A Model of Extranet Implementation Success Effects on Business Performance

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Introduction and Justification

The eBusiness revolution is impossible to ignore. It has transformed businesses in virtually every industry and reshaped the global economy. eCommerce has revolutionized the way companies buy and sell goods and services, and eBusiness has transformed the way companies interact with customers, partners and employees (Timmers, 1998). Initially, companies developed public web sites on the Internet to promote their products and services. An evolution of public web sites was the development of intranets, or internal secure web-based information systems, for employees. Many companies are now building extranets to improve communication and connectivity with their customers, vendors, and partners. All these phases utilize the same Internet technologies.

Suppliers have realized the need to offer customers easy access to customer-specific information. This has led to the development of password-secured extranets over the Internet. These "premium" web-pages can offer customers value-added services as well as fulfilment services and order management functions (Biros, 2001). An extranet serves as a bridge between the public Internet and the private intranet. Extranets are projected to play a crucial role in the development of business-to-business marketing in the near future (Ling and Yen, 2001).

Most past research has focused on investigating current or planned extranet implementation, how companies are using extranets, or describing how companies benefit from extranet implementation. There is a gap in the research regarding factors influencing successful extranet implementation. Clegg et al. (1997) found that 80-90 percent of Information Technology (IT) investments in general do not meet their performance objectives mostly due to non-technical reasons. They found that change management, range of human and organisational issues, and the role of managers and end-users are critical factors affecting IT implementation. We propose that research should be conducted to further describe the factors influencing the success of an extranet implementation. The goals of the proposed research are to:

- Define the factors affecting successful extranet implementation in the business-to-business context.
- Explore both the organizational and external factors influential to the implementation success of an innovative information technology (IT) application.
- Investigate extranet impact on performance.
- Conceptually investigate how extranets can be integrated in business strategy and value chain, and to explore whether extranets can be regarded as a competitive advantage.

Business Information Systems and Communication Technologies

Traditionally, business transactions and customer relationships have been facilitated by telephone, fax, and mail. The majority of sales representative activities historically have been to prepare documents for order processing and delivery and answering customer inquiries on the status of their orders. This routine work requires considerable time and effort without creating any additional value in the customer relationship. The Internet offers mechanisms to automate these and other routine company process and tasks.

For example, Internet-based technologies offer numerous applications that increase efficiency and productivity, such as linking employees, offices, customers, and partners from remote locations, regardless of time or place, distributing sales information more promptly and efficiently, and reducing operation costs (Vlosky and Fontenot, 1999).

Before the Internet was launched, companies were already trying to reach out beyond their organizational boundaries to information exchange between vendors and customers. During the 1970's and 1980's, companies extended their computing power beyond the

company walls by exchanging data in the form of electronic documents between supply chain partners using system-to-system connections over value-added networks and proprietary systems (Chan and Davis, 2000).

Traditional system-to-system connections are based on Electronic Data Interchange (EDI). EDI is a computer-to-computer electronic communication method whereby trading partners exchange business transactions. The transactions consist of documents in structured formats that can be processed by the recipient's computer application software (Senn, 1998). The expense, complexity, lack of flexibility, and limited functional scope of EDI implementation has generally limited its use to large enterprises with large transaction volume and an ability to incur large investments (Acly, 2000).

Beyond traditional EDI, the Internet has improved the way enterprises communicate and transact with their trading partners. Specifically, extranets enable companies to use the Internet to create proprietary and customized information flows between themselves and their business partners. Extranets are considered to be more economical than creating and maintaining one-to-one proprietary networks (Ling and Yen, 2001). Chan and Davis (2000) have estimated that establishing a supply chain link via an extranet is $1,000 per partner compared to $50,000 using EDI.

Internet Technologies

The Internet is a global network that enables computers to communicate and share services around the world. The Internet is an enormously valuable shared global resource of information and knowledge, as well as means of collaboration and cooperation among countless diverse communities (Internet Society, 2001). Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol). TCP/IP is the basic communication language of the Internet.

The Internet and eBusiness has not only changed the way companies do business and communicate with their partners but has, for many, become a requirement for business survival. In order to be competitive in today's networked business environment, companies must be able to deliver applications and services with real value for their partners (Ling and Yen, 2001). Internet-based IT can manage the flow of goods, services, and information inside and across organizations, thus reducing the basic transaction costs involved in the vertical flow of goods and services along a value chain (Clemons and Row, 1991).

Extranets

Based on an on-line IT encyclopedia: "an extranet is a private network that uses the Internet protocol and public telecommunication systems to securely share business information with suppliers, vendors, partners, customers, or other businesses" (Whatis.com, 2003). Ling and Yen (2001) distinguish four important characteristics of an extranet:

1) An extranet is a part of the World Wide Web, or at least based on the major Internet protocols and backbones.
2) An extranet is private in contrast to the Internet, and is public compared to an intranet.
3) An extranet is mainly for business-to-business information sharing and access.
4) An extranet must provide means for security and access-control.

Extranets connect business partners online behind virtual firewalls, where "those who share in trusted circles" can network in order to achieve "commercial-oriented objectives" (Tan et al., 2000). Extranets are flexible, scalable, extensible, and able to integrate across distributed, and heterogeneous system environments and platforms (Siegel and Hartman, 1998). Extranets can extend key information to business partners throughout the supply chain and facilitate collaborative relationships with business partners separated geographically

(Vlosky and Fontenot, 1999.). Extranets can also be used in automating supply chains, developing new products jointly, and transforming business processes (Ling and Yen, 2001). Tactical extranets increase customer loyalty, commitment, and confidence, all of which drive revenue and create competitive advantages (Ling and Yen, 2001).

