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Abstract

This paper traces the evolution of Internet-EDI technology in the last 3 years through two illustrative cases of it's implementation - an Internet-EDI pilot project by Bank of America (BofA) and Lawrence Livermore National Labs (LLNL) in 1994, and a robust, production level Internet-EDI implementation by McKesson in 1996. While BofA took a proof of concept approach in its early implementation, McKesson applied the traditional life cycle model in the system design and purchased much of its Internet-EDI capability up front, albeit at a prohibitive cost. The rapid evolution of the technology has resulted in the availability of browser-based systems in early 1997. By facilitating entry of small to mid size companies into EDI networks, these inexpensive systems could transform the competitive landscape within these networks.

1. Introduction: Evolving Potential -- Internet-Based EDI

The Internet seems to present a cost-effective transmission medium for EDI transactions (Curtis, 1996; Frye, 1995; Gill, 1996; Harler, 1996; Messmer; 1996a, Messmer, 1996b; Nash, 1996; Segev, Wan, Beam, Toma, & Weinrot 1995; Weisul,1996). However, the decision to move EDI to the Internet is not a simple decision. Contrary to initial notions, the Internet is not always the cheaper alternative for three reasons. First, to maintain their customer base, current transport medium carriers -- e.g. value added networks (VANs) -- are lowering their rates to stay competitive as an increasing number of firms consider moving their EDI transactions to the Internet. Moreover, since many VANs are now offering Internet-based services, organizations need not switch to an Internet Service Provider (ISP) to obtain Internet access or capability (Curtis, 1996; Davis and Parsons, 1995/1996; Fox, 1996; Harler, 1996; Kilbane, 1996; Messmer, 1996c; Minkoff, 1996; Ross, 1996; Socka, 1996). Second, the cross-platform user-friendly nature of web technologies is fueling the growth of computer-based inter-organizational services at many corporations. As EDI-aware corporations are beginning to realize, the web paradigm facilitates inter-organizational transactions that need not be based on EDI standards. For example, firms specialized in the transportation of goods and information -- e.g., Federal Express (FEDEX) -- offer full service logistics support without using EDI forms and standards for communications and tracking among trading partners (Lappin, 1996). Third, concerns over the security and reliability of public networks like the Internet means that porting EDI to the Internet requires additional procedures to insure the security and reliability of EDI transactions (Frye, 1995; Gould, 1997; Gill, 1996; Harler, 1996; Nash, 1996; Reinbach, 1996; Smith Bers, 1996). Any savings on the transport medium could easily be canceled out by the investment in developing and implementing such procedures and the risks and costs of a large a security violation or reduced service quality due to delay or the loss of EDI forms sent over the Internet.

This paper illustrates two approaches to building an Internet-EDI capability (1) a proof of concept approach which means using borrowed resources for temporary, experimental organizational arrangements and information systems to gain confidence over a concept such as Internet-EDI (Porra, 1996); and (2) traditional information systems design approach with detailed, specific user requirements and considerable investments in a robust system up front (Segev, Porra, & Roldan, 1997). The approaches reflect the contrasting conditions in which they were applied -- BofA/LLNL started developing their pilot in mid-1994 during the early days of Internet-EDI evolution while McKesson started its implementation in early 1996. When BofA started its pilot, the design of Internet-EDI systems was still being worked out, indeed, Premenos's Templar was still being tested and, with co-sponsorship of CommerceNet, the BofA/LLNL pilot was seen as part of the effort of refining Internet-EDI specifications. The BofA/LLNL teams benefited from extraordinary conditions that shielded them from constant oversight, and allowed them to experiment

with the new technology for almost 2 years. Paramount among these conditions were the uncertainty over the ultimate application of a newly and enthusiastically appropriated technology (the Internet), the presence of well-recognized EDI and Security experts at both organizations, and the relatively low cost of the entire experiment ($80,000). In essence, the pilot, was sustained in a pocket of ambiguity and slack resources (March 1981) -- similar to many organization's initial forays into Internet application. When McKesson attempted its own implementation, the technology had matured to a point where production grade systems could be purchased, albeit at an imposing price that limited the size of the trading network that could be built. At this juncture, the state of Internet-EDI technology suggests that McKesson's quandary is a temporary one and that soon the cost of implementing EDI capability may be low enough to promote more universal adoption. The purpose of contrasting the two cases was to find out whether the proof of concept approach would lead into a strategically differing potential for gaining Internet-EDI partners from the traditional information systems design approach.

2. Bank of America's Proof-of-Concept Approach

As one of the largest banking companies with assets of more than $227 billion, BofA offers diversified global financial services to individuals, businesses, government agencies, and other financial institutions in the United States and in 36 other countries (Segev, et.al., 1995). With its large corporate customers, BofA has used Financial EDI (FEDI) based systems for years. With the goal of widening its customer base to include small and mid-size firms, in 1994 BofA began to examine strategies which would consider the Internet as a alternative transport medium for its EDI services.

