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COMMISSION
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**ELECTRONIC
DATA
INTERCHANGE
IN MINNESOTA
STATE
GOVERNMENT**

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EXECUTIVE SUMMARY

Electronic data interchange (EDI) offers Minnesota state government an opportunity to make a technological and managerial leap forward that is akin to going from quill pen to the printing press, with similar attendant benefits in process efficiency, speed, and precision.

EDI provides a fast, efficient way to communicate and process data directly between the computers of separate organizations. Widely used in the private sector for such interbusiness exchanges as purchase orders and payments, scheduling, and financial reporting, EDI offers government a powerful tool for both processing data and reengineering business processes.

EDI is accomplished through the use of computers, telecommunication equipment, and software working together to perform functions on data that is then transmitted to another organization, eliminating the use of paper forms and copies in triplicate.

Several benefits can be achieved with the use of this electronic exchange of data, including improved customer-vendor relationships, decreased administrative costs, reduced material costs, improved inventory and audit control, better cash flow and cash management, and fewer delays and errors.

While most state governments have been slow to implement EDI, Minnesota has studied EDI and conducted a pilot project that confirmed its benefits, and now has efforts under way to use EDI. The Department of Revenue, for example, has been a leader in developing EDI for tax processing. The Department of Administration

has designed an investment initiative in which EDI would be implemented in statewide contract purchasing, and the Statewide Systems Project (SSP), which is designing ways to reengineer the state's businesses processes to be as efficient as possible, has embraced the use of EDI.

The Commission on Reform and Efficiency finds that EDI is not just a technology but, more important, a management tool that can help identify opportunities to reengineer business processes that can result in significant cost savings. It recommends that the state adopt a personal computer-based EDI system and implement a statewide application of it before the Statewide Systems Project comes on-line. It also suggests that state agencies be encouraged to develop EDI initiatives, the State EDI Committee be responsible for developing the state's EDI technology, and the state be involved in designing EDI standards and practices.

INTRODUCTION

If we are to achieve results never before accomplished, we must expect to employ methods never before attempted.

— Francis Bacon

The purpose of the Electronic Data Interchange Project of the Commission on Reform and Efficiency (CORE) was to examine state government's use of electronic data interchange (EDI) as a management tool and to determine whether the use of EDI can be expanded to save money, reduce paperwork, and increase state government's responsiveness to its vendors and customers.

Norwest Bank, which has extensive EDI experience, provided the assistance of Frank Zalesky, a senior consultant, to CORE in collecting data, formulating findings, and developing recommendations for the use of EDI by state government.

BACKGROUND

Electronic data interchange is the computer-to-computer exchange of business transactions and information in a standard format. EDI communicates data from common business documents in standard data formats, ensuring that different computer systems will be able to use the data without modification. Information flows directly from the sender's application to the receiver's application, without the intermediate medium of paper.

EDI has been used for many common business functions, including purchasing, pricing, reporting of order status and test results, scheduling, transmission of invoices and payments, and financial reporting.

Evolution of EDI

Organizations have historically conducted their business on paper, exchanging written information with other organizations, known as trading partners. The rapid growth in the number of exchanges and the amount of data generated has led many organizations to look to emerging technology for more expedient ways to communicate and process data.

The development of computer telecommunication techniques and the proliferation of computers throughout the private sector has led to widespread use of electronic data interchanges. The grocery and automobile industries are the most frequent users of EDI. Analysts predict that government, banking, finance, and insurance organizations will increasingly adopt the technology over the next few years. In 1989, 34 percent of the Fortune 1,000 companies, along with several large universities and government agen-

