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Assessing Needs in EDI Implementation

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ABSTRACT

Assessing Needs in EDI Implementation

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Electronic data interchange (EDI) promises to bring profound changes to the business world. However, for many organizations, its implementation has been less than satisfactory. A needs assessment research approach was used to uncover the problems associated with EDI implementation and to identify possible causes and solutions to such problems. The process of applying the needs assessment approach to this problem is first described. A brief explanation of the context is given, both EDI and needs assessment are explained and examined through literature reviews, and the methods used to conduct the needs assessment are described. The method of data collection implemented was telephone survey, using a structured interview protocol. Data were collected from forty-eight respondents representing forty-three EDI-capable organizations across Canada and the United States. EDI was well-established in most of these organizations. The majority of the problems reported stem from the partnership relationship. Organizations seem ill-prepared to enter into this new way of conducting business. The results strongly suggest that lack of knowledge is an important cause for the difficulties reported. Major problems were: the misuse of standards; lack of EDI capability among organizations; insufficient senior management commitment to EDI. Recommendations are made with respect to the types of educational interventions which could be considered to move from actual to optimal situations. Recommended educational interventions focus on four areas: Motivation, Comprehension, Application and Evolution. By examining needs across a wide variety of organizational contexts, as opposed to the standard application within a single organization, this thesis represents a unique application of needs assessment methodology.

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Chapter 1

INTRODUCTION AND BACKGROUND TO THE PROBLEM

Problem Statement

One of the most far-reaching technological developments to be introduced into the marketplace is EDI (Electronic Data Interchange). Although EDI is regarded as a major breakthrough by many organizations, its implementation is not proceeding as smoothly as anticipated. The problems with EDI implementation experienced by organizations seem to emerge from organizational rather than technical issues (Reed, 1991; Jenkins & Lancashire, 1991; Holland, Lockett & Blackman, 1992b). Implementing new technology in an organization will, according to Sankar, "impact on all elements of culture, such as behavioral patterns, norms and values, the organizational climate, rules of the game, organizational ideology, and so on" (1991, p. 75).

The greatest challenge facing organizations with regard to EDI implementation seems to be dealing with the changes it necessitates. The subject of change appears to be the central issue in the way organizations view EDI: "EDI implementation is difficult because EDI is much more than a technical tool - it is a cultural change"(Emmelhainz, 1990, p. 155). Because EDI can affect many aspects of a business, it threatens to change business practices, roles, job descriptions and more (Barber, 1990; Dookheran, 1990; Holland et al., 1992b). Barber prefers to view these changes as a transformation which he defines as follows: "Transformation refers to the process of rethinking all of the traditional aspects of our business and to the process of fundamental enterprise-wide change. Enterprise-wide transformation is significantly more complex than the typical technology installation and implementation approach" (1990, p. 44).

The purpose of the research described in this thesis was to identify the problems associated with EDI implementation, provide insight into the causes of the problems and

contribute to solving these problems. As Reed states: "For the full potential of EDI to be realized, it is imperative to understand the root causes for the vast majority of less than satisfactory results" (1991, p. 20).

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What is EDI?

EDI is a concept made possible by technological advances in communications which support electronic networks. EDI is defined as: "a conceptual development of fast information flows across organisational boundaries enabled by computerised information systems" (Holland et al., 1992b, p. 16).

EDI essentially involves two computers, in different organizations, sharing information with minimal human intervention. This information usually consists of, but is not limited to, standardized business documents such as purchase orders or invoices. The information is transmitted electronically between organizations and their suppliers and/or clients, who are called trading partners.

EDI was introduced in the late 1960s and is currently being used by organizations in many fields. These include manufacturing, the food industry, distribution, retail, banking, health care, the automotive industry and government. The benefits of "doing" EDI are numerous and among them are: gaining a competitive edge; increasing speed and certainty; reducing costs; and lowering inventory (Boland, 1989; Emmelhainz, 1990).

EDI is a unique innovation for several reasons: 1) it requires minimal human intervention; 2) it virtually eliminates paper, making the concept of a "paperless office" a plausible reality; 3) it requires the cooperation of at least two firms; 4) its communication capacity allows it to be applied on national and international levels (Emmelhainz, 1990). However, what sets it apart is its impact on the way organizations do business. From examining data flows to re-evaluating company philosophy and management approaches,

EDI implementation requires that organizations take a closer look at how they function. This is because the impact of EDI is felt throughout the whole organization and beyond. Emmelhainz states: "... the implementation of EDI will not only have a significant impact on technology and on processes, both within and outside the organization, but it will also impact on people and management philosophy" (1990, p. 155).

The impact of EDI on corporate identities and on world trade promises to be tremendous.

Problem Indicators

The failure of certain companies to successfully implement EDI has been attributed to certain implementation barriers. Farhoomand (1992) reports five implementation barriers based on a survey of 382 respondents. They are: 1) management attitude; 2) system cost; 3) lack of training; 4) lack of standards; 5) security concerns. No details were given on any of these items.

Barber (1990) saw EDI implementation barriers as: the need to educate users and partners; the need to adapt structures and procedures; resistance by middle and top management. Although he does not elaborate on the nature of these barriers, Barber does go on to say: "We have learned that traditional approaches are not sufficient to drive large-scale organizational change through an enterprise, let alone externally to trading partners" (p. 145).

Of the barriers to successful implementation, lack of education and training is perhaps the one most often cited in the literature. Rosenberg writes: "We are finally coming to understand that the abilities of our people will determine whether our enterprises succeed or fail during the next decade" (1990, p. 43). Knowledge requirements have been documented by, among others, Emmelhainz (1990) and Carter, Monczka, Clauson and Zelinski (1989). However, the precise nature of that knowledge

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and how it should be transmitted have not been specified. This can be illustrated by the following example. Carter et al. (1989) state that with respect to knowledge about EDI standards (ANSI X12), MIS (Management Information Systems) staff and users require the knowledge and it would be desirable for management, buyers and employees in the auditing department to have it. However, nothing is mentioned about the depth of knowledge each group should have or about the means by which these staff members are to obtain this knowledge.

Towards a Solution

An international EDI agency headquartered in Montreal, Canada, whose mandate is to promote EDI use, was concerned with the problems organizations were experiencing with EDI implementation and wished to take corrective actions. It approached educational technologists at Concordia University in Montreal to investigate the situation and identify the problems associated with implementation. As one of the aspects of the agency's mandate is to provide training and education for its members, and considering the paucity of available information regarding the nature of the problems believed to stem from a lack of education, the agency was particularly interested in finding out how training and education could be applied to solve whatever problems were identified.

A needs assessment was proposed to clarify and further define the problems ensuing from EDI implementation and to gather useful information in order to develop appropriate solutions to these problems. Because of the agency's educational mandate and because of the evidence in the literature that education was lacking, the focus of the needs assessment was on those problems for which training and education would be appropriate solutions. The needs assessment, however, was designed to allow other problems, as well as other solutions, to surface.

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The Needs Assessment Approach

Purpose

Although there has been much reported on the need for training and education, specific areas of intervention have not been precisely identified. The purpose of the needs assessment was to solicit information about problems, causes and solutions with respect to EDI implementation from individuals with extensive EDI experience in order to assess needs and opportunities for useful training and education.

Training and education are solutions for problems that involve a lack of skill, knowledge or motivation (Rossett, 1987). It is important to remember, however, that problems can be caused by a variety of factors including the environment, company policies and lack of support. Also, training is often prescribed as a solution regardless of the nature of a problem (Rossett, 1987). As Mager and Pipe point out: "Until the problem is understood in greater detail, proposing a solution is simply shooting from the hip" (1984, p.2).

Rossett (1987) describes five purposes for conducting a needs assessment: 1) to seek actual performances; 2) to seek optimal performances; 3) to gain knowledge about how those affected feel; 4) to unearth the causes of the problems; and 5) to develop solutions to the problems. According to Mayer, "The ultimate purpose of a needs assessment is to ensure that our efforts, time and money are spent on programs and interventions which are useful, in that they contribute to improving performance"(1986, p. 117). Needs assessments "identify, document and justify gaps in results, and select the most important for attention." (Kaufman 1986, p. 24). Gaps are also called needs and needs reflect problems, sometimes called performance problems. Indeed, Kaufman (1985) insists that if a need does not exist then there is no problem. The problem indicators described previously clearly point to discrepancies between what is now taking

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place with EDI implementation and what shôuld be taking place. Barriers to EDI implementation are essentially barriers to an organization's optimal performance using EDI.

The needs assessment was used to identify and better understand the problems associated with EDI implementation by: 1) determining the effects EDI implementation is presently having on organizations and what actions organizations are currently taking in light of these effects (actuals); 2) determining the ways in which EDI implementation could be carried out without adverse effects (optimals); 3) gathering information about the opinions and feelings of those involved with EDI, with respect to EDI implementation, including their views on possible causes and solutions.

The needs assessment provided information which can be used to help potential EDI users avoid currently existing implementation barriers. The information will be used to design training and education for those needs or gaps requiring such a solution. Needs necessitating other types of intervention will be made known to EDI users and EDI agencies, such as the EDI World Institute (EDIWI) so that appropriate solutions can be developed.

Methods

The needs assessment research approach involved a review of the EDI literature and 48 telephone interviews. Reviewing the literature provided an overview of the general situation concerning EDI implementation as well as background information about current EDI issues facing organizations. The information garnered from the literature review formed the basis of an interview guide which was used to facilitate the interviewing process.

The interviews were conducted among EDI capable organizations across the United States and Canada. In order to obtain various perspectives of EDI implementation issues

and needs, it was initially hoped that employees involved with EDI from different organizational levels (senior management, middle management, EDI expert and direct user) would be reached, however, this was not realized. With the exception of a few direct EDI users, only EDI champions or experts were interviewed.

The interviews yielded a great deal of direct, current information about the actual problems facing the organizations in the sample. Respondents were given the opportunity to freely express their concerns regarding EDI implementation. They also provided a wealth of information with respect to possible causes and solutions to the problems they described.

Project Description

This thesis provides a detailed description of the needs assessment research described above. It is divided into five chapters.

Chapter 2 reviews the literature regarding both EDI and needs assessment. Because the widespread use of EDI is a relatively new phenomenon, particular attention has been given to familiarizing the reader with its characteristics. Implementation problems and barriers described in the literature are also examined as are implications and opportunities for training and education.

The review of the needs assessment literature describes different approaches and perspectives to needs assessment advanced by various authors, including the definition of a need, the purpose of a needs assessment, its role in performance technology and its value in training and education.

Chapter 3 traces the history of this particular needs assessment project and describes the methodology used. The constraints and challenges of the project are also discussed.

Chapter 4 presents the results of the telephone interviews. It begins by explaining the data analysis procedure. It then describes the participants in the study and includes both individual and organizational profiles. The chapter also lists the problems described by respondents and provides detailed descriptions of the three major problems, including the causes and solutions which were suggested by respondents. The final section of the chapter reports the results obtained with respect to the issues addressed in the interview guide.

Chapter 5 compares the results of the needs assessment to the literature. This chapter also presents recommendations, drawn primarily from respondents' comments, for educational interventions.

Chapter 2

LITERATURE REVIEW

Because there are two important issues in this project, this chapter is divided into two sections. The first section reviews the literature relating to EDI and the second section reviews the literature concerning needs assessment.

Section 1: A Review of the EDI Literature

EDI is a complex issue. The following pages describe what EDI is both from a technical point of view and as a business practice. EDI's impact on organizations is also examined. This section ends with a discussion on the opportunities and implications for training and education with respect to EDI implementation.

What EDI Is Not

Before describing what EDI is, it is important to understand what it isn't. EDI is not fax or E-mail. Both of these methods of communication lack a "structured, machine-processable format" which, according to Emmelhainz (1990), is a key EDI concept . Although a fax is a digitized image of a document over telephone channels, it is not structured, cannot be processed without rekeying and using paper (Emmelhainz, 1990).

E-mail allows people to communicate person-to-person through the use of a computer. This is in contrast to EDI where there is computer to computer communication. E-mail is used to replace phone calls or letters. Whereas EDI data are highly structured, data transmitted by E-mail are unstructured and in a free format and must be interpreted and

rekeyed if they are to be processed by a computer (Baker, 1991; Dalton, 1989; Emmelhainz, 1990). Baker, however, views EDI as a sophisticated form of E-mail. In summary, when a message goes from one computer to another but then must be printed and retyped (human intervention) it is not true EDI (Emmelhainz, 1990; Pitts, 1992). Pitts observes that there are organizations who "implement electronic communication (fax, phone, data transmission) and call it EDI" (p. 19). EDI also differs from E-mail and fax because it uses standards (Jenkins & Lancashire, 1992).

A Brief History of EDI

Although not in itself a technology, EDI (Electronic Data Interchange) was developed using telecommunications technology, the result, according to Jenkins and Lancashire (1991) of the compatibility between computer and telephone technology. Recent advances in the area of electronic networks have contributed to an increased use of EDI.

Although widespread use of EDI in business began only in the last decade (Holland et al., 1992b), EDI was first used in the mid-1960s in the United States by the transportation, particularly rail, and automotive industries (Baker, 1991; Emmelhainz, 1990; Lauzon, 1991). In Canada, EDI began to be used in the early 1980s by the grocery and pharmaceutical industries (Jenkins & Lancashire, 1991; Lauzon & Botting, 1993) when two companies (Procter & Gamble and Drug Trading) succeeded in exchanging purchase orders and invoices without using paper. In 1985, the EDI Council of Canada was founded to assist companies in the implementation and use of EDI (Jenkins & Lancashire, 1991).

Around the mid-1980s, the use of EDI expanded significantly as large organizations insisted on trading electronically with their trading partners (Emmelhainz, 1990).

According to Kerr (1993), the EDI market in North America is growing by 20% annually. Peters (1992) believes that organizations will not be able to function without EDI.