An extranet uses the Web browser front end making it extremely user-friendly, shortening the learning curve (Ling and Yen, 2001). Using an extranet solution does not require high IT competence, because it is based on the Internet connection (Vlosky, et al., 2000). Extranets are based on open standards web technology. Furthermore, extranets are more economical than creating and maintaining a proprietary network (Ling and Yen, 2001).

Extranets started to gain interest and enthusiasm among businesses in the later half of 1990's. In 1998, 13 percent of the 2,500 companies surveyed by ActivMedia Inc., a market research company, said they had implemented an extranet (McCune, 1998). In the forest products sector, 10 percent of surveyed companies in 1998 had an extranet (Vlosky and Punches, 1999). Considering the general tendency of forest industry to lag other corporate sectors in technology development, this figure is significant. According to the survey by Vlosky (1998), order management services such as order tracking, status enquiries, and shipping notices were the most frequently used extranet applications in the forest products sector (Vlosky and Punches, 1999). In a cross-industrial survey by Vlosky et al. (2000) electronic communication with trading partners (89 percent of the respondents) was the number one use of extranets followed by customer contacts (71 percent), vendor contacts (59 percent), sales to customers (48 percent), product and service promotion (45 percent), and purchases (41 percent). To be successful, extranets may require a change of business culture. Information that has traditionally been unavailable to customers becomes far more broadly available (Vlosky et al., 2000).

Extranet Implementation

Some organizations have successfully implemented numerous information technologies, such as extranets, whereas others have failed in their effort (Harper and Utley, 2001; Armstrong and Sambamurthy, 1999). Information technologies must be integrated into firm's supply chain activities and business strategies before they can provide significant business value for the organization (Armstrong and Sambamurthy, 1999). Thus, Armstrong and Sambamurthy (1999) argue that effective application of IT supports, shapes, and enables firm's business strategies and value-chain activities.

The relevant questions with extranet implementation should not be based on its technical capabilities and configuration, nor should the implementation decision be based solely on external environment (competitive) pressure. The most important questions are: How to integrate extranet into business strategy? Which parts of the value chain would benefit the implementation the most? How to make extranet a competitive advantage?

According to Varadarajan and Yadav (2002) Internet technologies have the potential to affect business's competitive strategy as well as the efficiency of its operations. Anandarajan et al. (1998) classify benefits of extranet implementation in three categories: strategic, operational, and marketing/tactical. This classification enables exploring the effects of extranet implementation in strategic level, tying it into Porter's strategy types (1985), on the operational level, tying it into the value chain activities, and on tactical level by its potential as a tool for gaining competitive advantage.

Strategic Implications of Extranet Implementation

Barney (1996) defined strategy as a "pattern of resource allocation that enables firms to maintain or improve their performance" (Varadarajan and Yadav, 2002). The decision to implement an extranet should derive from rethinking business strategies, how services are

delivered, and how the company is connected with its stakeholders (Chan and Davis, 2000). However, Clegg et al. (1997) note that the most organizations are still struggling with successfully implementing IT systems into business goals and needs.

Extranets can be integrated in Porter's (1985) generic strategy types. Extranet adoption can contribute to both, cost leadership strategy by offering means to offer standardized and cost effective customer service, and differentiation strategy by offering a tool for greater customization and offering additional value added services. In a case study, Anadarajan et al. (1998) found that the following strategic benefits were gained through extranet implementation: faster trading cycle; ability to win new business or retain existing leading to improvements in business efficiency; ability to respond to highly competitive new market entrants. In another case study documented by Chan and Davis (2000), Marshall Industries, a large U.S. electronics distributor, has been able to increase its productivity through extranet implementation. Marshall Industries' sales and profit have doubled after extranet implementation, while its sales staff has been cut from 1,600 employees to 1,450 employees.

Table 1. Strategic implications of extranet implementation

Strategy Type	Extranet Contributions
Cost leader	- Efficient operations - Reduced transaction costs - Standardized and efficient customer service
Differentiation	- Value added services - Differentiated exchange experience - Tailored solutions - Mass customization
Focus	- Improved relationships - Offered to selected customers
Broad scope	- Cost effective to offer to a broad scope of partners
"Stuck-in-the-middle"	- Repeat off-line business processes - Imitate competitors - Serve everybody with generic solution

Operational Implications of Extranet Implementation

The operational benefits from extranet implementation include reduced costs and improved cash flow (Anandarajan et al., 1998). Extranets can result in cost reductions by: efficient procurement and logistics management (Anandarajan et al., 1998; Lin et al., 2002); better production planning and reduced inventories (Anandarajan et al., 1998; Tan et al., 2000; Vlosky et al., 2000); improved delivery times (Anandarajan et al., 1998); reduced sales costs (Anandarajan et al, 1998), reduced order processing and service costs (Anandarajan et al., 1998; Ling and Yen, 2001). Extranet services create value and supply chain visibility, enabling continuous availability to information (Vlosky and Fontenot, 1999). Overall, an extranet has the potential to provide information in a way that is immediate, cost-effective, easy to use, rich in format, and versatile (Ling and Yen, 2001).

