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ASSESSING IT BUSINESS VALUE WITHIN INTERORGANIZATIONAL PROCESSES¹

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Abstract

As information technology has evolved over the past four decades, so too have the means by which organizations leveraged IT to enable new and efficient business processes for value creation. Understanding and assessing the value of these IT and organizational co-innovations is vital in informing future IT investment decisions. While valuable to managerial decision making, extant research examining Internet-enabled interorganizational innovations taking place in the competitive environment is nascent. The current network era necessitates a broader perspective of IT value, one that focuses on networked trading partners integrating technologies and business processes to improve efficiency and attain competitive advantage. In this research-in-progress study, we explore the processes of interfirm IT value generation in prevailing settings and generate associated propositions. The study is an important component of a larger program of research assessing value creation via today's ubiquitous, interorganizational information technologies.

Keywords: IT business value, automation, transformation, exchange, collaboration, network era, inter-organizational

Introduction

In the 1960s, mainframe computers revolutionized corporate accounting, enabling organizations to tabulate customer transactions, inventory, cash, and materials. These new “electronic accounting machines” replaced banks of mechanical tabulating machines, improving the efficiency of data recording and processing. So great were the related efficiency gains that if one firm in an industry purchased a mainframe computer, its competitors had merely two choices: purchase a mainframe themselves, or go out of business (Tedlow 2001).

As IT has evolved over the past four decades, so too have the means by which organizations leveraged IT to enable new and efficient business processes for value creation. For example, in the late 1980s price and performance improvements in IT motivated the decentralization of computing throughout the firm. This era of computing, known as the PC era, was characterized by the use of IT to support organizational innovations in structure and business processes (Lawler et al. 2001). Specifically, personal computers linked via local area networks enabled the adoption of self-managed teams and small business units, helping to flatten the organizational hierarchy and creating value through increased organizational flexibility and faster decision making (Brynjolfsson et al. 1994, Lawler et al. 2001).

In recent years, the proliferation of networks – particularly those incorporating Internet technologies – has enabled yet another round of organizational process change for performance improvement. In the network era, firms are adopting Internet-based networks (e.g. intranets and extranets) to interconnect their value chains with those of their business partners. These IT-enabled interfirm business processes are reshaping industrial supply chains, altering the competitive environment, and presenting new opportunities for value creation through increased interfirm cooperation (Hammer 2001). Understanding and assessing the value

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of these IT and organizational co-innovations is vital in informing IT investment decisions. However, the extant literature in this area is only beginning to explore pieces of this complex puzzle.

To contribute to our knowledge of interfirm IT business value, we develop a conceptual framework to examine both the function and the impact of IT-enabled interorganizational business processes. We ground the framework using multiple case studies, suitable for new phenomena lacking well-developed theory (Benbasat et al. 1987). Our overall objectives in this research in progress are twofold – 1) exploration of the processes of interfirm IT value generation in prevailing settings; and 2) generation of associated propositions – both of which are important components of our overall investigation of how value is created via today's ubiquitous, interorganizational information technologies.

In the next section, we overview the four principal themes of the extant interfirm IT business value literature and identify how our research fits into the evolution of this research stream. Next, we introduce our conceptual framework of interfirm IT value, the use of which enables a systematic approach to examining business impacts of interfirm IT. In the next section – still in progress – we examine multiple cases to demonstrate the differing dimensions of interfirm IT value generation. Finally, we provide concluding remarks, specify work remaining, and indicate the potential of findings when the research is completed.

Literature Overview

Emerging IT business value research assessing the application of IT to business processes that extend beyond firm boundaries can be grouped according to several themes (Figure 1). First are classification schema examining major types of interfirm IT application and associated characteristics including value potential, whether based on the degree of relational exchange (Christiaanse and Markus 2003) or the number and arrangement of buyers and suppliers (Pavlou and El Sawy 2002). Studies in the second group identify and examine the processes by which interfirm IT value is created within specific contexts, such as procurement between a buyer and suppliers (Mukhopadhyay and Kekre 2002) and independent e-marketplaces (Soh and Markus 2002). Studies in the third theme empirically assess interfirm IT value and its moderators (Chatfield and Yetton 2000, Subramani 1999). Finally, studies in the fourth group examine how value is distributed among stakeholders, such as owners of an electronic network (Bakos and Nault 1997).