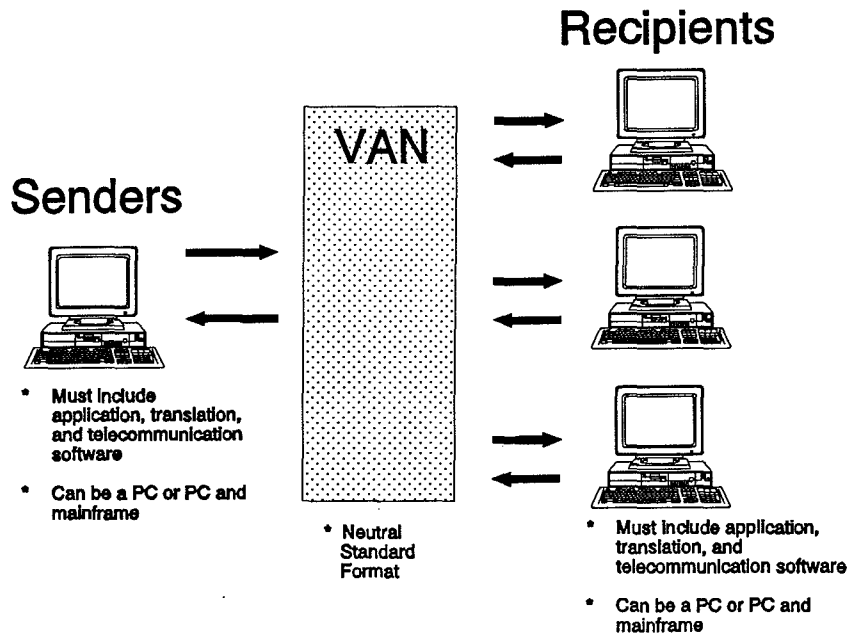
cies, were using EDI technology, and this trend has been growing rapidly [1]. As of October 1992, there were approximately 13,000 commercial EDI users [2].

EDI system components

EDI requires a combination of technology and management resources to efficiently communicate business information between the computers of separate organizations. To send and receive EDI transactions, the following components must be in place:

- *Hardware.* Both computers and telecommunication support equipment are necessary. The computers can be either personal computers (PCs) or PCs connected to mainframes.
- *Software.* Application, translation, and telecommunication software are required to operate an EDI system.
 - The application software produces and accepts data used to support business procedures and/or decisions.
 - The translation software initiates, controls, and terminates data interchange. It also translates trading partner information to a standard format.
 - The telecommunication software interacts with the modem, which in turn interacts with the value added network.
- *Value Added Network (VAN).* This medium transmits the information between organiza-

Figure 1. EDI Components



tions. The VAN acts as a mailbox instantaneously connecting the sender's data with the recipient.

Figure 1 shows an EDI system's components.

Computer options

For use in state government purchasing and other functions, EDI can be implemented in two ways. The first is through a mainframe computer application connecting with PCs at purchasing points statewide, and the second is through a system of PC applications.

The mainframe system has one application that performs EDI transactions. Each separate location (agency office) has a PC connected to the mainframe. The agency enters the transaction

data into the PC, which communicates the information to the mainframe. The mainframe receives the transaction, performs the function, and then sends the transaction to the trading partner through the VAN.

In the PC-based system, the PC performs the EDI transaction. The transaction is then sent via a modem to the VAN and then to the trading partner's PC.

With either system, PCs must be purchased for all locations that will be using the system. In a PC-based system, a copy of the EDI software must be purchased for each PC. In a mainframe system, one application would be designed for the mainframe to perform EDI transactions. However, the cost of designing and maintaining a single mainframe application is generally

significantly greater than the cost of purchasing software for a group of PCs (see the discussion of costs below for more detail).

Neither system is technologically superior. A PC-based system generally makes EDI implementation less costly than a mainframe system and provides greater flexibility to respond to advancing technology and changing user needs. However, where centralized controls are required, a mainframe-based system may be desirable.

EDI environments

EDI is most useful in certain business environments that have a large volume of recurring transactions, a need for timely processing, products or services that can be described by a code value, transactions that call for large amounts of paperwork, a need for careful data tracking and reporting, highly cost-competitive markets, and centralized data processing or distributed data processing with standardized applications.