What Is EDI?

There are basically two ways of looking at EDI: as a technical innovation and as a new approach to business in terms of managing information. EDI is a means of delivering or exchanging business documents "more quickly and accurately than conventional methods" (Baker, 1991). Holland et al. (1992a) present this definition of EDI produced by the U.K. Department of Trade and Industry:

> At its simplest, EDI is the process of computer-to-computer business-to-business transaction transfer. EDI involves the direct routing of information from one computer to another without interpretation or transcription by people, and to achieve this the information must be structured according to predefined formats and rules which a computer can use directly (p. 1).

The aspects that make EDI unique are the lack of human intervention and the concept of using a standard format to exchange information.

According to Emmelhainz (1990), EDI is a means of exchanging business documents that is quickly becoming the norm. Indeed, she emphasizes that EDI is becoming a necessity in many industries. Emmelhainz gives the following definition of EDI: "Electronic Data Interchange is the inter organizational exchange of business documentation in structured machine-processable form" (1990, p. 4). According to Emmelhainz, EDI is a tool that will not only eliminate paper but will also replace manual data entry with electronic data entry.

EDI as a Technical Innovation

The traditional method for exchanging business documents involves many steps. For example, the buyer entered the information into the computer to create a purchase order (P.O.), which was then printed. The printed P.O. was sent via mail, fax or personal delivery to a supplier. The supplier then entered the information into his or her computer. With EDI, information is entered once and transmitted electronically directly into a supplier's computer. According to Emmelhainz (1990), a typical transaction between a buyer and a supplier with traditional methods can involve as many as 22 steps, including rekeying information that is often redundant e.g., the P.O. number is entered each time the P.O. is handled. This not only increases the time spent on processing each P.O., it also increases the risk of error. Many of these steps can be done using EDI, without human intervention.

Firms can exchange many different types of business documents via EDI. These include P.O.s, P.O. acknowledgments, P.O. change requests, invoices, shipping notices, receiving advices and requests for quotations (Emmelhainz, 1990) as well as planning schedules, release notices, bills of lading and status reports (Lauzon & Botting, 1993). Some companies use EDI for only one or two types of documents while others use EDI for many transactions with many partners.

EDI can also be linked to other technologies to render them more efficient. Such technologies include bar coding and imaging (Lavery, 1993). Some of the steps in a typical business transaction between a customer and a supplier which can be done automatically through EDI are listed in Table 1.

Table 1
Steps in a Typical Business Transaction Which Can Be Done with EDI

- identifying an item and generating a P.O.;

- creating an order record (by supplier);

- acknowledging a P.O.;

- creating a status request;

- creating a status reply;

- creating a ship notice;

- producing an invoice;

- producing a payment authorization;

- issuing a cheque;

- updating accounts receivable.

Components of EDI. Emmelhainz (1990) assures us that EDI technology is not complicated. In order to receive or send an EDI message the following components are required:

1) a computer (Baker, 1991);

2) at least one trading partner (Holland et al., 1992a; Patrick, 1988);

3) a communication link (Baker, 1991; Emmelhainz, 1990; Jenkins & Lancashire, 1991; Walker, 1988);

4) standards (Emmelhainz, 1990; Walker, 1988);

5) EDI software (Baker, 1991; Emmelhainz, 1990; Jenkins & Lancashire, 1991; Walker, 1988).

Each of these components is described below.

A Computer - EDI transactions can run on micro (personal), mini or mainframe computers (Emmelhainz, 1990; Lauzon, 1991; Wolvelaere & Tannenwald, 1991).

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According to studies conducted in Canada, the micro computer seems to be the most popular platform (Institut EDI, 1992; Lauzon & Botting, 1993).

A Trading Partner - EDI is a unique application in that it requires the cooperation of at least another firm (Holland et al., 1992a). Two firms that exchange business documents using EDI are called trading partners. Kimberly (1991) defines a trading partner in the following manner: " ... any company, government department, or commercial or non commercial entity with whom an organization regularly exchanges documents containing formatted data (i.e., not just memos and letters) as a normal consequence of carrying out business or governmental functions" (p.6). As Patrick (1988) states: "EDI can only be used with the cooperation of trading partners" (p.230). Partners, according to McWilliams (1992), become an "integral part" of business.

A Communication Link - An EDI transaction can be carried out through a direct link from one firm's computer to another firm's computer (point to point) or by using what is known as a third party network, often referred to as a VAN or Value Added Network (Emmelhainz, 1990) and also called an electronic post office because it performs the tasks traditionally assigned to a post office (Jenkins & Lancashire, 1991).

With a VAN, a client is provided with an electronic mailbox which stores EDI messages, functions 24 hours a day and enables companies to avoid the problems associated with dealing with many trading partners. VANs use phone or data lines (modems). Firms need to make only one call or transmission to a VAN instead of reaching each trading partner (Emmelhainz, 1990; Jenkins & Lancashire, 1991). VANs also allow firms to use different communication protocols.

When a VAN receives electronic messages, it distributes them to the appropriate mailboxes and concerned trading partners check their mailboxes (Emmelhainz, 1990). VANs can also receive documents in a format specific to a particular firm and translate it into another firm's format. This and the other services offered by VANs (e.g., conversion from paper to EDI; security measures such as encryption and authentication; installation and

training) are what has earned them the name "value added". Organizations tend to use VANs as the number of their trading partners increases because, according to Emmelhainz, it is difficult and costly to keep many lines of communication open. The data are still transmitted electronically.

Standards -   The use of standards is one of the characteristics that defines EDI. Standards make up the common language trading partners must use to exchange business documents with EDI. Wolvelaere and Tannenwald (1991) offer the following definition of an EDI standard: "... a universal message format for common business forms, such as invoices, P.O.s or requests for price quotations" (p.8). In order for EDI messages to be transmitted directly from one firm's computer to another's, they have to be in a standard format. Although this may sound unusual, it really isn't if one considers that most business documents are already in some standard format (Jenkins & Lancashire, 1991). For example, for paper documents there is a format for a P.O., one for an invoice, etc. Each firm, however, has its own standard form for each of these documents. This means that the person who receives such a document must recognize the type of document it is and interpret the information it contains. In order for a computer to recognize the type of document and interpret the information without human intervention, a standard format is necessary because, as Emmelhainz (1990) points out, computers cannot interpret information the way humans can.

With EDI, a specific business document such as a P.O., is called a transaction set. Each transaction set is assigned a code (the code for a P.O. is 850) that identifies that particular transaction set (Emmelhainz, 1990). With standards, every firm's electronic P.O. will 'look' the same. Thanks in large part to standards, EDI transactions can take place "between totally different systems environments with very different equipment, hardware, operating systems and applications" (Chan, Govindan, Picard, Takach & Wright, 1991, p. 4).

Emmelhainz (1990) calls EDI standards rules of format and syntax and distinguishes between two types of standards:

1) formatting standards;

2) communication standards.

Formatting standards accommodate information about the type of document, the information to include, the sequence the information should follow and the form it should take, and the meaning the of individual pieces of information. Communication standards accommodate information about the type of electronic environment, the baud rate and the protocol by which the message is to be sent and the time.

Robinson (1992) identifies three different areas of standards use: controls, dictionaries and transaction sets. Controls define syntax, interchange rules and security. Dictionaries define segments and data elements that are used to construct transaction sets. Transaction sets define format and data content for trading via EDI.

At the onset of EDI use, large companies developed their own standards. These standards, used by one firm, are called proprietary standards (Jenkins & Lancashire, 1991). These later became a source of confusion as firms had different standards. Consequently, there was a move to adopt a common standard. The standard most businesses in North America are adopting is ANSI X 12 (American National Standard Industry X 12). Indeed, in surveys of EDI users in Canada, Lauzon and Botting (1993) and Farhoomand (1992) found that the ANSI X 12 standard is the one most used and Wolvelaere and Tannenwald (1991) report that it is the standard most accepted in the United States. In Europe, the most prevalent standard is the U.N. standard called EDIFACT - EDI for Administration, Commerce and Transport (Jenkins & Lancashire, 1991).

Rusk (1992) stresses that all organizations using EDI should not only use standards but the same standards should be used in order to communicate more effectively. She writes: "Everyone, sender and receiver, must use the same EDI standard so that everyone is

speaking the same language (p. 6)." Oravec (1993) urges companies to adopt only systems which will support accepted standards.

EDI Software - Wolvelaere and Tannenwald (1991) define EDI software, often called translation software, as follows: "Translation software allows a transaction generated by one trading partner to be formatted according to an EDI message standard" (p.12). According to Emmelhainz (1990), EDI translation software can be developed in house or bought and has three main functions. It

      1) converts data (extraction);

      2) formats data (generation);

      3) communicates messages (communication).

Emmelhainz (1990) also describes another type of EDI software, one which she calls 'bridging software'. This type of software allows organizations to link different applications programs. For example, bridging software can serve to link an order entry program with an invoicing program.

Another type of EDI software is described by Jenkins and Lancashire (1991) as an applications interface which is used to produce documents such as P.O.s and invoices.

EDI as a New Approach to Business

There is little doubt that EDI represents an exciting technological advance. However, what sets it apart from other technologies is the role it can play in the way organizations are managed. According to Baker (1991), EDI is a "management function not a technical one" and Emmelhainz (1990) states: "... EDI is doing more that just changing how businesses communicate; it is changing the way businesses operate" (p. xiii).

EDI is a concept that encompasses a powerful technological element which in turn promises to influence and modify traditional business approaches. For example, because EDI allows a company to operate with greater speed and to improve its production processes, it can be applied to support and enhance such business practices as Just in Time

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(JIT) and Quick Response (Baker, 1991; Brooks, 1992; Jilovec, 1993; Kerr, 1993; McWilliams, 1992) as well as a Total Quality business approach (Emmelhainz & Emmelhainz, 1992; Reed, 1991). Heflin (1993), however, warns that it is crucial for organizations to integrate EDI into their existing business systems or they will not be able to reap as many benefits from using EDI as organizations who have integrated it.

In a study of 18 U.S. and 7 European companies in industrial sectors such as electronics, transportation, engineering, banking, health care, manufacturing, distribution and retailing, Holland et al. (1992b) found that with respect to EDI, "organisational, strategic and marketing issues were more important than the technical issues" (p. 25).

Stone and Hill (1993) call EDI a "knowledge-based technology" and Lavery (1991) believes that only companies that view EDI as "a means of managing information more effectively" can realize its full benefits.

It is difficult to speak of EDI as a business approach without addressing the enormous change it promises to effect on the organizations who adopt it. For this reason, a section detailing EDI's impact can be found further in this chapter.

Who Uses EDI?

EDI is used by large and small firms in a wide variety of industries (Emmelhainz, 1990). Emmelhainz reports that EDI is used in over 50 industries, including transportation, grocery, automotive, electronics, chemical, retail, health care, warehousing, the U.S. federal government. Lauzon and Botting (1993) add finance, books and publishing, telecommunications, office supplies, pulp and paper, pharmaceuticals, metallurgy and mines, and heavy machinery to the list while Farhoomand (1992) adds insurance, the Canadian government and utility companies. As Holland et al. (1992a) state:

"... EDI is not limited to high tech industries and is being applied successfully in less glamorous businesses" (p. 541).

According to Emmelhainz (1990), organizations who have adopted EDI usually handle a large volume of repetitive standard actions, operate on a tight margin, face strong competition and operate in a time sensitive environment. Chan et al. (1991) state: "EDI environments are characterized by high volumes, high speeds and low human intervention" (p. 43).

Why Do EDI?

Organizations are realizing that to increase their efficiency and profitability they must implement EDI (Lauzon & Botting, 1993). EDI responds to a need for a more rapid and accurate exchange of information between firms (Kimberley, 1991). As Rockart and Short (1989, p. 8) write: "Competitive pressures are now forcing almost all major firms to become global in scope, to decrease time to market, and to redouble their efforts to manage risk, service and cost on a truly international scale."

There are both benefits and drawbacks to using EDI. Below is a description of the major advantages and disadvantages culled from the literature and reported in surveys.

Advantages

Increased speed was the benefit most often mentioned (Baker, 1991; Calderwood, 1991; Emmelhainz, 1990; Holland et al., 1992a; Jenkins & Lancashire, 1991; Kimberley, 1991; Turnbull, 1988; Wolvelaere & Tannenwald, 1991). Speed included a reduction in transaction time and in cycle time. In the words of Holland et al. (1992a) : "EDI links remove the constraints on volume and speed of information flows between separate organizations" (p. 544).

The elimination of duplicated data entry was also high on the list (Baker, 1991; Calderwood, 1991; Emmelhainz, 1990; Kimberley, 1991). Cost reduction was also considered an important benefit (Baker, 1991; Boland, 1989; Chan et al, 1991; Emmelhainz, 1990; Lauzon, 1991; Reed, 1991; Wolvelaere & Tannenwald, 1991). Cost reductions were seen in terms of labour costs and a reduction in the administration of paperwork. Quicker and better access to information (Chan et al, 1991; Emmelhainz, 1990; Lauzon, 1991; Reed, 1991) was reported as a benefit because information was more readily available to provide to the customer, which in turn led to improved customer service (Baker, 1991; Chan et al, 1991; Emmelhainz, 1990; Lauzon, 1991). This more efficient access to information was also reported to improve trading partner relationships due to the fact that companies could now share information regarding not only stock and orders but also about production schedules (Emmelhainz, 1990; Lauzon, 1991; Reed, 1991). This information allows suppliers to produce and supply what is needed when it is needed. Because relevant and timely information helps customers to plan better, EDI adds value to the information (Holland et al., 1992a). As Baker (1991) states: " ... the system can respond almost instantly to consumer demand" (p. viii).

