The Role of Trust and Collaboration in the Internet-enabled Supply Chain

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ABSTRACT

Collaborative computer-based information systems have become a major trend in today's business environment. Such systems are being used to link companies with suppliers, distributors, and/or customers, thus enabling the flow of information across the supply chain. The trend has accelerated with the emergence of the Internet and the wide scale adoption of e-business. While there are many potential benefits to such collaborative information systems, there are also a number of obstacles which make them difficult to implement. This paper traces the history of interorganizational systems and examines the critical role trust plays in their successful implementation. Several current-day collaborative technologies, specifically pertaining to supply chain management, are examined.

INTRODUCTION

It is difficult to pick up a trade magazine today without encountering the words 'trust' or 'collaboration' in relation to current business practices, particularly in the context of information sharing via the Internet. A collaborative approach to business, we are told, allows for much greater efficiencies along the supply chain and therefore greater customer satisfaction. As counterintuitive as this may seem to our competitive and independent sensibilities, we are further instructed that unless businesses quickly embrace this new paradigm they will not be able to compete in the emerging digital economy. Today's business transactions have become increasingly dependent on the exchange of information between the various links along the supply chain, which may include suppliers, customers, and even outright competitors. As opposed to the traditional approach, in which organizations cautiously guard their separate 'silos' of information, companies today are being forced to embrace a major transformation, where organizational boundaries are being eroded and information is 'visible' across the entire supply chain. All of this is made possible, of course, due to the emergence of the ubiquitous digital infrastructure known as the Internet.

The Internet-enabled supply chain is just the latest chapter in the ongoing evolution of information technology (IT) over the last few decades, typified by greater interorganizational flows of information. The term interorganizational system (IOS) has been coined to describe such information technology systems that cross organizational boundaries (Bakos, 1991). The concept of interorganizational information systems is not new - it has existed since the mid sixties- but the term has evolved to encompass a number of different technologies. Although differing in implementation detail, such technologies as extranets, virtual corporations, EDI, B2B e-commerce and now e-SCM, are all basically dependant on the same fundamental concept, i.e. the sharing of information between organizational entities. There are a number of obvious advantages that may be realized with IOS, such as reduced search costs, reduction in inventory, and tighter links to customers. (Johnston and Vitale, 1988). However, attaining the necessary levels of trust to make such interorganizational systems work is not an easy proposition and the long range outcomes are anything but certain.

The purpose of this paper is to examine the role of trust in today's Internet-enabled supply chain. Starting with the concept of organizational trust, the paper will then describe the evolution of interorganizational systems and the critical role trust plays in the successful implementation of such systems. Finally, several current day collaborative technologies, specifically pertaining to supply chain management (SCM), will be examined.

ORGANIZATIONAL TRUST

The study of trust has been undertaken from many different perspectives. Indeed, trust has been examined within the context of sociology, economics, international politics, law, marriage, and philosophy. Trust has been conceptualized as both a behavior and a belief system and has been viewed in terms of interpersonal, inter-group, organizational and societal relationships (Kramer and Tyler, 1996). It is the organizational aspect of trust, particularly in the context of information technology, that has received increasing attention in the literature and that will be the focal point of the current analysis. The idea that trust is an essential aspect of doing business is supported

by numerous research studies. Trust has been linked to successful outcomes in such processes as team work, leadership, goal setting, and performance appraisal. Questions such as how trust should be defined, how it evolves, how it is perceived and experienced, make up much of the research that has been done in this area. In a review of the literature on organizational trust models, Shockley-Zalabak, Ellis and Winograd (2000) suggest that conceptions of uncertainty, dependency, influence, and behavior expectations impact perceptions of trust. Further, they show that much of the research in this area relates organizational effectiveness to greater levels of trust. High levels of organizational trust have been linked to such outcomes as more adaptive organizational forms and structures, strategic alliances, responsive virtual teams and effective crisis management. Additionally, high levels of organizational trust have been shown to reduce litigation charges and lower transaction costs.

INTERORGANIZATIONAL SYSTEMS

Much of the literature relating to IOS attempts to develop taxonomies in order to classify the different types of systems (Cash, 1985; Johnston and Vitale,1988; Senn, 1999). One classification system, proposed by Sprague and McNurlin (1993), delineates the following eight characteristics of interorganizational systems: (1) require partners which are willing, able and ready to cooperate, (2) a key role for standards (e.g. data communications protocols, company policies), (3) importance of education in implementation, which is often more of an obstacle than the technology itself, (4) third parties are often involved, (5) the work must be synchronized, (6) work processes are often reevaluated, (7) technical aspects are less important than the new electronic relationships involved, (8) efforts often cannot be secretive i.e. IOSs require more openness especially when industry standards are adopted.