Benefits

The electronic exchange of data produces numerous benefits:

- *Improved customer-vendor relationships.* According to EDI users, the most important — and most surprising — benefit of electronic data interchange has been improved relationships with their trading partners. EDI encourages a tremendous degree of cooperation between organizations. It also makes it easier for customers to place orders, speeds delivery and payment, and decreases errors, all of which contribute to customer satisfaction [3].
 - *Decreased handling costs.* EDI eliminates the need for redundant keyboard data entry, curtailing data errors and decreasing administrative costs. Hewlett Packard found that as a result of implementing EDI, its purchasing agents have reduced the time they spend on administrative functions from 33 percent to 3 percent and its distributors are saving at least 10 percent of their time per week. Toys R Us was able to process 130,000 more invoices per year with no additional staff after it began using EDI.
 - *Reduced material costs.* EDI decreases the use of paper, envelopes, mailing, and other materials, thereby cutting costs. There is less need for overnight couriers, and telephone costs are reduced. Southern California Edison Co. saved \$21,996 in 1990 in mailing and paper costs from using EDI.
 - *Improved inventory control.* Use of EDI allows an organization to know at any time the amount of inventory it has. As a result, inventory size and the time it takes to manage it can be reduced. For example, Digital Equipment Corp. has used EDI to cut inventory from one supplier by 80 percent and to trim administrative cycle times from five weeks to three days.
 - *Improved audit control.* EDI can provide a thorough audit trail of activity, enhancing the auditing system of the organization.
 - *Improved cash flow and cash management.* Reduced inventory and more timely invoicing and payment improve cash flow.
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Potential problems

Security and privacy

Although the rapid exchange of information and funds through electronic means greatly increases efficiency and responsiveness to customers, exposing a previously closed data system to external forces through a telecommunications link poses some privacy and security risks. Price Waterhouse conducted a review of several Fortune 1,000 companies and found some major areas of concern for security and privacy, including:

- *Security of operating system.* An application or utility system is no more secure than its operating system. Where the operating system tends to be most accessible, there is the greatest difficulty in controlling application system activity. The design of an EDI system, therefore, needs to take into account which data is to be shared with trading partners and which should be protected.
- *Security of data.* Data being transferred between organizations must be in a secured environment that does not permit unauthorized persons to have access or exposure to content.
- *Complete, accurate, and timely exchange of data.* EDI transaction standards, which allow computers to process information automatically between organizations, include a range of end-to-end audit features that should be implemented to ensure complete and accurate exchange of information [4]. The timely receipt or transmission of information requires adequate logging, error detection, and correction procedures [5].
- *Hardware costs.* These costs are for purchasing and/or making alterations to the PCs or mainframe to accommodate an EDI system. The hardware costs for a PC-based system and a mainframe-based system set up on an existing mainframe are about the same. Both require purchasing or making alterations to a series of PCs, either to perform the EDI transactions or to communicate data to the mainframe so it can perform the transactions. The cost of purchasing PCs is the same under either system.
- *Software costs.* Application, translation, and telecommunication software are needed to create and transmit the EDI transaction. A PC-based system requires copies of the EDI software package at each site. Software costs for this system depend on the software's capabilities and the adaptations needed for it to function on the particular system. These costs generally range from \$200 to \$1,000 per unit of software. A mainframe uses a single application to perform EDI transactions. However, the cost of developing this application is often greater than the cost of software for 50 or more PCs. The cost depends on the size of the mainframe and how the application is tailored to meet the user's need. Most large mainframe applications cost more than \$50,000. Purchased software usually comes with free or minimal-charge updates as EDI technology evolves. In a mainframe-based system, however, the application must be rewritten, at substantial cost, each time an update is needed.
- *VAN charges.* Each EDI transaction sent through a value added network incurs a charge, generally about 50 cents per 1,000 characters. Accumulated charges can run between \$100 and \$1,000 a month.

