AN ELECTRONIC DATA INTERCHANGE (EDI) IMPLEMENTATION VIA E-MAIL IN LAW AUTOMATION SYSTEM

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by

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ABSTRACT

The increased computerization of the society is triggering major changes in the organization of work. Paper-driven processes are being reengineered to capture the benefits of doing business electronically. Businesses are implementing electronic commerce (EC) to meet the imperatives of an increasingly competitive world. Today electronic data interchange (EDI), which is one of the electronic commerce tools, is used to improve the quality and timeliness of data exchange, establish consistent methods, streamline processes and procedures, and reduce costs while increasing the effectiveness of personnel and information.

In this thesis, LEDI (Law EDI) - a data exchange system-, which uses informal EDI via e-mail, is proposed to be used for a Law Automation System. LEDI provides data interchange between the units of a company which use Law Automation System applications at their sites. The proposed model is suitable especially for the firms that have units located at geographically far places and need to exchange data and business documents with these units.

ÖZET

Toplumda bilgisayarlaşmanın artması, iş organizasyonunda büyük değişikliklere neden olmaktadır. Kağıtla yürütülen süreçler, işlerin elektronik olarak yapılmasının sağladığı faydalara sahip olabilmek için tekrar planlanmaktadır. İşyerleri her geçen gün büyüyen rekabet dünyasının şartlarını karşılamak için elektronik ticareti uygulamaktadırlar. Günümüzde, zamanında veri değişimini sağlamak, devamlı metotlar kurmak, süreçlerin ve prosedürlerin verimliliğini arttırmak, bir yandan personel ve bilgininin etkinliğini arttırırken, diğer bir yandan giderleri düşürmek için elektronik ticaret araçlarından biri olan elektronik veri değişimi (EDI) kullanılmaktadır.

Bu tezde, bir Hukuk Otomasyon Sistemi'nde kullanılmak üzere tasarlanan LEDI (Law EDI), yani e-posta yoluyla standart olmayan EDI' yi kullanan bir veri değişişim sistemi önerilmektedir. LEDI, bir şirketin Hukuk Otomasyon Sistemi uygulamasını kullanan her bir birimi arasındaki veri alış-verişini sağlamaktadır. Önerilen sistem, özellikle coğrafi olarak birbirinden uzak birimlere sahip olan ve bunlarla veri ve iş dökümanı değişimine ihtiyaç duyan şirketler için uygundur.

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CHAPTER ONE

INTRODUCTION

Companies cannot function in isolation. To meet customer demand they depend on close co-operation with suppliers. They rely on customer information and feedback for product quality. And, they call on many types of services of other organisations to do business adequately. Tax departments, financial institutions and accountants are involved in the financial aspects of running the business. There's nothing new in this. Well-known procedures for business operations between companies have evolved over time. Yet, these were based on traditional circumstances —such as stable markets, stable and simple business relationships, geographically limited markets, and mass production and marketing — and on traditional facilities — paper, phone, and fax.

This situation has drastically changed over the last few years. Customers have become ever more demanding and product innovation rates are high. Effective customer response has its consequences throughout the chain of organisations involved. Also, globalisation of markets and the availability of new electronic media lead to new players in existing markets and high pressure to work more effectively, reduce cost, and become more and more flexible.

Due to information and communication technology (ICT) flows of goods between parties in a value chain and flow of information have been uncoupled. This leaves room for new intermediaries within existing chains and for shifting roles. The information flow itself becomes an important area of business. Therefore, new transaction services are drastically changing the way companies function in their contexts.

Business transactions capture the essence of cross-company information flow: requesting a proposal, submitting a bid, making payments, and reserving production

capacity are all examples of transactions. Transactions are defined in advance and information is exchanged according to agreed procedures in order to do business. Many internal business processes and departments are involved: the purchasing department cancels an order, the personnel department sends details of new employees to a pension fund, the production group complains about the quality of raw materials, logistics reserves a truck, etc.

Nowadays, information and communication technology is being used increasingly for implementing and interpreting transactions and passing them on to the internal business processes, whether the latter are automated or not. Performing transactions electronically enables companies to:

- reduce transaction costs;
- implement new and complicated transactions cost-effectively;
- improve customer service, such as lead times and service quality;
- reduce error rates;
- reduce the time to market;
- extend inter-company transparency or span of control, for instance for optimising logistic planning and eliminating double work.

Next to that, other, more innovative, phenomena arise. As business organisations are, in essence, a means for co-ordination of activities, electronic communication can, for instance, lead to fluid and temporary networks of e-lancers: electronically connected freelancers.

New ways of doing business electronically and new forms of networked enterprises impose new demands on transaction services. Electronically business is named Electronic Commerce (EC) and currently used technologies are e-mail, EDI, Internet/Intranet and Extranet.

1.1 Electronic Commerce (EC)

Electronic commerce (EC) is an emerging concept that describes the buying and selling of products, services, and information via computer networks, including the Internet.

Electronic commerce uses several technologies, ranging from EDI to e-mail. In fact, buying food from a vending machine with a smart card is considered electronic commerce.

Electronic commerce applications began in the early 1970s with such innovations as electronic transfer of funds. However, the applications were limited to large corporations and a few daring small businesses. Then came EDI, which expanded EC from financial transactions to other kinds of transaction processing and extended the types of participating companies from financial institutions to manufacturers, retailers, services, and other forms of business. With the commercialization of the Internet, making available 60 million potential customers, EC applications have expanded rapidly. Over the last 5 years we have witnessed many innovative applications, from advertisement to auctions and virtual reality experiences.

There are many applications of EC, such as home banking, shopping in stores and malls, buying stocks, finding a job, conducting an auction, or collaborating electronically on research and development projects.

The applications are supported by infrastructure as shown in Figure 1.1. Their implementation depends on four major areas (shown as supporting pillars): people, public policy, technical standards and protocols, and other organizations. The EC management coordinates the applications, infrastructure, and pillars.

Figure 1.1 can be used as a framework for understanding the relationships among the EC components and for conducting research in the field (Zwass, 1996). It is clear that the EC field is very diversified and broad.

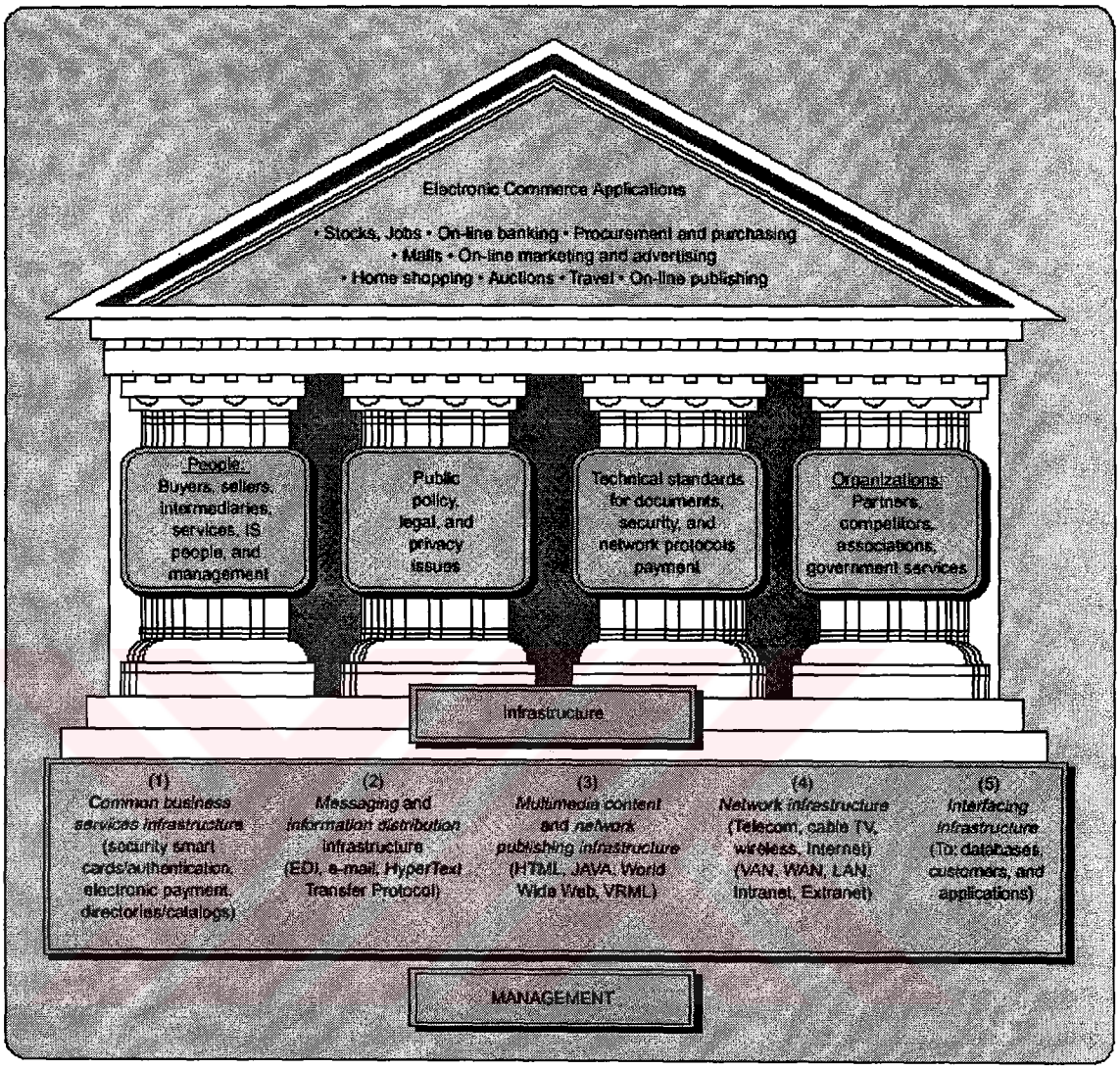

FIGURE 1.1 A framework for electronic commerce. (Modified from Kalakota and Whinston, 1997, p. 12.)

There are two potential applications of EC. One is Business to Consumers (B2C) which means trading between businesses and individual customers and the other is Business to Business (B2B) which means trading between two businesses.

1.1.1 Business to Consumers Applications (B2C)

750 million Internet users within 10 years could generate a huge volume of electronic business, which is currently still fairly modest. The most common applications are home banking, buying stocks and bonds, conducting personal

finance transactions, finding jobs, buying at electronic auctions, organizing travel, purchasing real estate, buying items at retail stores and electronic malls.

1.1.2 Business to Business Applications (B2B)

The applications described in the previous section are mainly suitable to business-to-customer situations. However, some of them, such as travel and home banking, are suitable to business-to-business applications as well. In this section attention is given to EDI, extranets, and Internet/intranet which can be used in the business-to-business applications that compose the majority of EC volume.

1.1.2.1 The Internet/Intranet

An internet consists of a set of connected networks that act as an integrated whole. The chief advantage of an internet is that it provides universal interconnections, while allowing individual groups to use whatever network hardware is best suited to their needs. The trend, as we enter the first decade of the new century, is toward ubiquitous connectivity.

There is a large internet par excellence. This is the Internet. The Internet, with a capital I, is a massive world-wide network connecting a plethora of subnetworks and computing/information resources located on these subnetworks, including devices such as computers, servers, and directories. As a network of networks, it provides the capability for communication between research institutions, government agencies, businesses, educational institutions, and individuals. It is an effective, open and inexpensive inter-enterprise network.

Internet-based technology has now migrated to what are called intranets. These networks are corporate networks, basically portions of or overlays to traditional enterprise networks, which use the same lower layer and application level protocols as the Internet, specifically WWW-related technology. Companies are deploying intranet technology in increasing numbers. Corporations are seizing the Web as a swift way to streamline and transform their organizations. These private intranets use the structure and standards of the Internet and the WWW, but are separated from the

public Internet by firewalls. This way, employees can access the Internet, but unauthorized users cannot come into the corporate intranet. The intranet Web is an inexpensive, yet very effective alternative to other forms of internal communications, in that is provides the mechanism to eliminate paper while increasing accessibility to information. Examples of applications of intranet-based information include internal telephone books, procedure manuals, training materials, requisition forms. All of this information can be converted to electronic form on the Web and updated in a low-cost manner.

Most companies already have the foundation for an intranet--a network that uses the Internet set of networking and transport protocols. Computers using Web-server software store and manage documents built on the Web's HyperText Markup Language (HTML) format. With a Web browser on the user's PC, the user can call up any Web document, no matter what kind of computer it is on. Firewalls are another element that may already be in place. Intranets allow the presentation of information in the same format to every computer. It is a single system of universal reach.

The use of intranets is increasing rapidly not only as an internal communication system, but also as a facilitator of electronic commerce. Intranets can facilitate electronic commerce inside a corporation; for example, they can be used to sell corporate products to employees, or to sell or trade services and products among business units. Intranets can facilitate external trade as well.

Intranets can facilitate transaction processing in the following ways:

- Efficient transaction entry. Wherever appropriate, data needed by systems to support financial functions are entered only once and are updated through electronic means, consistent with the timing requirements of normal business or transaction cycles. This also reduces errors.
- Common transaction processing. Common procedures are used for processing similar kinds of transactions throughout the system, enabling these transactions to be reported in a consistent manner.

- Consistent internal controls. Internal controls over data entry, transaction processing, and reporting are applied consistently throughout the system to ensure the validity of information and the protection of financial resources.

1.1.2.2 The Extranet

The exact definition of an extranet is still evolving, but the most universally accepted one is a network that links business partners to one another over the Internet by tying together their corporate intranets. The term "extranet" comes from "extended Internet." The goal of extranet is to foster collaboration between organizations.

An extranet uses the existing Internet interactive infrastructure, including servers, TCP/IP protocols, e-mail, and Web browsers. It links the company's intranet with suppliers, customers, and trading partners. Extranets may be used, for example, to allow inventory databases to be searched or to transmit information on the status of an order. An extranet enables people who are located outside a company to work together with the company's internally located employees.

The extranet, like an intranet, is typically behind a firewall and is closed to the public, but it is open to selected suppliers, customers, and other business partners, who access it on a private wide-area network run on public protocols. Alternatively, the regular Internet lines can be used.

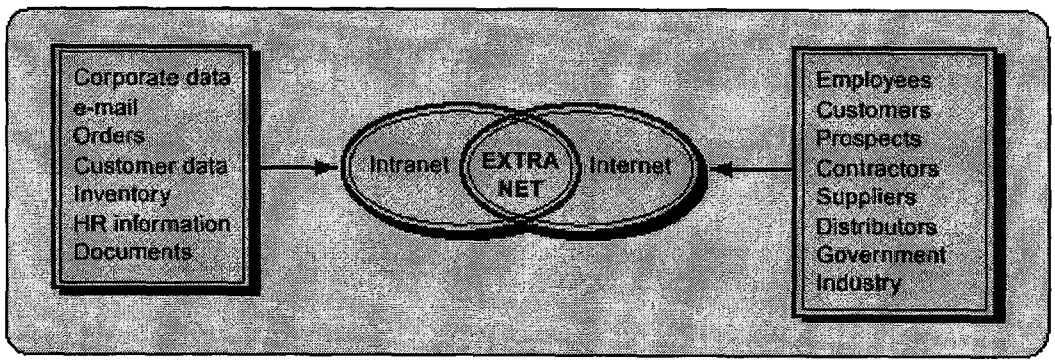

FIGURE 1.2 The extranet

The extranet allows the use of capabilities of both the Internet and the intranet as shown in Figure 1.2. External partners and telecommuting employees can use the

Internet to access data, place orders, check status, and send e-mail over the Internet. The extranet is far more economical than the creation and maintenance of proprietary networks. It is a nonproprietary technical tool that can support rapid evolution of electronic commerce.

1.1.2.3 Electronic Data Interchange (EDI)

Electronic data interchange is the computer-to-computer exchange of routine business information in a standard format. EDI is the major literature in this thesis project. That's why, in the next chapter, EDI will be mentioned in more detail.

1.2 Aim of This Work

Aim of this thesis is to develop data exchange system using Electronic Data Interchange (EDI) via e-mail. This application is used for transfering data, messages and some documents between the same client-server Law Automation applications running at geographically different places.

The main contribution of this study is developing a specific format for EDI instead of using its standard formats and using e-mail to transfer formatted data. The whole system is reviewed in chapter 3 in more detail.

1.3 Thesis Organization

This thesis is organised as follows.

In Chapter 2, Electronic Data Interchange (EDI) is explained in details. It starts with explaining basic description of EDI and detailed information about history of EDI. Then, market motivation and benefits are explained. Also, EDI Basics, which includes EDI standards, EDI communication methods and EDI software, are explained in details. In addition, information exchange process, EDI implementation, some applications of EDI, managing issues, security issues and concerns and a case study are explained in details.

In Chapter 3, Law Automation System (LAS) is explained in shortly. Then Law EDI (LEDI) and its working principle are explained. Implementation and exchange processes of LEDI are also explained. In addition, types of LEDI exchange processes are explained in details. Finally, Chapter 4 concludes some of the open issues and future trends of LEDI..

CHAPTER TWO

LITERATURE SURVEY

Electronic Data Interchange or EDI is a synonym for standardized inter-organizational data exchange (Kalakota, et.al., 1996). It has been used for more than 20 years in automating the interchange of business transactions between trading partners, suppliers, and customers in order to create a paperless flow of administrative, prepurchasing, purchasing, shipping, receiving, warehouse, customs, billing and payment information (Sokol, 1995).

2.1 Electronic Data Interchange (EDI)

EDI (electronic data interchange) is a member of a family of technologies for communicating business messages electronically, including EDI, facsimile (fax), electronic mail, telex, and computer conferencing systems (bulletin boards). Businesses use each of these technologies to exchange commercial messages with their trading partners. The boundaries between these technologies are not rigid. A message may, for example, begin as an EDI message, but later be converted (by perhaps an intervening network provider) into fax or e-mail format before it is delivered.

Electronic data interchange (EDI) is commonly defined as the application-to-application transfer of business documents between computers. Many businesses choose EDI as a fast, inexpensive, and safe method of sending purchase orders, invoices, shipping notices, and other frequently used business documents.

EDI is quite different from sending electronic mail messages or sharing files through a network, a modem, or a bulletin board. The straight transfer of computer files requires that the computer applications of both the sender and receiver (referred to as "trading partners") agree upon the format of the document. The standard

formats, that are used in the computer-to-computer exchange of routine business information, must be agreed to by the parties exchanging information or selected from a set developed by a recognized standards body [e.g., American National Standards Institute (ANSI) or the International Standards Organization (ISO)].The sender must use an application that creates a file format identical to receiver's computer application.

