

Association for Information Systems AIS Electronic Library (AISeL)

ICIS 1999 Proceedings

International Conference on Information Systems
(ICIS)

December 1999

Linking IT Use to Benefits in Interorganizational Networks: The Mediating Role of Relationship-specific Intangible Investments

Mani Subramani
University of Minnesota

Ciaran Murphy
University of Minnesota

Follow this and additional works at: <http://aisel.aisnet.org/icis1999>

Recommended Citation

Subramani, Mani and Murphy, Ciaran, "Linking IT Use to Benefits in Interorganizational Networks: The Mediating Role of Relationship-specific Intangible Investments" (1999). *ICIS 1999 Proceedings*. 33.
<http://aisel.aisnet.org/icis1999/33>

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 1999 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

LINKING IT USE TO BENEFITS IN INTERORGANIZATIONAL NETWORKS: THE MEDIATING ROLE OF RELATIONSHIP-SPECIFIC INTANGIBLE INVESTMENTS

Mani R. Subramani
Carlson School of Management
University of Minnesota
U.S.A.

1. INTRODUCTION

Collaborative action with suppliers and customers, often termed “partnerships” or “alliances” are increasingly becoming critical to performance in a range of competitive industries (Venkatraman 1994). These often occur within networks that comprise a large focal firm and its “constellation” of key suppliers and customers (Gomez-Casseres 1994) and provide the context for the creation of specialized capabilities that can be leveraged by network participants.

The formal mathematical modeling of interfirm interactions based on economic theory (Bakos and Brynjolfsson 1993) has contributed significantly to our understanding of issues in buyer-supplier relationships. These studies indicate that IT deployment in buyer-supplier relationships is a significant factor influencing the development of cooperative relationships. Two related chains of events are identified as responsible for the influence of IT use on closer cooperative buyers-supplier relationships. First, IT deployment in interorganizational interactions requires significant relationship-specific investments (e.g., in creating specialized processes and learning about the other firm), motivating firms to work with a smaller number of suppliers to minimize costs and benefit from learning curve effects. Second, the widespread deployment of IT in supply relationships, encouraged by industry standards for EDI, barcoding, etc., increases the importance of non-contractable, long term oriented investments by suppliers (e.g., in product innovations, improving product quality, and responsiveness) as sources of competitive advantage.

While these results have face validity as they parallel the findings of case-based research and anecdotal accounts of the implications of IT (Short and Venkatraman 1992), these results have never been empirically verified. This study seeks to validate the results of these economic models using field data. The confirmation of these results would amount to a multi-method triangulation and enhance our understanding of interorganizational networks.

The other issue examined in this study is the link between IT use¹ in interorganizational relationships and the creation of value for satellite firms (Gomes-Casseres 1994) in networks. While there has been considerable prior research on benefits from IT use for intra-organizational interactions (Barua, Kriebel, and Mukhopadhyay 1995), there has been limited attention paid to examining firm benefits from IT use in interorganizational interactions. Also, the limited work in examining benefits from IT-mediated interorganizational interactions (Short and Venkatraman 1992; Mukhopadhyay, Kekre, and Kalathur 1995) focuses primarily on benefits to the larger “network leader.”

Benefits to firms from IT use in networks are unevenly distributed (Riggins and Mukhopadhyay 1994), often skewed in favor of the larger network leader (typically the buyer firm, as examples Chrysler and Walmart in their networks of suppliers). The larger

¹While “IT adoption,” “IT deployment,” and “IT usage” are distinct constructs, we do not differentiate between them here. In the context of the relatively simple IT operations of most small suppliers created largely for interactions with the focal buyer, our interviews indicate that the distinctions between these constructs are minimal.

firm often derives advantages in IT mediated settings by shifting costs to smaller firms, for example, by shifting inventory costs to suppliers in JIT systems (Mukhopadhyay, Kekre, and Kalathur 1995). Overall, it is not clear if smaller satellite firms derive value from IT investment and use in interorganizational contexts (Bannerjee and Golhar 1994). In this study, we collect empirical data from suppliers to investigate the benefits to them from IT use in interactions with a focal firm in the network.

This study examines the following research questions:

- (1) Does the use of IT in buyer-supplier networks lead to the creation of specialized intangible investments by suppliers as predicted by economic models?
- (2) Does the use of IT in interorganizational relationships lead to benefits to supplier firms?
- (3) Is IT use associated with benefits both directly and indirectly (through the influence of IT use on specialized investments by suppliers)?

2. RESEARCH MODEL

The conceptual model underlying the study is presented in Figure 1.