As the phenomenon of Internet-based electronic integration among trading partners is relatively new, we choose to focus on the first two themes. Specifically, we build upon and synthesize extant typologies and case studies of IT value into a framework mapping both the function and the impact of IT-enabled interfirm business processes. This represents one of the first studies in the literature to explore how the characteristics of electronic integration among stakeholders map to business value generation and appropriation. In the next section, we explicate the framework, and subsequently examine several case studies to provide rich detail into associated phenomena.

Conceptual Framework

Interfirm IT enables a wide range of business processes, which we classify according to their *function* and *impact* (Figure 2). The two principal categories of function are exchange and collaboration, a grouping that is consistent with emerging interfirm IT value research (Christiaanse and Markus 2003). In contrast, although impact, which can be either automational or transformational, has been utilized within the internal firm perspective of IT value, its adaptation within the interfirm context is nascent.

Function, the first dimension, refers to the processes enabled by interfirm IT applications. Applications supporting the *exchange* function enable processes directly associated with buying and selling, such as electronic purchase orders, invoices and online auctions of commodity inputs. In contrast, *collaboration* indicates joint organizational pursuit of a common goal, such as new product development. Although exchange has been the traditional function supported by interorganizational information systems, web-based collaboration is growing rapidly (Rust and Kannan 2003; Christiaanse and Markus 2003). Internet-based systems enable collaborative value-added activities among trading partners, such as demand forecasting, product development, production planning, and inventory management. For example, the Cisco Supplier Connection extranet enables synthesis of its competencies in design and fulfillment with those of its contract manufacturers (Kraemer and Dedrick 1999). The result is a seamless chain of design, manufacture, test, and fulfillment with a consistent collaborative interface throughout. The competitive landscape reflects the shift in emphasis from exchange to collaboration, with the basis for competition increasingly being networks of trading partners, as against individual firms and isolated value chains.

<p>1. Categorizing Interfirm IT Schema development to categorize major types of interfirm IT applications and examine value implications:</p> <ul style="list-style-type: none"> • Christiaanse and Markus (2003) distinguish between transaction-oriented marketplaces and collaboration marketplaces. • Pavlou and El Sawy (2002) contrast two dimensions – the number of suppliers and buyers – to distinguish between neutral markets, dyadic relations, and biased markets.
<p>2. Processes of Interfirm IT Value Creation Processes by which interfirm IT value is created:</p> <ul style="list-style-type: none"> • Soh and Markus (2002) examine role of interconnection effects and strategic positioning in public, independent e-marketplace success across two cases. Strategic fit among value proposition, product-market segments, and value activities are associated with differences in performance. • Mukhopadhyay and Kekre (2002) assess strategic and operational benefits of electronic integration within the procurement function. When the buyer initiates the system and the supplier enhances the system's capabilities, value in the form of strategic benefits accrues to the supplier. When suppliers have advanced IT-enabled transactions, order-processing system significantly increases benefits to buyer and supplier.
<p>3. Estimation of Interfirm IT value Estimate value from interfirm IT and influencing factors:</p> <ul style="list-style-type: none"> • Chatfield and Yetton (2000) find that the strategic payoff from EDI is a function of EDI embeddedness, i.e., benefits to trading partners of adopting EDI are moderated by interorganizational relationships. • Subramani (1999) finds that IT use in interfirm relationships leads to the creation of closer cooperative interfirm relationships. Support for two dimensional conceptualization of IT use within the context of IOS: transaction processing and learning and expertise creation.
<p>4. Appropriation Examine how value is appropriated:</p> <ul style="list-style-type: none"> • Bakos and Nault (1997) model ownership and investment within modes of electronic governance using incomplete contracts theory. A principal finding concerns the indispensability of stakeholders, defined as “unique specific skills” required to effect a desired outcome from a specific network asset. • Brynjolfsson (1996) estimates that IT spending generates a substantial consumer surplus, some of which will not show up in productivity statistics (greater convenience, product quality, etc.)