When EDI is used, it's not necessary for a company and its trading partner to have identical document processing systems. When the trading partner sends a document, the EDI translation software converts the proprietary format into an agreed upon standard. When the company receives the document, the EDI translation software automatically changes the standard format into the proprietary format ofthe company's document processing software.

EDI is the primary technology used to support EC. Purchase orders, quotations, invoices, and other paper forms have been successfully replaced with standard EDI transactions.

Like other technologies, EDI is not a target in and of itself. When properly used, it provides many of the immediate benefits already attributed to information technology: lower data entry costs, more accurate information, faster communications, and decreased paperwork, and that leads to more effective decision making.

Electronic commerce is the paperless exchange of business information using EDI, electronic mail (E-mail), electronic bulletin boards, electronic funds transfer (EFT), and other similar technologies. Those technologies are normally applied in high-payoff areas, recognizing that mailing and other paper-handling activities usually increase expenses without adding value. The EC initiative seeks to achieve both direct and indirect benefits by building electronic information bridges within the trading community.

Electronic data interchange was developed for a high-volume exchange of commercial documents in standardized electronic format between the automated business processes of trading partners. In contrast, E-mail is the exchange of less structured correspondence in electronic format between and among people.

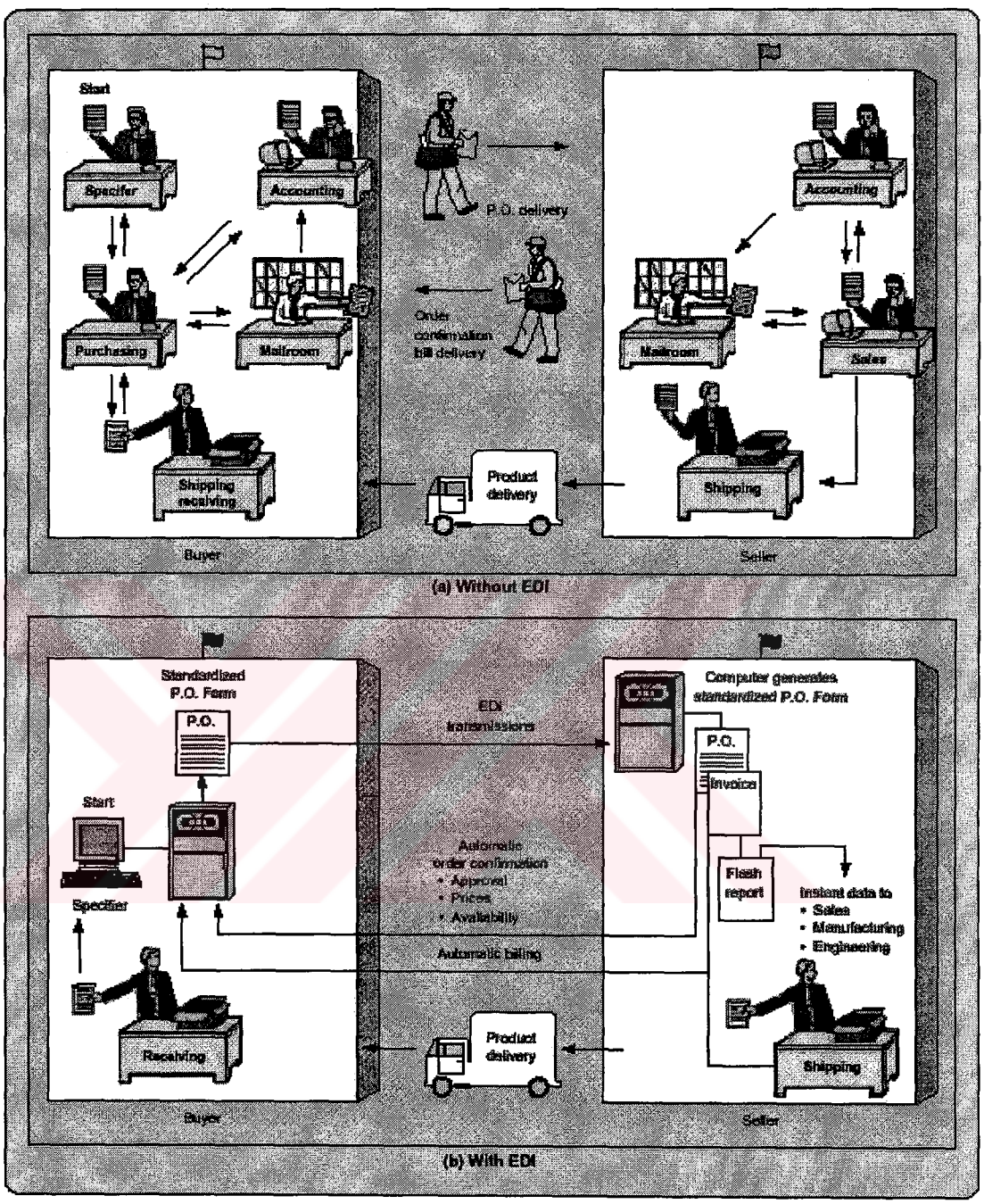

FIGURE 2.1 Order–delivery cycle with and without EDI.

2.2 History of EDI

It should be realized that EDI is not a revolutionary concept. As the powers of computing and telecommunications have grown, EDI technologies have evolved as a natural data carrier replacing the paper document. Nor is EDI a new concept or a new practice. It has existed for over two decades in Europe and North America in industry

sectors with products or services having a short shelf life but a high unit price. Electronic data interchange emerged in the late 1960's as a communications tool that enables companies within an industry to exchange electronically a wide range of business documents, including purchase orders, invoices, shipping orders and confirmations. In 1975, the concerted efforts of the Transportation Data Coordination Committee (TDCC) led to the publication of the first set of standards as EDI began to gather momentum. Palph Notto, past President of EDI, Inc., highlights six significant events leading to the current period uderlying the staying power of the early standards:

Development of the publication of the first set of EDI standards by TDCC (1974+0975)

Definition of the technology for processing EDI transmissions (1976+0977)

The A.D. Little study of the feasibility of EDI in the food and grocery industry and the resultant standards and pilot project (1977+0982)

Involvement of the American National Standards Institute (ANSI) and development of the ANSI X12 generic EDI standards (1978+0988).

Formation of the Joint EDI (JEDI) Committee and the broad agreement reached for the revision of the EDI data element dictionary (1983+0984).

Development of international EDI standards, EDI for administration commerce and trade, EDIFACT (1985+0988).

In addition, the founding issue of EDI Forum cites the work of several pioneers from the transportation, drug, food, and railroad industries as major contributors to the EDI movement.

More recently the profile of EDI has been greatly increased. A number of factors, including drastically reduced costs of computing hardware, software and telecommunications combined with the lifting of trade barriers across Europe mean that EDI is moving from an embryonic, innovative phase into a phase of exponential global growth, a classic market life cycle. Another major factor is the increasing realization of the role of EDI as a business enable in increasingly competitive and dynamic markets.

2.3 Market Motivation and Benefits of EDI

The major market motivation and benefits of EDI can generally be classified into strategic, operational and opportunity benefits and will vary in emphasis across different organisations, depending on why and how EDI has been implemented.

With EDI businesses can eliminate the need to re-enter data from paper documents and thus prevent clerical errors. Estimates suggest that 70% of all computer input has previously been output from another computer. Each re-entry of data is a potential source of error. It has also been estimated that the cost of processing an electronic requisition can be one tenth the cost of handling its paper equivalent. In addition EDI can reduce the need for personnel involved in orders and accounts processing. EDI systems can shorten the lead time between receipt and fulfilment of orders. When scheduling information is transmitted with ordering data, companies can plan production more accurately and thus reduce stock inventories. Reduction in inventory can result in major savings.

Use of EDI to transmit invoice data and payments can improve a company's cash flow and may increase the amount of working capital as accounts can be dealt with more efficiently.

Trading information obtained from historical data built up from EDI transactions is an invaluable source of market research and strategic planning information. The process of working with trading partners to implement EDI can also result in the benefit of closer working relationships with trading partners.

It has now become apparent that the greatest value of EDI will emerge in strategic areas such as the provision of better levels of customer service and improved marketing competitiveness.

The benefits of EDI fall into two categories: tactical, enabling your organization to cut operating costs and increase efficiency; and strategic, putting distance between your organization and the competition.

Specific tactical benefits which can arise from the successful implementation of EDI include:

- Reduced purchase prices, procurement and inventory costs
- Delivery of documents in seconds instead of days with far less likelihood of them getting lost or damaged, thus improving customer service and reducing postage and express delivery service costs
- Shortened order lead times while eliminating clerical tasks and possible keying errors
- The ability to electronically send invoice and receive financial transactions such as invoices and payments directly to and from your organization's accounting system
- A broad choice of system configurations, from PC-based to mainframe-based systems
- Customization of forms to meet your needs and the needs of your trading partners
- Communication across industry sectors with one common standard
- The ability to electronically communicate with thousands of companies without concern for hardware compatibility
- Complete auditing, billing and security functions.

Strategic benefits from:

- The ability to serve customers better, which for private sector firms can raise the value of their products or services and help increase market share. Government agencies can increase the effectiveness of customer service within current budgetary limitations
- The capability to track market trends as they develop, leading to focused, more responsive market strategies for private firms and the ability for governments to anticipate future constituent needs or take advantage of efficiency or cost reduction opportunities.

2.4 EDI Basics

2.4.1 EDI Standards

Although EDI has been around for over 25 years, its acceptance did not take off until the mid-1980' s. One major reason for its slow adoption has been the lack of content formatting standards. There have since been two different but parallel efforts towards a common standart, one based in Europe and the other in North America. Today, UN/EDIFACT and ANSI X12 are the most widely accepted standards. However, there are also several other less commonly used standards, developed by companies that are large enough to impose their standards on trading partners. These proprietary formats often exist in defined niches for specific industries.

In the case of X12 or EDIFACT, each EDI transaction begins with a code that specifies the nature of that particular transaction. For example, under the X12 standard, all purchase orders must begin with the code 850, while invoices have to start with an 810. For each type of document, a number of information-containing fields are also specified. The 810 invoices are described in the X12 standard, which defines the required fields, including address, transaction information, and total amount due.

The public standards were developed for flexibility; many data fields are either optional or conditional. Also, when two companies decide to use a particular standard, they must agree on the way certain fields will be used. Users can select off-the-shelf EDI software that will do most of what they need, and customize it to meet their specific requirements. The incompatibility between X12 and EDIFACT has complicated inter-corporate exchanges of data. Tgo rectify the situation, the Internet Engineering Task Force (IETF) is working towards u8niversal compatibility, while requiring a minimum of effort by current EDI users.

ANSI X12. The most common set of standards in the United States is the American National Standards Institute (ANSI) X12. It was formally adopted by ANSI in 1983 after being developed during the 1970s. Although X12 originally outlined how data can be exchanged, it did not define specific records or fields, which vary within different industries. Companies tailor X12 standards to their industry by defining a common set of records and fields (called "subsets"). As

trading partners and competitors adopted the tailored standards, de facto vertical industry standards emerged.

UN/EDIFACT. International applications have been limited to United States suppliers for two reasons. First, foreign companies have not readily adopted the technology. Most of these companies are European and a few are Asian. Secondly, there have been problems with establishing a non-US standard. An initial effort, called General Trade Document Interchange (GTDI), failed. Like X12, GTDI outlined how data could be exchangedand reqired users to define all document fields and records for each application. Unlike in the US, however, foreign manufacturers were not willing to step forward and tailor the GTDI standard to their industries.

The globalization of trade has created the impetus for the establishement of an international standard, bacause costly and excessive document and information exchange can impede international commerce. For example, when shipping its goods internationally, one US company exchanged 40 different documents a total of 26 times with 20 different parties. Furthermore, processing the paperwork for these shipments is expensive; by one estimate, paperwork alone cost corporations $150 billion, or 7% of the total revenue.

Spurred on by the incentive of cost reduction, a United Nations committee developed a set of standards, called EDI For Administration, Commerce and Transport (EDIFACT), in two and a half years. The EDIFACT standards were approved by the U.N. in the fall of 1988, and later by the International Standards Organization (ISO).

Migration from X12 to EDIFACT. In 1992, in response to goverment and industry pressure for a single global EDI standard, the Accredited Standards Committee (ASC) X12 Group announced that migration from X12 to EDIFACT would occur by 1997. Although then-current X12 standards could remain unchanged, any subsequent development would have to utilize the EDIFACT standard. However, in a compromise worked out in October, 1994, the ASC extended the deadline from 1997 to at least 1999. Moreover, users who prefer X12 or a proprietary system will be allowed to continue using whatever format that is appropriate for them even after the deadline. The delay was supported by representatives of the US transportation

and retail industries, but was opposed by companies working with the US Department of Defense. Those companies contended that a delay in EDI standards and thus harm US competitiveness. In the meantime, the Computer-Aided Acquisition and Logistics Support Industry Steering Group, a consortium of companies working on EDI with the DoD, will fund pilot projects to investigate how companies can migrate from X12 to EDIFACT.

2.4.1.1 The History of EDI Standards

The history of EDI standards can be divided chronologically into four phases, from the 1960s through the 1990s.

The 1960s marked the official beginnings of EDI. During this period, proprietary standards were implemented and organizations were created to develop both industry and cross-industry standards.

Early in the 1960s, the United Nations UN/ECE working party was formed. The purpose of this organization was to simplify and standardize trade documents. This organization eventually evolved into what is currently known as EDIFACT, the international EDI standards organization.

In 1968, the Transportation Data Coordinating Committee (TDCC) began exploring the potential use of establishing standards for the various transportation carriers.

Over the past twenty years, TDCC has evolved and now reprints many different industries in the EDI environment. It has changed its name to TDCC?EDIA. It should be noted that in its early stages TDCC was supported and funded by the Department of Transportation.

Although still in its infancy, EDI as we know it today was beginning to take shape in the 1970s. During this period industry-specific standards gained general acceptance and a greater awareness of the competitive power of interorganizational systems emerged.

In 1975. TDCC issued its first standard. Eight years after the initial vision, the first industry-wide standard was developed.

Organizationally, the TDCC devised the "straw man" concept to develop standards. With so many people involved in developing standards and the absence of one central decision maker, the standard-development process needed a way to avoid drowning in bureaucratic procedures. In addition to TDCC's contribution of the straw man process, the importance of TDCC on national and international EDI stands cannot be overlooked.

In 1978, Baxter Health Care, which was then known as American Hospital Supply, implemented a preprimary hospital ordering system.

In 1978, the grocery industry established an independent trade association, the UCC. In 1979, the X12 committee was chartered by the American National Standards Instituted and changed with developing general-purpose, cross-industry EDI standard.

During the 1980, the use of EDI increased dramatically. As its use spread to different industries, additional benefits and problems arose, which forced the reexamination of industry-specific standards and generated increased interest in cross-industry ones. Also, globalization became a corporate buzzword and the impact of international standards was felt.

In 1980, Arthur D. Little issued its grocery industry study recommending the use of EDI to reduce sots and improve efficiency.

In 1981, the Automotive Industry Action Group (AIAG) was established to evaluate just-in-time inventories, bar coding, and EDI as ways to improve industry competitiveness.

In 1982-83, JEDI was established by the X12 committee to standardize data elements and segment directories between TDCC and X12 transactions.

In 1985, EDIFACT was established and began work defining international EDI standards.

In 1985, the Office of Budget and Management issued a study on Federal Information Resources and declared that substantial cost savings could be achieved thorough the use of EDI.

In 1986, JEDI, EDIFACT, and X12 Committee helped draft and international standard syntax and EDI invoice transaction based to X12design.

Also in 1986, the Voluntary Interindustry Communcations Standards (VICS) Committee was formed.

The Date interchange standards association, Inc.(DISA) was formed in 1987 to be the administrative arm X12.

Internationally, in 1987 the EDIFACT invoice draft standard was approved.

In the early 1990s, EDI and EDIFACT is becoming one of he strategy technologies facilitating the unification of Europe.

2.4.2 EDI Communication

One of the key components of EDI is the communications medium used to enable the electronic transmission of business documents, between a large number of different organizations, throughout the country or indeed the world. In the early days of EDI, organizations evaluated the most appropriate means to support electronic communications between companies. Here are listed three most popular electronically channels for EDI:

2.4.2.1 Value Added Networks

Communication from buyer's computer system to seller's can be effected in different ways, including direct dial-up through the telephone. Much of the electronic traffic between companies does not have to arrive as soon as it is sent and, in any case, a smaller company's computer may not be ready to receive information at the time that the sending company wishes to pass the information on.

Large communications networks have been set up to provide post box (or electronic mailbox) services between EDI users. These networks are known as value added networks (VANs) or clearing centers and are often built and run by the public telephone companies or large computer suppliers.

A company which wishes to send EDI messages dials up the VAN and deposits packages of messages into its post box, each package of which includes the electronic address of the recipient. The VAN takes the data from the post box and sorts it into the recipients' mail boxes ready for those users to collect when they each dial in next. Thus at the VAN, each EDI user has its own post box into which it puts outgoing messages and its own mail box from which it retrieves incoming messages.

These VANs provide other basic services such as message tracking and the ability to link types of computers that could not otherwise link directly. By tracking messages through the network, VANs record whether and when messages arrive, are transferred and are picked up. So if there is a fault at any point along the end to end link or there is a dispute between the users, evidence can be produced to show what really did happen. This is similar to the registered letter service provided by the postal services.

VANs have developed the capability to exchange data with a wide variety of different computers using the appropriate communication protocols. As long as any two users can individually link to the chosen VAN, they will be able to send messages to each other through the VAN even though they may not be able to link directly to each other.

2.4.2.2 Direct Connection

Some large companies operate their computers most hours of most days and so have decided that they will not use the value added networks. Instead they have chosen to link directly to their customers and suppliers. These direct links can use normal telephone lines with modems at each end or special links which have been designed to carry digital data.

Communicating data directly between one user and another through the public telephone network. Direct links cost less than the use of another service in the middle

but they do have the disadvantage that an organizations may have to make many network connections when placing orders with all of its suppliers. If it used a value added data service it may have needed just one connection to send all of the data to all of its suppliers. The service in the middle then behaves like an electronic postal service where letters for lots of addresses can be put into a post box and the mail service will sort them and send them to the right destination.

A packet switching service is more like a postal service by telephone where a single delivery from the postman can contain letters from a variety of different people. An intermediate form of link is called packet switching. There is a single link between each company and a packet exchange network provided by the telephone companies. Any one terminal then sends information for many different destinations down that one line all interleaved together. The exchange network sorts out the route for each packet and sends it to the correct location. There is no mailbox in this particular option which means that the receiving terminal has to be listening and operating at the same time as the sender is transmitting information to it.