2.1 Conceptualizing IT Use: Transaction Processing and Learning

Actions in organizations comprise a mix of two classes of action: exploration and exploitation (March 1991). *Exploration* is the term for actions where the goal is to learn and improve performance in future periods. In contrast, *exploitation* refers to actions where the goal is to be efficient in task execution. Viewing IT as a means to enable firm activities (Weill 1992), we focus on two types of IT use: IT use for *transaction processing* and IT use for *organizational learning and expertise creation*, a distinction paralleling the notion of IT use for automating and informing (Zuboff 1988).

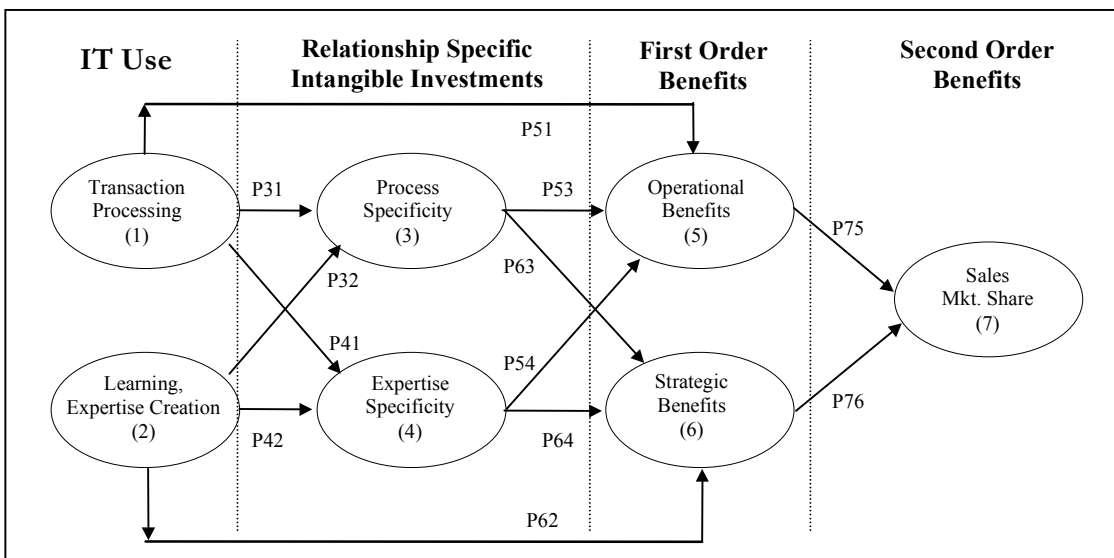


Figure 1. IT Use, Relationship Specific Investments, and Benefits in Interfirm Exchanges

IT use aimed to streamline interorganizational processes and increase the efficiency of the interface represents the transaction processing use of IT. Using EDI to transmit purchase orders with fewer errors, transmitting advance shipment notifications to provide delivery details, and transferring funds electronically are instances of IT use for transaction processing. This pattern of use is inherently focussed on efficient execution of structured interfirm processes.

On the other hand, IT use by managers at the supplier firm to learn more about the context of their relationship with the retailer and to learn about the operating environment of the retailer are instances of IT use for learning and expertise creation. Instances of these include suppliers interacting with a retailer's quality control staff to understand criteria used to determine product quality, interacting with merchandise planners to learn about the retailer's customers, etc. Similarly, the use of IT to examine sales data and understand customer preferences in different geographical locations of the retailer is an instance of IT use to support learning and expertise creation. IT use for learning exploits IT in the execution of unstructured tasks such as the application of judgment and the sharing of interpretations.

2.2 Conceptualizing Intangible Investments: Process and Expertise Specificity

Recent research on intangible value creating resources employed by firms suggests that they can be conceived as comprising two components: *know-how* and *know-what* (Kogut and Zander 1992). *Know-how* refers to the firm level understanding of task execution, the intangible investments that firms make to conceive tasks and create standard operating procedures for efficient task execution. The other component of intangible resources, *know-what*, refers to context sensitive, tacit understanding of subtleties that allows effective action and the resolving of ambiguities in task planning and execution. We, therefore, focus on *cospecialized* or *relationship specific* investments by suppliers along these two dimensions in interorganizational relationships: in developing specialized processes used to interact with the focal buying firm (creating *process specificity*) and investments in creating and maintaining specialized expertise deployed in interactions with the focal firm (creating *expertise specificity*).

We define process specificity as the *degree to which a supplier's key processes such as operating processes, administrative processes, and quality control processes are particular to the requirements of the focal firm.*

We define expertise specificity as the *degree to which a firm's critical expertise, such as competitive analysis and strategy formulation and new product development, are particular to the requirement of the focal firm in the relationship.*

We focus on the component of supplier investments that are *of little value* outside the relationship with the buying firm to capture the asset specificity of these investments, consistent with the logic of transaction cost theory (Williamson 1985).