Costs

The costs of implementing and maintaining an EDI system vary according to whether the system is mainframe- or PC-based. Three elements make up the total cost of an EDI system:

EDI IN STATE GOVERNMENT

State governments have been slow to implement EDI for two reasons: 1) few have the processes and software in place to take advantage of the technology, and 2) the return on the required initial investment occurs over three to five years, with no short-term savings [6]. Several states, however, are beginning to explore using EDI, including Wisconsin and Texas.

Wisconsin became interested in EDI primarily because of the size and complexity of the state's telecommunication bills. The state's telecommunications director saw EDI as a way to solve the problem of his staff spending many hours collecting and compiling data from printed telephone bills. The state received its first EDI-generated bill in May 1992. The staff is still being trained to take full advantage of this new format, but the state expects to realize significant benefits from its use, including the elimination of rekeying errors, an ability to use the data base to better manage telecommunications resources, and the reduction of waste [7].

Texas was the first state to promote EDI. Its Department of Information Resources was set up to introduce agencies to the technology and benefits of EDI. An EDI pilot project has been established with the Office of the Comptroller of Public Accounts for filing sales tax returns from a dozen participants; four hours of manual data entry are expected to be reduced to a ten-minute electronic transaction. Another project is planned with the Commission on Alcohol and Drug Abuse, which handles approximately 20,000 paper transactions a year [8].

Other states have expressed interest in developing EDI systems in a wide variety of areas, including medical claims processing, tax collec-

tion, and filing of court documents and payment for filing [9]. The use of EDI in state governments can only be expected to grow as states begin to implement the process and measurable benefits are demonstrated.

EDI IN MINNESOTA

Minnesota state government began actively exploring the potential for expanding the use of EDI in 1989, when the State EDI Committee was formed. Composed of representatives from all state agencies with interest and experience in EDI, the committee provides information and guidance to agencies interested in using EDI technology. The Department of Administration's InterTechnologies Group (InterTech) and the state MIS Directors Group awarded a \$50,000 grant to the committee to partially fund a pilot project using EDI and to hire a consultant to identify strategic opportunities for EDI use. The consultant, Price Waterhouse, completed its study in 1990.

The Price Waterhouse study identified 261 exchanges of information, also called data flows, among state agencies. The majority of these data flows, 78 percent, were for agency programs, 12 percent for payments and receipts, and 9 percent for purchasing or contracts. Of these data flows, 67 percent were on paper or electronic mail, 17 percent on tape or disk, 13 percent on-line; and 2 percent EDI. In many cases, similar or identical types of data flows, such as purchasing and payments, were identified across state agencies.

The 2 percent of data flows using EDI occur in four state agencies. The Department of Education uses a federal wire transfer for receiving federal grant money; the Department of Human Services uses electronic funds transfers for recovery payments and some grants; the Department of Labor and Industry uses EDI for a portion of its worker's compensation insurance claims and first reports of injury; and the Department of Transportation uses EDI for some

compliance and program reports. Since the completion of the study, the Department of Revenue has implemented EDI technology for its frequent communications with the Denver branch of the Internal Revenue Service.

Many data flows in the state would be more efficient if EDI were used. The study recommended the development of a centralized EDI program, which would allow the state to capitalize on the benefits of using, extracting, and/or interpreting data moving into, out of, or through its systems.

Pilot project

After analyzing the report, the EDI Committee embarked on a test project in one of the specific areas identified in the report as a good candidate for EDI, the purchasing function. The pilot involved the Department of Public Safety, the Department of Administration's Materials Management Division, and one of Public Safety's primary trading partners in the Bureau of Criminal Apprehension, Baxter Scientific.

The pilot project yielded several findings:

- The combination of EDI and work process redesign appears to offer significant monetary savings. Savings in the pilot project were approximately \$20 per purchase order processed.
 - The steps in processing purchase orders were cut from 37 to 12 as a result of the EDI project.
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- Computer systems of varied manufacture and design using different software applications can be compatible in EDI use.
- All partners must thoroughly understand the needs of other participating organizations.
- Minimal training is needed to master EDI.
- Nearly half of all business taxes are paid electronically.
- The provider tax for MinnesotaCare will be collected electronically.