2.4.2.3 Immediate Response Communications

In some situations data has to be processed soon after it has been received and a reply quickly returned to the sender. When a manufacturer is asking suppliers to provide components just-in-time, a requesting message may require a reply within a minute or two. Just-in-time enables a manufacturer to eliminate stock holding by calling off material from a supplier at very short notice. It is usual then for the manufacturer to use a direct link to the supplier or to use a network which has been designed especially to give a fast response time.

In other situations, a person working at a terminal may need direct access to an application in another company and will want immediate response to questions asked or requests made. When booking a holiday or ordering a motor spare, the customer will often be adjacent to the salesperson and expecting an immediate answer about the availability of an airline flight or an exhaust pipe. In these two cases, the

communications link must be designed to give the speed of response that the customer is expecting.

The form of the EDI message may be the same whether an immediate answer is required or whether tomorrow will do. The design of the communications link and the computer application at each end will depend on the speed of service that is required for each type of user.

2.4.3 EDI Software

It is the software that will present the greatest number of variables and must be carefully selected to accommodate the way EDI systems are used. In terms of basic functionality, for messages to be transmitted, an EDI software package must be able to perform two fundamental tasks, it must incorporate a facility to allow data to be entered and encoded into an EDI standard format. Conversely, for incoming messages the software must allow data to be decoded and entered into an in-house format. These two features define EDI software.

The choice of software is of crucial importance to the effectiveness of an EDI system. The process of software selection cannot, however, be made in isolation from the rest of the EDI system and should be viewed in parallel with intrinsically related business and technical issues.

Since it is never the case that any two EDI system's configuration will be identical, there are no hard and fast rules for software selection. However, by considering a number of criteria, a shortest of prospective suppliers can be drawn up. In some ways the process of EDI software selection is similar to choosing from a range of software for any other application.

Common Software Selection Factors:

Ease of use of software: Some software packages are more user-friendly than others, e.g. Windows-based or menu-driven, and this will have a cost effect on the number of days lost to training staff on the new system.

Hardware compatibility: Some software houses specialize in providing software for certain hardware platforms or operating systems. This can even be applicable for

PC-based products with some packages requiring a minimum of a pentium chip. Consideration of this factor will rule out specialist hardware-specific software packages.

- Ease of upgrade: As an EDI trading relationship matures there is likely to be an equipment for enhancement of the existing system. This may arise as a result of additional messages, changes to existing messages or standards, addition of new trading partners and their individual messaging requirements, inclusion of additional network connections or an increase in the number of business applications to be integrated.
- Network connectivity: Some EDI software packages are restrictive since they do not allow users to be connected to all of the major EDI networks. This is the exception to the rule since most of the most popular packages have multi-network connectivity.
- Multi-standards capability: In cases where a supplier is faced with a situation in which two or more trading partners require EDI messages to be transmitted using different standards the software must be able to accommodate this need. Print/report generator: Many SMEs will not be integrating their EDI application with their in-house systems and will require a hard copy print of any incoming EDI messages. This facility must be available on the software under consideration.

2.5 Information Exchange Process

There are generally two methods of data transport: formal and informal.

2.5.1 Formal EDI Exchange

The formal method is the older, more traditional way to exchange data using a closed or proprietary data exchange environment instead of an open standards based environment such as the Internet. This formal environment typically includes EDI translation software and value added networks (VANs).

The EDI translation software provides the means to communicate with the outside world, perform syntax or standards compliance checks, and manage all the data exchanges with various trading partners. The VANs are private third party data networks that supply electronic mailboxes and connections for the translation software and move the data from one location to another in a controlled environment.

The benefits to the formal method are:

- EDI format syntax checks: To ensure the data is in the right format and is using the correct qualifiers, the translation software performs a syntax check on the data and adds the outer addressing envelopes around the data. It may also perform mapping functions to translate data coming out of or going into an application to meet the EDI standard format requirements.
- Receipt notices: A receipt notice resembles a return receipt in the mail with a few extra features. It verifies that a customer received a message intact and that a deliverable requirement has been met. The 997 Functional Acknowledgment transaction set provides this.
- Audit trails: The formal EDI environment provides the means to trace a message throughout its journey from one point to another. In addition to providing a means of re-creating a transmission in the event of a problem, this audit trail verifies message integrity; for example, it confirms that the data were not altered or intercepted during transmission.
- Access controls: Passwords and other features in the EDI translation software and VAN connections help ensure that only authorized people have access to the information. This is important when transmitting highly proprietary information typical of program management data.
- Backups: All EDI messages are archived in the event it is necessary to re-create a transmission. Backups can be a key factor if a contract dispute arises between a contractor and the government.

On the down side, the formal method tends to be:

- More costly: The private VANs generally charge by the character and can be expensive. And unless EDI is used enterprise-wide, it can be costly to implement for one functional area.
- Harder to implement: The formal structure demands more of the internal application systems, procedures, and processes. It assumes all trading partners have assimilated formal EDI practices into their normal business environment for a broad range of functional areas and application systems. It can appear to be too complex, difficult to implement, and hard to use. A seamless integration into an application environment will demand more time and effort.

The following figure and steps illustrate this formal data exchange process:

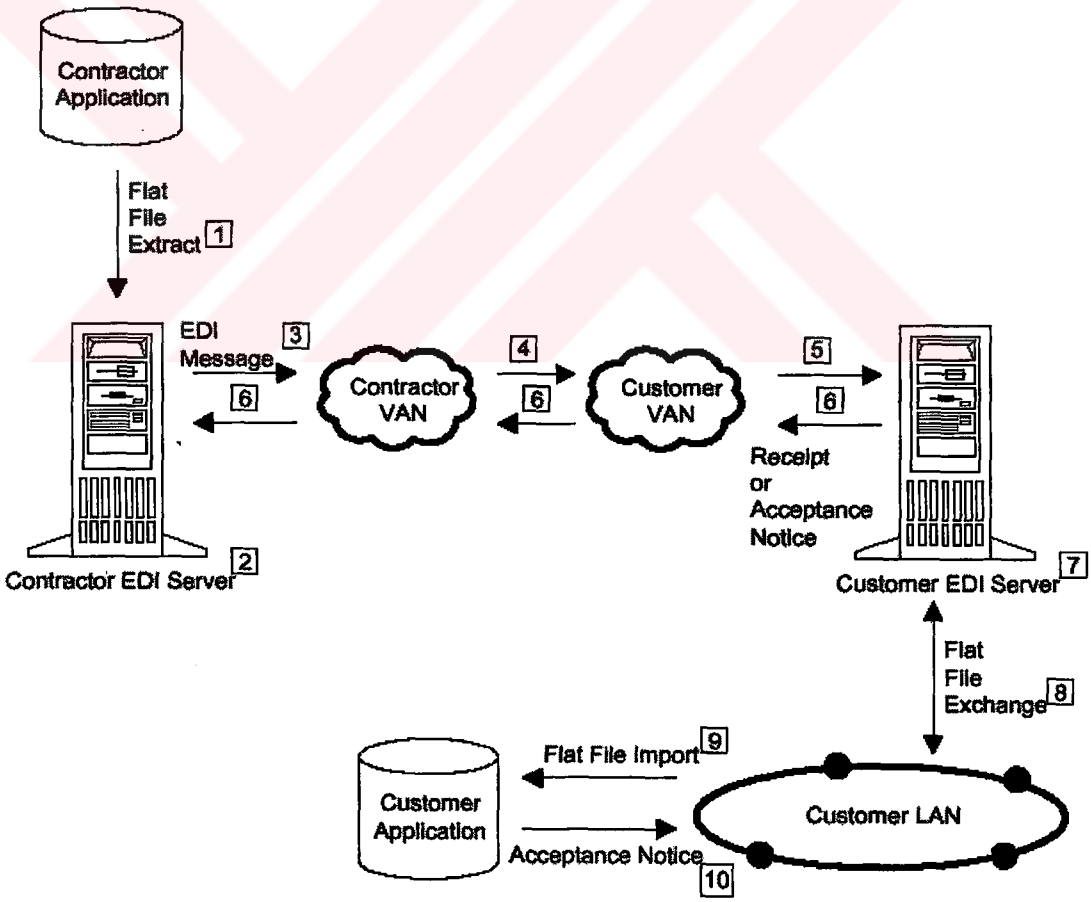

Figure 2.2 The formal data exchange process

1. The contractor extracts program management data from an internal application system. This export or extract routine typically produces a flat text file that can be in

an EDI ready format or can interface with EDI translation software. An EDI ready format is a flat file that follows the EDI syntax and format rules but does not include the outer addressing envelopes that the EDI translation software provides.

2. The contractor runs the application export file through the EDI translation software which performs a syntax check and adds the outer envelope data.

3. Using the EDI software, the contractor sends the EDI message to a VAN mailbox for delivery to the address noted in the outer envelopes of the EDI message.

4. The sending party's VAN delivers the message to the receiving party's VAN. VANs can exchange messages with each other; the sender and receiver do not have to use the same VAN or translation software.

5. The receiving EDI server pulls the message down from the VAN mailbox.

6. The receiving EDI server sends a functional acknowledgment (receipt notice) back to the contractor to acknowledge receipt of the message. The contractor's EDI software uses this information for management and audit reporting. The receiving EDI server also makes a backup copy of the message.

7. The receiving EDI server "unwraps" the EDI message and creates an application flat file.

8. This application flat file is delivered to the end user. It can move across phone lines, wide area networks, or local area networks (LANs).

9. The end user reads the flat file into the receiving software application.

10. The end user may elect to create and send an e-mail message or an acceptance notice EDI text message to notify the contractor that the program office has accepted the data report or to notify the contractor of any problems with the data content.

2.5.2 Informal EDI Exchange

The informal method incorporates open system or Internet based standards and Internet browsers as the means to exchange data. EDI translation software may or may not be used depending on the operating environment; the translation software can provide important functions such as EDI syntax checks and EDI message

management services. Value added networks are typically not used, although many now operate over the Internet. Direct connections may be used, however, these can be subject to proprietary connection limitations. The purpose for using Internet browser software is that it provides a common user interface regardless of the operating environment.

The benefits to the informal method are:

- Uses established connections: The informal method uses existing Internet based open system connections using e-mail or file transfer protocol (FTP) to exchange the data.
- Easy to implement: Because it uses established connections and Internet browser software, the process of making the data transmission connection is very simple. Computer system firewalls and passwords can be used to control access to the data. Encryption and digital signature software included with the high end browsers such as Explorer and Navigator can be easily implemented to authenticate the data.
- Cost is low or negligible: Because it uses the Internet as the transport mechanism, the cost of transmission is low. The cost of additional software and other services such as the VAN are also eliminated.

On the down side, the informal method requires:

- More discipline: The formal EDI transmission process includes a number of automatic safety features, checks, and audits to ensure the data arrives and arrives intact without any tampering. It includes automatic receipt notices and backup mechanisms. It may be necessary to establish similar audit and control features in the informal environment to ensure a message was received intact. Some type of backup system may also be required.
- Security: Computer system firewalls and related access controls such as passwords and smart cards are required to protect systems, applications, and data from unauthorized access; access controls ensure only the right people can get to the data. Encryption and digital signatures where appropriate are highly recommended for EDI exchanges that include

business sensitive information to authenticate the data. Security methods and processes must be established and strictly enforced to ensure data integrity and confidentiality.

- Means to acknowledge receipt: In the formal EDI environment, the 997 Functional Acknowledgment transaction set is used to acknowledge receipt of a message. This is an important feature particularly when CDRLs are involved. It may be necessary to establish some type of acknowledgment function to notify the sender that their data was received.

The following figure and steps illustrate this informal data exchange process:

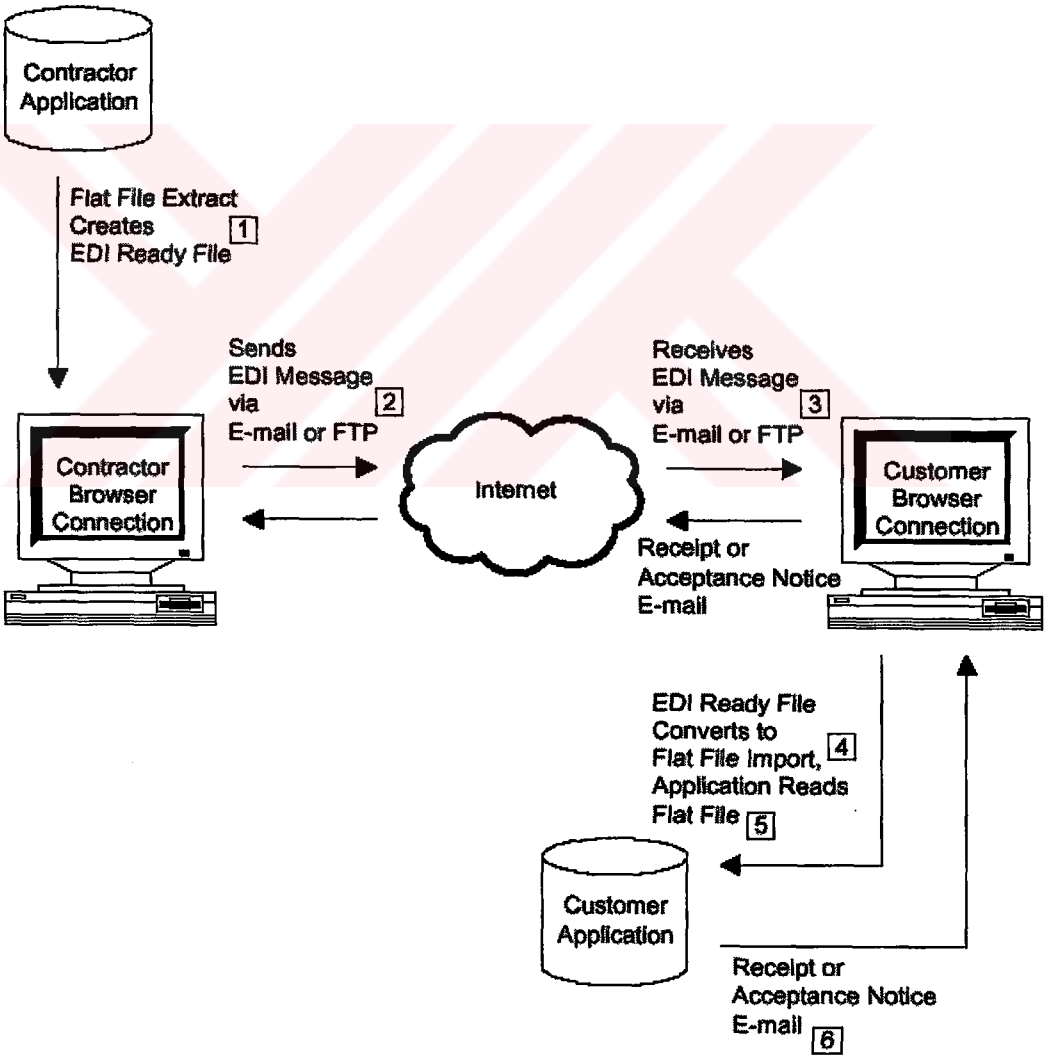

Figure 2.3 The informal data exchange process

1. The contractor extracts program management data from an internal application system. This export or extract routine typically produces a flat text file in an EDI ready format that can interface with EDI translation software if desired or sent as is. Again, an EDI ready format is a flat file that follows the EDI syntax and format rules but does not include the outer addressing envelopes that the EDI translation software provides.

2. Using an Internet browser, the contractor sends the EDI message to their customer via e-mail or delivers the EDI message to an FTP site. Standard encryption and digital signatures can be added to the message before it is sent.

3. The receiving party opens the e-mail message or accesses the FTP site to retrieve the EDI message. Standard encryption software can be used to decrypt the data and to verify any digital signatures; system firewalls and passwords can control access to the data.

4. The EDI message is converted into a flat file that the receiving application can read.

5. The end user reads the flat file into the receiving software application.

6. The end user may elect to send an e-mail message as an acceptance notice to notify the contractor that the program office has accepted the data report or to notify the contractor of any problems with the data content.

2.6 EDI Implementation

In the early days of EDI research, most of the research in this field focused on the benefits of EDI (Meier, 1992) and the ways in which EDI implementation would deliver many benefits from cost reduction to providing better customer service.

These studies then expanded to include the integration of EDI (Swatman 1993, Cox & Ghoneim 1996), often involving detailed analysis of a case study and the extent of EDI usage in organisations (Massetti & Zmud, 1996). A parallel theme in EDI implementation research concerned the factors contributing to success and failure of the implementation.

Studies investigating the factors influencing the adoption and implementation of EDI include the relationship between the influencing factors and the level of success of the implementation (see, for example, Benbasat, Bergeron & Dexter, 1993; Doukidis & Fragopoulou 1994; Premkumar, Ramamurthy & Nilakanta 1994; Williams 1994; Iacovou, Benbasat & Dexter 1995; Mackay 1995; and Drury & Farhoomand 1996). These authors have identified several factors which affect the adoption and implementation of the technology ¾ which we now discuss in some detail.

Implementation is a comparatively recent topic for researchers interested in the overall EDI phenomenon. At least until very recently, the majority of authors investigating this aspect of EDI have tended to focus upon influences and implications of EDI implementation. Only a very few studies have taken into account the various stages of the implementation process ¾ for example the work of Doukidis and Fragopoulou 1994, which was carried out in Greece. These authors investigated the introduction of EDI when it was forced upon a smaller company by an influential trading partner. The study examines the relationships between four groups of factors which generally influence the adoption and implementation of EDI:

- technology related factors
- infrastructure related factors
- organisation related factors; and
- organisational environment related factors

toward the stages in the implementation process:

- adoption
- implementation; and
- evolution.

The results of this study make it quite clear that 'the rule' (the factors generally influencing adoption) does not apply to these 'forced' companies, in which the implementation is initiated by the other party. The case study suggests that EDI implementation is, thus, not a straight-forward process ¾ but rather one in which the

various stages and processes can be influenced and affected by factors such as level of proactivity/reactivity.

2.6.1 Factors Influencing The EDI Implementation Process

Many studies into EDI implementation have emphasised the technical characteristics of the application. These studies usually based on the theory of innovation diffusion or information systems (IS) theory in general. By contrast, some authors (see, for example, Lucas 1986, or Emmelheinz 1992) believe that EDI implementation should be viewed in more managerial, rather than technical, terms. In this paper we suggest considering the factors influencing EDI implementation from both perspectives - technical and managerial.