Greater use of IT for *transaction processing* in interfirm relationships is likely to be accompanied by changes to business processes such as the redesign of replenishment processes for them to be triggered by point-of-sale data. Similarly, suppliers and retailer often make specialized changes to manufacturing processes and ordering processes to effectively integrate them using IT in establishing *just-in-time* supply of goods. The extent of use of IT for *transaction processing* is, therefore, likely to be directly related to the degree of *process specificity*.

On the other hand, greater use of IT for *learning and expertise creation* is likely to lead to changes to a supplier's understanding of the retailer's needs and therefore greater *expertise specificity*, *in line with* the mechanisms of knowledge creation discussed by Nonaka (1994). For instance, in contexts where the supplier's engineers use IT (such as e-mail, discussion forums, etc.) to interact with a focal retailer's service personnel to understand *patterns* in failures of their products in the field, these interactions are likely to progressively enhance the supplier firm's expertise in a manner that is *cospecialized* to the focal firm. Similarly, when marketing personnel in both firms confer (using IT enabled communication media) using data on past sales trends to determine stocking levels for the coming season at different warehouse locations, the supplier's expertise progressively grows more particular to the nuances and the context of the specific focal retailer.

We therefore propose the following hypotheses:

H1: The higher the level of IT use for transaction processing in the interfirm relationship, the greater is the level of relationship-specific processes in the exchange.

H2: The higher the level of IT use for learning and expertise creation in the interfirm relationship, the greater is the level of relationship-specific expertise in the exchange.

2.3 Conceptualizing IT Benefits: First Order and Second Order Benefits

Consistent with the multi-level conceptualization of benefits from IT (Barua, Kriebel, Mukhopadhyay 1995), we examine *first order benefits* to suppliers, e.g., cost efficiencies and innovation, as well as *second order benefits*, e.g., sales growth and market share growth. In addition, we distinguish between two classes of first order benefits: *operational benefits*, such as increased cost efficiencies, and *strategic benefits*, such as the development of new business opportunities.

2.4 Mediating Role of Specialized Intangible Investments

Arguments for the mediating role of specialized investments generally delineate the indirect influence of IT use on benefits. The logic is that IT use influences the establishment of specialized intangible investments, which in turn leads to benefits for firms.

Higher levels of IT use for *transaction processing* form the context for the creation of streamlined interfirm processes (creating *process specificity*). This in turn would enhance the level of *operational benefits* in the form of reduced delays, more streamlined operations, and fewer bottlenecks in interfirm processes. On the other hand, IT use for *learning and expertise creation* is likely enable a greater understanding of markets and customers, leading to higher levels of *expertise specificity*. This in turn would generate *strategic benefits* to supplier firms such as the ability to create new products, to identify new business opportunities, etc.

This leads to the following hypotheses postulating the dominance of the indirect effect of IT use on benefits in comparison to the direct effect:

H3: The higher the level of IT use for transaction processing, the higher are the levels of operational and strategic benefits achieved through the leverage of specialized intangible investments; the direct effects of IT use for transaction processing on operational and strategic benefits are smaller in comparison to the indirect effects through specialized processes and specialized expertise.

H4: The higher the level of IT use for learning and expertise leverage, the higher are the levels of strategic and operational benefits through the leverage of specialized intangible investments; the direct effect of the IT use for learning and expertise creation on strategic benefits is smaller in comparison to the indirect effect through specialized processes and specialized expertise.

Consistent with the two stage modeling of benefits, we have:

H5: The higher the levels of operational benefits in the relationships, the higher the level of market benefits.

H6: The higher the levels of strategic benefits in the relationship, the higher the level of market benefits.

3. DATA COLLECTION AND ANALYSIS

Data was collected from survey responses from 218 suppliers to a large retailer in Canada. We used path analytic techniques (Alwin and Hauser 1975; Duncan 1971) to verify the hypothesized relationships and trace the interrelationships of different types of IT use with specialized investments and benefits realized in the relationship.

4. SUMMARY OF RESULTS

The data support the effects suggested in H1, H2, H3, H5, and H6. Hypothesis H4, that the influence of IT use for learning and expertise leverage is mediated by investments in expertise specific assets, is not supported. The direct effects of IT use for

learning and expertise leverage on benefits are as significant as the indirect influence through the leverage of expertise specific assets.