Other benefits cited were:

- reduction in errors, especially considering large volumes (Baker, 1991; Calderwood, 1991; Chan et al., 1991; Emmelhainz, 1990; Holland et al., 1992a);

- market competitiveness (Baker, 1991; Boland, 1989; Chan et al., 1991; Emmelhainz, 1990);

- reduction in inventory (Emmelhainz, 1990; Lauzon, 1991; Wolvelaere & Tannenwald, 1991);

- improvement in management practices (Baker, 1991; Emmelhainz, 1990).

Lauzon and Botting (1993) add the following on the subject of benefits of using EDI: "... when used to full advantage, EDI can help increase business effectiveness" (p. 18).

Speaking from the perspective the organization, Patrick (1988) writes: "EDI will allow us to concentrate on the things that matter and thus be better at them" (p. 236).

Disadvantages

Although the benefits seem to far outweigh the disadvantages, benefits are only truly felt over the long term (Baker, 1991), particularly after EDI is well-established in an organization and particularly if EDI is part of an organization's overall business strategy (Boland, 1989). In light of this, it is not surprising that for EDI, the disadvantages are primarily related to implementation costs. Baker (1991) cites the following disadvantages:

- requires a large investment;
- benefits are only long-term;
- many changes are required;
- small businesses are strained due to costs;
- there are potential legal and security risks.

Emmelhainz (1990) adds the following costs:

- training;
- costs of transmissions;
- loss of float.

Reed (1991) believes that EDI use may reduce the number of phone calls and face-to-face conversations. Although this will save time, Reed fears that it may result in a loss of new ideas, often generated between people.

The Implementation Process

Approaches to Implementation

Successful EDI implementation requires willingness, investment and faith from organizations as well as a solid implementation plan. The literature proposes several

approaches for implementation and although a detailed discussion of the implementation process is beyond the scope of this work, three different approaches have been selected in order to provide insight into what organizations must consider and what actions they must take during this process. The steps recommended by the authors of the various approaches are briefly presented below.

Holland et al. (1992b) provide a general three-stage model for implementing EDI:

1) discovery;

2) data exchange;

3) strategic application.

During the discovery stage an organization develops its implementation and education plans. In the data exchange stage an organization has a working EDI system and at the strategic application phase, an organization experiments with new applications and increases its use of EDI by redesigning its business processes in order to take better advantage of EDI's possibilities.

Baker (1991) recommends the following four steps in EDI implementation:

1) master the technology;

2) implement EDI with application programs;

3) obtain the cooperation of trading partners;

4) use EDI as a strategic advantage.

Emmelhainz (1990) writes: "Implementing EDI requires a two-prong approach: one for technical issues and one for organizational and cultural issues" (p. 125). She proposes a more detailed approach:

decide on a EDI strategy in terms of how comprehensive and how integrated will EDI be;

- obtain senior management support;

- establish project team;

- obtain and conduct education programs;

- perform an EDI audit to understand flow of information;

- develop preliminary cost/benefit analysis;

- select EDI participants (trading partners, VAN, vendor);

- map with trading partners by coordinating efforts and establish ground rules;

- establish EDI contracts with trading partners;

- conduct a pilot test;

- expand EDI usage beyond pilot;

- publicize.

Emmelhainz warns, however, that for "EDI to be successful, its implementation must focus on attitudes and behaviors, not just on implementation steps" (1990, p. 155).

Reactive and Proactive Implementation

Although many types of businesses use EDI, there are companies that have adopted it on their own initiative and others that have adopted it at the request of a trading partner, most often a customer or client (Wolvelaere & Tannenwald, 1991). These proactive and reactive approaches to EDI affect the way in which an organization views EDI (Holland et al., 1992a). Those organizations who have been proactive, mostly large companies with many trading partners, have been able to take the time to plan their EDI implementation process. Those that have been forced to adopt it, may have had to implement EDI quickly and under pressure, leaving little time to consider EDI's impact on their organization. Examples can be found in the automotive and grocery industries. They have also had little time to think about the kind of trading terms they want or need and the type of EDI link they wish to establish (Holland et al., 1992a). According to Jackson (1988), an EDI implementation is easier to plan when it is not forced by a trading partner.

Lauzon (1991) reports that the majority of EDI users in Quebec who responded to his survey, adopted EDI at the request of a client while only a quarter of the respondents took a proactive approach. Farhoomand (1992) surveyed EDI users across Canada and found that

the majority of respondents had begun using EDI at the request of a trading partner. A survey of Canadian EDI users confirms this (Lauzon & Botting, 1993).

Barriers to Implementation

Despite the many benefits promised by EDI, many firms are still reluctant to adopt EDI. The literature suggests that this might be due primarily to a number of implementation barriers, the most important of which are described below.

Lack of Training and Education.

Lack of training and education is often described as a major barrier to EDI implementation. In a survey conducted by Lauzon and Botting (1993), based on customer lists of major EDI vendors and member lists of the EDI Council of Canada (EDICC) and of the EDI World Institute, respondents reported that one of the main difficulties in implementing EDI was a lack of training for EDI users.

In an earlier study conducted by Quebec's department of communications and the EDICC to determine the state of EDI in Canada, Lauzon (1991, p. 151) reports that "Lack of education was seen as the biggest barrier to implementation". No information was given about the type of training or education that was lacking nor were those most likely to benefit from training identified.

Based on a survey of 382 respondents, Farhoomand (1992) also reports lack of training as a major barrier to EDI implementation in Canada. A study by Institut EDI (1992) also revealed lack of user training as a barrier. The same study also showed a related factor - inadequate knowledge of EDI technology.

Referring to stud.es conducted by the Financial Executives Research Foundation in the United States, Emmelhainz (1990) reports that training-related factors were considered "important" or "very important" as a reason for delays in implementing EDI. She states: "Lack of knowledge of EDI has been identified as one of the major barriers to EDI implementation"(p. 153). Lavery (1991) also describes lack of EDI training, particularly education focusing on the business aspects of EDI, as the main barrier to EDI

implementation. Stone and Hill (1993) assert that a lack of education has been responsible for what they view as the relatively slow growth of EDI. The lack of training and education for senior management had also created a barrier (Baker, 1991; Emmelhainz, 1990; Farhoomand, 1992; Jenkins & Lancashire, 1991; Jilovec, 1993).

Lack of Senior Management Commitment. Another barrier often mentioned, closely related to the last point of the preceding paragraph, was lack of senior management commitment to EDI (Baker, 1991; Chan et al, 1991; Institut EDI, 1992; Jenkins & Lancashire, 1991, 1992; Lauzon, 1991). According to Jenkins and Lancashire (1992), this results in a lack of resources, funds and personnel.

Other Barriers. Other barriers to implementation include: integration differences (Baker, 1991; Chan et al, 1991; Jenkins & Lancashire, 1991; Lauzon, 1991; McWilliams, 1992); changing from paper to electronic format (Emmelhainz, 1990; Kimberley, 1991); a lack of commitment from partners (Baker, 1991; Lauzon, 1991; Lauzon & Botting, 1993); the perception that EDI implementation is excessively costly (Emmelhainz, 1990); viewing EDI as merely a technical issue and not a business issue (Jilovec, 1993; Stone & Hill, 1993).

Emmelhainz (1990) feels that the barriers to EDI implementation are mostly perceived and stem from a lack of information. She states that "potential EDI users are often misinformed about EDI" and believes that education is necessary to overcome most of the barriers.

Success Factors in Implementation

The literature recommends certain actions to overcome the barriers to EDI implementation and to ensure success.

Education. Because lack of education was described in the literature as a major barrier, several authors recommend that organizations educate and train their staff in order to reduce this barrier (Baker, 1991; Emmelhainz, 1990; Jilovec, 1993; Kimberley, 1991; Lauzon & Botting, 1993; Lavery, 1991; Reed, 1991; Wolvelaere & Tannenwald, 1991). As Emmelhainz states: "The organization needs a thorough understanding of what EDI is and how it works" (p. 129). Lavery believes that such education should focus on both the technical and the business aspects of EDI and should address the day-to-day concerns of organizations. Lavery also believes that because EDI is more effective if cooperation exists between technical and managerial staff, this education should be directed at both groups to ensure that each will have insight into the other's problems.

Baker (1991), Jenkins and Lancashire (1991) and Kimberley (1991) add that customers (trading partners) must also be educated. Carter et al. (1989) believe that the objective of EDI education is to gain commitment to EDI; they stress that employees from all departments affected by EDI should receive training.

Senior Management Commitment. Because the lack of senior management commitment was cited as another prominent barrier to implementation, it is not surprising that several authors urge organizations to secure the support of their senior management before beginning the implementation process. (Chan et al., 1991; Emmelhainz, 1990; Institut EDI, 1992; Jenkins & Lancashire, 1991; Lauzon & Botting, 1993; Reed, 1991). Baker (1991) and Boland (1989) stress that to be successful, EDI should be considered part of the overall business strategy and Reed (1991) believes that EDI should be linked to a corporate vision. An organization's senior management can play an instrumental role in ensuring that EDI is viewed in this way. Indeed, Reed states: "Executive vision at the corporate management level is key to successful utilization of EDI" (p. 138).

Pilot Test. Several authors stress the importance of conducting a pilot test with a partner prior to implementation (Baker, 1991; Emmelhainz, 1990; Holland et al., 1992b; Institut EDI, 1992; Lauzon & Botting, 1993). Wolvelaere and Tannenwald (1991) assert that a pilot test serves to verify such aspects as link up procedures, training programs and EDI "comfort levels" while Chan et al. (1991) described the pilot test as a low-risk procedure with less costly mistakes (as opposed to actually doing EDI). In their study of EDI users, Lauzon and Botting (1993) found that conducting a pilot helped organizations implement EDI more effectively.

Additional Success Factors. Other keys to successful implementation reported in the literature are:

- establishing a well-prepared EDI implementation team (Institut EDI, 1992; Lauzon & Botting, 1993);

- ensuring that employees are motivated with respect to EDI (Institut EDI, 1992);

- ensuring that enough human and financial resources are allocated to the EDI project (Institut EDI, 1992);

- establishing a high volume of transactions (Institut EDI, 1992);

- using EDI to a high degree (Institut EDI, 1992);

- building relationships with partners (Baker, 1991; Chan et al., 1991);

- updating appraisal and reward systems (Baker, 1991).

Specific Implementation Issues

EDI's uniqueness brings to the forefront specific implementation issues which are worth examining. These issues - standards, legal issues and security issues - do not necessarily create barriers. They do, however, require special attention.

Standards. One of the aspects that makes EDI unique is the need to use standards in EDI transactions. The development of standards began in 1968 with railroad companies through an agency called the Transportation Data Coordinating Committee (Jenkins & Lancashire, 1991). Since then, standards have evolved. They are now reviewed regularly, primarily by DISA (Data Interchange Standards Association) and are subject to change.

Although there are many benefits associated with standards, the literature also reports certain problems. Kimberley (1991) stresses the importance of the role of standards in EDI transmissions and believes that it is because of a lack of standards that businesses are still "buried under a mountain of paper" (p. 23). Jilovec (1993) observes that because of the changes in standards and the use of industry-specific subsets, organizations find it "almost impossible to keep up with standards". Organizations have little experience with EDI standards and keeping up with standards means that organizations must attend the many meetings of the standards review process or acquire standards documents reporting the changes.

According to Robinson (1992) standards are a complex issue due particularly to: the number of different relationships between the various areas of standards use; to the number of standards now in existence; to the number of standard sub-committees who develop standards; and to the fact that any organization can develop a new standard by following certain procedures. Robinson reports that DISA (in 1993) was contemplating the creation of a DISA Tech Center to help standards developers. Although such a center would be intended for developers, it would provide information on all aspects of standards. Robinson concludes that making standards work will always be a challenge but that an understanding of X12 will "go a long way to making the process both enjoyable and productive."

Multiple versions of standards also add to the confusion. Barber (1992) observes that the different versions of standards force organizations to adopt or create "sophisticated data mapping and systems integration". He suggests that perhaps a more effective approach

would be to accept what he calls "trading partner uniqueness" and to design interfaces and applications based on customer requirements.

Lavery (1992) quotes a white paper issued by a company that participated in an X12 standards committee which points out that new versions of standards and the changes standards undergo also complicate the issue and become "more confusing day-by-day." Lavery goes on to examine the validity of the white paper's assertions and concludes that the problems related to standards are due mainly to the rapid evolution of EDI and of standards as well as to the lack of software which could accelerate the standard setting process. He adds that a failure to use educational programs has stalled this same process. He states that this has led to "inconsistencies, redundancies, confusion, and slow response time". Lavery calls for radical changes to the standards setting process and suggests three actions to effect these changes: 1) that the X12 voting process be changed to become more streamlined and effective; 2) that the X12 meeting format be changed to semi-annual meetings to review and ratify work done by task groups; 3) that DISA expand its technical services department to be able to provide technical expertise with respect to developing and maintaining standards.

Lavery (1992) and Robinson (1992) both report problems dealing with the standards setting process and describe the obstacles that organizations might experience due to the confusion surrounding this process but neither author proposes solutions that organizations can adopt to deal with problems stemming from standards.

Legal Issues. The traditional legal system of most companies is paper-based. EDI represents a shift from this state because it replaces paper and ink with electronic documents. Several authors believe that the legal system will undergo profound changes as issues such as establishing the legality of electronic documents arise (Baker, 1991; Jenkins & Lancashire, 1991, 1992; Kimberley, 1991; Takach, 1991; Wheble, 1988). Jenkins and

Lancashire (1992) state that the term 'sign on the dotted line' may come to have a very different meaning with EDI.

EDI is moving and developing so quickly, it has in Baker's (1991) terms "run ahead of the law". He mentions that there are no laws (in 1991) to deal with questions of liability for errors or omissions in EDI transactions should they occur. Baker also mentions that the increased access to information by more employees may also have legal implications; however, he fails to mention in what way.

In their study, Lauzon and Botting (1993) found that although formal contracts can be made between trading partners, not many firms were using them.