Here, three groups of factors influencing the process of EDI implementation are identified:

2.6.1.1 Technological Factors

Previous studies (Premkumar, Ramamurthy & Nilakanta 1994) indicated that the characteristics of the innovation (technology) influence the implementation and adoption of EDI.

In meta analysis of a general innovation study (not specifically EDI), Tornazky and Klein (1982) found that three innovation characteristics - compatibility, relative advantage and complexity - are consistently found to be related to the adoption of an innovation. In terms of EDI as an inter-organisational system, Premkumar et al (1994) argue that communicability, cost and elapsed time should be added to these original three characteristics when considering this specific technology.

Premkumar et al (1994), who examine the relationship between characteristics of EDI (complexity, compatibility, relative advantage, cost, communicability and elapsed time) and the various aspects of the diffusion of EDI using a survey of 201 companies, found that three characteristics (compatibility, relative advantage and elapsed time) are major predictors for adaptation, diffusion and implementation success of EDI.

The results of this type of study (technical characteristics) are not always consistent - for example, the study by Premkumar et al (1994) found that complexity did not relate to any aspects of diffusion (including adaptation), although other authors have found complexity to be one of the factors inhibiting EDI adoption (Cragg and King 1993).

On the basis of earlier studies of EDI implementation, the following technology-related factors can be related to the implementation process and level of success.

Compatibility: Compatibility is the degree to which a technology is perceived as compatible with the existing values or needs of the organisation (Rogers 1983). In their study of innovation, Klein and Sorra (1996) found that innovation-value fit are important factors in the effectiveness of systems implementation. Furthermore they identify three possible strategies to foster the innovation-value fit:

- Persuade employees to participate in the decision to adopt the innovation
- Educate employee about the need for innovation for organisational performance
- Let the innovation-value fit increase over time.

In terms of EDI, compatibility usually refers to hardware, software, data format, or structure. Incompatibility in any of these factors could inhibit the process of implementation (Howells and Wood 1995). Premkumar et al (1994) also found that technical compatibility affects the diffusion of the technology internally and externally, as well as the success of the implementation.

Complexity: Complexity refers to whether the innovation or technology is difficult to understand and use, sometimes described in the innovation or systems literature as 'ease of use' (Borton and Brancheau 1994). In general, studies of innovation diffusion suggest that the simpler the innovation is to understand, the more quickly it is adopted (Rogers 1983).

In EDI, complexity involves the understanding of the technology and system, which can be simple or complex depending on the use of the application. For example, a simple application (i.e. generating a purchase order) and relationship (one to one transaction), may be 'relatively' easy to understand, but when the application

is fully integrated into the organisation's business transactions and processes and involves multiple trading partners (which may have different hardware, software and standards), it will become a very complex operation and this could affect the implementation process. In fact, some studies (Cragg and King 1993) found this factor among inhibiting factors for the adoption of the technology or, in other words, complexity is found to be negatively related to implementation adoption and implementation.

Relative advantage: Relative advantage is the degree to which an innovation is perceived as providing better benefits than other technology/innovation. These benefits may be measured in economic terms, or in terms of convenience or satisfaction. In the case of EDI, this variable is usually measured by direct benefits such as reduced transaction costs, reduced inventory levels and indirect benefits such as increased efficiency, better customer service, improved trading partner relationship, and greater market competitiveness.

Some authors (Rogers 1983; Premkumar et al 1994; Borton and Brancheau 1994) have suggested that relativeadvantage has a positive relationship with adoption and implementation - which means the greater the benefit of the technology, the more quickly it is adopted/diffused. Based on the literature, so far only one study (Doukidis et al 1994) has found this factor not important – it is notable, therefore that this study observed the type of EDI implementation which is forced upon the organisation.

Communicability: Communicability of an innovation is described as the degree to which aspects of an innovation may be passed on to others (Rothman 1974). In terms of EDI, Premkumar et al. (1994) believed that information on EDI (or EDI knowledge) should be passed to various functional areas within an organisation as well as among its trading partners. Although the results of this study suggest that communicability is not related to adoption and implementation, this factor should be considered during EDI implementation studies in addition to other factors (such as environmental factors) because training is fundamentally inter-twined with communicability. In general innovation study, this factor is assumed to be positively

related to the adoption and implementation of an innovation (Tornatzky and Klein 1982).

Cost: Cost of technology or innovation refers to the initial cost and also to operational cost and usually is assumed to be negatively related to the adoption and implementation of the innovation. Users usually evaluate the cost against the benefits before adopting the technology. In terms of EDI, the cost will include the set up cost of hardware and software (EDI translation and communication); telecommunications/transmission costs and also training costs. The cost of an innovation, while in many cases influencing the initial adoption (see for example Saunders and Clark 1992, Premkumar et al 1994, Howells and Wood 1995, Drury and Farhoomand 1996), does not seem to affect the implementation process (Premkumar et al 1994). This is also supported the literature reviewed by Tornatzky and Klein (1984) who found that from ten studies of cost, only five (3 positively related and 2 negatively related) reported a correlation between cost and adoption-implementation.

Elapsed time: Elapsed time relates to the time needed to adopt and utilise the new technology. As implementation is a process which can extend over quite a long period of time, the consideration of elapsed time as one of the factors influencing implementation is quite reasonable. Users need to learn how to use the new technology to perform their tasks. In the case of EDI, which needs to be fully integrated to gain optimal benefits, the elapsed time may take several weeks, months or even years. Although only one study (Premkumar et al 1994) suggests considering this factor when studying the EDI implementation process, it is reasonable to include this factor among other factors influencing the implementation process, since the implementation process is related to a period of time. The survey from Premkumar et al's study suggests that elapsed time is positively related to the implementation process, so that the longer the elapsed time, the better the diffusion of the technology.

2.6.1.2 Organisational Factors

As mentioned before, implementation of IS (including EDI) involves more than just technological problems. In fact, empirical studies show that organisational

factors influence the implementation process rather more than technological factors (see, for example Land, Le Quesne and Wijegunaratne 1992; Emmelheinz 1992). The following organisational factors should be considered when studying the implementation process.

Management involvement: In many empirical studies, management support and involvement are considered very significant influences in adopting and implementing EDI. Drury and Farhoomand (1996), for example, found that management attitude is the most important issue among the barriers to EDI adoption, followed by the cost of the system. A study of BHP Steel undertaken by Swatman in 1993 found that a top-down approach, where senior management took the initiative in implementing EDI, was a successful approach. Top management support for EDI implementation is also suggested by a number of other authors (see, for example, Emmelheinz 1992, Hendry 1994). A European study (Roberts 1995) also found top management support to be a critical success factor for EDI implementation.

User resistance: User resistance to change may result from personal insecurity or the threat of being by-passed by the implementation of technology (such as EDI or automatic trading transactions). Cragg and King 1993 identify a reluctance to use sophisticated hardware and software or applications among inhibitor factors for IS adoption. In order to deal with this problem, organisational development concepts such as overcoming user resistance using socio-technical approaches and addressing behavioural problems have been suggested to improve the likelihood of successful implementation (Desanctis and Courtney 1983). In modelling the implementation process of EDI, we suggest taking this factor into account in the conceptual model, as this is likely to affect the successful uptake of the implementation process.

Human resources (expertise): A lack of expert human resources (see, for example Cragg and King 1993) has been identified as one of the factors influencing IS implementation. Lack of the necessary expertise occurs frequently in small and medium enterprises and is a major factor in resistance to EDI implementation (Parker 1997).

2.6.1.3 Environmental/Climate Factors

A positive organisational climate is necessary to ensure a successful implementation. Factors such as ensuring employee skills in innovation use, providing incentives for the user and removing obstacles to innovation use are needed to improve the chances for EDI implementation success.

Trading partner participation: EDI is an inter-organisational information systems application and implementors depend heavily on other parties (such as trading partners, technical experts, etc.) to achieve successful implementation. Iacovou, Benbasat and Dexter (1995) for example, studied EDI in small organisations and found that partner imposition is one of the most critical adoption factors in small organisations.

Training: Drury and Farhoomand (1996) and Parker (1997) found that lack of training is a barrier to EDI adoption in adopting organisations. Providing employee skills in the use of the technology and providing on-going support during implementation are obvious ways of handling this problem. Training also provides communication for better understanding of the technology (see technological factors: communicability). Parker (1997) also suggests training for all players in the EDI implementation, not just the operational users, to achieve a successful implementation.

2.7 Application of EDI in Business in General

Businesses, government agencies, and other organizations use EDI for a vast range of transactions. The classic application of EDI is in purchasing. A manufacturer or a retail store might use EDI with its suppliers to replace paper purchase orders, material releases, shipping notices, and invoices. Here are a several major areas with application of EDI:

2.7.1 Sales

EDI is used in the sales process. By using EDI transactions sets, information can be exchanged regarding catalog, project catalog, product lists and specifications, and solicitations and bids. In Table 2.1 summary of transactions sets in sales is shown.

Table 2.1 Transaction Sets in Sales

Number	Name	Description
832	Price sales catalog	Communicates information about the price of goods or services
840	Request for quotation	Solicits potential supplies of goods or services. Provides price, delivery terms, and other information's
843	Response to request for quotation	Communicated to potential buyers price, delivery terms, and other information in response to request for quotation
864	Text	General-purpose transaction. Can be used to communicated promotional messages

2.7.2 Order Processing and Purchasing

An areas of extensive EDI use is order processing. Using EDI, a customer can electronically place an order and inquire about its status. The benefit to the supplier is that her can receive the order quicker and automatically enter it into his system, eliminating keypunch expense. The primary benefit to the customer is that EDI reduces the time between order placement and early date. In Table 2.2 the order processing transaction sets are shown.

Table 2.2 Order Processing Transaction Sets

Number	Name	Description
850	Purchase	Communicated a standard purchase order document to a supplier
855	Purchase order acknowledgment	Acknowledges that a supplier has receive a purchase order or group of purchase orders
860	Purchase order change	Communicates a change in the original purchase order to a supplier
865	Purchase order change acknowledgment	Acknowledges that a supplier has received a change to the original purchase orders
869	Order status inquiry	Requests information regarding the status of an order from a supplier
870	Order status report	Communicates to the purchaser the status of an order in response to the order status

2.7.3 Inventory Management

EDI transactions sets are used to improve inventory management efficiency and effectiveness. This includes handling requests for inventory information, communicating future material needs, authorizing the release of inventory items, and recording delivery and transfer of stock. In Table 2.3 the transaction sets used in inventory management are summarized.

Table 2.3 Inventory Management Transaction Sets

Number	Name	Description
830	Planning schedule with release	Communicated from a customer to a suppler a forecast of materials and labor to be used. It can also

		and labor to be used. It can also authorize the release of material to begin the manufactory process.
844	Product transfer and Account adjustment	Communicates credit/debit information regarding authorized transfer of goods
846	Inventory inquiry/advice	Communicates inventory information to a prospective purchaser, to representative agent, or from one location to another
849	Response to project trader account adjustment	Communicated a response to a company that is requesting an account adjustment

2.7.4 Distribution

Shipping uses EDI transactions to coordinate the distribution of projects. These transactions help coordinate the activities of customers, shippers and common carriers. In Table 2.4 shipping transaction sets are shown.

Table 2.4 Distribution Transaction Sets

Number	Name	Description
856	Ship notice/manifest	Communicates the contents of a shipment, the carrier, and the configuration of the shipment
858	Shipment information	Communicates detailed shipping information such as bill-of-lading data
862	Shipping schedule	Used by customer to communicates specific shipping schedule to a supplier

2.7.5 Financial Management

Financial service use EDI in many ways. Corporations can invoice customers electronically, receive payment remittance automatically, and have up-to-date information regarding its lickbox activity and band balances. There are four primary financial management transaction sets. In Table 2.5 financial management transaction sets are shown.

Table 2.5 Financial Management Transaction Sets

Number	Name	Description
810	Invoice	Used for the billing of goods and services
820	Payment order/remittance advice	To prove information to a seller about the application of a specific payment by a buyer
822	Customer account analysis	Primarily used by banks to transmit account information to its corporate customers
823	Lockbox	Used to transmit lockbox data regarding incoming payments from a bank to its corporate customers

2.7.6 Vendor Managed Inventory (VMI)

A new application emerging from EDI is vendor managed inventory ("VMI"). Before VMI, a buyer such as a retailer would analyze its sales, and based on its analysis place orders for new inventory. Under VMI, the responsibility for analyzing sales and for deciding when the buyer will receive new product shifts to the seller. The buyer sends raw sales data in electronic form to seller. Seller then makes judgments as to which products are more likely to sell in the future and decides which products to send. This shift in responsibility changes the allocation of risks and responsibilities between buyer and seller.

2.8 Issues of Managing EDI

Businesses use EDI to issue instructions to and make commitments with outside parties. EDI is often used to form legally binding contracts. Electronic contracts raise some issues:

1. Are they enforceable in court?

2. What terms and conditions are included within them?

3. Can they be proven in court?

4. How must they be recorded for tax purposes?

5. To what extent is a VAN liable if it loses an acceptance message and thereby prevents a contract from being formed?

2.8.1 Trading Partner Agreements

A common method for addressing some of the legal issues in EDI is for each pair of trading partners to enter a "trading partner agreement" (TPA). The American Bar Association has published a model EDI trading partner agreement. This form is designed specifically for use with EDI purchase orders, although it can be modified to use with other documents, such as bills of lading and letters of credit. The hope is that the model agreement can help to standardize the trading partner agreements used in industry. This would save users time and trouble.

Despite the value of TPAs, they have a drawback. They can be time consuming to negotiate and sign. They require business people to enlist the attention of lawyers. They can sometimes raise thorny, intractable issues. Accordingly, some EDI users can reasonably decide to forego TPAs. The costs can appear to outweigh the benefits.

There are alternative measures that fall short of full TPAs. A company could, for example, send a declaratory letter to its trading partner asserting the company's position and policy on the issues that would otherwise be in the TPA. Ideally the trading partner would sign this and return it (which would transform it into a TPA). But there is a good chance the partner will not sign it. Still, the letter establishes the

sender's position. In a dispute it may also give the sender an argument that its trading partner knew what the sender's terms were, did not object and therefore implicitly agreed to those terms.

2.8.2 Vendor Agreements

Unlike trading partner agreements, no models have been published for VAN agreements or EDI software agreements. Virtually all vendors for services and software, however, have their own standard form agreements that they ask customers to sign. These agreements are written by the vendor's counsel for the purposes of maximizing the vendor's rights and minimizing the vendor's exposure to liability. Customers are well advised to have counsel review these agreements before signing them. Vendors will often negotiate the terms of these agreements -- up to a point.

A guiding principle for any customer negotiating a vendor agreement is that all important terms should be clearly written into the agreement. If a customer expects the vendor to satisfy a particular technical requirement or provide a service promised in a sales pitch, the customer wants the contract to reflect that requirement or service. The typical vendor contract contains an integration clause stating that the contract embodies the entire and exclusive agreement between the parties. If the agreement does not contain a term the customer had bargained for, it is doubtful the customer can enforce that term.

Another general principle to observe with vendor agreements is that technical terms need to be defined carefully. Information technology terms mean different things to different people. The more thorough the definition of terms, the less room there is for misunderstanding.

2.8.3 VAN Agreements

A customer desires that its data remain confidential. It may also wish to restrict the freedom of a VAN to monitor the volume and direction of customer data traffic and to build statistical analyses of it. Such information could be competitively very

sensitive. A customer can insist that appropriate clauses to protect the customer be stitched into the VAN agreement.

Sometimes EDI system auditors need assurance that VAN systems function properly and are adequately controlled. Auditors may obtain that assurance by auditing the systems directly or by receiving reports from other auditors who have audited the systems. (Such reports are called "third party reviews.") To prepare for any potential auditor requests, a customer could add to the VAN agreement clauses requiring the VAN to maintain appropriate control and documentation thereof, and to periodically provide the customer's auditors either an appropriate third party review or access to the systems, documentation, and network staff necessary to conduct an audit.

2.8.4 The Role of Lawyers and Auditors

EDI presents legal and audit professionals some novel challenges. The application of laws, rules, and principles to EDI transactions may be unclear. Lawyers and auditors may be unable to use traditional devices (such as ink autographs) to accomplish evidence, control, and other goals. EDI thus demands innovative thinking and the exercise of judgment. It also demands re-education.

Eventually, all legal issues in EDI can be addressed. Paper and ink are just one among many means for recording and controlling information. Electronic methods can replace them.

Lawyers and auditors should not shrink from these challenges. Their clients rightfully expect insightful analysis and creative solutions, not roadblocks. Ultimately, many of these challenges boil down to an assessment of risk and reward. Seldom do the risks involve criminal or moral matters. Instead, they usually involve merely economic risks something businesses deal with day in and day out.

2.9 Security

Are EDI communications be secure? There is sometimes a fear that electronic communication is not quite as certain as using paper. If a paper document is not used

any more, is it possible to be certain that the electronic record will not get lost? If the EDI message contains personal information such as a medical record, how is it known that it will not get into the wrong hands or be changed in some way during transmission?

All the value added networks offer a sensible level of security and authentication. Security is provided in the design and quality of the service they operate. Authentication is provided by the use of identifiers and passwords when a user makes a connection. This level of control is sufficient for most applications. A similar type of authentication can be used for direct connections.

A higher level of authentication can be provided by the use of a smart card. In these circumstances, the smart card has to be read in during the sign on cycle when the terminal connects directly to the destination or to the VAN.

If very secure EDI communications are required, encryption can be used so that the receiver can be sure who the sender is, the sender can be certain who the receiver is and both know that the transmission has not been interfered with on the way. Suitable techniques are already used in defense communication and these can be used for EDI links where this is considered to be necessary.

2.10 Some Potential Disadvantages of Using EDI

Although EDI might seem like a panacea to frustrated executives trying to hold down costs, it is not without its challenges.

First, electronic data interchange isn't cheap to set up. The company should double the cost of the software to allow for implementation. Typically, there need to be several work days to a number of work months to get trading partners up and running.

Barriers other than cost also can also be daunting. These include lack of knowledge and education and the unwillingness of trading partners to try something new.

Once EDI is integrated into a company's application, the company have to educate its trading partners. They have to understand how to get EDI to integrate into their application.

In the federal government, culture change is the major sticking point. It is tough to educate the accounting clerk whose job is going to be eliminated by this innovation. It may be difficult to explain to the procurement office why EDI is a better way of doing business when it may need 50 percent less people.

Most of all, EDI has to be part of a larger business process improvement. A lot of new EDI managers are in the same position that CIOs were in several years ago when they were viewed as not being closely aligned with the business.