Porter (1985) developed his widely cited value chain framework for companies to critically analyse their activities in order to gain competitive advantage (**Figure 1**, **Table 2**). Porter identified a chain of activities that are common to a wide range of firms. The goal of these activities is to create an output that exceeds the cost of performing these activities. The primary activities defined by Porter (1985) are:

- Inbound Logistics: relationships with suppliers; activities required to receive, store, and disseminate inputs.
- Operations: activities required transforming inputs into outputs (products and services).
- Outbound Logistics: activities required to collect, store, and distribute the output.
- Marketing and Sales: activities to inform buyers about products and services; induce buyers to purchase them, and facilitate the purchase.
- Service: activities required keeping the product or service working effectively for the buyer during and after it is sold and delivered.
- The secondary activities are:
- Procurement: acquisition of inputs or resources for the firm.
- Human Resource Management: activities involved in recruiting, hiring, training, developing, compensating, and when necessary dismissing personnel.
- Technological Development: equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.
- Infrastructure: ties organization's various parts/departments together.
- In this study setting, procurement (secondary activity) is combined with inbound logistics (primary activity). Other secondary activities are left out of this study's scope.
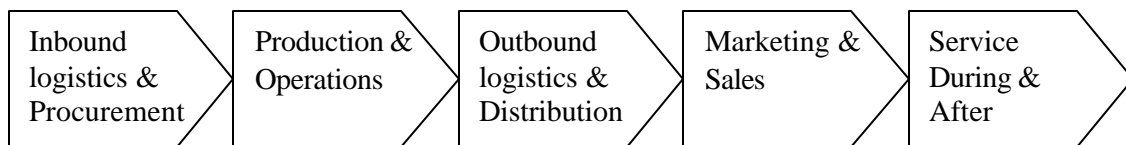
| Inbound logistics & Procurement | Production & Operations | Outbound logistics & Distribution | Marketing & Sales | Service During & After |

Figure 1. Primary activities of a value chain   *(Modified from Porter. 1985)*

Anandarajan et al. (1998) analysed in a case study context the effects of extranet implementation to activities of a company within the framework of the Porter's (1985) value chain. They found that extranet adoption resulted in significant changes in the value chain activities performed by the investigated company causing reductions in operation costs. They found that extranet adoption led to significant reduction in costs related to purchasing and inventory management, material handling, order processing, production scheduling and sales promotion. "By implementing high-priority (extranet) projects that produce impressive results, mangers can gradually extend the use of the extranet to other areas of business" (Chan and Davis, 2000). Thus, it is worth estimating which parts of the value chain would benefit the implementation the most in a particular organizational and business setting.

Procurement & Inbound logistics

Extranet implementation enables electronic data integration between the business partners. Companies can achieve reduced purchasing and inventory costs by extranet enabled collaboration with a vendor. Programs like just-in-time delivery (JIT) and continuous replenishment (CRP) rely on the dissemination of scheduling, production, and shipment information between the business partners involved (Tan et al., 2000; Vlosky et al., 2000). Extranet adoption may reduce order cycle by reducing purchasing lead times allowing smaller and more frequent orders resulting in lower inventory costs (Anandarajan et al., 1998). General Electric Company was able to half its 14-days purchasing cycle after adopting extranet communication instead of using phone, fax and mail (Vlosky et al., 2000). When a

procurement extranet application has been adopted, supplier selection and bidding process may be eliminated leading to operational cost savings.

Production & Operations

"The focus in supply chain management has shifted from engineering efficient manufacturing processes to the coordination of activities in the supply chain networks through knowledge management" (Tan et al., 2000). Extranets allow for the incorporation of timely and accurate data into the company's planning and control system (Anandarajanet al., 1998; Vlosky et al., 2000). By sharing manufacturing schedules, production capacity information, and consumer demand information, companies are better able to coordinate and streamline its production and supply chain activities via improved demand forecasting (Tan et al., 2000). In the past, manufacturers estimated future demand based on previous consumption. However, fluctuating order patterns made this method inaccurate increasing the stock-levels. Thus, extranet reduces the excess inventory building bullwhip effect caused by lack of accurate consumer (upstream) demand information.

Distribution & Outbound Logistics

In the case of intangible products, where the product information can be maintained and distributed in electronic form, the cost savings achieved by extranet implementation can be extraordinary. Extranets also can simplify the physical supply chain by disintermediation, eliminating middlemen in the supply chain (Anandarajan et al., 1998).

Marketing & Sales

Extranet adoption has the potential to improve market and customer knowledge through open and timely shared information, thus reducing the cost of market research (Anandarajan et al., 1998). An extranet can simplify workflows in ordering, reporting, and managing customer service and support (Ling and Yen, 2001), because it enables electronic order processing and documentation, extranet implementation has allowed faster preparation, transferring, and processing of orders and invoices, resulting in reduction in average time for payment by approximately ten days (Anandarajan et al., 1998). Extranet offers significant savings in publication costs, while manuals and other sort of publications are distributed electronically. An extranet can enable cost savings by simply being less expensive communication method compared to mail, EDI, and even phone and fax. Also, it may reduce printing costs of numerous mailings of documents and manuals. For example, McDonnel Douglas's commercial aircraft manufacturer has been able to eliminate global distribution of 4 million pages of documentation annually by transmitting its maintenance bulletin electronically (Chan and Davis, 2000). Furthermore, while sales representatives are freed from time and labor consuming documentation they are able to devote more time to establishing close customer relationships (Vlosky et al., 2000).

