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Bundling digitized logistics activities and its performance implications

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ABSTRACT

Bundling information technology (IT) applications to support logistics activities provides a means for firms to improve their logistics performance. Grounded in the logistics management and management information systems literature, as well as the resource-based view (RBV) of the firm, this study empirically: (i) investigates if there exist digitized logistics activities bundles in firms; and if so, (ii) explores the association between digitized logistics activities bundles and logistics performance of firms in terms of logistics cost and logistics service improvements. We surveyed 227 trading firms in Hong Kong and performed a factor analysis of the survey data, from which we identified three digitized logistics activities bundles and found the sample firms were clustered into four types based on the patterns of their digitized logistics activities. We then carried out a MANOVA on the data, the results of which show that different patterns of digitizing logistics activities are associated with different logistics performance outcomes. Specifically, firms with more extensive digitized logistics activities bundles and utilizing them more intensively achieve better logistics performance. Academic and managerial implications for digitizing logistics activities to improve logistics performance are discussed.

1. Introduction

Logistics management deals with intra- and inter-organizational processes, involving the coordination and management of the critical flows of information, products, services, and finances, spanning organizational functions within a firm and linking to partner firms in a logistics chain (Christopher, 1998). Prior studies have suggested that application of information technology (IT) in both intra- and inter-organizational business processes is essential to enhancing coordination and communication within firms and among partner firms, which will lead to effective decision-making and superior logistics performance (Kengpol, 2007; Lai, Wong, & Cheng, 2008; Lee, Padmanabhan, & Whang, 1997; Rogers, Daugherty, & Stank, 1992). The primary objective of digitizing logistics activities is to leverage the potential of IT to create customer value by delivering products to the right place at the right time in a cost-effective manner to fully satisfy customer requirements (Wu, Yeniyurt, Kim, & Cavusgil, 2006).

Digitization of logistics activities refers to the application of IT to enhance the performance of logistics activities (Ngai, Lai, & Cheng, 2008). Many prior studies on the deployment of IT for logistics management were limited to examining the performance effect of a single IT application for a specific logistics activity, e.g., warehouse management system (WMS) for warehousing activities and electronic data interchange (EDI) for information sharing (Hill & Scudder, 2002; Kekre & Mukhopadhyay, 1992; Nurmilaakso, 2008). These studies have been criticized for failing to consider the collective nature of IT applications that are interdependent in producing and sustaining business performance (Singh, Lai, & Cheng, 2007; Wade & Hulland, 2004). An individual IT application on a logistics activity can be part of a digitized logistics activities bundle that may comprise a wide range of IT applications such as order processing, inventory management, shipment schedule planning, and so forth (Bharadwaj, 2000).

Drawing on the resource-based theoretical perspective, researchers have called for due recognition of IT bundles within firms that form a complex resource that is difficult for competitors to recognize and imitate (Coates & McDermott, 2002; Lai, Wong, & Cheng, 2006; Whittington, Pettigrew, Peck, Fenton, & Conyon, 1999). This resource-based view (RBV) of the firm suggests that a resource can be a source of sustained advantage when it is not easily imitated (Barney, 1991). Following this line of thinking, Miles and Snow (2007) reasoned that a firm's decision and investment in its logistics management activities should be anchored on RBV. On the other hand, Clemons and Row (1991) argued that imitation by competitors could erode the advantages gained from IT applications because most business processes can be computerized by adopting readily available IT hardware and software. To attain IT-based competitive advantages, there are three feasible paths: (i) reinvent IT advantages continuously through avant-garde IT innovation; (ii) move first to attain

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unassailable first-mover advantages; and (iii) utilize IT in a way that generates valuable and sustainable resources (Clemons & Row, 1991; Powell & Dent-Micallef, 1997). The first two paths are considered unsustainable due to short IT development cycles and fast obsolescence of IT (Sager, 1988; Warner, 1987). Taking a bundling approach, rather than focusing on one-on-one IT application in managing logistics activities, is consistent with the ideas advanced in resource bundling research (Bharadwaj, 2000; Vicente-Lorente, 2001). This bundling approach extends beyond a specific IT application with a focus on the extent to which digitized logistics activities are collectively employed in a way that suggests an organizational level effect. In other words, digitized logistics activities bundles capture the collective effects of IT applications and the bundling approach is particularly appropriate for investigating firm-level effects of technological resources on logistics performance (Shah & Ward, 2003).

Although the literature tends to suggest that digitized logistics activities bundles are beneficial to organizations, there is a lack of empirical evidence supporting this view. One objective of this study is to explore the existence of different digitized logistics activities bundles and their underlying resource configurations. Another objective is to establish and empirically test if firms displaying different configurations of digitized logistics activities bundles vary in their service- and cost-related logistics performance. These objectives relate to the following research questions: Are different configurations of digitized logistics activities bundles associated with particular clusters of firms? If so, how are the differences in logistics cost and logistics service performance of the clustered firms accounted for by configurations of IT-based resource bundles?