2.11 Issues and Concerns

2.11.1 Points of Confusion

Typically, there are two main point of confusion surrounding electronic commerce and EDI. They are:

On-line access versus data delivery.

On-line access can take many forms. Typical examples include a contractor allowing a government customer to access their internal application to view selected cost and schedule data where an secure Internet or intranet site has been established to allow a customer to access various reports or graphs that can be viewed on-line with a browser. This provides the customer with immediate access to the data. Typically, this a view only mode; the data cannot be manipulated or downloaded into another application. Depending on contract requirements, this may be sufficient for the customer. The only drawback is if the customer must learn contractor unique applications to access the data – Internet based browser approaches provide a more universal and open system user interface.

EDI plays a role when the data needs to be extracted or downloaded for the purpose of reading the data into one or more application systems. For users who want to go beyond viewing pages on-line, EDI supplies the means to collect and merge data for use in other applications regardless of their source. EDI's application neutral standard format allows data to be extracted and read into a variety of application systems for further analysis and reporting.

On-line access and EDI could also be combined in an environment. For example, a secure Internet site could be established to allow the customer to view the reports and graphs. In the event the customer wanted to extract the data for further analysis, a download option could also be included on the WWW page. This download function would use the EDI format to provide the data to the customer in a standard format. This approach also embraces the future of standards on the Internet including XML or extensible markup language, which is a method for extending and annotating HTML (hypertext markup language). A draft proposal under consideration with World Wide Web Consortium (W3C) provides the guidelines to combine XML with EDI to provide a standard framework to describe data in a standard format; look for these Internet and EDI environments to continue to merge over time.

Transport mechanism and standard data format.

Many times the EDI standards get confused with the method of data transport. They are two separate entities. The standard formats can be exchanged over any electronic messaging service.

In the past, the EDI standards have been married to the formal, traditional method of data transport that dictated that EDI translation software must be used and a value added network or proprietary direct connection were required to do EDI. This formal traditional approach can be costly and hard to implement, typically relegating EDI to large corporations who can afford it.

Today, EDI data is moving over many types of electronic messaging services including the Internet. The Internet open system based standards make it very easy to implement EDI at minimal cost. The Internet has leveled the playing field for small

and medium sized companies. It has also made it more cost effective for a program office to implement EDI because of the variety of commercial off the shelf tools that are available to exchange EDI messages between application systems.

2.11.2 Things to Consider

There are a number of things to consider in a digital program office environment. The goal is to streamline processes, make things easier to use and access, get rid of the paper, and make better use of data for timely management control and decision making. Things to consider in the transition process to a digital environment include the following:

- Security. The security precautions taken to protect data exchanged in an electronic environment should be at least as strong as those employed for the exchange of paper, but should not be so stringent that they add unnecessary cost or burden to the trading partners.

  In a formal EDI environment, the normal operating procedure level of data protection is usually sufficient. The EDI software and VAN connections usually require some type of password to control access to the data and transmission process. The value added networks can track the movement of a message because it operates in a controlled environment. Studies have shown that business sensitive data is much more secure going through a formal EDI message exchange than when paper is exchanged. In the event a more secure environment is desired, the X12 outer envelopes can be used to provide encryption.

  In an informal EDI environment, computer system firewalls, access controls, and commercial off the shelf encryption and digital signatures can be used. Computer system firewalls and access controls can be employed to protect the system, application, and data from unauthorized users and to ensure confidentiality of the data. Encryption and digital signatures can be included in standard browser software used to exchange electronic messages. Generally, the same encryption and digital signature software or

utilities must be the same at both ends, but new products are now being offered that do not have this limitation providing a more open approach.

- Digital signature. Digital signature is typically tied to encryption methods when moving an electronic message over the Internet. The outer envelopes in a formal EDI environment can also include a Personal Identification Number (PIN), a form of digital signature. Digital signatures provide authentication that an electronic message has been sent by an authorized person. This can provide a measure of control and replace paper signatures typically used today to certify delivery of program management data. The goal is to eliminate current paper processes and replace them with electronic equivalents.

- Receipt notice. In a formal EDI environment, the 997 Functional Acknowledgment transaction set is used to verify that an EDI message has been received. In an informal environment, it may be necessary to establish some type of electronic based procedure to verify that an electronic data delivery has occurred. Keeping a backup copy of the receipt notice should also be considered. This information can be important in the event of a contract dispute.

- Acceptance notice. Acceptance of the data is a separate process from a simple receipt notice. It may be necessary to establish some type of electronic acceptance notice that goes back to the contractor to let them know the program office has accepted the data or there are problems with the data and needs to be resent. This can be as simple as an e-mail notice. If there are problems with the data, the e-mail could include an error report attachment that could help the contractor pinpoint data problems.

- Data content. The EDI standards are only concerned with providing a standard format to exchange the data. The content of the data is outside the scope of the EDI standards. If there are certain data content rules that must be followed, provide all trading partners with those requirements. Data content requirements could range from using specific reporting structure element codes to verifying data calculations. Various commercial off the

shelf software analysis tools can also be used to verify the data content before it is submitted for electronic delivery.

- Get rid of the paper. The objective of a digital environment is to remove the paper processes. In the event both paper and electronic copies of program management data are being submitted, there needs to be an established plan to stop the paper once the electronic method has been verified that it provides the same data. Running a parallel process makes sense when a new method is being implemented. However, once the new method has been proved and the data results are the same, the paper process must stop. It is costly and inefficient to produce a paper and electronic copy.

- Use a single method. The goal is to use a single approach to electronic data formats and delivery. Using standard formats provides consistency and a reliable means to import and export data regardless of the application used or in the event the underlying applications change. Using a single approach to data delivery is also important. The goal is avoid using different delivery methods for the various types of data and use a single method such as e-mail, FTP exchange, or formal EDI data exchange. Mixing and matching methods depending on the type of data makes it harder for the user to follow all the different steps they need to get the right data. Keep it simple.

- Use open systems, standards based methods. The purpose of open systems and standards to is allow all types of applications, computers, and computing environments to work together. Proprietary systems and proprietary solutions lock users into a closed environment that limits options and mandates specific approaches. Technology changes too quickly to mandate how a digital environment will work. Open systems and standards change and grow with the rapid advances in technology. Using open standards provides the ability to take continual advantage of the changes in the underlying technology.

2.12 Case Study:Westminster Public Libraries

2.12.1 Profile of the Organisation

2.12.1.1 Background

Westminster Libraries and Archives provides the public library and archive service for the City of Westminster. It consists of 11 "Community Libraries", a Mobile Library, a Home Library Service, Schools Library Service, City Archives and Technical Services. Libraries offer a range of services to the public including adult lending, reference, specialist medical, children's services and a local history and archive service. The libraries cater to a resident population of nearly 200,000, swollen during the day-time by commuters and students to 650,000.

2.12.1.2 Structure

Funded by the local authority, Westminster is divided into three Business Units: Westminster Libraries, which covers Lending and Information services; Westminster City Archives; and Technical Services. Westminster Libraries and Archives works under a Client / Provider split. Each Business Unit operates to a Contract and Specification.

Westminster Libraries and Archives Technical Services embraces Cataloguing, Inter-Library Lending, Systems and Supply i.e. the sourcing and purchase of books and other materials. EDI development is being undertaken and implemented by the Business Unit.

2.12.1.3 Market

The library service has 11 Community libraries. The public library concept was started in Victorian times to provide opportunities to the general public to educate and better themselves. Current library services throughout the UK are governed by the Public Libraries and Museums Act of 1964, which provides for a free service, although some charges are permitted, such as fines, reservations, music recording and video loans. Successive Governments have broadly endorsed the principle of a

free core service. Anyone who lives, works or studies in the borough is entitled to use the service, as are members of other UK public libraries. The service offers books and information resources to the general public but there is also a "Housebound" service taking books to the elderly or house-bound, a mobile library and an Information for Business service which is a subscription service providing information to small and medium sized businesses.

2.12.1.4 Provision of Electronic Services

One of the key functions of Westminster Libraries is to provide information to its customers. This is usually done with paper-based books but increasingly this is being supplemented with electronic and digital media such as CD ROMs. These can be stand-alone or they can be networked e.g. previous issues of the Guardian and The Independent newspapers. They also provide on-line public access to the Internet using two dedicated PCs with a leased line to the Internet service provider, Pipex. This service is free at present and is being evaluated. This service will be expanded as a major new role for the library as has happened elsewhere. To use this service, half hour slots can be booked up to a week in advance. E-mail can be accessed by using a number of commercial web-sites. Westminster Libraries and Archives are also involved in a number of projects as a partner in EARL, the consortium for networking public libraries. Westminster is also involved in a commercial partnership with Input/Output to provide a greater range of Internet and PC services in libraries.

The branch libraries are connected by a variety of megastream, kilostream and DLCT links, depending on the services being offered. Technical Services is setting up a link to take part in the LAMDA, (London and Manchester Document Access) EDD (Electronic Document Delivery) service. Technical Services and the Reference Library also take in requests for information and books via e-mail.

2.12.2 Description of Current Electronic Trading

2.12.2.1 EDI Messages

Westminster has identified a number of electronic messages to enhance their business processes. They have implemented several of these already and are now working on developing new messages where appropriate. Taking these messages in sequence of process, the messages are Title Information, Order, Order Acknowledgement, Chaser, Delivery Note and Invoice.

Title Information

Westminster receives title information for forthcoming books from various sources. Browns provides information on-line on a monthly basis. This goes into a PC and is uploaded to Westminster's Geac system. The data is loaded into the Potential Requirements File, from whence it can be used as the basis of an order record and be pushed to Circulation as required. Several other suppliers provide this information on mag tape or floppy disk.

Westminster would like to receive title information electronically from all its suppliers. Data currently sent in on magnetic tape and floppy disk would ideally be received in an on-line electronic format using EDI, so long as this could be achieved cheaply enough. The frequency of transmission could be improved, particularly where data is only submitted on a monthly basis. At present, basic title information is taken chiefly for forthcoming material. Discussions are already underway as to the supply of full catalogue records, tailored to Westminster Libraries and Archives' needs.

Orders

Westminster Libraries and Archives Technical Services obtains books and resources from Library Suppliers and Bookshops. They use a tendering method and they agree terms of supply, services and discount on a three-yearly basis. Their main suppliers are: Morley Books, Browns, Greenhead Books, Askews, Books for Students, Library Services (UK), Cramer, Ulverscroft, Chivers and the Ordnance Survey. Many of these library suppliers, wholesalers, or publisher-distributors are now receiving EDI orders and some also provide order acknowledgements in return.

Several years before the advent of the BIC standards, Westminster Libraries and Archives Technical Services and T. C. Farries set up an electronic link using X.25 to transfer files of order information and bibliographic records between their two systems. When the BIC standards were formulated, Westminster Libraries and Archives Technical Services was the first authority to implement EDI using First Edition, starting with the order message.

Westminster uses Geac's Automation System GLIS, the Geac Library Information System. Geac runs on-line during the day and at night it goes off-line and provides a batch EDI capability. During the day when orders are placed, the system displays a vendor flag showing whether the order is to go via EDI or not. If it is for EDI then the order is put into a file and down-loaded via Intercept Plus to First Edition. The order format used is the BIC/Tradacoms Book Trade Order Format.

Enhanced Order Acknowledgements

Geac are developing further order acknowledgement capabilities. The original software was jointly funded by 8 library authorities and envisaged orders and acknowledgements. There were then some changes in the acknowledgement message and Geac are now updating this to bring them into line with B.I.C. recommendations. It is easy to simply print out an order acknowledgement but the clever part is to process an acknowledgement automatically, using the order acknowledgement message to decide the action to take, e.g. to cancel the order, re-order, order from a new vendor, or report to the relevant department.

Chasers

Westminster is keen to develop a claim or chaser message. They chase automatically orders over-due beyond a number of days pre-set by vendor. This printed output is currently sent by post but EDI would be a better alternative from Westminster' s viewpoint. The chaser includes the original order number so suppliers should be able to refer it back to orders already received and thus avoid the risk of duplicating the orders. Discussions with suppliers have, however, indicated that they are not yet in a position to receive chasers by EDI, several saying that their systems would treat them as orders, resulting in duplication. It is a matter which will need to be addressed further at a managerial level".

Delivery Notes

Delivery Notes could also be used to improve receipting of goods. Libraries use an accession number i.e. a unique bar-code, for each book which identifies that individual copy of the book along with the library that has ordered it. Suppliers do the servicing for the library, putting these bar-codes on the books. They are given a range of bar-codes from a bar-code supplier and they then allocate a bar-code to each book. Westminster would like them to include the bar-code which is used on the book in a delivery note message sent in advance of the delivery so that receipting could be a matter of reading the message and matching the catalogue record to the message. This would both confirm delivery of the right book and link the item to its record in Circulation. Reading the bar-code would not just accept delivery but could also record the item as 'in processing' or put it into in-transit on its way to the branch library. It was decided in discussions under the auspices of BIC, however, not to implement the EDI delivery message. An alternative method of achieving the same end was devised by allowing for the inclusion of the bar-code number on the EDI invoice message. This requirement would need some additional work and consultation with the library suppliers involved as it may be a demanding requirement from their point of view. EDI is excellent for challenging the way that things have always been done and for facilitating new methods of working.

Invoicing

Invoicing is an important priority and Westminster sees this as a major benefit. There are some initial considerations to be worked through in that the invoice message for libraries has to contain invoicing for library servicing and VAT as well as for the materials themselves. Westminster are initially working with Browns and Books for Students (B.F.S.) to develop these facilities, which will then be extended to other suppliers. This facility is on the point of going live at the time of writing.

Geac are also developing a link between the Council's mainframe and the Acquisitions package. This will enable invoices to be passed for payment in a much more efficient manner. At present, invoice numbers are keyed into

Acquisitions at the receipting stage to allow the System to build the invoices ready for authorization. This process adds significantly to the time required to

complete receiving. This data must then be re-keyed into the Council's mainframe accounting package for payment. In order to minimize this manual work, suppliers submit consolidated invoices for entry on to the Council's accounting package, summarizing those invoices already passed on the library Acquisitions package. This is laborious task which Westminster hopes will be much improved by EDI and the systems currently in development by Geac.

2.12.2.2 Standards

Westminster has a good relationship with Geac who in turn is active within Book industry Communication, working on EDI standards and implementation issues in the library sector. Currently the PRF (Potential Requirement File format) is not a Tradacoms message but a non-EDI message using the US MARC format which can easily be mapped into their database. The remainder of the development work done for Westminster has been to the Tradacoms standard. As suppliers undertake development, however, they are moving to the EDIFACT standard. Methods of transferring messages between the two are currently being investigated.

2.12.3 Decision to Implement EDI

Westminster's decision to do EDI was based on looking at the costs of the service and the traffic charges together with the lead-time on EDI orders set against the costs and lead-time of normal post, sent 2nd class. EDI costs c. £25 a month. Posting the same orders would have cost at least £1.30 - £2.60 a day, i.e. £32.50 - £65 a month, at minimum postage rates. An order could be prepared on a Monday, posted on Tuesday, received at the supplier up to 5 days later, say the following Monday, opened up and checked and then eventually keyed into the supplier's system on Tuesday or even later. At peak times it was calculated that with EDI taking only one day to get from the library's system to the supplier's system (and then straight into the order file), Westminster could be knocking up to two weeks off the lead-time of the postal method.

It is much quicker to produce a file of orders, down-load it and transmit it via EDI software rather than print it out, burst it, remove extra header pages, stuff into envelopes, address them and then post them (or have the supplier collect them) There is thus a saving on labour costs in addition to order lead-time and postage costs.

In addition to all the above benefits, when Westminster also took the improved accuracy of EDI into account and the future potential of Order Acknowledgements and Invoices, EDI was accepted and the decision to implement was made.

2.12.4 History of EDI Implementation

Westminster was approached by First Edition who had a relationship with Geac, who supply Westminster's automation system so once the decision to do EDI in principle had been taken it was relatively easy to get started. In October 1994, Westminster started testing orders with Browns and T.C.Farries and then swiftly rolled orders out to other suppliers once the testing was complete.

2.12.5 Costs of EDI Implementation

There was and still is significant development work to do. The initial development for the Geac GLIS System was funded by eight library authorities who were all keen to implement EDI. Costs for each library authority were thus limited. EDI played a significant part in re-assuring the local authority that the library service was forward-thinking and investing in EDI in order to cut costs. The PR effect of this should not be under-estimated. Any library which is doing EDI is displaying that it is concerned about its costs. This is important when defending the library from cuts in its funding.

Other costs included the First Edition service (£300 p.a.), traffic charges of a few pence per kilobyte and an envelope charge of a few pence per transmission. Even with these costs, EDI ordering is judged to be significantly cheaper than even 2nd class post (and of course much quicker), as demonstrated in point 3 above.

2.12.6 Benefits of EDI Implementation

Some attempt to cost-justify EDI development was undertaken at the start and on-going analysis helps to justify the continued investment. Westminster judges its effectiveness on a number of key measures: speed of supply, speed of processing and the number of days to catalogue etc. Westminster has been able to track the effect of EDI on some of these measurements e.g. supply times have improved significantly.

Westminster has identified EDI benefits in terms of speed of ordering and cost-saving as against 2nd class post. They also see benefits in accuracy, having information about their orders, and potentially a major benefit from solving their issues with invoices and receipting (delivery notes). EDI provides an ideal opportunity to add value by preventing the re-keying of invoices and automating the receiving process. Also the delivery note message could be very beneficial if it could cater for accession numbers.

2.12.7 Guidance and Learning Points from Implementation

Westminster maintains that EDI is a prerequisite for a company seeking to be one of their suppliers. They judge their suppliers on stock holding, servicing quality and cost, discount and customer service and on their attitude to EDI, the facilities they can offer and their willingness to develop new messages when required. The recommendation for a public library which is not currently doing EDI is therefore to start to talk to your trading partners about EDI and find out what they think about it and which messages are available now as well as what their plans are for the future.

It is also useful to start talking to your library system supplier about EDI. What is your system capable of? Who is already doing it? What messages does it handle and how?

Then prioritise the messages in their importance to the business and formulate an EDI strategy in consultation with your systems suppliers and your product suppliers.

Talk to the V.A.N.s (Value Added Networks) e.g. First Edition and Whitaker TeleOrdering and look at the costs involved in EDI (Set-up costs e.g. mailbox, software, consultancy as well as traffic and other charges e.g. do they charge for

storage after a certain number of days?), consider their service, and reputation for reliability and also the number of trading partners in their community who are of interest to you. As you will have to pay the telephone charges to connect to the V.A.N.s, it may be worth looking at the speed at which the V.A.N.s can connect and ensure that your modem can optimise this so that telephone charges are minimised.