Despite warnings of the ways in which EDI might affect the legality of documents, the literature does not cite known problems faced by organizations with respect to this issue.

Security Issues. Security issues present many of the same types of concerns as legal issues. Jenkins and Lancashire (1991) mention such aspects as preventing fraud and applying electronic security techniques to EDI. The literature stresses the importance of using processes such as authentication (to verify the source of a message), encryption (to transform plain text into a coded format) and an audit trail (a trail of EDI transactions to verify the accuracy and integrity of the data (Baker, 1991; Chan et al., 1991; Jenkins & Lancashire, 1991). Calderwood (1991) adds that using computer and network security features and return acknowledgments can also reduce security risks. These techniques are important to protect the confidentiality and integrity of an EDI message so that unauthorized individuals are prevented from intercepting, altering and originating messages.

The Impact of EDI

Thus far, this literature review has focused primarily on the various aspects of EDI and its implementation. However, EDI's powerful impact on organizations is perhaps EDI's most salient feature. Organizations have undergone, or must undergo, enormous changes in order to use EDI successfully. These changes touch many departments within an organization and extend beyond organizational walls to influence the nature of traditional trading partner relationships. As Holland et al. (1992a, p. 549) state: "EDI can affect all parts of a business from supplier relationships to product markets".

Although the discussion on barriers and success factors to implementation alluded to certain organizational changes, it is important to understand the impact of these changes in order to fully grasp EDI. These changes, according to Jenkins and Lancashire (1992), seem to be the greatest challenge facing organizations who wish to implement EDI. This section briefly describes some of the ways in which EDI will affect organizations, employees and business relationships.

Impact on the Organization

Historically, the role new technology has been expected to play in an organization has been to enhance existing work processes by making them more efficient, more accurate and faster (Barber, 1991). With EDI, organizations cannot assume that this new technology will play a traditional role or that EDI issues can be addressed by traditional technology implementation approaches. Neither can organizations assume that their existing systems can accommodate EDI (Barber 1990, 1991).

By its very nature (faster, more direct, less intervention, no paper), EDI forces organizations to examine and perhaps modify the flow and ownership of information (Baker, 1991; Turnbull, 1988; Wolvelaere & Tannenwald, 1991). It will affect different departments in an organization (Barber, 1990; Kimberly, 1991), and the way in which

these various departments work together (Emmelhainz, 1990). According to Baker (1991), EDI will and does affect management in the assessment of the impact of changes in work practices and job content; the finance department in terms of cash flow, accounting and auditing practices; the legal department in terms of contracts and the legality of electronic documents; the sales and marketing department(s) in terms of training and customer information; the manufacturing department in terms of stock control; the purchasing department in handling negotiations with suppliers and new terms of trade; the personnel department in terms of job changes and losses as well as training. Emmelhainz (1990) states: "Because EDI changes relationships and interactions both within and outside an organization, managing the change process is very difficult" (p. 125).

Barber (1991) believes that existing business systems must be 're-engineered'. He defines re-engineering as follows: "Re-engineering is the effort to create an entirely new enterprise regarding roles, responsibilities, rewards, culture, patterns of interaction among people, measurements and controls" (p.6). Although Barber stresses the importance of re-engineering, he does not suggest methods which can help change the basic assumptions that may prove to be obstacles to the re-engineering process.

Barber (1990) also believes that EDI will bring profound changes to management practices, the organizational structure and the corporate culture, which he defines as the way things are done in a company or as "The shared beliefs, behaviours and assumptions about the organization that have developed over time" (p. 47). Fundamental changes in business practices and organization philosophy have been described by several authors (Baker, 1991; Jenkins & Lancashire, 1991; Turnbull, 1988). Heflin (1993) believes that changing an organization's philosophy is the most difficult thing to accomplish. He refers specifically to the way an organization views its operations, the procedures, that according to Heflin (p.9), are "the procedures that must be modified, changed or completely eliminated and new ones put in place" to do EDI.

Impact on Employees

Implementing EDI affects so many aspects of an organization that its impact on employees who use EDI cannot be ignored. According to Emmelhainz (1990), potential EDI users might be concerned about changes in roles, job descriptions, status and responsibilities. Several of these aspects have unfortunately been viewed as barriers (described earlier). Emmelhainz and Emmelhainz (1992), however, see EDI as having a positive impact on people's jobs by offering people the opportunity to do more interesting jobs and to be more productive. Reed (1991) also believes that EDI will allow employees to perform more interesting tasks. Describing potential changes in job roles, Holland et al. (1992b) cite an example from a high tech electronics firm, where the sales staff became advisors to their clients instead of merely taking and recording orders.

Kimberley (1991), Turnbull (1988) and Wolvelaere and Tannenwald (1991), believe that job roles will have to be redefined and Barber (1990) believes that skills must change, responsibilities may shift, patterns of communication may be altered and new organizational structures will develop.

Impact on Trading Partnerships

Although organizations have always had trading partnerships with other organizations, they have also traditionally operated as separate entities. Indeed, their focus has been on internal operations since the 1950s (Barber, 1991). Much of the literature dealing with EDI recognizes EDI as a catalyst to changing the traditional nature of trading partner relationships (Baker, 1991; Barber, 1990, 1993; Chan et al., 1991; Wolvelaere & Tannenwald, 1991).

Rockart and Short (1989) assert that because of steadily decreasing costs of electronic interconnection among firms, organizational borders are being "punctured". As a sophisticated means of interconnection, EDI promises, or threatens, to change the nature of organizational partnership by helping to dissolve these borders. EDI offers organizations

the opportunity to develop very close partnerships (Baker, 1991; Chan et al., 1991; Emmelhainz, 1990; Heflin, 1993; Jackson, 1988) and Jenkins and Lancashire (1991) stress the importance of developing solid relationships with partners. EDI is also seen as a way of strengthening partnerships by presenting new opportunities for trading partner relationships (Emmelhainz, 1990). According to Kimberley (1991), EDI helps foster a closer relationship between trading partners. As Baker (1991, p. 70) states: "EDI facilitates an atmosphere of partnership, in which you work together to improve quality, reduce costs and solve problems".

The closeness between partners that EDI requires may prove to be a challenge for many organizations. Chan et al. (1991) observe that for organizations to enjoy mutual benefits from EDI, they must eliminate the "historical distrust " between suppliers and clients and that this new type of partnership is "drastically at variance with the classical model of management where each company takes an insular view of the other" (p.35). Holland et al. (1992a) feel that this necessity to closely work with trading partners can result in what they see as "difficult and complex managerial problems". Emmelhainz (1990, p. 168) writes: "For EDI to be fully successful both within and between organizations, traditional boundaries must begin to break down, and organizations must rethink their operations, their processes, and their relationships."

Barber (1992,1993) believes that an EDI partnership requires not only that organizations redefine how they will function in the future but how *their partners* will operate as well. This is also a departure from the way organizations have traditionally operated and planned for the future. With EDI, they must now always see themselves as partners, not as separate entities.

Workable Partnerships. Barber (1992) is one of the few authors who offers specific potential approaches to achieving a workable partnership. He suggests that employees from one firm spend time in the partner's firm in order to better understand their

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partner's business environment. He also proposes the formation of internal user groups to study how "inter-enterprise business is conducted."

Barber (1992, 1993) stresses that any resistance or reluctance to use EDI on the part of trading partners, should be viewed in terms of a partner's willingness or ability and suggests that education should be provided to solve a lack of ability and motivation for a lack of willingness. Barber (1993) believes that organizations cannot merely establish what he calls an 'arm's length' partnership and that EDI partnerships should strive toward achieving synergy which he defines as: "both partners having common goals, mutual interdependence in achieving those goals and both partners acknowledging the interdependence" (p.14).

Barber (1993) suggests that an EDI partnership have four levels. These are:

1) interaction - "the ability and willingness to communicate effectively";

2) understanding - "the ability and willingness to value diversity";

3) integration - "the ability and willingness to merge ideas together";

4) implementation - "the ability and willingness to develop mutual

implementation plans".

While interaction is the basic step of communicating EDI requirements, understanding is the organization's acceptance that no two trading partners will be the same. Barber believes the integration level is necessary to fully integrate EDI if an organization wishes to fully enjoy its benefits. In a partnership, Barber stresses the importance of both partners integrating EDI to the same degree so they can exchange the same types of documents, particularly when one partner wishes to exchange a new document. He also believes that it is crucial for organizations to understand each other's business environments. Finally, Barber sees the implementation level as one where an organization addresses what he calls the "ripple effect" in a partner organization. This is the effect that is felt by an organization when it is asked to exchange a certain transaction for which it may or may not have the

necessary preparation. According to Barber, an organization's EDI program, regardless of its size or influence, will only be as successful as its "least capable trading partner".

Heflin (1992) believes that for changes to occur with respect to the ways organizations view partnerships, key employees should be allowed to participate in what he calls "industry matters". He says that this can best be achieved if these individuals attend industry conferences and are members of committees concerned with EDI. He believes that these activities will provide information about the solutions other companies have implemented to deal with EDI problems and in what way organizations are working together toward the same objectives. Heflin also urges that attendees share the information they have gained at these meetings with their co-workers and their senior management.

Holland et al. (1992a) suggest that the trend now is for a firm to create "very strong links with a few suppliers" (p.542) and Oravec (1993) stresses that organizations should have a good understanding of their trading partners' capabilities and limitations. According to Baker (1991), some larger organizations have strengthened their partnerships by subsidizing the cost of EDI start-ups among their smaller partners to help them adopt EDI.

The Role of Training and Education in EDI Implementation

Throughout the literature, the need for training and education is often cited. Training and education are proposed as solutions to overcome certain barriers to implementation or to cope with the changes resulting from EDI implementation. In at least three Canadian studies (Institut EDI, 1992; Lauzon, 1991; Lauzon & Botting, 1993), training remained an important issue and concern for respondents over time.

While Patrick (1988) and Oravec (1993) stress the importance of education to develop a solid understanding of EDI technology, Barber (1990, 1992) and Jackson (1988) believe that education will play a role in teaching employees the new skills which may be needed as a result of EDI implementation. Oravec believes that if EDI is to be promoted as

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a "strategic tool" throughout the organization, employees must fully understand its capabilities. Wolvelaere and Tannenwald (1991) also believe education will play a crucial role in helping people explore new ways of using EDI and that EDI training must evolve as EDI evolves.

Barkan (1991), speaking from a mostly technical perspective, bemoans the lack of educational material while underlining the importance of education. He says: "EDI will become a truly successful and widely-used technology when educational information is readily available" (p.18).

Carter et al. (1990) urge organizations to identify the skills necessary to implement EDI by establishing an overview of training and education factors such as skills inventory, recipients, advantages and disadvantages of different types of training and general seminar topics.

Referring to a study conducted by the Financial Executives Research Foundation based on 1094 interviews, Emmelhainz (1990, p. 146) reports that "... the lack of knowledge was often cited as a reason for delaying implementation." In the same study, training was the area in which respondents felt the greatest need for external assistance. Emmelhainz reports that training-related factors included lack of knowledge, lack of senior management awareness and a difficulty educating trading partners. She notes: "Because EDI affects so many diverse functions within an organization, and because the impact is felt at all managerial levels with the organization, training requirements for EDI are numerous and diverse" (p. 147). Emmelhainz classifies the knowledge and skills required by EDI into three general categories:

      1) EDI overview (basic concepts, strategic use, examples, costs/benefits);

      2) EDI components (standards, software, system configuration);

      3) EDI implementation issues (tasks, impact, security).

Emmelhainz also urges that training or education programs be designed in accordance with an organization's needs. She views the training available from service providers such as

VANs, vendors and EDI consultants is sometimes overly generic and does not necessarily address an organization's unique needs.

Stone and Hill (1993) observe that much of the available education is directed toward the specialist or EDI professional. They outline three levels of educational needs with respect to EDI: 1) technical and service support level; 2) functional manager level; 3) top management level. Stone and Hill believe that existing educational programs are primarily directed at Level 1 needs which has a technical focus. Level 2 needs are described as the needs of those who do not require a detailed knowledge of EDI but do require help to manage more effectively in an EDI environment. Stone and Hill feel that current training or education do not address the needs in this level. Although they believe that the needs of level 3 are the most urgent and crucial, particularly with respect to senior management understanding the power of EDI. Stone and Hill feel that these needs are being totally ignored by available educational programs. They feel this is due in part to the lack of recognition by business schools of EDI as a business approach. They also believe that because EDI is often delegated to technical staff, senior management might not be receptive to this type of education. Another reason they suggest is that those involved in training and education efforts are still in what they call a "tactical/technical framework". They urge educational programs to be designed with a more "management-focused, more strategic view of EDI" to answer such questions as: How can EDI help achieve a competitive advantage? How can EDI contribute to quality improvement? How can it help us re-engineer our company's information flow? Where does EDI fit into strategic automation plans? The authors view of education is as follows: "Education, broadly defined, is the key to how fast the coming EDI revolution transforms business" (p. 28).

Several other authors view education as a means to help senior managers understand and support EDI (Emmelhainz, 1990; Holland et al., 1992a; Wolvelaere & Tannenwald, 1991).

Takach (1991) believes that there will be opportunities for training in the area of legal issues where knowledge is still not diffused.

Jilovec (1993) proposes that continuing education in both technical and strategic applications is necessary to maintain commitment to EDI. Technical applications include learning correct mapping techniques, learning how to select capable translation software and a VAN by first understanding their capabilities and services, understanding trading partner capabilities in terms of changes to documents and additions to new documents. Jilovec suggests attending meetings and seminars in these areas. Strategic applications are the business applications of EDI. Jilovec recommends creating a data flow model to properly understand existing systems and then, based on what was learned from the first model create, or re-engineer, an electronic model. He suggests that the best means of being educated in strategic applications is through close partner contact, particularly with experienced partners.