Figure 1. Interfirm IT Value Literature Themes and Representative Studies

Function	Collaboration	<p>Processes</p> <ul style="list-style-type: none"> • Joint product design • Joint project management • Virtual Conferences/Meetings • Team scheduling • Interfirm Information sharing 	<p>Processes</p> <ul style="list-style-type: none"> • New product development • Customer relationship management • Supply chain management • Production planning <p>Cases</p> <ul style="list-style-type: none"> • Firms: Cisco (Networking Technology) • Value components: Efficient supply chain, more effective target marketing
	Exchange	<p>Processes</p> <ul style="list-style-type: none"> • Electronic purchasing • Electronic billing • Electronic payment • Online catalog publishing <p>Case Examples</p> <ul style="list-style-type: none"> • Firms: Benfield Blanch (Insurance) • Value components: Error Correction, Cost Savings 	<p>Processes</p> <ul style="list-style-type: none"> • Electronic marketplaces • Online auctions • Online contract negotiation • Online RFP process
		Automation	Transformation
Impact			

Though current findings are limited to automating exchange and transforming collaboration, we are currently analyzing several potential contexts for automating collaboration and transforming exchange.

Figure 2. Conceptual Framework of IT-Enabled Interfirm Business Processes

The second dimension, impact, refers to whether IT applications are used to automate an existing process, or, whether IT is used to enable a complete process redesign. *Automation* denotes conducting similar processes more efficiently, i.e., substituting IT for labor to save time and improve accuracy. An example is the use of EDI to eliminate the need for manual order input, resulting in improved labor productivity and capital efficiency (Unitt and Jones 2001). In contrast, *transformation* involves the redesign of processes to maximally leverage new IT-enabled functionality (Sandberg 2001, Williams and Frolick 2001). An example is integrating back-end ERP systems with a supplier network to transform the purchase of production parts. In summary, automation is the continuous improvement of existing processes, while transformation involves a change in the process itself – leveraging new technologies to create new ways of doing things (Hammer 2001).

A range of technologies supports each of the four cells in the function-impact framework (Figure 2). From an automation perspective – the traditional purview of IOS – EDI and networked CAD/CAM systems have represented the major underlying technologies for exchange and collaboration, respectively. The electronic data interchange (EDI) standard for application-to-application exchange of business documents has been a traditional enabler of exchange. Though it began as an expensive solution requiring substantial up-front and recurring costs, Internet standards have lowered adoption barriers (Williams and Frolick 2001). Web-based standards such as HTML and extensible markup language (XML) expand the menu of interfirm exchange functionality. However, new web-based technologies, including online marketplaces and web services, are rapidly changing this automational landscape to enable transformation of both exchange and collaboration. According to the U.S. Census Bureau, one half of U.S. manufacturing plants accessed vendor's products or catalogs online in 2000, with 75% expecting to by the end of 2002. Significant growth is expected for other applications, including online bidding (8% to 27%), and the use of electronic marketplaces (7% to 33%).

In sum, our conceptual framework synthesizes extant research to map the function and impact of IT applied within inter-organizational processes. This provides a simple yet comprehensive structure within which to examine the processes of interfirm business value generation. We now summarize research completed to date of multiple case studies of interfirm IT business value generation within specific contexts, which are structured according to our framework and which identify and explicate the rich details associated with interorganizational IT business value.

Application of Framework

In this section we utilize the function-impact conceptual framework to examine richly detailed cases of interfirm value creation phenomena and generate propositions that encapsulate our findings. We focus on two cells of the framework: automating exchange, and transforming collaboration (as this portion of the research remains in progress, what follows is a report of findings to date).

Automating Exchange

Many implementations of electronic data interchange (EDI) can be viewed according to a hub and spoke model with a principal vendor or buyer at the center leading its trading partners in the automation of paper-based processes. Business process automation using EDI involves the exchange of a wide range of electronic documents, including purchase orders, confirmations, shipping notices, invoices, and payments (Unitt and Jones 2001). In particular, firms within information-intensive industries have the potential for substantial value generation using EDI automation, including cost savings and error reduction

Benfield Blanch is the U.S. subsidiary of the world's third largest reinsurance intermediary, Benfield Group plc. By providing insurance to other insurers, reinsurance maintains industry stability by spreading losses among many companies in the event of catastrophic events, such as earthquakes (ACORD 2002). A critical process within this industry is writing, tendering, and maintaining insurance policies – a highly structured and paper-intensive process revolving around contract negotiation, exchange, acceptance, etc. In 1999, Benfield Blanch initiated an EDI hub to automate exchange of contract-related documents between itself and its trading partners (ACORD 2002). Implementation of the EDI system included rationalizing data into a single database, mapping such data into EDI data formats, and implementing an EDI translator to enable the interfirm data exchange process. By 2002, the automation of the paper based process had been so successful that over 100,000 messages had been exchanged electronically between Benfield Blanch and its trading partners. More importantly, Benfield Blanch and its partners have been able to generate value from the system through the elimination of data reentry, improved document accuracy, and improvement in their overall relationship (ACORD 2002).