The V.A.N.s will be very helpful in answering questions and giving advice and BIC will also be happy to help. BIC also hosts implementation clinics by sector for those implementing new messages and finding issues which need to be solved in consultation across the whole community.

Look at staffing, resources, training and cover for sickness and holidays. Look at the structure of the systems department and ensure that enough people know which buttons to press.

Set up a trading relationship with your EDI trading partners which formalises your relationship and "what happens if" and "who pays for what." Look at each-other's systems because there is an opportunity to work together to reduce each-other's costs by scheduling your orders to hit the supplier at a mutually convenient time for example.

Test thoroughly and parallel run using fax or posted print-outs to ensure that the implementation is sound. Consider all your requirements even things that only happen once a year e.g. when a library wants to cancel dues towards the end of a financial year.

Go live when testing is complete and monitor the situation closely for some time. If you have problems get your system supplier or V.A.N. to help.

Be sure to develop generic applications and implementations so that all trading partners get the same formats. This makes it much simpler to maintain and makes future up-grading easier.

There are several pitfalls to watch out for. In addition to books, Westminster orders other products which do not have ISBNs and so their system does not validate ISBNs. Suppliers may expect ISBN validation to be happening at your end and may not validate ISBNs at their end leading to confusion when the wrong ISBN is used or

a catalogue number or bar-code number is used instead. Westminster sends 5 characters of the author field and 20 characters of the title field in addition to the ISBN/catalogue number so that the supplier will have more to go on in identifying the right product.

Local Authorities believe in undertaking a full tendering process when buying a new system. However, if EDI is seen as merely an up-grade to an existing system then a purchase can be made without a complex and expensive tendering process.

2.12.8 Conclusion

Westminster Libraries is convinced of the value of EDI to their business and their future developments are ambitious. It enables them to run their business more efficiently and although their EDI has only been going for two and a half years they are sure that it will offer increasing benefits for many years to come as new messages are implemented.

EDI is now crucial to their supply arrangements and their library suppliers have to offer EDI facilities in to get their business. Westminster's experience demonstrates the importance of the systems supplier, VAN and key library suppliers working together to get EDI off the ground. It is a collaborative effort and the more libraries which get involved the greater the benefits for the whole library sector.

CHAPTER THREE

AN ELECTRONIC DATA INTERCHANGE (EDI) IMPLEMENTATION VIA E-MAIL IN LAW AUTOMATION SYSTEM

In this chapter Electronic Data Interchange (EDI) implementation running for Law Automation System will be explained. Exchanging data, messages and documents like Microsoft Word, Excel, using EDI via e-mail will be explained. Also, in shortly, technical structure and working principle of Law Automation Software system will be explained.

3.1 The Law Automation System (LAS)

The Law Automation System is a client / server software system which is named shortly LAS. LAS is developed for applying legal action for collection of debts. Some similar software systems exist, but they are less functional and run only in stand-alone attorneyship offices. LAS is designed for large companies - like banks, telecomunication companies, electricity or gas distribution companies and large-scaled marketing companies - having many customers or subscibers .

Appliying legal action for collection of debts includes many operations like calculation of different types of debts by adding interest that increases as the time passes, preparing petitions for different situations, taking lists for applying different law processes and recording all the needed data - like sales, distraints, lawsuits, etc. - for these processes.

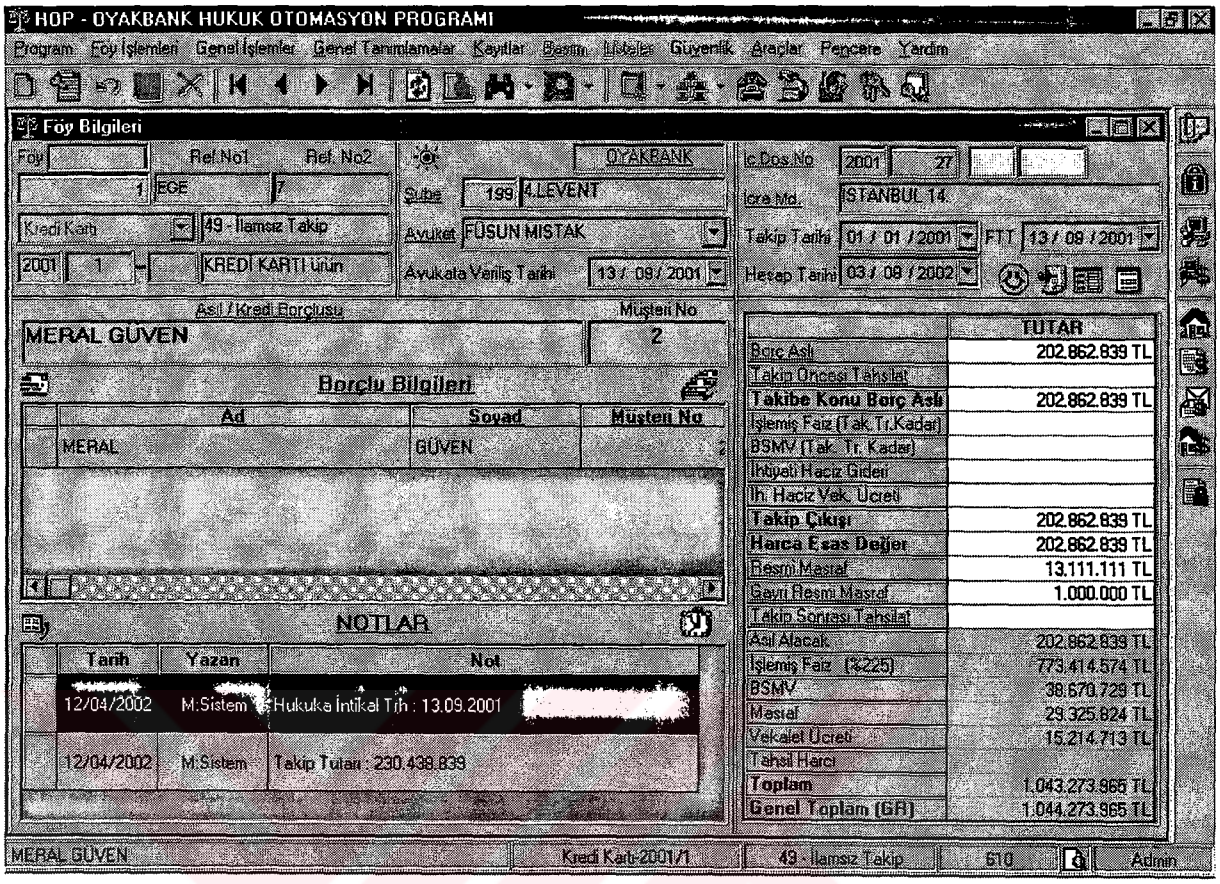

Figure 3.1 Main window of LAS automation software

In figure 3.1, the "File" window, which is the main window of LAS application software, is shown. In the application a debtor's all information is kept in the logic of files. File types and the information that must be kept in the files change according to the debt's type.

3.1.1 Technical Structure of LAS

LAS is a 32 bit Windows application designed to work on Windows 9x, Windows XP, Windows NT 4.0 and Windows 2000 operating systems. As data management system Microsoft SQL Server7.0 or Microsoft SQL Server 2000 is used. Microsoft Access 2000 solution is also provided for the situations where the user number is not very high. LAS is developed with "Visual Basic 6.0 Enterprise Editon" programming language, Microsoft ADO technology and ActiveX components. By means of its modular structure, the programme is open to updates and changes.

3.1.2 Working Principle of LAS

Law Automation System is currently used at the Law Consultant Department of Garanti Bank and Oyakbank. Garanti Bank and Oyakbank are two of the huge banks that have hundreds of branches and millions of customers all over the country.

LAS as a bank's Law Automation System is used to apply legal action for collection of debts resulting from unpaid credit and credit cards. Huge number of customers means huge number of possible deptors, which are subjects to be data.

Distributed location of the banks' branches causes the deptors to be distributed all over the country, so applying legal action for collection of debts from one center is almost impossible. Because of these reasons, Law Consultant Departments of the banks are divided into units locating geographically in different cities. A debtor's file is kept and all the law operations are followed at the nearest law unit to where he lives. Every unit is responsible for the debtors around its place, but the Center, which is Law Consultant Department of the bank, must be informed about the operations done. All the information about the current states of the files must also be available at the Center. In addition, Center must have a control mechanism on the units' operations.

LAS application software is set up on the computers at each law units, so the units can apply legal action for collection of debts in a computerised system. In order to share the units' information with Center, a data exchange system between the units and the Center throughout the country is needed. Electronic Data Interchange (EDI) is used as the communications software and E-mail is used as the communications medium to enable the electronic transmission of data.

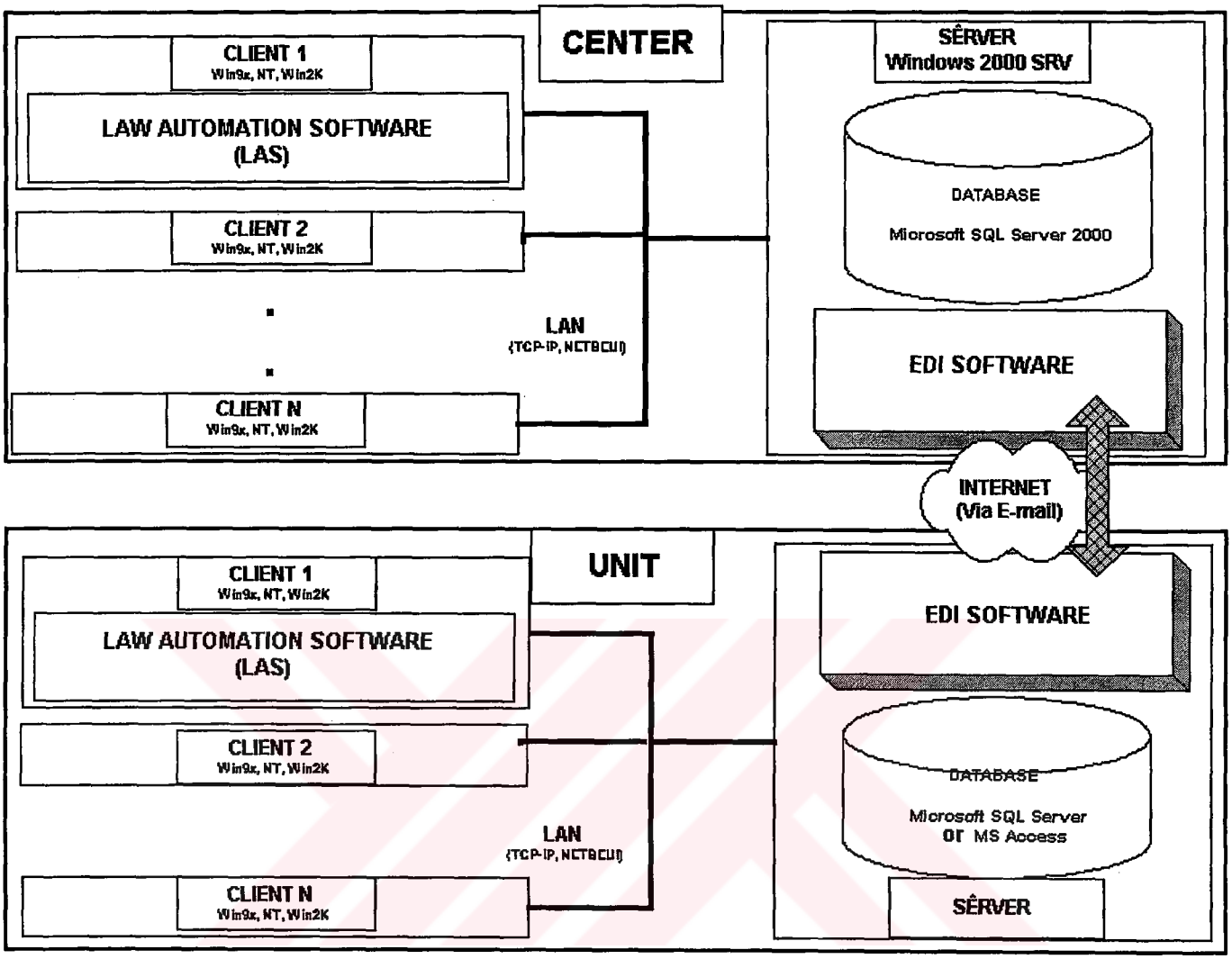

Figure 3.2 Architecture of Law Automation System

In Figure 3.2, architecture of LAS is shown. At Law Consultant Department of the bank (Center) there exist a server and clients connected to it.

On Server Windows NT 40 or Windows 2000 as operating system and Microsoft SQL Server 7.0 or SQL Server 2000 as database management system are used. Also EDI software runs on server in order to exchange data between Center and units.

On Clients Windows 9X, Windows NT or Windows 2000 are used as operating system. LAS application software is run on every client.

There is almost no diference between Center's system and units' system. Every unit has its own database. In addition, according to the density of the work, Microsoft Access database solution can be given with Microsoft SQL Server solution.

3.2. EDI Implementation in LAS (LEDI)

As explained in the previous chapter, Electronic data interchange (EDI) is commonly defined as the application-to-application transfer of business data between computers. Many businesses choose EDI as a fast, inexpensive, and safe method of sending purchase orders, invoices, shipping notices, and other frequently used business documents.

In this study, informal EDI, which is one of the data transport methods, is used.

EDI software used in LAS, which is called "Law EDI" or "LEDI" in short, provides data sharing between the Center and the units. LEDI runs on the servers of both Center and the units. Data exchange is done via e-mail over Internet by using Microsoft Outlook components and VBA (Visual Basic for Applications), which was developed for Microsoft Office products. LEDI gets data from database and converts the data to an appropriate format and sends it via e-mail according to certain events and situations. In the other side, software gets data from the incoming e-mails and converse them in order to update the local database.

LEDI works on the servers of both units and center. LEDI's working mechanism can be summarized as: There is a time robot inside. Robot starts when computer starts up and it is minimized on Windows taskbar as a eye icon. Taskbar icon is shown in figure 3.3.

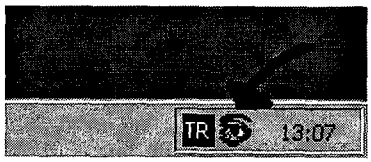

Figure 3.3 Taskbar icon of LEDI robot

There is a settings interface to select time period for starting robot. LEDI exchange process starts when robot's time period fills. As the robot starts up LEDI, exchange process begins. Path of import-export files and Outlook folder name which is "HOP_IE" in default, are entered in this settings interface. There is also an error messages interface to show occurred errors and faults. In figure 3.4, figure 3.5 and figure 3.6, interfaces of robot are shown.

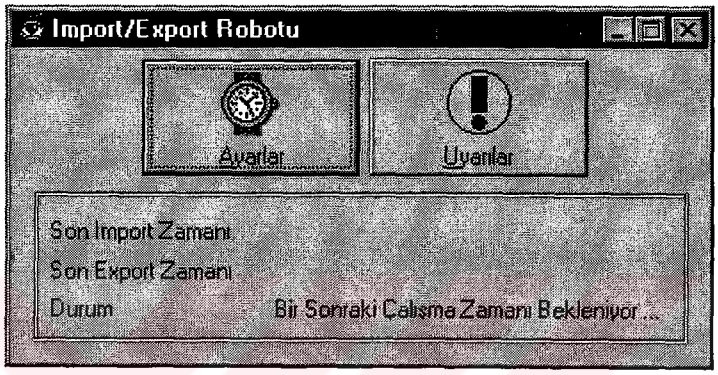

Figure 3.4 Main interface of LEDI robot

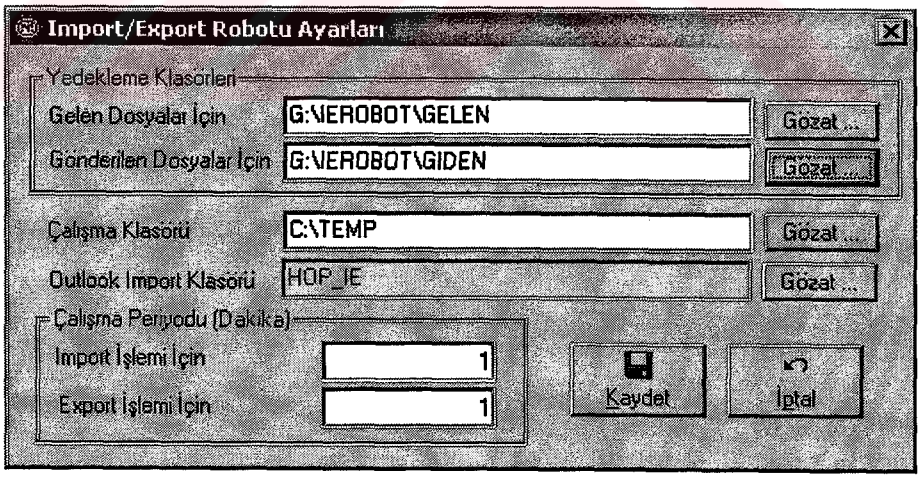

Figure 3.5 Settings interface of LEDI robot

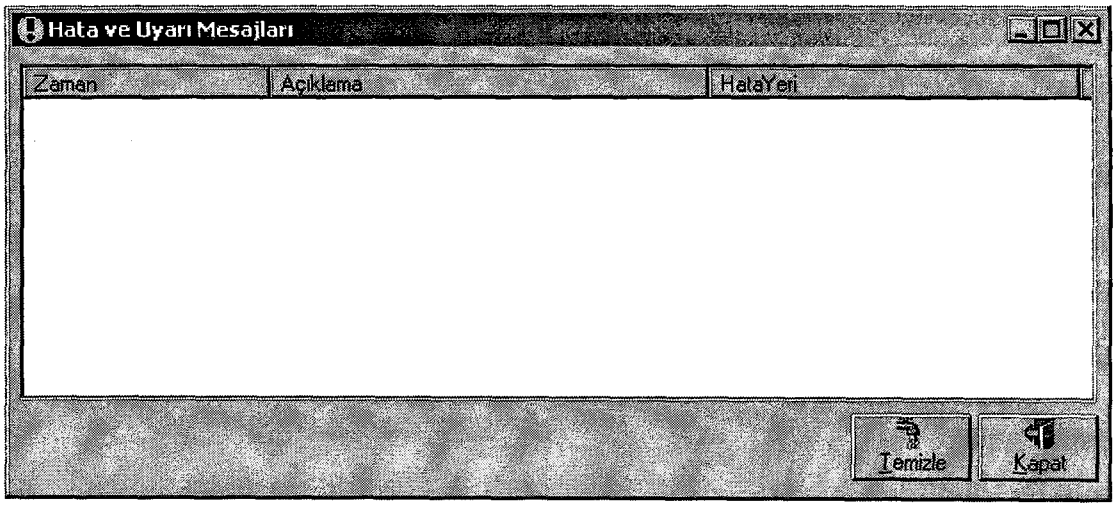

Figure 3.6 Error messages interface of LEDI robot

There are 4 types of data that are exchanged between the Center and the units:

- Data of LAS
- Messages
- Microsoft Word and Excel documents
- Demand and approval information

3.2.1 LEDI Exchange Process

LEDI is an informal EDI software which was designed only for Law Automation System (LAS). Data exchange process of LEDI can be divided into 3 sub processes: Translation, Transportation and Receiving. In Figure 3.7, data exchange process of LEDI is shown.

