability and firm performance positively and significantly related to each other.
Tippins & Sohi (2003)	<i>Strategic Management Journal</i>	IT knowledge; IT operations; IT objects; IT competency; firm performance	SEM	The mediating effect of organizational learning between IT competency and firm performance is supported. IT knowledge, IT operations and IT objects need to exist in order to have IT competency.
Santhanam & Hartono (2003)	<i>MIS Quarterly</i>	IT capability; financial performance; firm performance (profit and cost ratio)	Longitudinal; benchmark comparison; Wilcoxon and t-test	Superior IT capability shows superior current and sustained firm performance.
Peppard & Ward (2004)	<i>Journal of Strategic Information Systems</i>	IS capability; IS competencies; organizational performance	Conceptual	An organization's performance will significantly depend on its IS capability and recognizing IS/IT plays an integral role.
Wade & Hulland (2004)	<i>MIS Quarterly</i>	Information systems resources; competitive advantage; IS strategic planning; information resource management	Conceptual	Resource-based view is a useful tool to understand firm effects; understanding the role of IS in the firm; RBV makes a great distinction between IT and IS.
Ravichandiran & Lertwongsatien (2005)	<i>Journal of Management Information Systems</i>	IS human capital; IT infrastructure flexibility; IS partnership quality; IS capability; IS support for core competencies; firm performance	PLS	Firm performance is explained by IT, which supports and enhance a firm's core competencies. An organization's ability to use IT to support core competencies is dependent on IS functional capabilities, which are human, technology and relationship resources.

Appendix (Continued)

Author(s)	Source	Study Constructs	Methodology	Main Findings
Gregor (2006)	<i>MIS Quarterly</i>	Examine the structural nature of theory in IS	Conceptual	Introducing theory types in IS and legitimacy and value of each theory type is useful. Building integrated theory encompasses all theory types.
Mithas, Ramasubbu, & Sambamurthy (2011)	<i>MIS Quarterly</i>	Information management capability; performance management capability; customer management capability; process management capability	SEM	Information management capability has a positive association with customer management, process management and performance management.
McLaren, Head, Yuan, & Chan (2011)	<i>MIS Quarterly</i>	IS capabilities; operational efficiency; operational flexibility; planning; internal analysis; external analysis; competitive strategy (defender, prospector, analyser, reactor)	The multilevel strategic fit measurement model; qualitative case study	There is a perfect fit between the capabilities of IS and the firm's competitive strategies.
Grover & Lyytinen (2015)	<i>MIS Quarterly</i>	Information systems seek to domesticate high level reference theory in the form of mid-level abstraction	Conceptual	Critically examines and debates negative impacts of the field's dominant epistemic scripts and relaxes them by permitting IS scholarship to implement alternative forms of knowledge.