Regardless of how IOSs are classified, there is one common thread tying them together, i.e. the sharing of information and the centrality of trust. Although the idea of an IOS was first articulated in a Harvard Business Review article in 1966, it wasn't until American Hospital Supply Corporation (AHSC) and American Airlines implemented their IT systems in the 70s that the notion came to fruition. (Applegate, McFarlan and McKenney, 1999). In the case of AHSC, the original system was initiated by simply placing card readers at hospitals to enable better coordination and management of its internal order entry and inventory control. The system met with great success and over the years has evolved into a full scale Internet based B2B system. Airline computer reservation systems (CSR), such as American Airlines' SABRE and United Airlines' APOLLO, are other examples of early proprietary IOS. Like the ASAP system, the CSRs linked buyer and seller, but in addition they allowed competitors to share the same system. Although modest in scope by today's standards, both of these systems were revolutionary in the sense that they enabled information to be shared between organizations to achieve a more efficient operation and a 'win-win' outcome.

The next big push of IOS systems came with the introduction of electronic data interchange (EDI) systems in the 1980s. EDI is a type of IOS that involves the direct computer to computer exchange of information stored in standard formatted business documents (e.g. invoices, bills of lading, and purchase orders) among organizations participating in a trading partnership network. One of the more extensive treatments of EDI can be found in Swatman and Swatman (1992) who review the literature and examine many of the system integration issues. Although EDI was seen as the silver bullet that would totally eliminate paper transactions, it has met with a number of obstacles such as high cost and difficulty in learning proprietary software packages. In general, EDI is being surpassed by open systems which utilize the Internet, such as Internet EDI, extranets, and web-based B2B e-commerce (Turban, McClean and Wetherbe, 2004).

Interorganizational systems are more complex and multifaceted than traditional information systems, making them difficult to implement. Allen, Colligan, Finnie and Kern (2000) offer the following critical factors that impact the success or failure of an IOS: (1) effective communications, (2) trust, (3) operational uncertainty, (4) different objectives, (5) changes in business processes, (6) information, data standards, and protocol, (7) power relations and politics, (8) cross-cultural issues, (9) resistance to change,(10) disparate expectation levels, (11) use involvement and participation, (12) training of users, and (13) relationship management. The authors conclude that such 'soft' organizational issues are of much greater importance than technical issues in successful implementation of IOS. It is the transition from an inter-firm competitive approach to one of cooperation that poses the largest challenge but which also presents the greatest promise for IOS. Sharing of information between suppliers and customers has the potential to reduce inventory levels and production costs across the 'value' chain, thus dramatically improving channel efficiencies. Once achieved however, the cooperative and collaborative mindset must be vigilantly maintained. Kumar and van Dissel (1996) argue that unless IT enabled cooperation is carefully

nurtured, it can degenerate rapidly into conflict. The authors develop a typology for characterizing IOS along the dimension of interorganization interdependency in inter-firm relationships. Characteristics of three types of IOS (pooled information resource IOS, value/supply chain IOS, and networked IOS) are examined along with the potential conflicts stemming from economic, technical, and sociopolitical factors. The authors conclude that for IOS systems to provide sustainable benefits, they need to be viewed as fragile 'human activity systems' which require careful attention and nurturing.

Riggins and Mukhopadhyay (1994) state that IOS impose a reduction of the manager's span of control, resulting in limitations on how firms control costs and realize benefits from these systems. Certain firms act as IOS initiators by strongly encouraging their partners, generally suppliers, to adopt the technology if they wish to be considered long term trading partners. The suppliers adopting the technology due to this type of pressure are called IOS followers, and frequently do not implement the technology in a sophisticated way. This may hinder their own abilities to take advantage of the benefits of IOS making it a much riskier proposition than traditional IS systems. The authors advocate extending the study of business process reengineering to include 'business partner reengineering'.

Westland and Clark (1999) articulate a similar concern over imbalances that may arise among channel members utilizing an IOS. IOSs can often increase switching costs and commitment for both customers and suppliers in a channel relationship, reducing the bargaining power of both parties at the same time. When the reduction of channel power occurs simultaneously for all partners along the supply chain, it can result in a virtual channel alliance, with long-term relationships based on mutual trust rather than market based short-term contracts. But due to discrepancies in power relationships among channel members, the benefits of IOS are not always realized across the board. The authors point to the U.S. auto industry, in which only the customers of the large auto manufacturers have been able to capture the benefits of IT innovations such as EDI. Smaller firms are often forced to adopt innovations in order to maintain supplier relationships with large customers, but without realizing any of the savings provided by them.

