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Industrial Marketing Management 33 (2004) 627–641
INDUSTRIAL MARKETING MANAGEMENT

The role of learning and technical capabilities in predicting adoption of B2B technologies†

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Received 13 January 2003; received in revised form 12 August 2003; accepted 1 October 2003
Available online 3 December 2003

Abstract

Using the resource-based view and the learning organization as its theoretical framework, this study hypothesized that organizations which possessed not only the technical capabilities for automation but also the ability to learn and share information would be most likely to automate their supply chain processes. An empirical study with the top suppliers of a major airline supported this hypothesis. As predicted, both learning capabilities and certain technical capabilities were important in predicting the likelihood of adoption of Ariba, a web-based e-procurement tool.

Keywords: Supply chain management; Information management; Knowledge management; Resource-based view; Technology adoption

1. Introduction

In his 1997 *Computerworld* Leadership Series, Davenport (1997) offered some insights into why IT practitioners continue to develop applications that are not adopted by users. Among his laundry list of items, Davenport began with the notion that systems are largely governed around how information flows within and around an organization. To this end, antiquated frameworks of data management have proven to be dysfunctional—thereby resulting in failures to meet customer demands, challenges to internal and interface integration, extreme cost overruns, and resistance to change (Goodhue, Kirsch, Quillard, & Wybo, 1992; Truman, 2000).

As organizations strive to electronically integrate not only their immediate customers and suppliers, but multiple tiers of customers and suppliers, adoption of these new technologies across global supply chains continues to be a major barrier (Handfield & Nichols, 1999, Chap. 1). As supply chain members begin to work together, integration must occur between functions both *internal* to the organization (purchasing, engineering, manufacturing, marketing, logistics, accounting, etc.) and *external* to the organization (end customers, third-party logistics, retailers, distributors, warehouses, transportation providers, suppliers, agents, financial institutions, etc.). Each goal contains its own set of challenges. For instance, *internal strategic integration* requires that all company members have access to an integrated information system spanning multiple functions and locations. This integration is most often accomplished through a company-wide ERP (Enterprise Resource Planning) system, which links internal groups via a single integrated set of master records. *External integration* refers to the systems that link external suppliers and customers to the focal company. External integration allows all supply-chain members to share critical information such as forecast demand and inventory levels across the supply chain. Systems used to integrate supply-chain members include e-procurement and e-logistics systems, trade exchanges, network communications, and Electronic Data Interchange (EDI) (Handfield & Nichols, 1999, Chap. 1).

This study is motivated in part by the very practical concerns of a large airline as it moved forward in its supply chain automation efforts. This airline was in the processes of implementing an e-procurement system in a parallel mode. The system, Ariba, is a web-based e-procurement tool that

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† This effort and these results are dedicated to those airline industry employees who lost their lives on September 11, 2001 and to their families.

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doi:10.1016/j.indmarman.2003.10.004

allows users to order items directly from supplier catalogs from a secure Internet website, thereby automating the order requisition, purchase order, and accounts payable processes.

Other software alternatives to Ariba include Commerce One, Lawson, Lonesource, and other providers that provide electronic tools and documents for purchase requisition, request for quotation, approval, purchase order, and accounts payable processes. These systems do not require suppliers to make a major investment in the technology. However, the systems do require that suppliers invest in alternative businesses processes in bidding, providing requests for quotation, and invoice submittal procedures. Supplier automation systems also require some baseline level of technical expertise, as suppliers may need to submit materials via online systems, develop electronic catalogs of item availability to the customer. Once a buying company implements a system such as Ariba, it is relatively difficult to switch to another system, as the compatibility with other purchasing systems may be relatively low. Systems such as Ariba or Commerce One, are, however, compatible with many ERP systems currently in use.

In this case, as Ariba was implemented, the airline continued to use a traditional manual process for purchase orders and invoices with many of its larger suppliers. As the airline moved forward with Ariba, executives were faced with the task of selecting supplier candidates for the pilot stage of the system. Executives eliminated many suppliers based on the criteria to include only large strategic supplier partners; however, this decision still left them with a total of 96 potential suppliers. Executives noted that the success of the pilot was critical to the success of the entire Ariba implementation. If the pilot was successful, the likelihood of other suppliers "jumping on board" was more probable. The selection decision needed to be made quickly, as the time frame for implementation was perceived to be rather short.

This paper first presents several key theoretical frameworks used to develop a model for the likelihood of adoption of B2B technologies by suppliers. The literature review suggests the hypothesis that suppliers can be clustered into four groups on the basis of technological and learning dimensions, and also suggests that these clusters will vary in terms of their likelihood of adoption and cycle time improvements. This paper then discusses the constructs and scales that were developed to test these hypotheses and the methodology used to analyze the resulting data. Finally, the results and managerial implications of the study are presented.

1.1. Theoretical background

The resource-based view contends that competitive advantage is achieved by combining resources and capabilities that create value for customers and profits for the firm (De Castro & Chrisman, 1995). Firms achieve competitive advantage through heterogeneous, specific, and difficult-to-imitate resources that include intangible assets, such as customer and supplier information (Barney, 1991; Itami & Roehl, 1987, Chap. 2; Mahoney, 1995; Penrose, 1995, Chap. 2; Prahalad & Hamel, 1990). However, it is not just a firm's assets, but how they are leveraged across supply chains that provide competitive advantage (Handfield & Nichols, 1999, Chap. 1). For example, research shows that it is not the IT system itself that provides competitive advantage, but how the system is used in conjunction with complementary human resources (Hult, 1998; Powell & Dent-Micaleff, 1997).

In fact, it has been suggested that firms' ability to learn may be the only true source of long-term competitive advantage (Garvin, 1993; Sinkula, Baker, & Noordewier, 1997; Slater & Narver, 1995). Learning processes are difficult to develop in and of themselves, but the specificity and intangibility of these associated assets makes them more difficult for others to imitate, ultimately creating advantage for those with effective learning processes. As organizations seek to integrate customers and suppliers, this learning capability becomes an important asset that managers are recognizing as key to successful deployment of relationship structuring, material flows, and information system deployment (Hult, 1998; Hult, Hurley, Giunipero, & Nichols, 2000).

For example, in the customer context, the process of learning has been linked to success in the development of Customer Relationship Management (CRM) systems which store and process information about the customer so that dialogues may be developed with relevant customers (Massey, Montoya-Weiss, & Holcomb, 2001). To manage effective relationships with suppliers, certain key information from them is required as well (Monczka, Peterson, Handfield, & Ragatz, 1998). The ability of suppliers to adopt tacit information regarding customer requirements and realign their technology roadmaps has been deemed critical to success of integration in new product development processes (Handfield, Ragatz, Monczka, & Peterson, 1999).

A major problem faced by executives is the ability to accurately assess these "soft" criteria associated with knowledge management, which are not readily quantifiable. For example, the number of engineers on staff or the number of training hours received by employees is not necessarily a good representation of the degree of learning present in an organization. Yet, the importance of assessing these skills is believed to be a critical determinant associated with successful implementation of new supply chain information systems. Another important variable associated with implementation success is the strength of the relationship between parties (Vlosky & Wilson, 1994). Just as companies seek to develop strong relationships with their industrial customers (in the relationship marketing literature), they now seek to develop these relationships with their suppliers (Morgan & Hunt, 1994; Walter, Ritter, & Gemunden, 2001; Whipple &