2. Theoretical background and hypothesis development

2.1. Resource-based view and digitized logistics activities

The RBV of the firm in strategic management focuses on rents accruing to the owners of scarce firm-specific resources (Barney, 1991). Organizational heterogeneity in acquiring and deploying resources and assets would differentiate the ability of firms to generate superior returns from the markets (Oliver, 1997). RBV entails that firms compete on the basis of their unique resources, whereby firms' resources possess distinctive and idiosyncratic characteristics. Resource selection, accumulation, and configuration (e.g., adoption, adaptation, and application of IT and management practices) are key attributes that distinguish a firm from its competitors, where superior performance can be attributable to the unique bundle of organizational resources possessed and deployed by the firm (Barney, 1991).

Recent thinking suggests that the key to improving a firm's performance lies in configuring its resources and assets to create business value (Eisenhardt & Martin, 2000; Sambamurthy, Bharadwaj, & Grover, 2003). Resources of firms, such as digitized logistics activities, are useful to generate rents when they are appropriately bundled to add value at the firm level (Barney, 1991; Teece, Pisano, & Shuen, 1997). Resource bundles have been empirically found to engender sustainable cost and service advantages (Kettinger, Teng, & Guha, 1994). Bundling digitized logistics activities concerns the acquisition of idiosyncratic resources and assets by: (i) utilizing electronically networked solutions that exploit and integrate internal and external competencies among firms in a logistics process (Mentzer et al., 2001; Hammer, 2001), and (ii) attaining a complex mechanism through which the digitized logistics activities may help improve the logistics performance of firms (Milgrom & Roberts, 1995; Zhu, 2004). As the resource bundle could be difficult for competitors to imitate in managing their logistics activities (Barney, 1991; Day, 1994; Dierickx & Cool, 1989; Hammer, 2001), RBV provides an appropriate theoretical lens to explore the extent to which firms digitize their logistics activities in hopes of achieving better logistics performance.

2.2. Logistics management and digitized logistics activities

The objective of logistics management is to create customer value by utilization of a firm's resources in order to maximize its competitiveness through its logistics chain (Wheeler, 2002; Lambert, Cooper, & Pagh, 1998). Logistics management involves: (i) the control of product and information flow, (ii) the management processes related to the transformation of materials into value-added products, and (iii) the delivery of finished products through appropriate channels to markets, in order to maximize customer value and satisfaction (Narasimhan & Kim, 2001). This management approach gains strategic importance by enabling product and service offerings to be differentiated, yielding cost and service advantages to practicing firms by forming cooperative relationships (Christopher, 1998; Lai, Bao, & Li, 2008; Tan, Kannan, & Handfield, 1998). To this end, IT application is useful for coordinating the logistics activities amongst partner firms, establishing electronic connections, and digitizing logistics activities to improve logistical coordination (Daly & Cui, 2003).

From the coordination-theoretic perspective, which is a body of principles about how business activities can be coordinated amongst multiple organizations that work together towards common goals such as cost reduction (Malone, 1988; Malone & Crowston, 1990), logistics management is increasingly recognized as an important area for innovation and investment in IT (Arshinder & Deshmukh, 2008; Bowersox & Daugherty, 1995). This is because information is an element that holds firms in a logistics chain together in response to ever changing market requirements (Evans & Wurster, 1997). Prior studies have suggested that digitizing logistics activities would bring favorable impact on organizational structure, communication, information exchange, business processes, buyer–supplier relationships, and bargaining power (Bowersox & Daugherty, 1995; Lewis & Talayevsky, 1997; Williams, Nibbs, Irby, & Finley, 1997). Advances in networked IT allow firms in a logistics chain to work closely and meet customer requirements at a lower cost (Williams et al., 1997; Narasimhan & Kim, 2001; Hill & Scudder, 2002).

By establishing information-sharing linkages, the application of IT facilitates logistics operations as it provides electronic connections among members of a logistics chain (Vickery, Jayaram, Droge, & Calantone, 2003). Digitization can contribute to the management of logistics in a number of ways from information storage to active, dynamic, and interactive systems that support the performance of different logistics activities (Chatterjee, Rajdeep, & Sambamurthy, 2002). Digitizing logistics activities can add value to stakeholders including customers and suppliers (Lambert et al., 1998) by furnishing an electronic connection for trading convenience and information exchange that could differentiate the customer service and reduce the operations costs of a logistics chain. Such electronic connections are highly desirable for logistics management, which requires the establishment of inter-organizational information networks and the construction of integrated logistics information systems (Bowersox & Daugherty, 1995; Cash & Konsynsky, 1985; Narasimhan & Kim, 2001; Williams, Magee, & Suzuki, 1998).

The scope of logistics activities in firms is broad ranging from purchase order management, delivery schedule planning through to customer relationship management. According to Porter's Value Chain Model, logistics activities contribute to customer value creation in both inbound and outbound logistics of firms (Rutner & Langley, 2000). Prior studies have investigated the use of IT to support logistics activities. For example, Closs and Savitskie (2003) examined the influence of internal logistics information integration and customer integration on customer service performance. Sanders and Premus (2002) identified operations-oriented IT and marketing-oriented IT that support the supply chain activities of firms. Operations-oriented IT assists decision-making and improves both intra- and inter-organizational operations efficiency (Hsiao, 2008), while marketing-