Kumar and Crook (1999) use a case study approach to explore the complexities of managing IOS. The authors propose a multidisciplinary framework that includes collaboration, organization, and technology issues for the design and management of such organizations. The implementation of IOS is much more than simply a technological or organizational problem, but rather a complex and multidimensional managerial problem. The authors suggest that managers consider not only individual factors relevant to collaboration (e.g. economic, strategic, social, and conflict management), but also their effects on organizational and technical factors.

Using organizational theory as a foundation, McKinney and Gerloff (1997) propose a model to study uncertainty, trust and communication factors as they relate to the various roles of business partners using IOS. The four proposed IOS roles are viewed along a spectrum: transactions, inventory, process and expertise. As an IOS is expanded from a transaction based to a knowledge based role, the following will occur: (1) the amount of uncertainty experienced in the system will increase, (2) the amount of trust between business partners must be increased and (3) the need for effective communication will increase. The authors assert that trust is the most critical factor for sustained business relationships and that it needs to be nurtured between partners for successful IOS implementation.

IOSs can create a number of organizational imbalances which may introduce risk, shifts in power relationships, and uncertainty. Sherer (1997) provides a framework for understanding different types of IOS and risks that they pose. The author discusses three dimensions of risk that affect IOSs : technical, organizational, and environmental. Technical risks may result from interconnectivity problems or security breaches. Organizational risks may result from changes to internal organizational structures that occur as a result of changing roles among IOS participants. Environmental risks may be broken down into dependence risk (e.g. where one organization becomes dependent on another organization that attempts to change the terms of the contract) or competitive risk (e.g. where on organization attempts to steal competitive information from another). Further, the author suggests that while the IOS reduces the need for certain traditional intermediaries, it also provides a new role for the 'trust' intermediary, whose major role is to minimize competitive risks. The problems inherent in collaborative IOS may also be compounded by other external factors, such as those relating to culture. Kwok, Lee and Turban (2001) suggest that by properly managing 'inter-cultural apprehension', the fear or anxiety associated with interacting with people of different cultural groups, managers may be better able to bring organizations of different cultures together for successful collaborative e-commerce projects. The authors propose a model that relates the factors of cultural

climate, technological environment and communication leadership with 'inter-cultural communication apprehension'. Further, they present hypotheses relating the Hofstedian dimensions of power distance, uncertainty avoidance, and work centrality to intercultural communication apprehension.

Boddy, Macbeth and Wagner (2000), in an empirical study of supply chain partnering, also found that cultural and other differences between parties may cause difficulties that hinder collaboration. The authors provide an interaction model of partnering consisting of seven contextual factors that influence the effectiveness of cooperation. Direct actions taken to change the context to one of greater cooperative behavior were shown to improve relations among supply chain partners.

THE INTERNET-ENABLED SUPPLY CHAIN

The goal of refining and reengineering business processes has been a consistent theme in businesses over the past few decades. Gaining impetus from such quality initiatives as Total Quality Management (TQM), American companies have been steadily honing their best practices in order to gain competitive advantage through value generation. While companies have implemented cost cutting measures to increase productivity, many have reached the point where there is little left to be gained from the traditional efficiency measures such as cutting labor, reducing inventory, and consolidating transportation.