It is important to note that training and education appear to be synonymous terms throughout most of the literature and were used interchangeably in the needs assessment project. Reed (1991, p. 21), however, makes the following distinction between education and training: "Training shows how, education explains why. Training is rarely lacking, education is often lacking."

Educational Methods

In addition to stressing the importance of education with respect to EDI and the changes it represents, many authors offer recommendations for the means of delivering such education or training.

Lavery (1991) describes the ideal education program as one that will "provide practical, hands-on training through a task-oriented approach to learning" and that EDI workshops should be taught by experts who have several years experience in EDI and are active in EDI committees and groups. He warns, however, that although vendors can be

involved in such education, they should not use it as an opportunity to market their products. Lavery also recommends customized, on-site educational programs for large organizations and courses in convenient locations for other companies and suggests training videos for smaller companies who cannot afford to send employees to external courses. He recommends assessing the training and education that is already available from EDI providers before developing it. Lavery makes the following observation about EDI and education: "... the education of a company is the mirror of its future" (p.13).

Barber (1992) believes that effective ideas regarding EDI use will not be found in courses or texts about EDI but will, instead come from asking questions of other users and experts, particularly at user group meetings or from attending conferences.

EDI users in Quebec, in a study sponsored by Institut EDI (1992), reported that their greatest sources of information were books, magazine articles and newsletters. They had received or desired the following types of training:

- EDI awareness and introduction;

- EDI concepts;

- EDI implementation;

- technical aspects;

- standards;

- organizational change;

- partnership approach.

This list is interesting in that the first three areas were mentioned most frequently as having been received and reported much less frequently as being desired. Training addressing technical aspects and standards were less desired while there was a noticeable gap between received and desired training addressing organizational change and the partnership approach. More respondents desired it than had received it. This suggests that the organizations in the sample are moving away from technical issues toward organizational and partnership concerns.

In the same study, respondents also reported desiring different types of help to facilitate implementation. These were ranked according to the frequency with which they were reported and the importance they were given. (Please note that this list was originally in French and that the word 'training' has been used to translate the word *formation* which can mean either training or education.) The types of help desired were:

- user directory;
- telephone support;
- sector specific implementation guide;
- on-site customized training;
- user groups;
- sector specific conferences;
- computer based training - CBT;
- newsletters in French;
- self-teaching materials;
- external training;
- introductory video;
- multi-sector conferences;
- publications.

Conclusion

The preceding section has presented an overview of the literature concerning EDI. Although particular attention has been paid to examining what has been said about EDI's impact, it is important to remember that much of what is written in the literature is predictive. Many authors speak in terms of what EDI will do. This is because EDI is new and not enough time has elapsed to verify its impact and the problems (and successes) associated with it. Only authors of the very recent articles write with any degree of

confidence about what is actually happening in EDI use, but their assertions are often made with reservations.

With respect to training and education, much of the literature has focused on technical training, and although there are authors who urge that senior management and trading partners be educated in other areas of EDI, these areas remain relatively vague and unspecified.

Section 2: A Review of the Needs Assessment Literature

What exactly is a needs assessment? What is a need? What purpose do needs assessments serve? What role does a needs assessment play in education or training? Through a review of the literature on needs assessment, this section aims to answer these questions and clarify the nature of a needs assessment as well as examine the different perspectives regarding needs assessment. The section will also look briefly at needs assessment in the context of performance technology.

It is important to note that all of the authors cited refer to a single organizational or institutional context. This differs from the present needs assessment whose purpose was to gage the needs among many organizations in a variety of industries with respect to a common challenge - the implementation of EDI.

What Is a Needs Assessment?

Kaufman (1982, 1984, 1986a) views needs assessment as the first step in the problem solving process, a step that serves to identify the problem. According to Kaufman, needs assessments provide "the direction for useful problem resolution through identifying, documenting and selecting appropriate problems" (1987, p. 78). Kaufman and

Valentine (1989, p. 11) define a needs assessment as follows: "A needs assessment identifies gaps in results, places them in priority order, and selects the most important for closure or reduction". Thus, from this particular perspective, a needs assessment not only serves to identify problems, it should also rank them in terms of importance.

Kaufman (1983a) calls his approach to needs assessment a "holistic system approach" which involves 2 phases:

1) identifying, defining, documenting and selecting needs; and

2) getting from what is to what should be.

This was later altered to include opportunities (Kaufman and Bowers, 1990):

1) identifying problems and opportunities, and then

2) resolving the problems and taking advantage of the opportunities.

Kaufman (1987) has also identified three levels of needs assessment which he has called middle, comprehensive and strategic. These different levels parallel three types of results he has defined: products, outputs and outcomes (see What Is a Need? further in this section). They also parallel the three levels of planning he espouses: micro (individual or small group); macro (organization); mega (society) (Kaufman, 1991a,b; Kaufman & Stolovitch, 1991;). Kaufman has brought all of these elements together in a model he calls the Organizational Elements Model (see for example, Kaufman 1985b, 1986a, 1987; Kaufman & Valentine, 1989), which he describes as a framework which can be used to link an organization's resources and processes with the three types of results described earlier.

Mayer's approach to needs assessment is similar to Kaufman's. According to Mayer (1986), a needs assessment seeks to answer two questions:

1) Where are we going?

2) Why are we going there?

The answer to the first question will identify goals and objectives while the answer to the second question will provide the justification.

Rossett's (1987) approach to needs assessment is quite different from Kaufman's. To Rossett, a needs assessment is a specific process embedded within a more global process she calls a Training Needs Assessment (TNA) and for which she gives the following definition: "TNA is the systematic study of a problem or innovation incorporating data and opinions from varied sources in order to make effective decisions or recommendations about what should happen next" (p.3). TNA is a term she coined to encompass all of the other terms that add to the general confusion surrounding this subject, namely; analysis, front-end analysis, needs assessment, needs analysis, discrepancy analysis, problem analysis and pre-training analysis.

Kaufman and Bowers (1990) say this process is "unfortunately ter..ed". They believe that using the word "training" in the title implies that training will be a solution and they assert that a proper needs assessment should never presume a solution. Rossett's perspective, however, is that the task of conducting a needs assessment usually falls to training professionals, thus the title. She does caution that, despite its inclusion in the title, training may not be an appropriate solution. She says, "Problems often have several causes. We're only able to solve problems if we can ferret out their cause or causes" (1987, p. 30.) and then explains that different causes require different solutions.

As mentioned above, Rossett views needs assessment as part of the TNA . She defines a needs assessment in the following way: "Needs assessment is the systematic effort that we make to gather opinions and ideas from a variety of sources on performance problems or new systems and technologies "(1987, p.62).

Rossett also makes a distinction between a macro assessment and a micro assessment. A macro assessment is organization oriented and seeks information primarily in three areas: proficiency (to identify what employees need and want); criticality (to identify the problems employees are having and prioritize these problems in terms of "impact for the dollar"); and frequency (to identify management's priorities). A

micro assessment is more individual oriented and seeks information about what an employee needs to know and what skills are essential to his or her job.

Another approach to needs assessment is put forth by Rummler (1987). He unabashedly calls his approach "determining training needs" and says, "There is no more critical task in the training process" (p. 217). According to Rummler, it is important to determine needs in order to develop training that "will make a difference".

Lampe (1986) offers a definition of needs assessment in very practical terms: " ... an effort to reveal the gaps between what people do at work and what their employers would like them to do" (p.101). Westgaard (1992) views needs assessment from a business perspective. He believes the process "defines problem areas and makes it possible for managers to choose arenas for action that will return the most for investment" (p. 9).

Wircenski, Sullivan and Moore (1989), describing a needs assessment at Texas Instruments which was conducted to find out what engineers needed in order to become instructors, explain that the needs assessment was necessary to avoid assumptions about what was needed and to verify actual needs.

Stufflebeam, McCormick, Brinkerhoff and Nelson (1985) offer a slightly different definition of needs assessment by introducing the concept of decision-making: "Needs assessment is a process that includes gathering and using information for making decisions about the direction or worth of a program or practice" (p.21). The authors outline three areas which needs assessments can be used to address: 1) performance; 2) current or potential activities; 3) decisions.

Lee and Roadman (1991) believe that the power of needs assessment is its use in identifying the discrepancies between "expected" and "actual" performance. They define needs assessment in the following way: "Needs assessment is a systematic process for determining goals, identifying discrepancies between goals and outcomes, and establishing priorities for action" (p.4).

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Needs Assessment or Needs Analysis?

The distinction between a needs assessment and a needs analysis seems to have become a point of contention among certain authors. Some authors use the terms interchangeably while others make clear distinctions. Still others include needs analysis in the process of needs assessment or vice versa.

Kaufman (1985b, 1985c, 1986b) views needs assessment as distinct from needs analysis which he sees as a subsequent process that involves analyzing needs in order in order to find out their causes and origins. His perspective is that one cannot begin with an analysis because one cannot assume that the need is correct. A need must therefore first be correctly identified through needs assessment before it can be analyzed. With Bowers (Kaufman & Bowers, 1990) and with Valentine (Kaufman & Valentine, 1989), Kaufman stresses that although distinct, these two processes are closely linked.

Rossett (1987) does not see needs analysis as a separate process from needs assessment. She defines needs analysis as: "analysis activities trainers use to examine and understand performance problems or new technologies" (p. 14). As can be seen, this definition closely resembles her definition of needs assessment cited earlier. Indeed, Rossett (1986) stresses that it is the purpose, not the name, of the analysis that is of importance.

Turoff (1991) equates a needs assessment with a needs analysis. She stresses that a good needs analysis should look at the business climate or culture of an organization as well as the level of skills, knowledge and abilities of employees require do their jobs.

Brinkerhoff (1986) approaches needs assessment from a human resources perspective and calls it a needs analysis. He suggests that we question whether training is really a solution and describes the role of the needs analysis in the following way: "It must ask whether training or something else might address better a need or problem -- or whether training plus something else is called for " (p. 64).

Citing Zemke and Kramlinger (1982) and Kuh (1982), Benjamin (1989) contends that needs assessment and needs analysis are not two separate processes and points out that these authors use the terms synonymously. His definition of a needs assessment is as follows: "Needs assessment identifies and prioritizes needs while needs analysis breaks needs down and suggests causes of and solutions to needs" (p. 12). He believes that one cannot properly identify and prioritize needs without looking at their causes and the implications of resolving them, particularly in light of financial and human resource requirements. He proposes that we avoid the confusion by using the term, 'situational analysis', which he borrows from Mattimore- Knudson (1983).

What Is a Need?

Kaufman (1983a, b, 1984, 1985a, 1986b, 1991b) defines a need as the difference between what is and what should be, or, as a gap in results. He identifies three types of results which he has named products, outputs and outcomes. Products and outputs occur within an organization and outcomes occur outside the organization. Products relate to human performance, outputs are the deliverables and outcomes are the societal impact of the outputs.

Kaufman and Valentine (1989) further delineate the term 'need' by explaining that accomplishments, performance and achievements are different types of results. Thus, a need can also be a gap in accomplishments, performance and achievements.

Kaufman cautions that it is imperative that a need not be mistaken for what he calls a "quasi-need" which he defines as a gap in resources or processes (1987). He also makes distinctions between means and ends where means are the ways things are done and ends are the results obtained from using a certain type of means (Kaufman, Mayer &

Butz, 1984). He equates means with inputs and ends with results. According to Kaufman (1985c) means are important only insofar as they accomplish worthwhile ends.

Lapointe (1992) adheres very much to Kaufman's approach by defining a need in Kaufman's terms: the difference between what is and what should be (Kaufman 1972, cited in Lapointe, 1992). Like Kaufman, he believes that objectives must emerge from needs: "... les objectifs retenus doivent provenir d'un établissement systémique des besoins des 'clients' pour qui le système d'apprentissage, d'enseignement ou de formation est développé" (p. 35). There is, however, one significant difference between the two perspectives. Lapointe's focus is on an educational setting and on educational and training needs whereas Kaufman (Kaufman and Bowers, 1990) remains adamant that one cannot propose a solution (i.e., training) prior to conducting a needs assessment.

Lapointe's approach stems from a teaching perspective and he categorizes an educational need as a type of need. He never suggests that a needs assessment might reveal problems for which education is not an appropriate solution.

Rossett (1987) defines a need as a difference between optimals (what is desired) and actuals (what is). Rossett outlines four types of information a needs assessment should aim to gather: optimal performance; actual performance; feelings (perceptions) about the subject; and the cause(s) of the problem. To avoid potential confusion about the terms Rossett uses, here are her definitions of optimals, actuals, feelings, causes and solutions:

> OPTIMALS: visions of desired knowledge or performance. [It is important to note that this is not necessarily the desired performance but how people define that desired performance.]
>
> ACTUALS: the way things are; what people know and do.
>
> FEELINGS: opinions or feelings about the performance, task or the competence related to it.
>
> CAUSES: reasons for the existence of a problem.

SOLUTIONS: ways of eliminating or reducing the problem.

Rossett (1987) has also identified four types of causes for problems, or gaps between optimals and actuals. They are:

1) the absence of skill or knowledge;

2) the absence of incentive or improper incentive;

3) the absence of support from the environment (personnel, policies, tools);

4) the absence of motivation.

She has also identified two broad categories of solutions. These are:

1) training;

2) reporting and restructuring.

According to Rossett (1992), solutions generally emerge from the causes. She adds that training is an appropriate solution when there is an absence of skills, knowledge or motivation.

Burton and Merrill (1977, cited in Lee and Roadman, 1991) identify five types of needs. These needs are: 1) a normative need, as compared to an industry standard; 2) a felt need - what employees think they need to solve a problem; 3) an expressed or demand need - when management determines that certain training is needed for employees to perform more effectively or efficiently; 4) a comparative need - when one division in an organization is functioning a lower level than other divisions who accomplish the same tasks; 5) anticipated or future needs - when resources are projected for a division of a company in order to achieve maximum performance. Lee and Roadman believe that a needs assessment should address as many of these various types of needs as possible to ensure that potential solutions are not overlooked and that training, should it be selected as a solution, is effective.