Service During & After the Sale

The real value of extranet based customer service is not direct sales, but the improved customer relations that retain customers (Vlosky et al., 2000). In a case study by Anandarajan et al. (1998) extranet adoption improved customer service through improved access to information that the customers need for their decision making and planning, and decreased lead times, thus enabling faster decision making and improved operations planning. Extranet enables mass customized value offering. For example, embedded extranets can provide customers with additional, but sometimes highly valuable information. Embedded extranets can offer queries on another company's database and transmit the information transparently (Chan and Davis, 2000). An example of an embedded extranet is a vendor's extranet which is

able to display order-tracking information retrieved from the logistics provider's information system. Extranet implementation enables timeliness of information exchange, thus, improving customer service (Vlosky et al., 2000).

Table 2. Dominant problems in the value chain and impact of extranet implementation

Value Chain Activity	Problem	Impact of Extranet
Inbound logistics & Procurement	- Long lead time - Incompatible IT systems - Supplier selection	- Increased collaboration - Reduced order cycle - Reduced search cost - Enables JIT and CRP without EDI - More responsive supply - Small and frequent purchases
Production & Operations	- Inaccurate demand forecast - Bullwhip effect - Excess inventory	- Sharing supply and demand information - Integration of timely and accurate data into planning - Better demand forecast - Reduced bullwhip effect - Reduced inventory
Outbound logistics & Distribution	- Multiple middlemen - Delivery costs	- Elimination of intermediaries - Electronic delivery - Accurate shipment - Improved availability of tracking information
Marketing & Sales	- Costly and difficult market information attainment	- Improved market and customer information - Faster documentation process - Faster payment cycle - Lower communication costs - Improved relationship
Service (during & after)	- Response time - Costly customized information	- 24/7 information access - Faster response - Customized service at low cost

Tactical Implications of Extranet Implementation

An extranet has the potential to offer intangible marketing benefits. Extranets can deepen business partnerships and collaboration (Anandarajan et al., 1998). Companies can engage supply chain partners in joint product development and intelligence sharing (McCune, 1998). Emergence of electronic communication has diminished the information asymmetry between suppliers and buyers, as well as enriched transactional and relational environment information (Varadarajan and Yadav, 2002).

Extranets make a great marketing tool and a platform for offering value-added services, such as inventory visibility, reporting tools, up-to-date forecasts, on-line chats, delivery tracking, and customized user interfaces. Extranets allow low-cost information exchange and offer customization through customer interface profiling. Furthermore, sales representatives are able to move from routine work to establishing a close customer relationship (Vlosky et al., 2000). Anandarajan et al. (1998) argue that having an extranet may also lead directly or indirectly to an enhanced corporate image. In support of this argument, a survey by Vlosky et al. (2000) conclude that the extranet partners are perceived to be more "cutting edge" and customer orientated companies, and more committed to long-term relationship.

Extranets and Sustainable Competitive Advantage

Firm resources and skills are considered valuable when they aid a firm to formulate and implement strategies that improve its efficiency and or effectiveness. Mizik and Jacobson (2003) argue that companies can create competitive advantage on the functional strategy level through value creation or value appropriation. Extranet adoption can be integrated to value

creation by enabling business process innovation and value-added services. Extranet adoption serves value appropriation by erecting entry barriers through virtual integration. As business partners' information systems are integrated, it becomes more complicated for them to change vendors due to increased switching costs. Competitive advantage can result either from implementing a value creating strategy not simultaneously being implemented by any current or potential competitors, or through superior execution of the same strategy as competitors, and when these other firms are unable to duplicate the benefits of this strategy (Barney, 1991; Bharadwaj et al., 1993). Porter has been quoted to say "competitive advantage grows from the value a firm is able to create for its buyers that exceeds the firm's cost of creating the product or service" (Byrd, 2001). Value-creating strategies are an example of Porter's generic strategy types of cost leadership and differentiation of goods/services. Baharadwaj et al. (1993) note that IT investment allows business to achieve differentiation advantage by securing relationships through improved service quality and its ability to quickly respond to market shifts.

The potential of IT in creating competitive advantage has been strongly emphasized in the literature (Barney, 1991; Clemons and Row, 1991; Bharadwaj, 2000). But there is a growing realization among researchers and professionals that achieving competitive advantage through IT may be more difficult than initially assumed (Clemons and Row, 1991). Due to the fact that IT systems can be purchased and duplicated fairly easily, it is often argued that physical IT systems are likely not to be considered as competitive advantage (Mata et al., 1995).

Importance of information technologies as a source of competitive advantage derives from successful execution and potential to impact value chain activities. The following possibilities for achieving competitive advantage were suggested by Porter and Millar (1985) (in Bharadwaj et al.,1993) in the context of IT's capabilities in attaining competitive advantage. Extranet implementation can provide a company with a competitive advantage by 1) enabling companies with new ways of doing business, 2) outperforming competitors by extended value offerings, 3) lowering cost of doing business, 4) differentiating and even customizing the value offer, 5) building switching costs and barriers to entry.

Sources of competitive advantage can be either unique resources (assets) or distinctive skills (capabilities) (**Table 3**). Day and Wensley (1988) characterize superior skills as the distinctive capabilities of a firm's personnel that set them apart from the competitors and superior resources as more tangible assets that enable a firm to exercise its capabilities (Bharadwaj et al., 1993). Further, Bharadwaj et al. (1993) notes the following drivers for competitive advantage discussed in the marketing literature: resource-based drivers include economies of scale and scope, brand equity, and reputation; skills-based drivers underlie the innovativeness and superior quality of business's offerings. "Company's skills and resources constitute potential sources of competitive advantage only if they offer benefits desired by customers" (Bharadwaj et al., 1993). The maintenance of a sustainable competitive advantage requires constant monitoring and investing in the present sources of advantage, as well as exploring new potential sources of competitive advantage (Bharadwaj et al., 1993). It is argued that sustainable competitive advantage cannot be obtained when strategic resources are evenly distributed across competing firms and when they are highly mobile. Thus, Barney (1991) concludes that the search for sources of sustainable competitive advantage should focus on firm resource heterogeneity and immobility. Barney (1991) also defined the following criteria for resources or skills to have the potential to be a source for sustainable competitive advantage:

- It must be valuable (exploits opportunities and/or neutralizes threats in a firm's environment)

- It must be rare among firm's competitors (current and potential)
- It must be imperfectly imitable
- There must not be any strategically equivalent substitutes for this resource/skill.