Today's managers are focusing more on the new Internet enabled collaborative strategies, which represent a major shift in the corporate mindset. In order to make this transformation, a broadening of the corporate vision is required which incorporates the entire network of relationships and integrated business processes making up the enterprise. One of the most challenging aspects of modern day business is that of managing the supply chain, defined as the flow of materials, information, and services from raw material suppliers through factories and warehouses to the end customers (Turban, McLean and Wetherbe, 2004). The generic term *supply chain management* (SCM) is frequently used to describe all of the activities involved in planning, organizing, and coordinating the supply chain, the goal being to reduce uncertainty and risk and to positively affect inventory levels, business processes and customer service. It is interesting to look at the evolution of enterprise information systems and note how these systems have increasingly integrated more intra and interorganizational functions. The earliest systems, introduced during the 50s and 60s, dealt with short segments along the supply chain and were used for such applications as inventory management, scheduling and billing. These applications dealt with independent functional areas with little integration across the supply chain. Attempts to achieve greater synergies, linking scheduling to inventory management and purchasing for example, led to the early *material requirements planning* (MRP) systems. These early systems provided some major improvements but still fell short because they failed to truly integrate functions such as scheduling, inventory and purchasing with financial and labor resources. The next generation of systems, dubbed *manufacturing requirements planning* (MRP II), remedied some of these shortcomings and providing greater integration. Again, the utility of these systems were limited by the degree of integration attained. The next evolutionary stage saw the introduction of *enterprise resource planning* (ERP) systems, which integrated the transaction processing activities of the entire enterprise. While ERP systems have played a critical role in getting organizations to focus on business processes, they have not been as successful integrating processes across the supply chain. Since ERP systems are primarily transaction based they are not especially suited to environments in which a rapid response to real time changes in supply, demand, labor, or capacity are required. The latest generation of ERP systems, sometimes called 'post ERP systems', are now supporting more SCM software modules and provide a much greater awareness of the entire supply chain (Turban, McLean and Wetherbe, 2004).

A number of initiatives, designed to improve efficiency along the supply chain, have emerged over the past few years, such as space management, inventory management, dynamic forecasting, quick response, vendor managed inventory, scanner based trading, efficient consumer response, and category management (Ireland and Bruce, 2000)). Many of these efforts fell short because they maintained the single function approach as opposed to viewing the entire eco-system of the enterprise. For example, while some of the early JIT initiatives might have reduced inventory and shortened cycle times, many just pushed costs up or downstream and were not effective across the entire value chain. Successful collaborative alliances start by integrating the demand side with the supply side of the chain. Many of the early supply chain management initiatives, tended to be lop-sided in that they lean more heavily towards the supply side, i.e. replenishment, distribution, transportation, and logistical functions. Although moving in the right direction, supply side oriented systems left the consumer and demand side disconnected from the rest of the supply chain.

A breakthrough in thinking is clearly needed to get past the 'us vs. them' mentality so common in business, and to effectively implement collaborative technologies. Smith (2000) claims that before building the necessary collaborative and analytic capabilities, an organization must first break through the existing 'cultural' barriers that have been ingrained over time. Collaboration implies the ability to electronically share information about business activities and interact on a

near real time basis across the supply chain. This requires the breaking down of traditional organizational boundaries and a move beyond mere communication and cooperation capabilities. Another important step towards collaboration is to provide 'visibility' into the supply chain, allowing a much broader view by more people and a greater ability to measure the supply chain's effectiveness. How measurements are made is another process that needs to be revamped. Whereas the traditional measurement model is based on cost and revenue, the new model needs to be based on metrics that align to cross-organizational business processes. Once these barriers have been addressed, according to Smith (2000), the next steps are to reduce the decision cycle process (i.e. decisions need to based on more information in days and hours, not weeks), improve decision-making collaboration (i.e. sharing of business plans and forecasts among channel members to reduce inventory levels and improve delivery times) and reduce opportunity and problem resolution latency (i.e. managers need the authority to react to changing market conditions, customer demand, supplier defects and warehouse shortages).

Today, industry leaders are taking many of these steps and we are beginning to see new initiatives that are moving towards real collaboration. One industry wide effort receiving a lot of attention is Collaborative Planning, Forecasting and Replenishment (CPFR). The primary goal of CPFR is the promotion of business practices that are tightly integrated among trading partners and the use of Internet technology to reduce inventories and expenses, while improving customer service. A number of key manufacturers and retailers have jumped on the CPFR bandwagon including Nabisco, Kmart, Levi Strauss, Proctor & Gamble and WalMart, as well as supply chain vendors like Manugistics and Logility. As part of the effort, a group called the Voluntary Interindusty Commerce Standards (VICS) association publishes a set of guidelines to help companies work together to achieve better efficiencies in planning, forecasting and replenishment of products.

CPFR focuses the collaborative effort at the point where the consumer, retailer and manufacturer converge, i.e. the intersection of where a product is planned, ordered and replenished. This intersection is often where such incongruities as excess inventories, out of stock, and production fluctuations occur. Proper forecasting and demand planning, which is at the heart of CPFR, can often correct such irregularities. Some of the benefits of focusing collaboration efforts on forecasting are: (1) it builds business alliances which deal with jointly managed processes, (2) it results in a single, mutually owned, consumer- driven forecast, (3) it provides a higher level of forecasting accuracy than statistical measures, (4) it links demand with supply planning and execution, (5) it forces an examination of operating processes, both functionally and cross functionally, and (6) it lays the foundation for business processes and technology, thereby facilitating other collaborative applications (Ireland and Bruce, 2000).