Novack (1991) believes that a need exists when "specific job tasks or behaviors are important and an employee's proficiency in them is low"(p. 69).

Stufflebeam et al. (1985) write that a need is a discrepancy or a gap between measures or perceptions of desired performance and observed or actual performance.

Although they may use different terminology, all of the authors mentioned above regard needs assessment as a valuable process and agree that it should be used to identify problems before any attempt at designing a solution is made. They also share the view that a need is the difference between a current situation and a desired situation, and that this gap represents a problem. An area of divergence among the authors, however, is that some believe that solutions other than training should be allowed to surface during a needs assessment and that the need should dictate the type of solution that is selected, while others, perhaps because they are writing from a purely educational context, consider that a needs assessment should be used to determine the type of *educational* solution that will be implemented. There are also marked differences in the way the various authors distinguish between needs assessment and needs analysis.

What Purpose Does a Needs Assessment Serve?

According to Kaufman and English (1979), the purpose of a needs assessment is to identify the problems so that appropriate solutions can be found: "Needs assessment is a tool by which one may be increasingly assured that the intervention, once selected, is related to basic gaps and problems, not just to the obvious symptoms or to problems poorly defined" (p. 55).

The needs assessment process helps organizations avoid ineffective and costly solutions. Needs assessments, according to Rossett (1990, p. 38) "are done to gather the kinds of information that instructional designers need to make good decisions." Despite the value of assessing needs, Rossett (1989, 1992) warns that many organizations do not provide the necessary resources to conduct one. To human resource practitioners who

find themselves in such a situation, she suggests that they not call the process a needs assessment when describing it to people who are unfamiliar with it. Instead she urges practitioners to use more accessible terms such as "study", "planning" or "pretraining activities" and to describe the type of information that could be gathered and the ways in which this information will affect the product.

According to Stufflebeam et al. (1985), a needs assessment serves two functions. The first is that it helps to determine what needs exist and how they should be addressed. The second is to provide the criteria against which a program's merits can be evaluated.

Needs Assessment in the Context of Performance Technology

Needs assessment is a tool often used by performance technologists to detect individual or organizational performance problems. In order to fully grasp the concept of needs assessment, it is useful to be familiar with the field of performance technology. This section provides a general overview of performance technology and its relationship to needs assessment.

Performance

The fundamental concept of performance technology is performance, and performance, according to Harless (1992), is what people "do and accomplish". Performance technology seeks to improve these behaviours and results. Stolovitch and Keeps (1992) provide a more formal definition of performance, writing that it refers to: "a quantified result or set of obtained results," as well as "the accomplishment, execution, or carrying out of anything ordered or undertaken, to something performed or done, to a deed, achievement, or exploit, and to the execution or accomplishment of work"(p.4).

Desired performance is based, or 'benchmarked', on the performance of those that exemplify mastery of a particular skill or subject (Gordon, 1992).

Carr (1991) stipulates that performance takes place within the context of the interaction of three factors: the task-based systems of an organization (the procedures that increase the market value of an organization); the social-political systems of an organization (the processes that produce and maintain the distribution of power); and the factors of individual action (what an individual knows how to do, what he or she can do and what he or she will expect to get out of doing it).

Rossett (1992) suggests that performance problems often exist when employees do not do what is expected of them even if they are capable of doing it. As Rossett writes: "Performance problems occur in situations where there is good reason to assume that employees have the capacity to do what is expected of them but do not do it" (p. 105). Or, as Geis (1986) has phrased it, a performance problem exists when a gap exists between:

- "What Is and What Ought to Be;
- What You Have and What You Want;
- What Is Real and What Is Ideal." (p. 5)

Geis adds that a problem is subjective because it is always perceived by someone.

Performance Technology

The traditional view in organizations has been that most human performance problems could be solved with training and education (Geis & Coscarelli, 1987) or as Mager (1986, p. ix) phrased it: "Instruction was seen to be the cure." Indeed, according to Harless (1992) this type of intervention is often rewarded. The field of performance technology evolved as a new approach when it became clear that not all organizational problems could, or should, be solved by educational interventions or that "training doesn't

work for everything" (Rosenberg, 1990) and that human performance problems had many aspects (Geis & Coscarelli, 1987; Gordon, 1992; Rossett, 1991).

The underlying philosophy of performance technology is one that views organizational problems from a perspective that does not predetermine a solution. It places training or education as one among many solutions to human performance problems by recognizing other solutions to such problems, including incentive programs, job aids and job redesign (Rossett, 1992) depending on the nature of the problem and the relevance of the intervention to the situation. In fact, Harless (1992) reports that according to a study done by his company of 300 needs assessments, often called 'front end analysis' in the performance technology field, training and education were the least frequently recommended solutions to performance problems.

In addition, educational interventions also tend to be costly solutions (Geis & Coscarelli, 1987; Rosenberg, 1988). Performance technology helps to ensure that if education is developed it is not only the appropriate solution but it is also effective. Performance technology is an approach that is used to avoid what has been called the 'spray and pray' method of training - spray training on employees and pray that it works (Gordon, 1992). With performance technology, problems are first identified and analyzed and then an appropriate solution is found instead of assuming that one solution, often training, is appropriate for all problems (Rosenberg, 1988). Rosenberg (1990) stresses, however, that training and education remain important and that they are often crucial in maximizing performance.

Harless (1992) believes that human performance technology should be focused on three elements: people, performance and goals. The goals are those of the organization such as profits or satisfied customers. To attain these goals a certain performance is required and, as Harless writes, the purpose of performance technology is: "To assist humans to do and accomplish things that are compatible with worthy societal, business, and personal goals" (p. 5). Harless defines performance technology as follows: "The

process of analysis, design, development, testing, implementation, and evaluation of relevant and cost-effective interventions on worthy human performance"(p. 7). In this process, needs assessment is part of the analysis phase and plays a major role in determining what type of intervention will be used to improve performance.

Harless (1992) lists 18 different types of interventions, ranging from training to work redesign to providing job aids to reassigning the worker. He has classified these interventions into four general categories:

1) Information;

2) Environment;

3) Motivation/Incentives;

4) Selection/Assignment of personnel.

The first category would include providing information through various methods such as teaching and coaching. It would also specify what is meant by "successful performance". In the second category, the work environment could be altered to improve performance by providing better tools, removing obstacles to performance or redesigning the work. The third category could include such solutions as providing feedback and recognition and giving employees valid reasons for wanting to perform. Finally, the fourth category deals with the decisions made about assigning or hiring the right people for the job. Note that these categories are similar to the four types of causes for problems identified by Rossett (1987) and described earlier in the section called 'What Is a Need?'.

In a similar vein, Budke and Kerka (1988) believe that the goal of performance technology is to "to insure that individuals have the knowledge, skills, motivation and environmental supports to do their jobs effectively and efficiently" (p. 2). According to Budke and Kerka, a human performance system comprises the following components:

- the job or context;

- individual abilities, motivations, actions, decisions and behaviors;

- responses required for performance;

- consequences of responses;

- feedback on consequences.

Rosenberg (1988) defines performance technology as a "set of methods and processes for solving problems - or realizing opportunities - related to the performance of people. It may be applied to the performance of single individuals, small groups, or large organizations" (p.3). He equates performance improvement with optimizing an organization's human resources. He proposes the use of two models, Gilbert's performance engineering model (1978, cited in Rosenberg, 1988) and the Human Resources Model. Gilbert's model uses a matrix built from three areas (information, instrumentation and motivation) and two factors (people, environment) to assist in finding the causes to performance problems. The Human Resources Model is based on four concepts (human resources development, organizational development, human resources management, environmental engineering) and, according to Rosenberg, is helpful in managing solutions. Rosenberg believes both models should be used in a performance improvement system.

Rummler and Brache (1992) view performance technology as a framework that would allow the president of a large organization experiencing problems to "understand the variables that affect performance, to diagnose which of these variables are not operating as expected, and to determine the precise set of actions required to address the deficient variables" (p.33). This framework draws from a variety of fields including psychology, industrial engineering, training and development, ergonomics, human factors engineering, compensation and benefits.

Needs Assessment and Performance Technology

The Basic Performance Technology Model. Most of the performance technology approaches described in the literature stem from a basic model which involves the

following five steps: analysis, design, development, implementation, and evaluation. Individual authors propose variations of this model, but the fundamental approach remains. The analysis step of this model is usually equated with needs assessment.

The model Harless (1992) describes has an additional step, 'testing', which precedes implementation. Brown and Schwartz (1988) apply a similar process which they call an engineering approach. This approach differs from the basic model in that it proposes 'definition' as a first step. Rummler and Brache (1992) also suggest a five-step model. Their model, however, is introduced with 'problem/opportunity definition' as the first step and 'design' and 'development' are combined into one step. Hutchison (1990) also outlines a five-step model - needs assessment/analysis, design, development, implementation, evaluation.

Rosenberg's model (1990) offers a slight variation of the basic model. The steps of his model are: conduct a performance analysis; specify performance problems, causes and opportunities; design solutions; implement solutions; monitor and evaluate the results and revise solutions.

Geis's model (1986) although congruent with the basic model is more descriptive. Geis describes performance technology as involving certain activities. These are: determining needs, analyzing performance, developing tentative solutions, trying out draft solutions, revising draft solutions on the basis of evaluation and measuring success.

Needs Assessment as Analysis. From a performance technology perspective, a need is a "performance deficiency" and a performance analysis serves to identify the performance deficiency by measuring actual and optimal performances (Rosenberg, 1988).

In Harless's (1992) view, needs assessment, or front-end analysis, plays a crucial role in guiding the performance technology process. The analysis phase heads the effort by determining problems, causes and solutions and consists of three steps:

1) clarifying the goal of the organization;

2) analyzing the desired and the deficient or new performance relevant to the goal;

3) determining the appropriate intervention(s).

Once the intervention(s) is (are) chosen, the remainder of the process will consist of designing, developing, testing, implementing and evaluating them.

For Brown and Schwartz (1988), the analysis phase is a needs assessment in that it includes the following activities to help determine appropriate interventions:

- collecting information;

- analyzing information to determine causes;

- developing recommendations for problem resolution;

- documenting and presenting findings.

Using this approach, Brown and Schwartz have found that an approach using a single intervention is rarely sufficient to improve performance and they recommend that "intervention packages" can be created.

Rossett (1992) also views analysis as a first step in performance technology. She writes: "In analysis, professionals identify opportunities, identify and describe problems, ask recurring questions, establish hypotheses, eliminate possibilities, parse parts and elements, separate facts from fiction and render judgments and recommendations"(p.97). She views analysis as a process which involves three elements: the individual worker, the work environment, and the organization.

Rossett (1987, 1992) also addresses the situation where a new policy, program or technology is introduced into an organization. She stresses that in such a situation, analysis should focus on identifying the optimal performance (individual and organizational) envisioned by the individuals consulted in the analysis as well as the feelings of the people who will be affected by the changes brought on by the new situation.

Mager (1986) believes that analysis techniques help determine when instruction is appropriate in solving a performance problem and when some other intervention would be more suitable.

After reviewing the various authors on the subject of performance technology it can be said that a needs assessment, or performance analysis or front-end analysis, forms the basis of any effort to improve performance.

Models and Methods for Assessing Needs

In addition to describing needs assessments and stressing their importance, several authors suggest specific ways to conduct them. These approaches include steps derived from theoretical models as well as methods for collecting and using data. Below are brief descriptions of some of the more prominent models and methods found in the literature.

Models

Based on his Organizational Elements Model (described earlier), Kaufman (1986a, 1987) recommends 10 steps to conduct a needs assessment. These are:

1) Decide to plan using data from a needs assessment;

2) Select the needs assessment and planning level: middle, comprehensive or holistic;

3) Identify the needs assessment and planning partners;

4) Obtain the participation of needs assessment and planning partners;

5) Obtain acceptance of needs assessment and planning level;

6) Collect needs data (both internal and external);

7) List identified and documented needs;

8) Place needs in priority order;

9) Reconcile disagreements;

10) List problems (selected needs to be resolved) and obtain agreement of partners.

Lapointe (1992) has developed two terms, *pré-conceptanalyse* |pre concept analysis| and *conceptanalyse* |concept-analysis|. He uses these terms to describe two phases of needs assessment which he calls an *étude de besoins* |study of needs|. The pre-concept analysis phase involves defining the problem situation; establishing the limits of the concept analysis; and defining the variables, ends and goals of the concept analysis for education. The concept analysis phase seeks to determine the target audience; describe the indicators and techniques used to prioritize needs; adopt, adapt or create instruments which will provide information about the optimal and actual situations as well as the gaps between these; determine and describe how needs were prioritized and data were treated; examine, enter and treat data; analyze and interpret data and make recommendations; and finally produce a report.

Dodge (1987) calls a needs assessment an "evolutionary process" which should be done in stages. He proposes a series of steps for conducting a needs assessment. These are:

1) obtain management support;

2) meet to form agenda;

3) decide on the type of assessment: a) already taking place or b) happening .at some time in the future;

4a) if about something already taking place, hold group discussions;

4b) if about something happening in the future, develop a task chart;

5) write course objectives

6) develop course.

Steps 5 ad 6 are executed after the assessment is completed. Dodge suggests that experts and instructional designers can be consulted in order to assist in uncovering "major topics

or categories" for the study. It is important to note that by including course objectives and course development, Dodge's plan presupposes that education or training will be the solution to any problems revealed by the needs assessment.