Overall, the results extend our understanding of IT use in interorganizational relationships on several fronts:

- (1) The results support the view that IT use in interfirm relationships leads to the creation of closer cooperative interfirm relationships as evident from investments in relationship-specific intangible assets by suppliers. The nature of assets created is determined by the pattern of IT use. IT use for *transaction processing* leads to the creation of cospecialized processes by suppliers while IT use for *learning and expertise creation* leads to the creation of cospecialized expertise. These results further refine the logic of *IT enabled electronic integration* suggested by Zaheer and Venkatraman (1994), proposing two dimensions along which interfirm integration occurs. The results also provide empirical support for the results of analytical modeling of the phenomenon by Bakos and Brynjolfsson (1993).
- (2) The results provide support for the two dimensional conceptualization of IT use. In the context of the use of interorganizational information systems, IT use for *transaction processing* and IT use for *learning and expertise creation* are two salient dimensions influencing the nature of resource commitments and supplier benefits in the relationship.
- (3) The results indicate that benefits from IT use for *transaction processing* are completely mediated by specialized investments in specialized processes in the relationship. However, IT use for *learning*, in addition to being significantly mediated by investments in specialized expertise, appears to be directly linked to benefits as well.
- (4) This provides initial evidence that patterns of IT use that do not leverage relationship specific resources might become widely known and confer no differential benefits to firms. However, when the patterns of IT use leverages specialized process investments (e.g., a supplier process that enables production orders to be released based on actual retail sales) such use is likely to provide significant benefits to suppliers.

This evidence has significant implications for satellite suppliers in organizational networks: that IT use, which is often enforced by leading focal firms, offers a potential route to significant operational as well as strategic benefits when accompanied by investments in relationship-specific intangible investments (in specialized processes and specialized expertise, for instance) that would tie them more closely to the focal player. However, a corollary is that this opportunity is also laced with significant vulnerabilities associated with the committing of such investments.

The data is from suppliers to one large retailer, limiting the generalizability of our findings. Also, there are several issues particular to IT adoption in small businesses that are not included in this study, such as the level of top management commitment, the level of technology expertise, etc., which may influence outcomes significantly (Thong, Yap and Raman 1996). This is an area for future research.

5. REFERENCES

- Alwin, D. F., and Hauser, R. M. "The Decomposition of Effects in Path Analysis," *American Sociological Review* (40), 1975, pp. 37-47.
- Bakos, J. Y., and Brynjolfsson, E. "Information Technology, Incentives, and the Optimal Number of Suppliers," *Journal of Management Information Systems* (10:2), 1993, pp. 37-54.
- Banerjee, S., and Golhar, D. Y. "Electronic Data Interchange: Characteristics of Users and Nonusers," *Information & Management* (26:1), 1994, pp. 65-74.
- Barua, A.; Kriebel, C. H.; and Mukhopadhyay, T. "Information Technologies and Business Value: An Analytic and Empirical Investigation," *Information Systems Research* (6:1), 1995, pp. 1995.
- Duncan, O. D. "Path Analysis: Sociological Examples," in *Causal Models in the Social Sciences*, H. M. Blalock (ed.), Chicago: Aldine-Atherson, 1971, pp. 115-138.
- Gomez-Casseres, B. "Group Versus Group: How Alliance Networks Compete," *Harvard Business Review*, July-August, 1994, pp. 62-74.
- Kogut, B., and Zander, U. "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology," *Organization Science* (3), 1992, pp. 383-397.

- March, J. G. "Exploration and Exploitation in Organizational Learning," *Organization Science* (2:1), 1991, pp. 71-87.
- Nonaka, I. "Dynamic Theory of Organizational Knowledge Creation," *Organization Science* (5:1), 1994, pp. 14-37.
- Mukhopadhyay, T.; Kekre, S.; and Kalathur, S. "Business Value of Information Technology: A Study of Electronic Data Interchange," *MIS Quarterly*, June, 1995, pp. 137-157.
- Riggins, F. J., and Mukhopadhyay, T. "Independent Benefits from Interorganizational Systems: Opportunities for Business Partner Reengineering," *Journal of MIS* (11:2), 1994, pp. 37-57.
- Short, J. E., and Venkatraman, N. "Beyond Business Process Redesign: Redefining Baxter's Business Network," *Sloan Management Review* (34:1), 1992, pp. 7-21.
- Thong, J. Y. L.; Yap, C.-S.; and Raman, K. S. "Top Management Support, External Expertise and Information Systems Implementation in Small Businesses," *Information Systems Research* (7:2), 1996, pp. 248-267.
- Venkatraman, N. "IT-Enabled Business Transformation: From Automation to Business Scope Redefinition," *Sloan Management Review* (35:2), 1994, pp. 73-87.
- Williamson, O. *The Economic Institutions of Capitalism*, New York: Free Press, 1985.
- Weill, P. "The Relationship Between Investments in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector," *Information Systems Research* (3:4), 1992, pp. 307-333.
- Zaheer, A., and Venkatraman, N. "Determinants of Electronic Integration in the Insurance Industry: An Empirical Test," *Management Science* (40:5), 1994, pp. 549-566.
- Zuboff, S. *In the Age of the Smart Machine: The Future of Work and Power*, New York: Basic Books, 1988.