Table 3. Extranets and criteria for sustainable competitive advantage

SCA Criteria	Extranet	Does extranet qualify?
Valuable	- Reduced transaction and operation costs - Improved customer relationship and service - Speed-up information and cash flow	YES
Non substitutable	- EDI, eMarketplace, phone, fax, mail	NO
Rare	- Widely implemented in B2B	NO
Imperfectly imitable	- Successful implementation difficult	YES

Extranets can be regarded valuable resources because they enable firms to capture and implement strategies that improve efficiency and effectiveness, by either reducing firm's costs or differentiating its products or services. Implementing an IT solution, which is shortly implemented by competitors, leads only to temporary competitive advantage, where as implementing a valuable IT solution, which is simultaneously implemented by several competing firms, provides competitive parity (Mata et al., 1995). Extranets as a communication method have several substitutes (e.g. EDI, e-marketplace, phone, fax, mail). Also, EDI and e-marketplaces may fulfill the same strategic goals of increased efficiency and effectiveness. Thus, extranets are substitutable in this regard

Early adopters and first movers with extranet technology viewed extranet implementation as a method to gain competitive advantage. As more competitors have adopted extranets, and while it has become more a necessity to remain competitive, an extranet has become less effective as a tool for creating competitive advantage (Anandarajan et al., 1998; Clemmons and Row, 1991). However, Barney (1991) notes that valuable but common resources can help a firm to ensure its survival when they are exploited to create competitive parity, and thus should not be neglected. Because the hardware-software packages can be easily obtained (purchased), any strategy that exploits just the tangible part of IT system is likely to be imitable and thus not a source of sustainable competitive advantage (Barney, 1991). On the other hand, an information processing system that is deeply embedded in firms' informal and formal processes, structures, management, and decision making systems may hold the potential to being a sustainable competitive advantage (Barney, 1991).

Previous research has suggested difficulties in extranet and IT system implementation (Barney, 1991). While technical skills are essential in IT application implementation, they are seldom sources of sustainable competitive advantage. IT managerial skills include management's ability to 1) understand and appreciate the business needs and needs of other functional managers, suppliers, and customers, 2) communication and working skills with other functional managers, suppliers, and customers in developing appropriate IT applications, 3) coordinate IT activities in ways that support other functions, suppliers, and customers, 4) anticipate the future IT needs of other functions, suppliers, and customers (Mata et al., 1995). According to Mata et al. (1995) it is reasonable to assume that these relationships between other functions, suppliers, and customers are not common, and thus these relationships may be heterogeneously distributed across firms. Therefore, Mata et al. (1995) argue that if managerial IT skills are valuable and heterogeneously distributed across

firms, they can be a source of sustainable competitive advantage and not imitable, since these relationships are developed over time (history), tacit, socially complex and causally ambiguous, and thus hard to imitate. In support Bharadwaj (2000) concludes that IT capability is an imperfectly imitable complex organizational capability due to time compression diseconomies, casual ambiguity, and path dependencies. Due to the social complexity of managing extranet implementation, extranet can be regarded as an imperfectly imitable resource. Thus, we can conclude that extranet is more about the enterprise wide capability to leverage information attained by technological (network) innovation than about technological functionalities.

Challenges and Impediments for Extranet Implementation

While most firms are making significant investments in IT, not all of them have been able to successfully implement IT, such as extranets, into their value-chain activities and business strategies (Harper and Utley, 2001; Armstrong and Sambamurthy, 1999). Many companies have experienced a significant learning curve and initial drop in productivity as they try to initiate and employ new IT initiatives (Harper and Utley, 2001). Clegg et al. (1997) found that 80-90 percent of IT investments in general do not meet their performance objectives mostly due to non-technical reasons such as human and organizational aspects of IT implementation and management.

Impediments for extranet implementation include: lack of commitment from senior management and staff (Hamill, 2000; Clegg et al., 1997), management fear (Hamill, 2000), user resistance (Hamill, 2000; Anandarajan et al., 1998), resistance to share data and knowledge (Anandarajan et al., 1998), change management (Clegg et al., 1997), and the process of integrating extranets into existing operating processes of the firm (Vlosky et al., 2000).

Information technology is often used as an instrument for realizing downsizing goals. Thus, organizational resistance to new technology implementation may result from employee perceptions that their jobs are in jeopardy (Clegg et al., 1997). Liability has also been raised as a risk for extranet implementation. "Who is at risk when an extranet crash causes lost sales and additional costs?" asked Vlosky and Fontenot (1999). Clegg et al. (1997) identify the following additional concerns affecting successful IT implementation: "objective setting, performance review and evaluation; managing business, organizational and technical complexity; techno centrism and technology-led change; competitiveness and cost reduction; project management; structured methods; human and organizational factors, especially concerning structures and processes; organizational design and change; the role of end-users and the barriers to their participation; the role of managers, their understanding and values; organizational fragmentation and politics; managerial and organizational susceptibility to fads and fashions; the dissemination and diffusion of knowledge between organizations and different communities; the fragmentation that exists within and between spheres of economic activity; and so on."