Current EDI efforts

Statewide Systems Project

The Statewide Systems Project is a joint effort by the departments of Finance, Employee Relations, and Administration to review the statewide systems, including accounting, human resources, payroll, and purchasing, and design a way to reengineer the state's business processes to be as efficient as possible.

One of the SSP strategic objectives is that all system areas must support EDI. EDI would be used in accounting, for example, to receive invoices and remit payments and in procurement to update budget availability, initiate purchase orders, and identify closed purchase orders. When fully operational, the SSP will have the software available to support EDI.

Department of Revenue

The Department of Revenue has been at the forefront of EDI development for tax processing with several accomplishments:

- Electronic filing of state income tax has been an option for taxpayers since 1990.
- Electronic transmission of refunds has been available since 1992.
- A reengineering project in sales tax collection is developing a way to process returns and payments electronically in 1993.

The number of taxpayers who choose to use EDI options for filing, payments, and refunds has increased yearly and is projected to continue to grow as more functions become available. Revenue has realized several benefits to its tax processing function from EDI, including a decreased error rate, speedier payments and returns, and less time and fewer resources spent on dealing with paper documents. Revenue plans to use a new IRS-standardized transaction for all tax filing.

Department of Administration

The Department of Administration is requesting funds from the legislature to implement EDI technology for the state's central contract purchasing function during the 1994-1995 biennium. The request is referred to as an investment initiative and was developed by the department, CORE, and the EDI consultant.

Purchasing has many of the characteristics of a business environment where EDI is most useful: It has a large volume of recurring transactions, a need for timely transaction processing, a large amount of paperwork, and a highly cost-competitive market environment.

The use of EDI for purchasing has been well established in the private sector. Georgia Power found that its purchasing lead time was reduced by six days when EDI was implemented. Hewlett Packard reported similar results.

The investment initiative would focus on the central contract purchasing function, which is handled by the Purchasing Section of the Depart-

ment of Administration's Materials Management Division (MMD). In 1991, the Purchasing Section spent \$70 million on purchases and \$100 million on contract purchases [10].

The investment initiative has three steps:

1. An EDI cross-functional work team would be formed. This team would reside in the Materials Management Division and be headed by a data expert from the division. The team would also include a business process expert from the Department of Administration's Management Analysis Division and purchasing experts on mobility assignment from other state agencies.
2. During the first year, the EDI hardware and software systems would be purchased, installed, and tested. Four purchasing contracts would be converted to EDI.
3. During the second year, eight more purchasing contracts would be converted to EDI, and the capability to receive transactions electronically would be added. This would allow for electronic reconciliation against purchase orders and acknowledgments.

The total value of transactions for the 12 contracts converted to EDI over two years would be \$39.6 million. The contracts selected for EDI conversion would be for commodities, such as office supplies and computers, that are used regularly by virtually all state agencies, thus allowing all agencies to acquire some experience in using an EDI system for purchasing.

Benefits — Based on its pilot project with Public Safety and on public- and private-sector experiences with EDI, the Department of Administration believes that EDI-based transactions in contract purchasing would reduce the time from order to receipt of goods from weeks to days;

tell customers within minutes of order placement how much they will receive and when; provide managers with instant access to data about all transactions so volume, price, and vendor performance can be monitored constantly; reduce paper printing, handling, mailing, and storage costs; and reduce errors.

Costs — The investment initiative is projected to cost \$841,961 for the 1994-1995 biennium and \$311,772 for the 1996-1997 biennium. This includes costs for staffing, training, software, VAN transmissions, computer processing, and PCs. The total cost per site is \$2,004.