Other cases currently under examination that illustrate the value implications of automation – whether exchange or collaboration – include BT and Federal Express (Unitt and Jones 1999; Williams and Frolick 2001). Though such research is ongoing, several

questions have emerged: 1) how do the costs of implementing interfirm IT-enabled business processes focused on automation relate to the benefits?; 2) how do industry and organizational factors relate to the dimensions of value generation?; 3) what intangible benefits might arise related to strategic options in terms of learning curves and future implementations; and 4) how is the value generated distributed among stakeholders? Regarding the first question, we posit that the value captured by using interfirm IT to automate existing processes exceeds the costs of such systems:

Proposition 1: The value generated by IT-enabled interfirm business processes focused on automation exceeds the cost of implementation and maintenance.

Transforming Collaboration

Transformation via the use of interfirm IT applications may take the form of a single firm building its own system. In this scenario, the firm operates as a hub that connects to its suppliers and vendors via an internally developed and maintained web-based IOS. Within the integrated supply chain, information associated with raw materials and semi-finished products used in the manufacturing process is exchanged, enabling collaborative activity among trading partners (e.g., planning, vendor managed inventory, and new product development). Interfirm IT applications may also take the form of industry partnerships for joint system development. This development method can benefit from economies of scale and liquidity, while at the same time, reducing the need for joint negotiation and change among development partners. We now summarize research to date concerning transformational collaboration.

Cisco is a leading systems integrator of networking equipment for the Internet. Unlike traditional capital equipment providers, its value added activity focuses on only four domains: design; final assembly and test; fulfillment; and management of the supply chain. A key component of Cisco's business process is the integration of suppliers into its production system, which, among other things, enables product to be shipped directly from manufacturers. Moreover, the tight integration of its information systems with Cisco trading partners allows for the dynamic replenishment of supplies through the direct flow of information between all parties (Kraemer and Dedrick 1999). The information gathered at each stage of Cisco's supply chain is fed into historical and real-time analytic models to reduce variability in demand forecasts and responses to targeted customer promotions. Even product pricing has been transformed through the pre-certification of some 30 suppliers who are able to respond to request-for-bids for specific Cisco components within hours of the original request (Kraemer and Dedrick 1999). Cisco has generated tremendous value via transforming its collaborative relationships with its suppliers and contract manufacturers through the use of IT. Fulfillment cycles have shrunk from three weeks to three days, time-to-market for new products is now three months, and bottom-line margins have been enhanced by over \$100 million (Jones 2000). Covisint is an additional case currently in progress that illustrates both the value implications as well as the risk inherent to IT-enabled transformation.

As with automating exchange, several questions have emerged regarding the use of interfirm IT applications for transforming collaboration. Salient dynamics include the ability of firms to gain a competitive advantage, the relational aspects and incentives among the various participants, and the appropriation of value (Christiaanse and Markus 2003). Competitive advantage results from four elements: (1) resource heterogeneity leading to the achievement of rents; (2) ex ante limits to competition for resources; (3) the ability to appropriate rents due to imperfect resource mobility; and (4) sustainability of rents via ex post limits to competition (Peteraf 1993). As illustrated by the Cisco example, the reorganization of IT-enabled interfirm business processes that are unique and difficult to imitate may enable competitive advantages. We thus propose that:

Proposition 2: In transformational collaboration, the greater the extent of complementary changes to business processes that enable unique and difficult to imitate processes critical to a given industry, the greater the likelihood of achieving competitive advantages.

Summary and Contribution to Knowledge

In this research-in-progress paper, we have summarized the early phases of an ongoing research program examining the contribution to value generation of network-era IT and organizational process co-innovations. We motivated the need for such research by drawing a parallel between different eras of IT and their associated organizational process changes. We identified interfirm IT value generation in the current network era as an understudied yet increasingly salient research domain. To improve understanding of the impacts of such developments, we developed a two-dimensional conceptual framework encompassing both the functionality and the impact of organizational co-innovation in interfirm IT and organizational processes. We applied our framework in examining multiple case studies – still in progress – and developing two initial propositions. When completed, the contribution to current knowledge of our research program is fourfold: 1) emphasizing the salience of IT value in the interfirm

context; 2) development of a simple analysis framework; 3) using multiple and detailed case studies as a basis for the generation of related propositions; and 4) empirical testing of propositions.

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