Ensuring secure transactions on the extranet site and security of corporate data are one of the biggest technical concerns companies have with extranets (Ling and Yen, 2001; Hamill, 2000; Chan and Davis, 2000). The most common practice is to use firewalls around the corporate information system to protect the information. The firewall proxy server scrutinizes messages from outside the firewall to determine whether they are allowed to access the system (Tan et al. 2000). Technical reliability and liability concerns have also been noted to concern companies (Vlosky and Fontenot, 1999). If a company doesn't already have a sound information infrastructure, these problems will be magnified by extranet implementation (Chan and Davis, 2000). An additional potential impediment of extranet adoption is that it is supplier-specific. A customer with multiple suppliers would need to use

several separate supplier-specific extranet log-ins and sessions in order to interact with the suppliers.

Many companies have had great difficulties in measuring the costs, benefits and return on investment (ROI) associated with extranet implementation (Ling and Yen, 2001; Hamill, 2000). Netscape was quoted to estimate the typical initial investment of a large scale extranet to be $40 or less per user (Ling and Yen, 2001). Chan and Davis (2000) estimated that establishing a supply chain link via an extranet is $1,000 per partner, compared to $50,000 using EDI. Beyond startup costs are costs associated with redesigning business processes, integration of existing databases and applications, purchase of hardware upgrades, technical support, and project management (Ling and Yen, 2001). According to Chan and Davis (2000) the greatest extranet implementation costs are "people costs" for training, including training for content creation and system management. In a large retail chain branch setting Anandarajan et al. (1998) documented the costs of extranet implementation as $2,215,000, including hardware, software, telecommunication, training, and maintenance costs.

A Conceptual Model of Extranet Implementation Success and Performance
Investigating successes and challenges in implementing extranets can help to develop a framework to guide companies to successful extranet development. Although extranets use established Internet-based technologies, the implementation process is far from simple and success is not always guaranteed. Vlosky et al. (2000) note that the organizational variables affecting extranet relationships are business culture, technology implementation, decision making, control, degree of centralization, and organization structure. The conceptual model in **Figure 2** contains four internal (organizational) and three external (environmental) factors that affect extranet implementation success from the suppliers' perspective. Following is a discussion of these variables and associated research hypotheses.

Internal Factors Affecting the Success of Extranet Implementation
Corporate culture often presents challenges in sharing knowledge with business partners (Anandarajan et al., 1998), as well as in the organization. Thus, to be successful, extranets may require a change of business culture (Vlosky et al., 2000). Organizations with successful IT adoption have realized the value of free flow of information between individuals and groups (Harper and Utley, 2001). A study by Vlosky et al. (2000) indicated that companies share more information with their extranet partners than with their non-extranet partners. Increased information sharing between trading partners results in lower total transaction costs, higher order fulfillment rates, shorter order cycle times, and more accurate demand forecasting (Lin et al. 2002).

Harper and Utley (2001) suggest that organizational culture should adequately address appropriate human behavioral elements in order to successfully implement IT systems. They found that as the human component was deemphasized, IT success declined Their analysis revealed that the following cultural attributes had a positive correlation with the successful IT implementation: autonomy, trust, team oriented work, flexibility, and sharing information freely. Negative correlations were found with rule orientation, compliance, carefulness, preciseness, and predictability.

H_1: *A corporate culture that fosters employee involvement and transparency is positively correlated to extranet implementation success and performance*
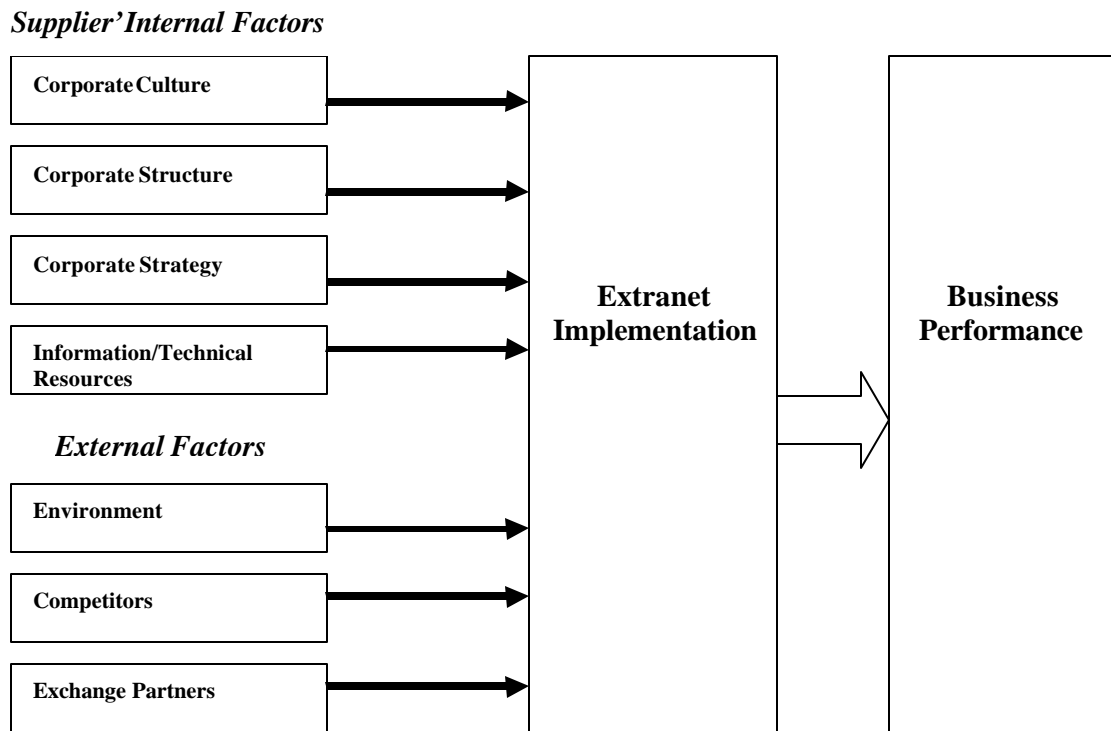
Supplier' Internal Factors