For forecasting to be accurate, it is critical that input from the consumer be integrated. Individual forecasts, which can involve information one end of the supply chain to the other, are unlikely to be accurate unless they are cognizant of end-consumer behaviors. The infamous 'bullwhip' effect, named for the undulating effect that inaccurate forecasts can have on inventory levels, is one of the byproducts of doing things in the traditional way. In order to protect themselves against potential shortfalls, companies along the supply chain tend to maintain a surplus of inventory. The cumulative effect of this at the various points along the chain invalidates the individual forecasts at each of the links. According to a U.S. Commerce Department report (Ireland and Bruce, 2000), the projected amount of inventory for year 2000 across all tiers of the supply chain was $1.1 trillion for retail sales of roughly $3.2 trillion. Clearly, excess inventory is a major problem and perhaps the greatest driver leading to the development of CPFR as well as other collaborative supply chain practices. The earliest CPFR proof of concept pilot took place in 1995 with Wal-Mart and Warner Lambert leading the group of vendors involved. The goal was to define an integrated time-series distribution requirements planning (DRP) forecasting process, linking customer demand to replenishment needs through the entire supply chain. Results of the initial pilot were very successful, revealing jumps in sales, lowering of inventory, and a leveling of production cycles. Some examples of 'out of the box' thinking included in this pilot were : consumer driven demand planning and forecasting, stable manufacturing plan, proactive exception management, aligned goals, objectives, and processes, and trusted partnerships (Ireland and Bruce, 2000). Since the first pilots, CPFR initiatives have proliferated, with quite a few projects underway. Such efforts have resulted in more than 500 collaborative trading agreements using the Internet, many of which involve foreign countries such as the United Kingdom, Germany, Mexico, Belgium, the Netherlands, and the Philippines. Two recently launched CPFR based exchanges are the WorldWide Retail Exchange (www.worldwideretailexchange.org) and GlobalNetXchange (www.gnx.com). E-marketplaces such as these are quickly becoming important vehicles for automating business processes among buyers and sellers along the supply chain.

As with any system that involves collaboration there are some serious challenges in implementing CPFR systems. First and foremost, it is absolutely essential for senior management to understand the intricacies of collaboration and for the e-business collaborative strategy to be clearly articulated. Another point is that technology should be viewed as an enabler of collaboration not as a panacea. In other words, the business processes need to be aligned before throwing technology at the problem. Finally developing successful collaborative systems should be part of the overall corporate e-business strategy. This is a transformational strategy and companies need to learn by continually doing, testing and making adjustments Those companies who are least successful generally lack the necessary culture to carry it out. In too many instances, CPFR attempts fail to result

in the desired "win – win" outcomes, but rather one of "I win, you figure out how to win". (Ireland and Bruce, 2000). It may be that collaboration by itself is not enough and that it is simply counterintuitive in many organizations. Since poorly planned efforts at collaboration may actually do more damage than good, it is perhaps more realistic and meaningful to consider a different approach. The term 'coevolution', has been used to describe a new way of obtaining the synergies attempted via collaboration. Essentially this approach encourages collaboration within reason, while still allowing competition to flourish. Eisenhardt and Galunic (2000) claim that too much collaboration can be counter productive and that managers should be careful to balance the number of collaborative links. Too many may actually restrict adaptation while too few may fail to provide the necessary synergies. The co-evolution strategy suggests building a shifting web of relationships that continuously exploits new opportunities while dropping ones that are no longer productive.

CONCLUSION

We are witnessing the emergence of a new organizational model which is redefining traditional value chains. New and complex knowledge sharing systems that connect pricing, product and design information with suppliers and customers, are being developed. The significance of this trend goes beyond the introduction of a few new buzzwords. Neilson, Pasternack and Viscio (2000) claim that this new, extended or 'e-stended' enterprise will ultimately replace the traditional enterprise and that the organizational chart as we know it will soon be an archeological artifact. Critical to this paradigm shift is the sharing of information, which is inextricably linked to organizational trust. The subject of trust in IOS will only become more important as the digital economy takes hold and competition becomes fiercer. Although the collaborative business model may be a difficult pill to swallow for some, it may be that the alternatives are even more distasteful. The challenge over the next few years will be for companies to make the necessary paradigm shift while minimizing the associated risks and maintaining competitive strategies.

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