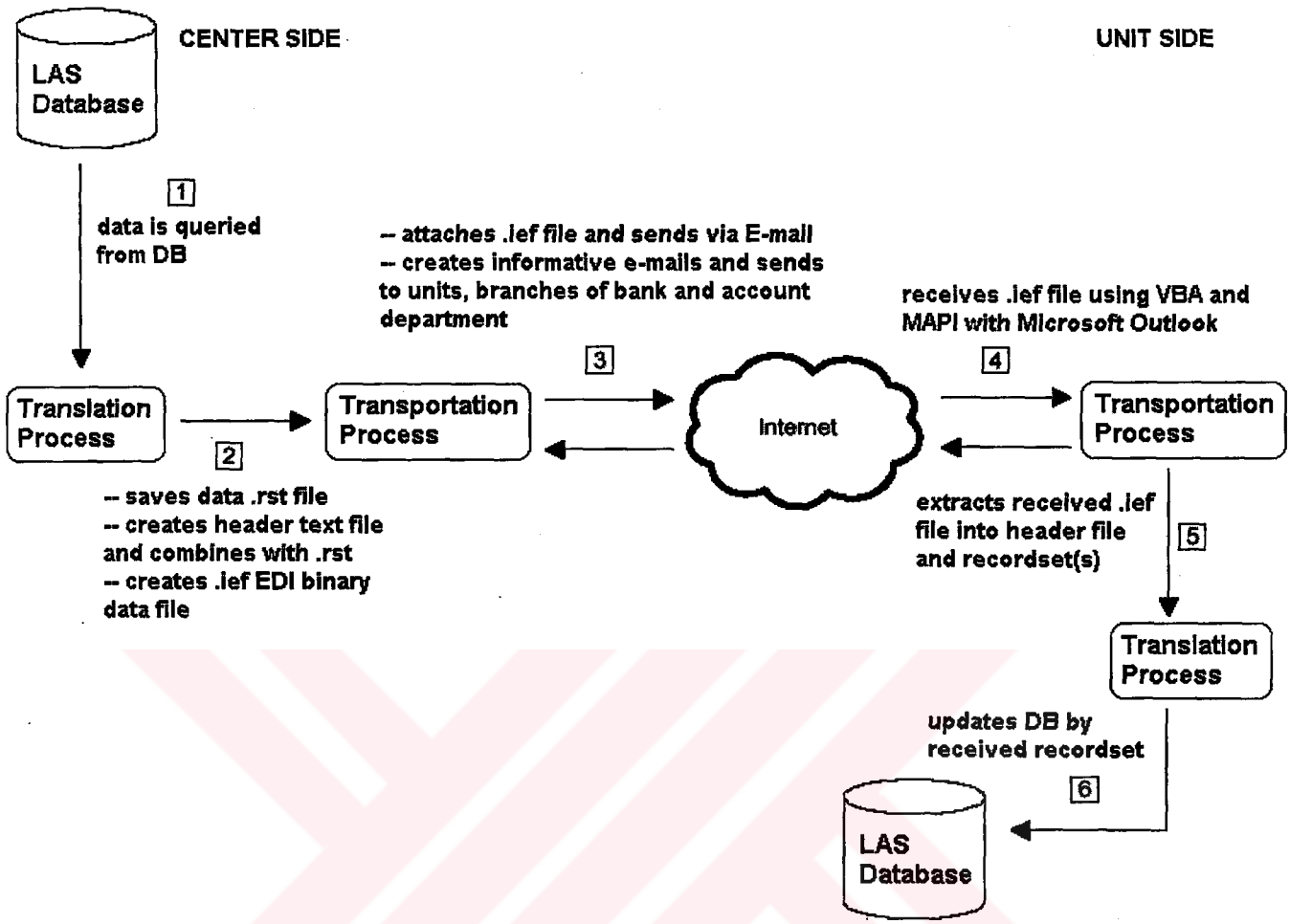

Figure 3.7 LEDI exchange process

1. Data to be exchanged are eliminated according to related records' "IEStatus" fields. This field exists in all tables of LAS database which are subjects to exchange. "IEStatus" field can take the values shown in table 3.1.

Table 3.1 Values of IEStatus Field

IEStatus Value	Description
1	Record will be sent
2	Record was sent before, will not be sent again
3	Record was sent before, but has permission to be sent again

2. In translation process, data are selected from database into recordsets and these recordsets are combined to be one recordset file and saved in a temporary disk area as one file with "rst" extension. Also a flat text file is created in the same temporary disk area. In text file, law unit's code (UID) and type of data that will be transfered (DTID) are stored. If the data direction is from Center To Unit, UID represents the receiver unit's code, but if the data direction is from Unit To Center, UID represents the sender unit's code. Also possible values of DTID are shown in Table 3.2.

Table 3.2 Values of Data Type ID (DTID)

Data Type Value (DTID)	Description
1	File information will be sent
2	General descriptions will be sent
3	Premium reports will be sent
4	Demands for changing and opening new file will be sent
5	Revenue approval will be sent
6	Advance approval will be sent
7	Representing approval will be sent
8	Rates of exchange information will be sent
9	Change approval needed window information will be sent
10	Messages will be sent
11	Microsoft Word/Excel documents will be sent

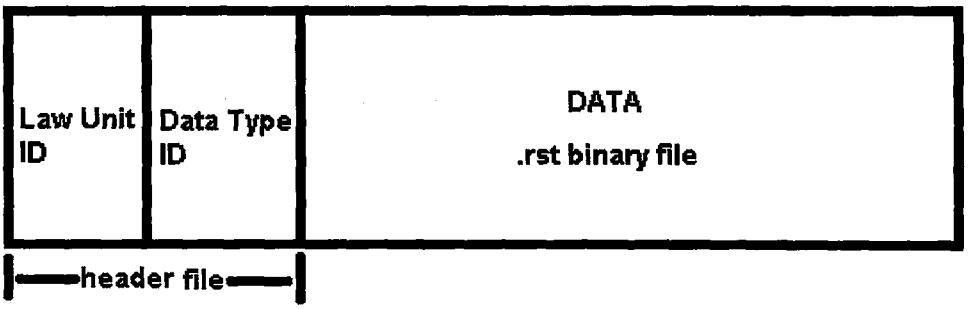

Figure 3.8 General format of ief extensioned LEDI data file

After these steps, flat text file and .rst recordset file are combined into a binary file, which is called as an "import/export file" with "ief" extension. In Figure 3.8, general data format of .ief file is shown.

3. Transportation process transforms the .ief file into e-mail format by using VBA in Microsoft Outlook and Mail API (MAPI). E-mail is put into "Sent Items" folder in Microsoft Outlook. Then the LEDI message is sent to the related location via e-mail over Internet. In figure 3.9, "Sent Items" Outlook folder is shown. In some cases, an informative or directive e-mail is sent to units, branches of the bank or accountant department of the bank with respect to data type. In figure 3.10, coming informative e-mails are shown.

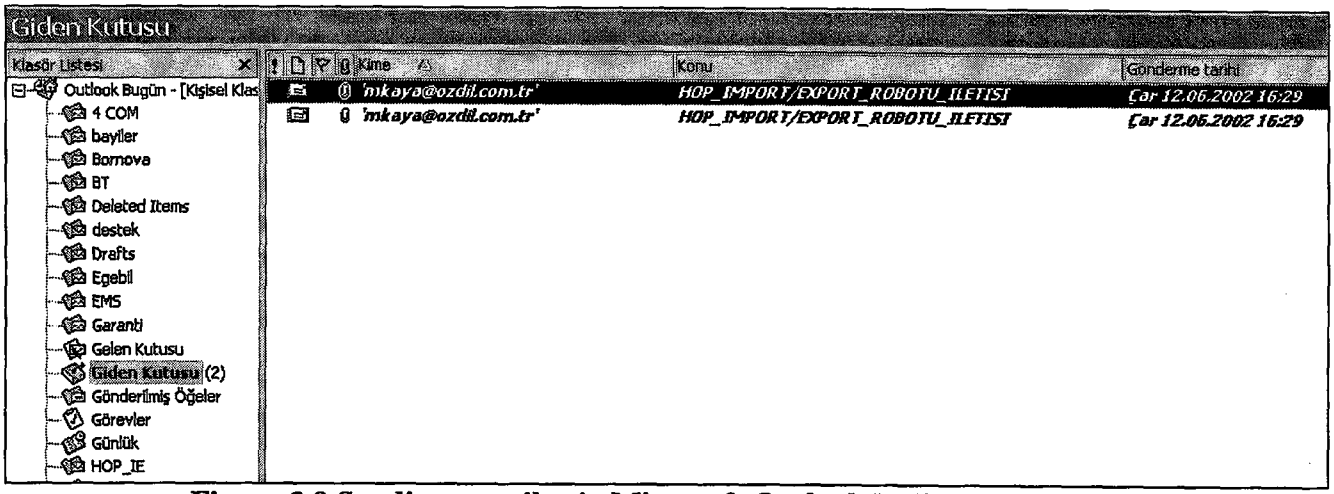

Figure 3.9 Sending e-mails via Microsoft Outlook by LEDI

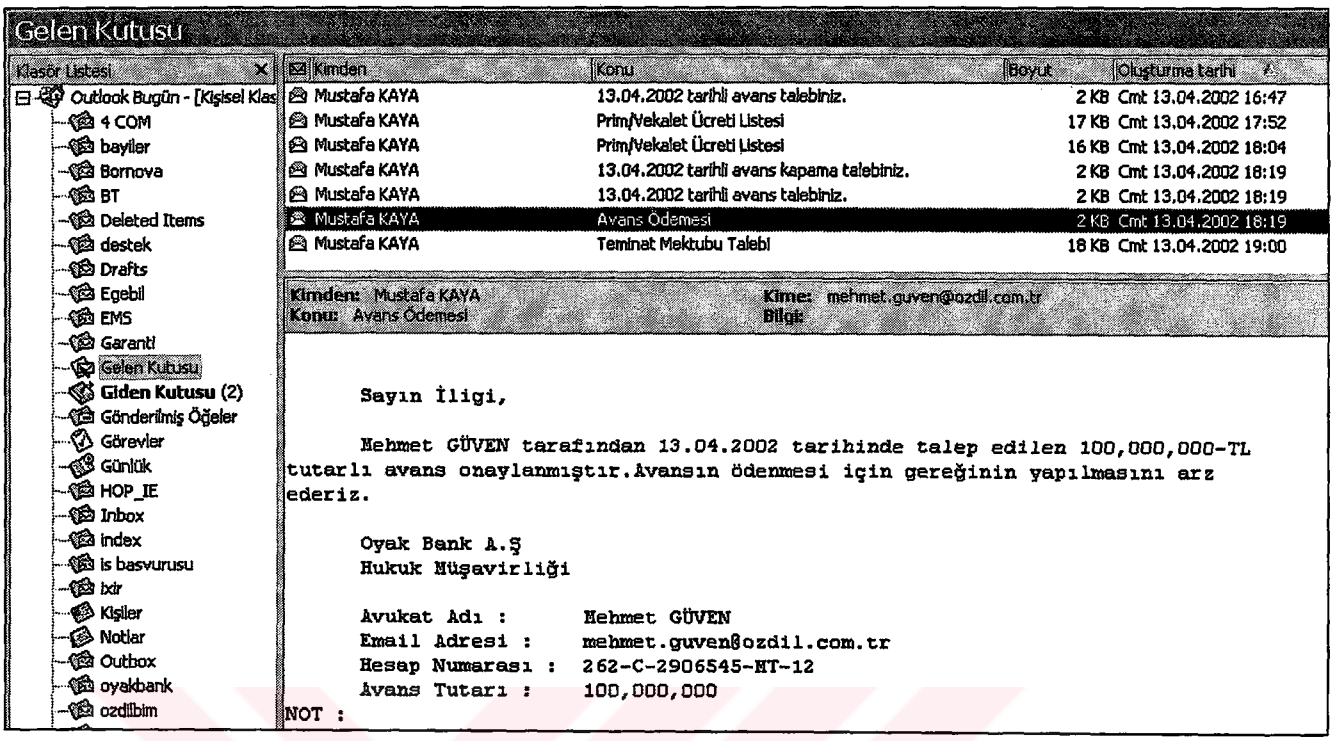

Figure 3.10 An informative e-mail coming from center

4. At the receiver side, all e-mail messages sent by LEDI are dropped into the "HOP_IE" Outlook folder, which is created for LEDI transportation process. Transportation process gets the import/export file from the folder e-mail. In figure 3.11, e-mails in HOP_IE folder are shown.

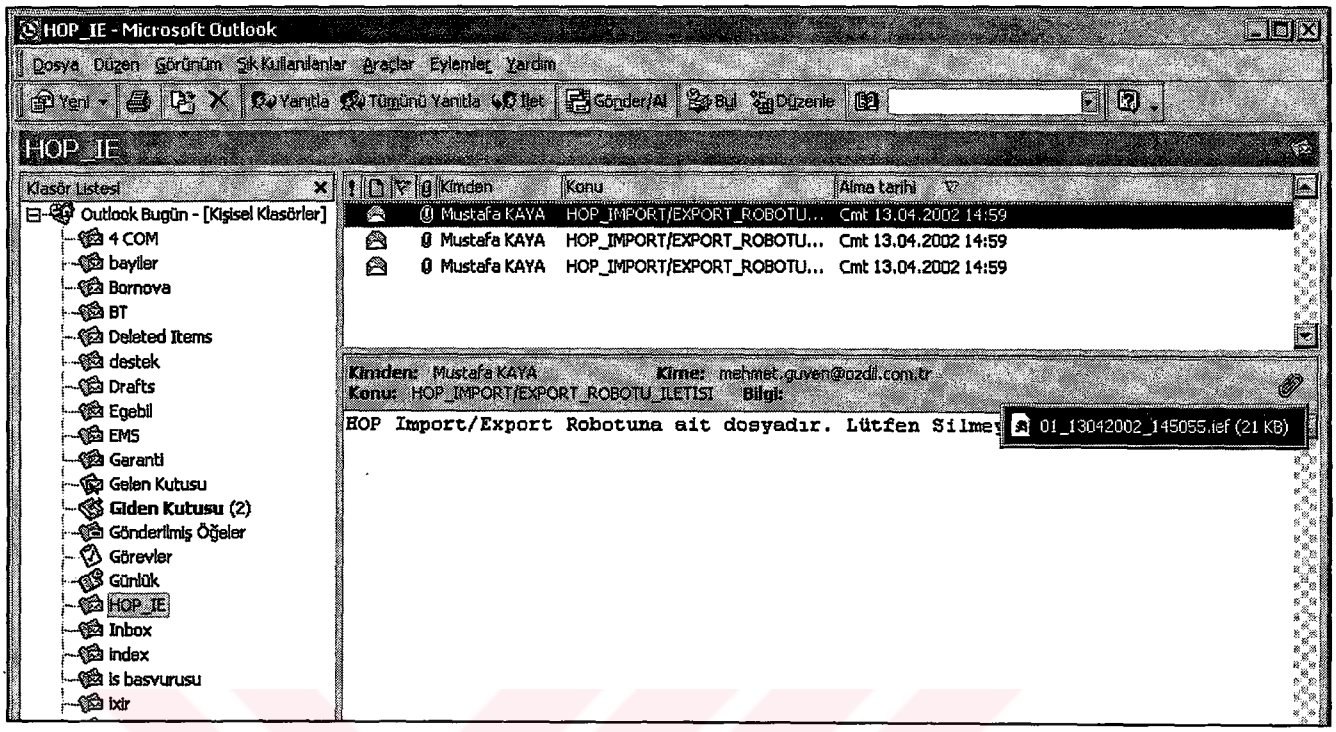

Figure 3.11 A e-mail with attachment "01_13042002_145055.ief" coming from center

5. In translation process coming import/export file is extracted. .Recordset file (.rst file) and header text file are obtained.

6. LAS Database is updated using received recordset(s).

LEDI's main exchange processes were explained in 6 steps above. However, there are different kinds of data types to be exchanged and LEDI exchange processes may work different with respect to different kinds of data. Mentioned in previous chapter, there are mainly 4 types of data that are exchanged between the Center and the units. Exchange processes of these data types will be explained in details in the next chapter.

3.2.2 Data of LAS Exchange Process

There are 4 types of exchange processes for data of LAS:

3.2.2.1 Sending Assigned LAS Files

Sending assigned LAS Files exchange process is performed from center to unit. After robot initialization, LEDI exchange process begins. If DTID (the field that represents the data type) is set "1" in the database , all required data for new files are queried and stored in recordsets. In this operation, data is gathered from many tables, so many recordsets are created.

In translation process, these recordsets are formed to be one recordset and the resulting recordset file is combined with header text file. As a result .ief extensioned binary data file is created. One binary file includes only one unit's assigned file data.

In transportation process, created ief files are attached to e-mails and sent to each assigned law unit. After sending data file, an informative e-mail with list of sent files is sent to all law units, to which e-mails with attached files were sent.

At Unit side, data e-mail is taken by transportation process. After that, ief file is divided into recordsets and database is updated using these recordsets. In Figure 3.12, format of assigned LAS files exchange process is shown.