Olshfski and Joseph (1991) describe conducting a needs assessment using a method known as the Delphi Technique. This method involves 4 steps: 1) designing a questionnaire; 2) identifying participants; 3) monitoring participation, 4) tabulating responses. Topics for questionnaires are established by obtaining information from experts and an in-house literature search. For this to be effective, the authors say several "rounds" of questionnaires must be sent out, with each round probing deeper.

McKillip (1987) sees needs analysis as a decision-making tool which involves the five following steps: 1) identify users and uses of the needs analysis; 2) describe target population and environment; 3) identify needs - describe problems, describe solutions; 4) assess importance of needs; 5) communicate results.

Stufflebeam et al. (1985) describe a checklist for conducting a needs assessment which includes six general stages. These are:

1) preparation;

2) information gathering;

3) needs analysis;

4) reporting the results of the needs assessment;

5) using the needs assessment results;

6) evaluating the needs assessment.

The first step involves such actions as identifying the people involved in the needs assessment, explaining the purposes and the scope of the needs assessment, and identifying and describing information needs. The information gathering stage involves determining information sources and developing sampling plans, procedures and data collection instruments. In the needs analysis phase, note that it is included in the needs assessment, information is essentially reviewed and analyzed. A report of the results

includes descriptions of the audience, purpose, content, format and media or the assessment. The results should then be reviewed and outcomes and objectives should be identified and a program addressing the existing needs should be designed and evaluated. Finally, the needs assessment process should be evaluated in terms of utility, feasibility, propriety and accuracy. In their text, Stufflebeam et al. (1985) describe standards corresponding to these four areas.

Methods

There are different ways to collect data which can be used in a needs assessment. The methods used depend largely on the context of the situation, including the constraints of the project. Data collection instruments can range from individual interviews to mailed questionnaires to focus groups, depending on resources and the nature of the project.

Mayer (1986) lists data collection techniques which divide data into two categories: soft data and hard data. Soft data can be obtained through a literature review; the lessons learned from the experiences of other organizations, a review of an organization's internal documents, a human resource or personnel analysis, individual interviews, and surveys (when dealing with many people). Hard data, according to Mayer, can be collected through observations and performance assessments. Although there are many ways to collect data, Mayer suggests that compromises may have to be made due to factors such as priorities, budgetary constraints, resources and the time frame of the needs assessment. In addition, Stufflebeam et al. (1985) say that the shape a needs assessment takes will depend on the way in which the client will use results.

Kaufman (1986a, 1987) also divides the data into hard and soft data. Kaufman, however, recommends that both internal and external data should be collected. The sources for internal data are the perceived needs of those involved in the needs assessment as well as observed performance discrepancies. Kaufman suggests that

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external data might include perceptions of an organization's clients and data regarding societal impact. According to Kaufman, several tools can be used to collect relevant needs assessment data, including interviews, face-to-face meetings and questionnaires. The choice of tool, Kaufman stresses, will depend on the kind of needs assessment.

A needs assessment, according to Rossett's approach (1986, 1987, 1989, 1990), is conducted in stages with information gathered in one stage influencing subsequent stages - " ... to move from a general problem" to "the specific nature of the performance discrepancy and the cause(s) for it" (1990. p.39), bringing us closer to identifying the problem and knowing why it exists. In Rossett's approach (1987, 1989, 1990), the process of gathering information involves as many concerned sources as possible, depending on budgetary and other constraints. Sources are those individuals who will be affected by any changes which might result from the needs assessment. Opinions, feelings and ideas can be gathered through interviews, surveys and group meetings as well as observations and document examination. Rossett stresses that it is crucial to ask participants how they view a situation and what they feel can be done about it if there is a problem. She writes: "The sources who are consulted influence the nature and richness of the proposed solutions" (1992, p.103).

Rossett (1989, 1992) mentions that interviews are the most frequently used tool in needs assessment but that the decision to use one particular technique will depend on such factors as cost, anonymity and the ability to follow up. She adds that the interview is particularly appropriate when the information sought is technical, involves considerable detail or might be "emotionally charged" (1992).

Rummler (1987) suggests that data collection can be done through questionnaires, interviews or small groups, or a combination of these, and that the needs which emerge should be prioritized according to the frequency they are mentioned. Lampe (1986) believes that it is important to consult many sources. Brown and Schwartz (1988) report

that data can be gathered in a variety of ways: through interviews, observation, review of resources, review of data and through a literature review.

As can be seen from the descriptions above, data for a needs assessment can be collected in various ways. The selected method, or methods, will depend on such factors as the type of needs assessment, the time frame and available financial and human resources.

The Role of Needs Assessment in Training and Education

Kaufman (1985b) views training as a means and as a potential solution to a problem: "Training is one possible intervention which could be used to improve organizational results" (p. 28). He stresses, however, that training is not the solution to all problems and to use it without first identifying a problem may prove to be premature and erroneous. Kaufman feels that identifying needs will lead to the formulation of learning objectives which in turn will help determine the training effort, if training is an appropriate solution (Kaufman, 1986b).

Rossett (1987) believes that before training can be recommended as a solution, a needs assessment should be conducted to verify that there is indeed an absence of skills, knowledge or motivation. According to Rossett (1992), training, in the form of information, can be used to motivate workers by informing them of the benefits, impact and value of a particular course of action.

Rummler (1987) suggests that the needs assessment process affects the trainees, which he refers to as 'performers', and the relevance of training to their jobs, as well as the organization to the degree that training improves performance. Like other authors on the subject, Rummler stresses that determining needs will identify which areas can be addressed by training and which cannot: "The training analyst must know what

performance can be impacted by training and what performance can't, and what performance factors must also be altered if the recommended training input is to result in meaningful performance output" (p. 24).

Rummler (1987) has identified four basic levels for identifying training needs within a framework which links training and performance. These are:

1) performance analysis;

2) task analysis;

3) competency study;

4) training needs survey (an opinion survey of several informed sources but with a focus on a particular type of employee, (manager, clerk, etc.).

Rummler's basic premise is that the "primary objective of training is to improve individual and organization performance" (p. 218). His model is based on systems theory where inputs are knowledge and skills and outputs are performance.

Although Rummler calls his approach "determining training needs", his arguments demonstrate that he agrees that training is an effective solution when a problem is caused by an absence of skill or knowledge. In Rummler's words, "Determining training needs is basically the process of establishing this critical linkage between performance needs and knowledge and skill requirements" (p. 247).

Lee and Roadman (1991) view needs assessment as a first step in the development of successful training. They write: "When adequate needs assessment is not conducted, objectives will be off target, and thus the evaluation will be misdirected" (p. 4).

Writing in terms of performance technology, Rosenberg (1988) stresses that training is an appropriate intervention only for performance deficiencies caused by a lack of skill or knowledge. He adds that training can also be a part of a recommended intervention.

From what the preceding authors have written about the relationship of needs assessment to training it can be said that the process of needs assessment, although often

delegated to training professionals, is considered a valuable tool not only..to identify problems but also to determine which problems can be successfully addressed by training and which cannot. Furthermore, should training be revealed as an appropriate solution to a particular problem, a needs assessment will indicate the areas where skills and knowledge are lacking.

Conclusion

A needs assessment is a process that is used to identify problems, usually within one organization. Despite different perspectives regarding needs assessment, experts in the field concur that a needs assessment is an important first step in developing effective interventions to solve problems. Most of the authors reviewed believe that a needs assessments should not focus on training as a predetermined solution; they should allow other types of solutions to stem from identified and documented problems. Some authors (Lapointe, 1992; Dodge, 1987), however, do view needs assessment as a tool which is used to find an educational solution.

Although authors may not agree on the precise terminology or even what a needs assessment does or does not include or how to go about conducting one, the following conclusions about needs assessments can be drawn from this review of the literature:

- it is crucial to conduct a needs assessment before undertaking the development of any kind of solution;

- a needs assessment is part of a problem-solving process and is itself a tool in decision-making;

- a need is a discrepancy between actual and desired results. Results can be measured in terms of performance or accomplishments;

- it is important to properly identify the need(s) in order to address it (them) through appropriate means;

- data relevant to a needs assessment can be gathered through a variety of ways including interviews, questionnaires, focus groups, observation and document examination;

- relevant data can include hard data (observations or assessment of actual performance) or soft data (opinions, feelings and perceptions);

- training is an effective solution for those problems where there is a lack of skill or knowledge, and in some cases, a lack of motivation;

- training as an appropriate solution is not to be taken for granted;

- if training is an appropriate solution, it is best to identify specific areas in order to define objectives that stem from actual/real needs;

- finally, needs assessment is a fundamental part of the analysis process in the performance technology model.

Chapter 3

THE NEEDS ASSESSMENT PROJECT

This chapter describes the methods used to carry out the needs assessment project outlined in Chapter 1. A description of the process for selecting participants and a discussion of the project's constraints are also included.

The Request

A request to conduct a needs assessment originated from a Montreal-based, international agency whose mandate is to promote EDI internationally. In this chapter, this agency is referred to as the 'sponsoring agency' or 'sponsor'. The sponsoring agency requested the needs assessment to investigate the problems associated with EDI implementation that were currently being experienced by organizations. The ultimate goal of the project was to find solutions to these problems.

One of the roles of this agency is to provide or coordinate training and education for its members. It is for this reason that the particular focus of the needs assessment was training and education and it resembles what Rummler (1987) calls a "training needs survey".

The needs assessment itself was carried out by educational technologists from Concordia University in Montreal, Canada.

The Approach

The approach for this needs assessment project is not based on one particular model but draws from the various perspectives described in the literature review, most notably

Rossett (1987). It combines both needs assessment and needs analysis in that it not only sought to identify problems but also to uncover causes and find potential solutions.

It was decided that the most efficient approach to carrying out this project would be to consult people with EDI expertise within EDI-capable organizations. This was done to be able to draw from their expertise and apply the information to less experienced organizations. The survey was chosen as the most appropriate method. In order to reach as many EDI users as possible, a mailing of written questionnaires was first envisaged. During the final phase of the questionnaire's formative evaluation, it was decided that a more appropriate instrument would be a telephone interview using an interview guide. Detailed descriptions of the interview guide and the interview process can be found further in this chapter.

Participant Selection Process

The sponsoring agency chose to limit the survey to organizations in Canada and the United States. Because phone interviews are more time consuming and more costly than sending questionnaires, and because the rate of response is usually higher, it was decided that fewer respondents would be contacted.

A list of potential organizations to be contacted was constructed from four main sources:

1. the attendee list of the EDI Advanced Strategies Conference (ADV. STRAT.);

2. the attendee list of the 1992 EDI Forum sponsored by the EDI Council of Canada (EDICC);

3. the membership list of the Institut EDI du Québec (IEDIQ);

4. the sponsoring agency's internal sources.

The selection of participating organizations was not done randomly. The sponsoring agency felt that large organizations thought to have solid experience with EDI should be contacted. It would have been preferable to obtain a list of highly EDI-capable organizations and then do a random selection. But this was not possible. The previously mentioned lists were the only ones available and only someone who knew which organizations had EDI experience could make a selection. Members of the sponsoring agency made this selection from these lists.

In order to obtain a broader perspective, an attempt was made to select organizations from a variety of industries. Organizations selling EDI services were deliberately excluded from the sample because it was felt that these organizations would not be in a position to accurately report on problems associated with EDI implementation within the organization and might bias the results. Geographical location within Canada and the United States was not a consideration.

The lists described above included the names, addresses and telephone numbers of EDI contact persons in the organizations. To obtain different perspectives of EDI within organizations, it was initially envisaged that data would be collected from individuals involved with EDI at four organizational levels; 1) senior managers for a global perspective of EDI's function within the organization; 2) middle managers for a 'front-line' perspective; 3) EDI experts for a perspective based on their in-depth knowledge of EDI; 4) direct users for a 'hands-on' perspective. (A direct user was defined as someone who carries out EDI transactions as a central part of his or her job). The strategy was to contact the person responsible for EDI in the organization and then to request the names of those involved with EDI at the different levels.

Unfortunately, this strategy did not work as expected. Respondents were reluctant to provide the names of other employees, particularly of senior managers, unless these employees were known to be EDI experts or had special EDI experience.

Procedure

Interviews were conducted with 48 respondents from 43 organizations throughout the United States and Canada. These interviews were supported by an interview guide developed from a questionnaire that had been originally created for a mail survey. When the decision was made to conduct the survey by phone instead of mail, an interview protocol was also developed. Below are the descriptions of each stage of this procedure.

Instrument Development

Questionnaire Construction

A first questionnaire was constructed based on information garnered from current EDI literature and meetings with EDI experts and educational technologists. The questions focused particularly on non-technical issues as these seemed to be the areas of most concern.

Because the project was a needs assessment, the questionnaire was designed with the intent of eliciting feelings, attitudes and opinions about what is/was and about what should be/should have been. The format of the questions and of the questionnaire itself were developed in accordance with recommendations found in the literature on questionnaire design (Alreck & Settle, 1985; Borg & Gall, 1989; Converse & Presser, 1986; De Vaus, 1990; Dillman, 1977, 1987; Fink & Kosecoff, 1985; Lapointe, 1992; McKillip, 1987; Oppenheim, 1992; Rosset, 1987; Stufflebeam et al., 1985; Zemke & Kramlinger, 1982).

Although a needs assessment does not usually anticipate solutions, questions dealing with training and education were specifically included in the questionnaire. There had been enough information in the literature to suggest that training and education were lacking and one of the goals of the project was to validate this and to identify what methods and content of training were needed or desired.

At the request of the sponsoring agency, a section dealing with automated tools was also added to the questionnaire. Again, because it presupposes a solution, this type of information is not usually included in a neeJs assessment.

Formative Evaluation. The questionnaire underwent several phases of formative evaluation. It was first subjected for review by EDI experts (as subject matter experts) to ensure the accuracy of the content. It was also reviewed by educational technologists to obtain feedback about format, question design, wording and sequence, and clarity of instructions. Members of the sponsoring agency were also asked to review the questionnaire to ensure that the issues it addressed were in keeping with the agency's goals.