The BofA Internet-FEDI pilot project started as a "grass-root joint venture". At a CommerceNet meeting in 1994, the bank's representatives teamed up with its customer (LLNL) to answer a mutually interesting question: Could critical business transactions be transmitted over the Internet in a secure, reliable and fast manner? The bank garnered support for its strategy by anticipating the inexpensive Internet-EDI software packages. For LLNL, Internet-based EDI had potential to support the organization's efforts in cost containment through reengineering people and paper intense processes. The BofA/LLNL project team took a prototyping approach to developing the IS. In order to gain management acceptance, it was necessary to address some common negative perceptions about the feasibility of the Internet as a critical business transaction carrier before implementing production applications. In the project team's opinion, the best way to prove the solution was to conduct an experiment under real circumstances. Exchanging actual business data over the Internet between BofA and LLNL for a period of 12 months should provide adequate support for pursuing Internet-based EDI.

During the following six months, the project group researched several available Internet-based security products. A satisfactory solution was designed around Privacy Enhanced Mail (PEM) and its electronic mail extension (MIME). The project team implemented an inter-organizational FEDI system with the Internet as the transport mechanism. In this pilot system, existing EDI processors at BofA and LLNL continued to generate transaction documents while PEM/MIME servers encrypted and signed the documents before they were sent over the Internet. The results of the pilot project where encouraging. During the 12 months of the two phase pilot project, no security violations were encountered. Moreover, delays were mainly caused by coordination problems between two organizations and by the EDI applications -- not by the Internet. In late 1996, BofA started providing Internet-FEDI services to additional customers (Segev, Porra, and Roldan, 1996; Smith Bers, 1996). Prospects for adding a number of WWW based Internet-EDI customers in the future are promising.

3. McKesson's Traditional Information Systems Design Approach

With $13 billion in revenue, McKesson is the leading wholesale corporation in the pharmaceutical industry. The company has excelled in its business acquisitions and in the use of information technology for improving the efficiency of pharmacy and warehouse operations. Recently, the Internet-EDI involvement of the company was hastened by bidding on a large contract. The conditions of the contract included providing access to McKesson's product inventory and ordering systems: the capability to check price and

inventory levels at McKesson; order single items over the Internet; and conduct EDI transactions over the Internet. To win the contract, McKesson had to provide a solution in 90 days.

McKesson chose the IS development life cycle model approach to solve the problem. The company chose to buy as much of the system as possible. Because of the security risks associated with customer access to the corporate IS, McKesson employed two systems: a WWW-based Extranet system for emergency inventory checking and ordering single items; and an Internet-EDI system for all other inter-organizational transactions (Wheatman, 1996). The prospect of winning a large contract served as an incentive for sharing human resources between the line organization duties and the project. It also justified considerable investments in project specific IS infrastructure. Among the infrastructure investments were redundant web servers and a double firewall built to meet the high security and availability requirements of McKesson and its customer. To allow controlled access through the firewall, a password protected Netscape-browser based system was implemented using HTML and PERL. This Extranet solution allowed authorized representatives of the customer check inventory levels and order individual items over the WWW. For it's Internet-EDI application, McKesson purchased a full-scale Internet-EDI package -- Premenos's Templar -- for itself and its customer. Though a complete solution, the system requires Templar to operate on the machines of both trading partners. Since Templar is relatively expensive, trading partners have to make a considerable initial investment in order to become part of McKesson's Internet-EDI network. Consequently, almost six months after the system was finished, McKesson was still conducting EDI with only one trading partner.

1. **Conclusion**

It is likely that as the Internet-EDI infrastructure matures and cheaper software becomes more readily available, Internet-EDI capability will be a commodity which can be acquired on demand. In effect, companies planning to enter the Internet-EDI arena in 1997 are mid-cycle adopters, able to benefit from the experimentation done by early adopters like BofA, LLNL, McKesson, and its major customer. Already, many VANs such as Harbinger, Sterling Commerce, and GEIS, have products and trading partner networks that greatly reduce the cost of building Internet-EDI capability. An emphasis on interoperability and facilitation of set-up using browser-based applications could result in a situation where even small companies and occasional EDI users can quickly and inexpensively acquire the capability to handle EDI transactions. At that point, being EDI capable would cease to be a competitive advantage for suppliers. Buyers need not be locked in to suppliers solely because they are EDI capable and suppliers who are not EDI capable need not be locked out of a trading networks. Such a scenario portends a transformation of the competitive landscape within such networks. Buyers can place less emphasis on pressuring suppliers to build up EDI capabilities and more on other aspects of buyer-supplier relationships -- cost, trust, product quality, co-development. Ideally, this could result in improvements in product quality, as organizations are no longer limited to EDI capable firms in their search for suppliers. Ultimately, the winners may be the EDI infrastructure providers, as widespread adoption translate into major increases in EDI transactions. Albeit, the potential windfall for EDI providers is somewhat mediated by the potential competition from non-EDI based inter-organizational systems solutions -- e.g., logistics services provided by FEDEX, Extranets. Although it is not possible to generalize the results of only two cases, it seems possible that BofA's proof of concept approach is applicable in organizational learning about novel technologies while McKesson's traditional approach is suitable in solving a specific problem in a comprehensive and fast manner. In the two cases, the proof of concept approach may facilitate expanding the system for future Internet-EDI partners (flexibility) whereas McKesson's solution solves a specific customer relationship promoting high quality information systems (rigor).

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