Potential savings — The EDI investment initiative could result in significant savings over the longer term. The Public Safety pilot project resulted in the following savings:

- Overall staff savings of \$20 per department purchase order
- Time required to process an order reduced from 130 to fewer than 30 hours
- Number of personnel involved in processing an order cut by up to one-third
- Number of approval signatures reduced from seven to three

By conservative estimates, if 100,000 DPOs were issued electronically, a savings of \$2 million a year could be realized.

Other efforts

Several other agencies are planning for possible EDI implementation for some of their functions, including the departments of Human Services, Transportation, and Health; the Housing Finance Agency; the Pollution Control Agency; and the State Treasurer's Office.

CORE findings

- EDI is not just a technology to be implemented. It is a management tool that can be used to identify opportunities to reengineer business processes.
- Cost savings result from reengineering business processes, not from EDI in and of itself.
- Although there is significant interest in EDI in state government, EDI is being used in very few data flows.
- The roles of the various actors working in the EDI arena are often unclear. Those actors include: InterTech, which is responsible for operating and maintaining the state's mainframe computer system; the Information Policy Office, which evaluates technology purchases and sets and publicizes standards for EDI transaction sets; and the State EDI Committee.
- Both mainframe- and PC-based EDI systems have advocates within state government, and the state has not yet committed to using one system over the other.

Conclusions

Significant benefits will result from the implementation of EDI technology in state government. While many people feel that EDI is a new and even radical way of doing business, this technology has been in use for more than 20 years, and its potential for cost reduction has been demonstrated in many industries. Minnesota should be able to capitalize on similar benefits.

The benefits result from two factors: the replacement of paper documents with electronic interchanges and the streamlining of internal processes. These efficiency improvements and cost savings occur when business operations are reengineered. To facilitate reengineering, internal processes should be reviewed and business and strategic plans developed. Every agency should foster an environment that is open to change.

Recommendations

1. *An EDI system should be implemented for a statewide application before the Statewide Systems Project comes on-line.*

State government has little experience in the use of EDI. Implementing a statewide application would help to identify and address any unresolved issues in the process before the system is expanded under the SSP. Among the specific questions that should be addressed are:

- Which value added networks offer the state the best service and the widest array of trading partners?
- What alternative means can be used to link small business vendors that are not EDI-capable with a state EDI system?
- How can the costs of developing an EDI infrastructure be minimized?

The Department of Administration's EDI investment initiative for statewide contract purchasing would be a good place to start developing EDI. This initiative would provide virtually all state agencies with EDI experience.

Contract purchasing would be an appropriate testing ground for EDI application because:

- *The impact of contract purchasing is widespread.* Contracts for purchase are negotiated on behalf of all state agencies, as well as many local units of government. More than 550 sites statewide make purchases.
- *All agencies would gain EDI experience.* The contracts selected to be converted to the EDI system are for commodities used by virtually all state agencies. As a result, the learning from this EDI implementation would occur not only in the Department of Administration but in all agencies that purchase from the contracts, including all 26 cabinet agencies.
- *This implementation would not preclude the development of EDI for the Statewide Systems Project.* In fact, as stated above, the learning from this process would help facilitate the implementation of EDI for other statewide systems.

Some issues in the EDI investment initiative would need to be resolved, particularly costs and savings. Cost estimates are high because the initiative includes both mainframe- and PC-based solutions. Estimates also are based on using IBM PCs. Several quality IBM-compatible PCs are available that have the same capabilities but would cost significantly less.

The project savings to be generated by the investment initiative are based on the savings achieved by a pilot project. That project dealt with one contract between one vendor and a single state agency. Because each of the contracts that would be converted under the investment initiative affects more than one

agency, and each agency would be likely to have contact with more than one EDI-converted contract vendor, it is possible that the benefits would be substantially different.

Nonetheless, the expected cost reductions and process improvements that would result from a limited implementation of EDI for purchase orders more than justify the expense associated with becoming "EDI capable."