| Corporate Culture |
| Corporate Structure |
| Corporate Strategy |
| Information/Technical Resources |

External Factors

| Environment |
| Competitors |
| Exchange Partners |

Extranet Implementation

Business Performance

Figure 2. Supplier perspective model of extranet implementation success and performance

Corporate Structure also impacts extranet implementation success. According to Hamill (2000), impediments to extranet implementation include: lack of commitment (senior management and staff), management fear, and user resistance. Management must commit to processes, practices, methodologies, and standards to support the full utilization of the extranet business environment (Anandarajan et al., 1998). Managing an information system across multiple business and organizational functions is a difficult task, requiring internal collaboration. Clegg et al. (1997) found that failure of IT project implementation is rarely purely technical in origin, instead organizational and human issues; poor management generally, poor implementation management, poor articulation of user requirements, and inadequate attention to business goals contribute the most to the IT systems' failure to meet their objectives.

Extranet adoption is also an organization wide effort. Thus, consensus of the goals inside the organization is highly important. General objectives and values should be set forth, agreed on, and the information should be shared throughout the organization (Harper and Utley, 2001). Also, Clegg et al. (1997) point out the importance of organizational politics in IT fused organizational and technical change management. Salisbury et al. (2002) have developed a consensus on appropriation (COA) scale to measure the internal consensus regarding the IT implementation. They define consensus on appropriation to be the extent to which group participants perceive that hey have agreed on how to adopt and use a technology. Salisbury et al. (2002) argue that "this agreement may exist prior or develop as the technology is appropriated, but it is a perquisite for users to effectively employ the technology".

Teamwork has been found to be utilized the organizations successfully implementing IT systems (Harper and Utley, 2001; Clegg et al. 1997). Vlosky et al. (2000) project that hierarchical management systems will flatten paving the way for decentralized team-oriented management systems. An organization's ability to disseminate business and IT knowledge throughout the organization is essential for superior IT adoption (Armstrong and Sambamurthy, 1999). Clegg et al. (1997) place importance on finding ways of integrating different forms (technical and strategic) knowledge and expertise in the organization. Senior managers have a critical role in developing integrated approach to organizational and technical change management (Clegg et al., 1997). Bharadwaj (2000) notes that senior management ability to coordinate the broad set of required activities is closely associated with successful IT system implementation.

H_{2a}: *Organizational consensus on extranet implementation is positively related to extranet implementation success*

H_{2b}: *General cross-functional collaboration is positively related to extranet implementation success*

Information Resources refer to the nature and amount of information possessed by the firm about individual customers, whereas information processing skills involves the ability of the firm to use the information to gain insight about individual customers and use this knowledge to customize its future interactions (Varadarajan and Yadav, 2002). Varadarajan and Yadav (2002) argue that resources and skills determine the ability of a firm to pursue competitive advantage in the electronic marketplace, make better decisions in the realm of various marketing mix variables, practice dynamic pricing (e.g., changing the price according to prevailing supply and demand conditions; inferring buyer's price sensitivity), and ultimately increase revenue and reduce cost.

Technical Resources include the level of sophistication of the corporate IT environment (e.g. integration and infrastructure). Information system infrastructure is defined by Byrd (2001) as the computer resources (hardware and software), communication technologies, data, and core applications that provide the technological foundation for widespread communication interchange across organization, and design, development, implementation, and maintenance of present and future business applications. Armstrong and Sambamurthy (1999) found that the sophistication of IT infrastructure has a significant impact on IT adoption. Also Byrd (2001) argues strongly that the development of information system infrastructure is the most important aspect of managing IT resources in an organization. Chan and Davis (2000) note that if a company doesn't already have a sound information infrastructure, these problems will be magnified by extranet implementation.

Technical skills are essential in IT application implementation, but the resource-based view of the firm suggests that the most important aspect in IT implementation is the process of organizing and managing IT within the firm (Mata et al., 1995). The IT managerial skills include management's ability to 1) understand and appreciate the business needs and needs of other functional managers, suppliers, and customers, 2) communication and working skills with other functional managers, suppliers, and customers in developing appropriate IT applications, 3) coordinate IT activities in ways that support other functions, suppliers, and customers, 4) anticipate the future IT needs of other functions, suppliers, and customers (Mata et al., 1995). IT management's ability to manage relationships between other functions, suppliers, and customers is the base for sustainable competitive advantage (Mata et al., 1995; Bharadwaj, 2000). Armstrong and Sambamurthy (1999) summarize based on the literature

that senior leadership (McKenney et al., 1995), CIO's technical and business knowledge (Synnott, 1987; Rockart et al., 1982; Earl, 1989), and IT-literate business management (Keen, 1991; Boynton et al., 1994) has an essential role in successful innovation implementation.