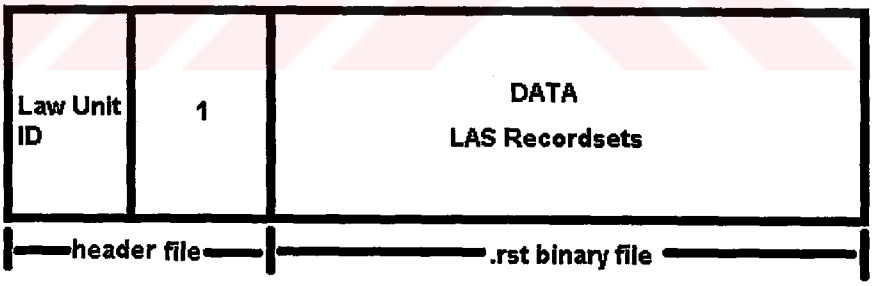

Figure 3.12 Format of assigned LAS files exchange process data

3.2.2.2 Sending End of Day Information

Sending end of day information exchange process is performed from unit to center. All changes on records or files in a day are signed by LAS. At the end of the day, DTID is set "1" in the database. After robot initialization LEDI exchange

process begins. All required data are queried and stored in recordsets. In this operation, data is gathered from many tables, so many recordsets are created.

In translation process, these recordsets are formed to be one recordset and the resulting recordset file is combined with header text file. As a result .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the center.

At Center side, data e-mail is taken by transportation process. After that, ief file is divided into recordsets and database is updated using recordsets. In center database, up to date information of law unit can be seen. In Figure 3.13, format of end of day information exchange process data is shown.

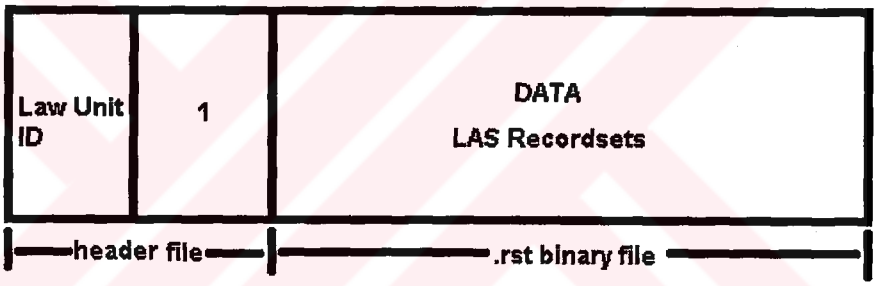

Figure 3.13 Format of end of day information exchange process data

3.2.2.3 Sending General Initial Descriptions and Information

Sending general initial descriptions and information exchange process is performed from center to unit. For sending up to date values of parameters, rates or declarations DTID is set "2" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in recordsets. In this operation, data is gathered from so many tables. That's why so many recordsets are created. ,

In translation process, these recordsets are combined into one recordset and with header text file .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the law unit.

At unit side, data e-mail is taken by transportation process. After that, ief file is divided into recordsets and database is updated using these recordsets. In unit database, up to date values of parameters, rates or declarations can be seen. In Figure 3.14 format of general descriptions and information exchange process data is shown.

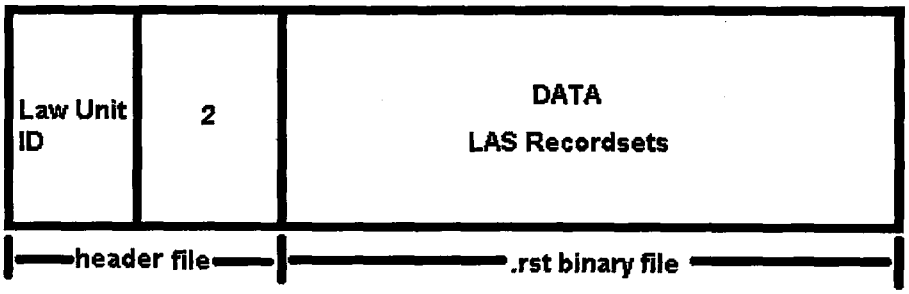

Figure 3.14 Format of general descriptions and information exchange process data

3.2.2.4 Sending Rates of Exchange Information

Sending rates of exchange information exchange process is performed from center to unit. For sending up to date values of exchange rates DTID is set "8" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the law unit.

At unit side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In unit database, up to date values exchange rates can be seen. In Figure 3.15 format of rates of exchange information exchange process data is shown.

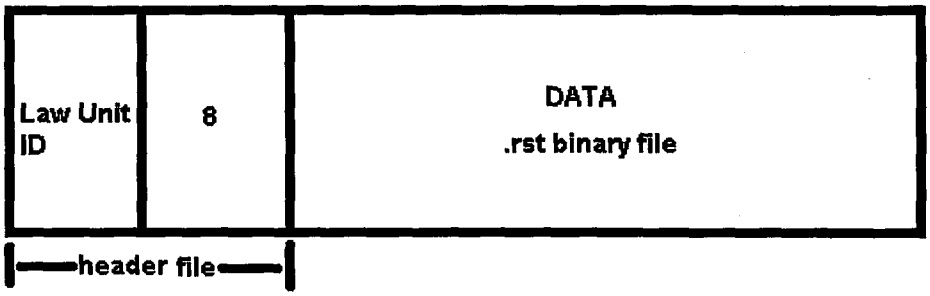

Figure 3.15 Format of rates of exchange information exchange process data

3.2.3 Messages Exchange Process

Exchange process of messages is a very usefull operation because it reduces telephone&fax traffic between users of Center and units. Data flow for this process is both from Center to units and from units to Center. Stand-alone messages as well as file related messages can be sent to any unit or center. These messages are entered and, if wanted, connected to the related files by LAS using special Microsoft Outlook Express style interface. Then DTID is set "10" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the destination.

In destination side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, new messages can be seen. In Figure 3.16, format of exchange process data of messages is shown.

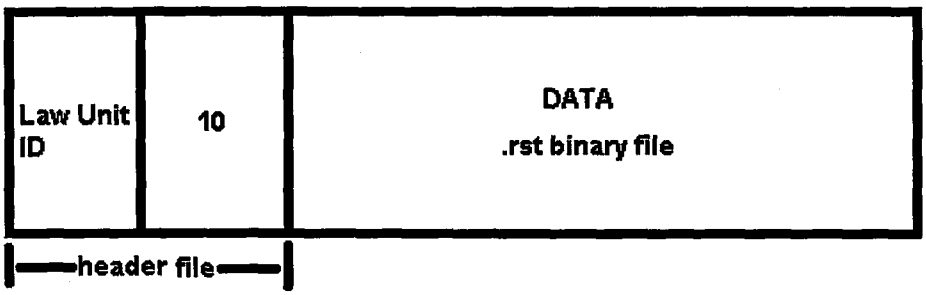

Figure 3.16 Format of exchange process data of messages

3.2.4 Microsoft Word Excel Documents Exchange Process

Exchange process of Microsoft Word-Excel documents is performed between center and units. Word-Excel documents are attached into related LAS files and saved in LAS database. This reduces fax traffic between users of center and units and provides all related documents are saved and reachable all the time. For sending Microsoft Word-Excel documents to the unit or center, DTID is set "11" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the destination.

At destination side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, new Word-Excel files can be seen. In Figure 3.17 format of exchange process data of Microsoft Word-Excel documents is shown.

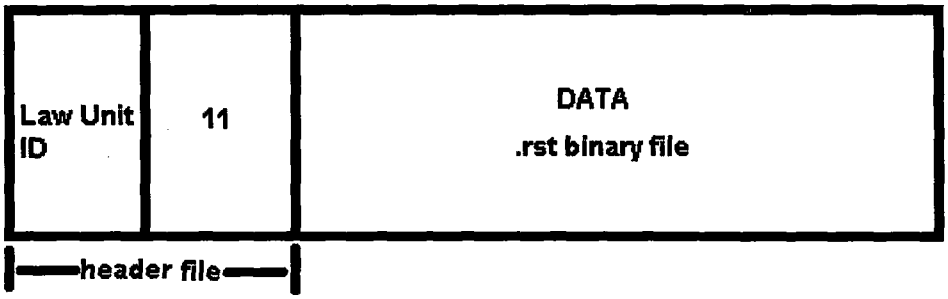

Figure 3.17 Format of exchange process data of Microsoft Word-Excel documents

3.2.5 Demand and Approval Information Exchange Process

In this process, data of demand and approval operations is exchanged. Demand and approval information types can be categorized in five categories. Three of them are related with accountancy and money, the others are related with security and permissions.

3.2.5.1 Demand and Approval of Advance Exchange Process

Advance is related with money. Demand and Approval process of advance is very important. Demand is performed from unit to center and approval is performed from center to unit. Demand and approval of advance exchange processes are performed when DTID is set "6" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

- Demand of advance process:

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the center.

In center side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, new demand of advance can be seen.

- Approval of advance process:

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the unit. An informative e-mail is also sent to the same unit to inform refusing or approving of demanded advance. When advance is approved, an e-mail is sent to the branch of bank of the unit to pay the advance value to the manager of the unit.

At unit side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, up to date advance information can be seen. In Figure 3.18, format of demand and approval of advance exchange process data is shown.

Figure 3.18 Format of demand and approval of advance exchange process data

3.2.5.2 Approval of Revenue Exchange Process

Approval process of revenue is the key point of LAS so it is also very important. Approval is performed from center to unit. Approval of revenue exchange process is performed when DTID is set "5" in the database. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the unit. An informative e-mail is also sent to the same unit to inform refusing or approving of demanded revenue.

At unit side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, up to date revenue information can be seen. In Figure 3.19, format of demand and approval of revenue exchange process data is shown.

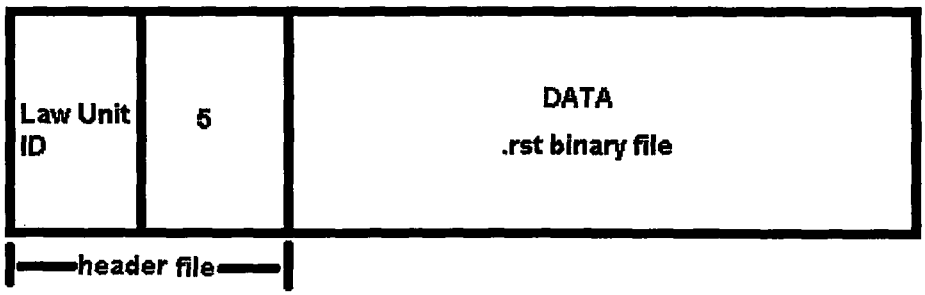

Figure 3.19 Format of demand and approval of revenue exchange process data

3.2.5.3 Premium Report Exchange Process

Approved revenues and representing fees of units are payed by center monthly. A premium report is prepared by LAS and sent when DTID is set "3" in the database. After robot initialization LEDI exchange process begins. All required data are queried, sorted by units and stored in a recordset.

In translation process, for each unit the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, for each unit created ief file is attached to an e-mail and sent to the unit. An informative e-mail, which includes premium report, is sent to the same unit to inform total money and total premium. A directive e-mail, which includes premium report, is sent to the bank of the unit to pay the money value to the manager of the unit. An informative e-mail, which includes premium report, is sent to the accountant department of the bank to inform payed total money and total premium to the unit.

At unit side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, up to date premium information can be seen. In Figure 3.20, format of premium report exchange process data is shown.

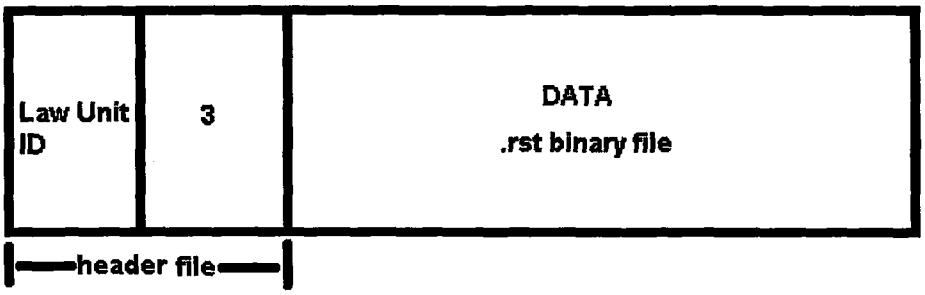

Figure 3.20 Format of premium report exchange process data

3.2.5.4 Security and Permissions Exchange Process

In LAS security is provided inside application with user rights and passwords. However, in some important cases, for example related with money operations users have no right to delete or update. In that reason some permissions are required from the center. In that case a demand and approval exchange process is required. Demand is performed from unit to center and approval is performed from center to unit. Demand and approval of permissions exchange processes are performed when DTID is set "4" or "9" with respect to rights. After robot initialization LEDI exchange process begins. All required data are queried and stored in a recordset.

- Demand of permissions process:

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the center.

In center side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, new demand of permissions can be seen.

- Approval of permissions process:

In translation process, the recordset is combined with header text file and .ief extensioned binary data file is created.

In transportation process, created ief file is attached to an e-mail and sent to the unit. An informative e-mail is also sent to the same unit to inform refusing or approving of demanded permissions.

At unit side, data e-mail is taken by transportation process. After that, ief file is extracted to recordset and database is updated using recordset. In database, up to date permissions information can be seen. In Figure 3.21, format of security and permissions exchange process data is shown.

Figure 3.21 Format of security and permissions exchange process data

3.3 Benefits of LEDI Implementation

LEDI can eliminate the need to re-enter data from paper documents and thus prevent clerical errors. Each re-entry of data is a potential source of error. It has also been estimated that the cost of processing an electronic requisition can be one-tenth the cost of handling its paper equivalent. In addition LEDI can reduce the need for personnel involved in entering data to LAS.

For example, assigned files are sent to the units by using LEDI. By means of this system, at unit side one thousand files of LAS can be opened and made ready to work on them in minutes. If LEDI did not exist, all the files would need to be entered manually to the database. Assume that entering one file takes two minutes; one thousand files take two thousand minutes of work time. Besides entering time, clerical errors would be subject to troubleshoot. In addition number of required personnel had to be increased in order to manage this data entry work successfully.

If the control mechanism were supplied manually instead of by using LEDI, it would be so much time consuming to exchange demands and approvals. LEDI

system shortens the exhange time of demands and approvals of advances, revenues and payments as well as changes, between Center and units. For example, an advance demand from unit to Center, approval from Center to unit and also information for the branch of the bank can be sent manually via fax or telephony. All of these processes consume much time that would lead to decrease in efficiency. With LEDI, advance demand from the unit is approved and replied to the unit in only afew minutes. At the same time, a directive e-mail is sent to the branch of the bank to pay advance to the lawyer of unit.

LEDI has the ability to electronically send some financial transactions such as payment directives and lists to the branches of bank and accountant department of the bank. This reduces time for some operations between law department and accounting system of the bank.

Using LEDI, delivery of word-excel documents and messages becomes fact in seconds instead of days without getting lost or damaged, thus it can be said that LEDI is a fact to improve service as well as to reduce fax, paper, printer, postage and express delivery service costs.

Using Internet and E-mail as transportation infrastructure makes LEDI cheaper then the others. Because of competitives between Internet Service Providers (ISPs), Internet usage charge is getting cheaper. Also ISPs makes Internet usable all over the country. For this reason, LAS can be used with LEDI in every unit of the law department all over the country.

Use of LAS and LEDI reduces time in many operations, so related to this law department of the bank picks more revenues. As the efficiency of law department increases, credit risks of the bank decreases. Anyway, reducing credit risks of the bank is the main duty of law department.

Information obtained from historical data built up from LEDI transactions is an invaluable source of performance and market research and strategic planning information. The process of working with units to implement LEDI can also result in the benefit of closer working relationships with the units. Implementing LEDI with units give the center the ability to control them and measure their performance easily.

It has now become apparent that the greatest value of LEDI will make the law department of the bank serve better and easier, which helps the banks to increase market share. In shortly LEDI makes the bank competitiveness.

3.4 Disadvantages and Deficiencies of LEDI

In LEDI, informal EDI data format is used. As a property of informal EDI, standardization is a deficiency. There is no international standard, so communicating with the other systemneeds to work on.

LEDI software is designed for LAS and integrated to LAS tightly; there are no generalization properties to use with other application software systems.

In LEDI, there is no online connection for viewing some documents and reports on Internet or intranet platform of the bank. This is a deficiency. For example; using ASP or/and XML (Extensible Markup Language) with LEDI, online connection can be provided.

In LEDI, when a message and data is sent to the other side, no acceptance or receipt notice is sent back. There is a log system for sending data, but it doesn't run automatically. When an e-mail is not sent correctly, it can be sent again but manually.

For a unit to be able to work with bank's law department, it must pay for LAS application software and LEDI. Buying new software may not be very attractive for a unit.

CHAPTER FOUR

CONCLUSION

In this work, a data exchange system (Law EDI or LEDI) was designed by using Electronic Data Interchange (EDI) via e-mail. This application is used for transfering data, messages and some documents between the same client-server Law Automation applications running at geographically different places.

For this new data exchange system, a specific format was developed for EDI instead of using its standard formats and e-mail was used to transfer formatted data.

LEDI eliminates the need to re-enter data from paper documents and thus prevent clerical errors. Each re-entry of data is a potential source of error. It has also been estimated that the cost of processing an electronic requisition can be one-tenth the cost of handling its paper equivalent. In addition LEDI can reduce the need for personnel involved in entering data to LAS.

Using Internet and E-mail as transportation infrastructure makes LEDI cheaper. Because of competitives between Internet Service Providers (ISPs), Internet usage charge is getting cheaper. Also ISPs makes Internet usable all over the country. For this reason, LAS can be used with LEDI in every unit of the law department all over the country.

LEDI software is currently designed for LAS. In future, a formal data exchange format like ANSI X12 or EDIFACT can be created and using this standard data exchange format, an independent LEDI software, which can be run with any other systems, can be developed.

In the event, a more secure environment may be desired while exchanging data. For this, computer system firewalls, access controls, and commercial off the shelf encryption and digital signatures can be used. Computer system firewalls and access controls can be employed to protect the system, application, and data from unauthorized users and to ensure confidentiality of the data. Encryption and digital

signatures can be included in standard browser software used to exchange electronic messages.

By means of data integrity between units and the Center, receipt notices and acceptance notices can be added. Receipt notices can verify that a LEDI message has been received, and acceptance notices verify that data has been accepted or an error has occured before data acceptence and data needs to be resent.

These can be as simple as e-mail notices. If there are problems with the data, the e-mail could include an error report attachment that could help the contractor pinpoint data problems. Also the log system of LEDI that is used at the present time and works manually, can be reformed to work automatically.

LEDI allows data to be extracted and read from one database into a separate database for further analysis and reporting. For users who want to go beyond viewing data on-line, on-line access and LEDI could be combined in an environment. For example, a secure Internet site could be established to allow the bank branches to view the reports and graphs. In the event the customer wanted to extract the data for further analysis, a download option could also be included on the WWW page. This download function would use the LEDI format to provide the data to the bank branch in a standard format. This approach also embraces the future of standards on the Internet including XML or extensible markup language, which is a method for extending and annotating HTML (hypertext markup language).

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