2. *The state should implement EDI through a PC-based system.*

A PC-based system offers several advantages over one that is mainframe-based:

- *Evolution of technology.* Most industries are moving away from large mainframe systems and toward more decentralized PC-based systems for all applications, including EDI. To keep up with its trading partners, the state needs the same capabilities and applications.
- *Lower hardware cost.* A group of PCs would be required under either system. If the PCs are performing the EDI application, they would require an asynchronous modem to communicate with the VAN, at a cost of approximately \$500 per unit. PCs that are serving as terminals to a mainframe-based EDI system would require synchronous modems to link with the mainframe, at a cost of approximately \$1,000 per unit. In addition, the maintenance costs for a mainframe are significantly higher than those for PCs.
- *Lower software cost.* In a PC-based EDI system, each PC must be equipped with EDI software. However, it is often cheaper to purchase multiple copies of EDI

software for a group of PCs than it is to create a single mainframe EDI application.

- *Increased flexibility.* EDI is an evolving technology. Changes and improvements are being made constantly. As a result, any effective EDI system must be able to stay current with developments in the technology. PC software can be easily updated or replaced inexpensively. Changing mainframe applications requires reprogramming at a substantial cost in time and money.

A mainframe can be used to centrally collect data by receiving information from the PCs, becoming a partner in the EDI process while not actually creating the EDI transaction.

3. *State government should expand its use of EDI.*

Numerous opportunities exist for the expansion of EDI technology throughout state operations. State agencies should be encouraged to develop initiatives using this technology. Other areas that offer significant opportunity include health care, vendor payments, and information exchange.

4. *The State EDI Committee should be responsible for coordinating the development of EDI technology in state government.*

It is important that the state not fall into the trap of viewing EDI as an automation project. EDI is more than technology; it is a way of doing business. Therefore, it should be directed by the users of the systems, not technology experts.

Typically, EDI development results in the creation of an EDI office or a cross-domain

steering group to plan and develop the implementation of EDI. The State EDI Committee is an established group of users of EDI whose function has been to share information about EDI with their colleagues across the state. This committee should be empowered to plan for and coordinate the development of EDI in state government.

5. *State government should be involved in developing EDI standards and practices.*

The state should actively work with its trading partners and organizations concerned with EDI standards to establish these standards and practices to ease the transition to EDI and maximize opportunities for efficiency.

EDI implementation in other government units at the federal, state, and local levels has resulted in inconsistency. For example, 30 states are collecting taxes electronically, and there are 30 different standards for tax collection. As more units of government focus on collecting tax dollars through EDI, the inconsistency across levels of government will hamper the effectiveness of EDI. Therefore, it is imperative that the state work toward attaining consistency in EDI implementation planning among the federal, state, and local governments.

CONCLUSION

Just as the printing press revolutionized the communication of ideas, EDI is changing how information is exchanged by organizations and how organizations do business. EDI technology can improve the efficiency of state government by decreasing handling and material costs, streamlining inventory and auditing control, and improving cash flow and cash management. It can also augment state government's responsiveness to its customers by increasing

cooperation and decreasing delays and errors in the exchange of information.

The greatest potential of EDI, however, is that it can be used to reengineer and restructure the way state government does business.

State government can benefit significantly from investing in and using this technology. The result will be not only improved services but more efficient government for the citizens of Minnesota.

ENDNOTES

1. Wisconsin Department of Transportation, *Imagineering '89 Technology Workbook* (Madison: Department of Transportation, 1989), p. 46.
 2. Milford Sprecher, "EDI: Status in State Government," *Government Technology* 5 (October 1992):38.
 3. Sprecher, "EDI," p. 38.
 4. EDI standards minimize the need for users to reprogram their systems to accommodate the interchange. The most widely used standards have been developed by the American National Standards Institute.
 5. Price Waterhouse, *Study of EDI Applications for the State of Minnesota*, June 1990, pp. 118-19.
 6. Sprecher, "EDI," p. 38.
 7. Ibid.
 8. Ibid.
 9. Ibid., p. 41.
 10. This does not include service contracts.
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