H$_{3a}$: Level of technical IT resources is positively related to extranet implementation success

H$_{3b}$: Level of technical IT skills is positively related to extranet implementation success

Corporate Strategy. The decision to implement an extranet should derive from integrating extranet into existing business strategies. Extranet adoption can integrated in Porter's (1985) strategy types of cost leadership and differentiation. Extranet adoption can contribute to a cost leadership strategy by reducing transaction costs or enabling standardized and cost effective customer service. Extranets can contribute to a differentiation strategy by offering a tool for greater customization and offering additional value added services. Although the decision to implement an extranet should derive from business strategies (Chan and Davis, 2000, Clegg et al. (1997) note that the most organizations are still struggling with successfully integrating IT systems into business goals and needs.

H$_4$: Alignment of business strategy and extranet goals is positively related to extranet implementation success

External Factors Affecting the Success of Extranet Implementation

Environment. The macro environment includes legal, political, regulatory, social, cultural, economic, and technological factors (Varadarajan and Yadav, 2002). In order for a company to implement an extranet with its business partners, the macro environment needs to support electronic communication. First, the communications infrastructure needs to support the global Internet connectivity. The prevailing technology (hardware and software) needs to be sophisticated enough to facilitate uninterrupted Internet communication. There also needs to be institutional and legislative support and social acceptance and trust for electronic communication and electronic business to take place.

H$_5$: Macro environment readiness for electronic communication is positively related to extranet implementation success

Competitors. Extranets should not be implemented just because competitors are doing it (Chan and Davis, 2000). On the other hand, extranet adoption should not be ignored if competitors are using extranets to collaborate with their exchange partners. Implementing an IT solution implemented by competitors often leads to a temporary competitive advantage. In addition, an IT technology simultaneously implemented by several competing firms provides immediate competitive parity (Mata et al., 1995).

H$_6$: Extranet implementation as a direct competitive response is negatively related to extranet implementation success

Exchange Partners. Companies need to identify potential partners with whom extranet connections would be beneficial and profitable. Business partners can be classified based on their importance to the company according to the following classification, loosely based on the customer life cycle value classification. *Strategic partners* are crucial to company's success; *major partners* are important but less critical; *minor partners* are not critical;

transactional customers have the least value for the company. It is common that companies implement extranets with trading partners with whom they have had the longest relationship and who are bringing the largest amounts of money in terms of sales (Angeles, 2001). Managerial decision may be made, that extranet application will only be offered to the biggest and most important customers. Extranets may also be viewed as an incentive to deepen the business relationship and become a strategic partner (Chan and Davis, 2000).

Close dialogue with exchange partners to jointly define desired extranet functionality and applications is a precursor for successful implementation. Consensus on common goals between organizations is also important (Siegel and Hartman, 1998). It is important to make sure that the extranet partners are motivated and on the same technology trajectory in order to effectively partner in extranet implantation (Vlosky and Fontenot, 1999).

H_{7a}: Consensus of common goals and commitment between exchange partners is positively related to extranet implementation success

H_{7b}: Technology trajectory alignment between exchange partners is positively related to successful extranet implementation

Business Performance and Successful Extranet Implementation

A business's competitive advantage as a result of IT implementation is reflected in marketplace performance (e.g. market share, market share growth, sales, sales growth, customer satisfaction and loyalty) and financial performance (e.g. ROI and shareholder wealth) (Varadarajan and Yadav, 2002; Bharadwaj et al., 1993). Although accurate ROI for extranet implementation is extremely difficult to estimate, some staggering returns on investment and payback periods have been documented. International Data Corporation (IDC) return on investment for intranets (of which extranets are extensions) was over 1,700 percent within the first year of implementation with payback periods ranging from six to twelve weeks (Arandarajan et al., 1998). Arandarajan et al. (1998), calculated annual cost savings to be $33,720,000 with a ROI of 1,522 percent in a large retail chain branch extranet implementation setting. However, these results need to be treated with caution because the numbers are largely based on estimation, instead of hard financial data. Furthermore, as Arandarajan et al. (1998) note, "Even though the company has implemented an extranet, any improvements in profit cannot be directly attributed to the implementation of the extranet technology. It could be attributed to a wide variety of market factors. However, the reduction in estimated cost is significant enough to warrant the claim that the extranet technology is a sound investment."

A cross-industrial survey indicate that growth in purchases/sales, service received, inventory turns, and reduction of claims is perceived to be significantly higher than with non-extranet partners (Vlosky et al., 2000; Vlosky and Fontenot, 1999). On the other hand, Clegg et al. (1997) found that 80-90 percent of all IT investments fail to achieve their objectives. Lack of clearly specified performance objectives and lack of systematic performance evaluation were suggested to contribute to the high (80-90 percent) failure rate.

H_8: Success in extranet implementation is positively related to business performance

Testing the Model

Past research has focussed primarily on frequency of extranet implementation, how companies are using extranets, or how companies are able to benefit from extranet implementation. Benefit analysis has concentrated both on theoretical assumptions of benefits achieved using extranets and case studies of extranet implementation. There has been a gap in the research on studying internal and external factors influencing successful extranet implementation and its effect on business performance. Model testing will be framed in terms of research objectives:

1. Test a conceptual model of how extranets are implemented in the context of corporate business strategy
2. Explore whether extranets are regarded as a source of competitive advantage
3. Test both the organizational and external factors influential to the implementation success of an innovative information technology (IT) application
4. Investigate extranet impact on corporate performance
5. Compare the US paper industry to other industrial sectors

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