Reviewers' comments were received and examined and revisions to the questionnaires were made accordingly after each phase of evaluation.

A final draft of the questionnaire was then sent to small group of EDI-capable organizations. When questionnaire reviewers did not return the questionnaire promptly and researchers called the reviewers, it was discovered that this was only one of several questionnaires they had recently received and mentioned feeling intimidated by the questionnaire. These reviewers, however, had very willingly provided feedback over the phone. Reviewers who did complete the questionnaire commented that it was easy to answer and well-done but a little long. In light of these evaluations, it was decided that interviewing potential respondents by phone might yield a better response rate. The telephone interview approach was also advantageous because it eliminated the need and expense of translation. Based on comments made by the reviewers, the questionnaire was again revised (shortened). In order to shorten the questionnaire, it was decided that the questionnaire would focus on training and education. The final version of the questionnaire was then adapted to serve as a guide for the interviewer.

This interview guide (Appendix A) was reviewed by a committee of those involved in the project and consequently refined. Unfortunately, at this point in the project there was little time to field test the guide. At the end of the first interview, the interviewer asked the respondent for comments about the questions and interviewing style. The comments were quite positive. In light of this, and considering that the content and the issues had been extensively reviewed and that time was an important constraint, the interviewing process began without further testing. It is important to note, however, that the interviewer adjusted her interviewing techniques as she progressed.

The Interview Guide

The interview guide is divided into 2 sections: 1) Organizational and Personal Preparation: 2) On-the-job Problem Solving. The issues addressed in the guide move from the general to the specific.

The purpose of Section 1 was to obtain information about the impact of EDI on individual jobs and on the organization itself as well as the actions the organization took to prepare for EDI. This included the type of training respondents had received. The issues addressed with respect to training were those culled from the literature for the written questionnaire. Section 2 of the interview guide sought to establish the types of resources which were available to respondents to solve EDI related problems. Throughout both sections, the interviewer asked respondents what they desired in the form of organizational actions, of training, and of resources. Please note that each section of the interview guide is described in detail in the following chapter which presents the results of the survey.

A separate questionnaire containing questions aiming to establish organizational and respondent profiles (Appendix B) was created and appended to the Interview Guide. These questions were used to determine the extent of an organization's or an individual's experience with EDI and to provide a contextual reference for the responses.

The Interview Process

Interviews were conducted over a two-month period. All of the interviews were conducted by the same person. This eliminated the risk of serious variations in interviewing techniques often associated with data from interviews done by more than one person. However, with each new interview, the interviewer was able to apply the experience and knowledge she had gained about the specific problems facing respondents from previous interviews and the interviews became more focused. In addition, after 20 interviews, a meeting was convened to assess the interviewer's progress and to discuss future strategy. At this time, it was decided to place more emphasis on eliciting potential solutions from respondents.

The original strategy of contacting the person responsible for EDI in the organization and then asking for the names of three other people from different organizational levels (senior management, middle management, direct user) was kept but proved to be unfruitful. Respondents, although very cooperative regarding the interviews, were, for the most part, reluctant to provide names (only nine respondents did so) and several reported that the organization did not have EDI end users.

The greatest obstacle to contacting respondents was voice mail. Messages were left and although most were returned, some were not. When a message was left, the interviewer left her name, that of the sponsoring agency, the number where she could be reached and a brief general reason for the call. A second attempt at reaching each potential respondent was made if the original message had not been returned. If this second try did not result in contact, another message was left on the voice mail system. In cases of chronic "telephone tag", the interviewer made as many attempts as were needed until she contacted the respondent.

Interviews were conducted in French with four participants from Quebec. As the interviewer was fluently bilingual, these interviews were conducted with the same degree of ease as the English interviews.

Interview Protocol

The interview protocol selected was based on the recommendations found in the literature concerning telephone interviewing (Dillman, 1977; Fowler, 1984; Oppenheim, 1992; Rossett, 1987; Zemke & Kramlinger, 1982).

It was decided at the onset of the interview process that the tone of the interviews would be informal. As there was no way of anticipating the range of challenges organizations faced, it was felt that this approach would encourage respondents to voice their opinions and thoughts about their concerns with respect to EDI and about the issues that were being examined.

When the interviewer contacted a potential respondent, she greeted the respondent and identified herself and the sponsoring agency. She explained the purpose of the call to the respondent and asked if he or she could spare 15 to 20 minutes to answer questions about his or her experience with EDI. It is important to note that the interviewer explained to respondents' that their answers would be kept confidential. The interviewer also offered to schedule an appointment at the respondent's convenience.

The interviewer began each interview by giving the respondent the opportunity to express his or her concerns about the problems and challenges the organization had faced, or was facing, with respect to EDI implementation. Respondents were generally very amenable to this approach. This aspect of allowing participants to immediately speak about their concerns constitutes an important difference between the written questionnaire approach and the telephone interview. Issues which respondents felt were critical emerged without bias of questioning or pre-established expectations. The approach also set the tone for the rest of the interview, i.e., one of genuine interest for the interviewees.

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Members from the sponsoring agency had suggested that warm-up questions at the beginning of the interview about the respondent or the organization might be helpful in establishing a rapport between the respondent and the interviewer. This approach was tried during the first few interviews but did not seem to put the respondents at ease. The approach of asking the respondents about their concerns seemed to be more effective and it was this method that was adopted for subsequent interviews. Questions addressing the respondent's or organization's profile were asked at the end of each interview and respondents very willingly answered them. Respondents did, however, sometimes volunteer information about themselves or their organizations at the beginning of the interview. When such was the case, the interviewer noted the information as it was given and, at the end of the interview, asked only the profile questions which had not been answered.

After respondents had been given the opportunity to voice their concerns about EDI, the interviewer then proceeded to question the respondents about the specific issues pertaining to EDI implementation found in the interview guide (Appendix A). When respondents could not think of problems offhand, the interviewer simply began with questions on the specific issues mentioned above and often respondents were reminded of problems. In this sense the interview guide was used primarily to prompt respondents after they had been asked a general question. In compiling the results, a distinction was made between a prompted response and an unprompted response (please see the following chapter, Results). In all of the interviews, an attempt was made to address the issues that had been identified as areas of primary concern: senior management commitment, legal issues, security issues and automated tools.

At the end of each interview, in addition to the information the interviewer gathered about the respondent and the organization, the interviewer asked for the names of senior managers and direct users. If the respondent hesitated, the interviewer gave the respondent the option of calling back with the names or to sending the names by fax,

however, none of the respondents did so. The names of middle managers were not asked for because the interviewer soon discovered that: a) the EDI expert was usually the middle manager in the unit where EDI was being implemented; b) names of middle managers were not forthcoming. It is also important to add that the EDI champions often considered themselves 'end users'.

The interviewer always concluded each interview by thanking the respondent for his or her participation and by offering to send a copy of the survey report to the participant. The interviewer also forwarded information describing the sponsoring agency if a participant requested it.

The question of whether to tape the interviews arose before the interview process began. Due primarily to ethical and legal considerations this approach was not adopted.

It is important to note that the interviewer was not a professional interviewer and had not been trained for the project although she was very familiar with EDI and the issues being investigated.

Interview Characteristics

All of the respondents were encouraged to express their concerns with respect to EDI, to suggest potential solutions to the problems they reported, if any, and to voice their opinions with regard to the effectiveness of training and/or education to deal with these problems. Respondents were also encouraged to identify the types of training most likely to be needed. The sequence of all of the interviews reflected the sequence of the interview guide and emphasis was placed on the key issues mentioned earlier (senior management commitment, legal issues, security issues and automated tools) for all interviews.

Needless to say, each respondent dealt with the questions differently. Although every attempt was made to keep all of the interviews identical, it was impossible to address all of the issues in the Guide with all respondents. Some respondents provided

very succinct answers while others provided a great deal of detail. In some cases, respondents spoke at length about the problems they had encountered with EDI and had little to say about other issues, even when asked. Some respondents were pressed for time after having described the challenges they were facing and others preferred that the interviewer adhere to the issues.

Certain respondents would sometimes ignore a prompt and spoke of other matters. The interviewer allowed these respondents to express themselves and then would try to bring them back to the original prompt or topic although this was not always successful. Some respondents also spoke in terms of other companies. Although this information was difficult to classify, this perspective is reflected in the results.

Interviews also varied in length. The average length of an interview was approximately 30 minutes. However, when the interviews were straightforward, they were about 15 to 20 minutes. Longer interviews, from 45 to 60 minutes, were due to the fact that the respondent had thought a great deal about EDI and had a great deal to say.

During each interview, the interviewer took quick notes, using the interview guide as a prompting tool but not trying to fill it in. This was done to ensure that as much information as possible was recorded. When the interviewer did not understand a point, particularly when a respondent spoke quickly or the material was technical, the interviewer reframed the information or asked for clarification. The interviewer scheduled time after each interview to record the information in the appropriate section of the interview guide and to write out the main problems reported during the interview. This was done immediately after the interview while the information was still recent. At the end of the project, there were 48 completed interview guides. When appropriate, the interviewer recorded problems on a separate 'problem page'. This facilitated access to the information concerning problems.

One of the interviewer's most difficult tasks was to root out the actual problems, to sort them from the causes and symptoms described by respondents. This was difficult

because causes for problems and the problems themselves were often confounded. A cause could be interpreted as a problem and a problem as a cause. Solutions from respondents aided in clarifying the distinctions but not entirely. In the results sections, causes and problems have been classified into what were viewed as the most useful categories in developing solutions and recommendations, but there is, admittedly, still room for interpretation.

The introduction to the interview was perhaps the most difficult aspect of the interviewing process, particularly because of the 'cold call' approach. The interviewer was aware that she would be disturbing respondents and asking them to take time away from their busy schedules. In light of this, the interviewer always offered the respondent the option of being interviewed at his or her convenience. Most respondents who agreed to be interviewed chose this alternative. The interviewer then scheduled an appointment with the respondent and called the respondent at the designated time. There was little difference between an interview that was scheduled and one that was unscheduled, however, respondents who chose to schedule interviews may not have been willing to be interviewed had they not been given this option. Knowing that the interview was scheduled and that the respondent was expecting to be interviewed, made calling the respondent easier for the interviewer. Respondents who chose to be interviewed without an appointment assured the interviewer that they had the time. Indeed, an appointment, even if the interviewer had indicated the approximate length of time it would take, did not guarantee that the respondent would be available for the entire period or that he or she would not be interrupted. Although a few respondents seemed to resent being surveyed, (even with an appointment) most were very cooperative and friendly.

It is important to manage one's time when conducting interviews, particularly before and after each interview. Taking a few minutes to prepare oneself before the interview is crucial as is spending time after the interview, while the respondent's answers are still 'fresh' in one's mind, to write out and clarify the notes taken during the

interview. The process of telephone interviewing requires enormous concentration and complete attention.

Discussion of Methods

The needs assessment approach worked very well for this project. There were, however, certain constraints. These are described below.

<u>Constraints</u>

The most important constraint was the difficulty obtaining lists of potential participants. This was due to a misunderstanding between the sponsoring agency and another EDI organization. The lists which were made available did not contain a sufficient number of organizations to make it possible to randomly select the organizations who would participate in the survey. This obstacle also resulted in delays in conducting the survey. It was in part because of this lost time that the interview guide was not subjected to a formal evaluation.

Not being able to randomly select participating organizations was an important constraint. This meant that in order to have a reasonable number of participants for this survey, the number of available organizations could not be further reduced. The inability to randomize means that the sample cannot be considered representative of EDI users throughout North America and Canada and that the results cannot be generalized to all EDI users.

The lack of time to properly and thoroughly evaluate the interview guide as an interview guide and not as a questionnaire, was also an important constraint. The guide was useful in reminding the interviewer of the specific issues to be addressed; however, it was awkward to use. A more streamlined instrument would have been more useful.

Because of the newness of EDI and the difficulty anticipating the types of responses, it would have been difficult to decide what to include and what to delete. This had also been a major challenge in developing the original questionnaire.

Another constraint faced throughout this project was the sponsoring agency's focus on obtaining information about the potential use of automated tools in an EDI environment. As mentioned previously, this focus on a potential solution is not usually part of a needs assessment. It was a constraint in that it added to the time needed to construct the questionnaire; indeed many revisions were made so that this section could be included. It also added to interview time.

Constraints also presented themselves during the interview process. It was often extremely difficult to reach people and even after making appointments, some participants were not available. Initial conditions for interviewing were not optimal because the interviewer did not have a permanent space and had to move around. This meant having to constantly inform the secretaries of a new number or a new location so that they could receive calls from respondents who might call back. Once the interviewer was established in a closed, permanent office, away from such distractions as people talking on the phone and the noise of photocopiers, the process became much easier.

Conclusion

As in most surveys, answers cannot be anticipated. There was a certain disappointment in not being able to obtain the names of employees from various organizational levels, as this could have broadened the perspective of the problems reported. However, a respondent cannot, and should not, be forced into providing an answer he or she does not wish to give.

Fortunately, the telephone interviews were flexible in that they allowed respondents to express unanticipated answers. The approach of allowing respondents to freely express their concerns and needs provided data which directly tapped the real needs of EDI users. Had they been restricted to a questionnaire, respondents may not have had the desire or motivation to provide such data, despite the open-ended questions that had been foreseen.

Despite these constraints, the interview process proceeded smoothly and yielded some interesting, and surprising, results (described in the following chapter).

Chapter 4

RESULTS

This chapter reports and describes the data gathered during the needs assessment. It begins by describing the analysis procedure used to compile the data and the respondent and organizational profiles. It then details the problems and challenges of greatest concern to the respondents and reports the results of the questions posed about the issues contained in the interview guide.

Data Analysis Procedure

Because the purpose of the study was to uncover the problems associated with EDI implementation, the researcher first examined the data for reported problems. Although most of these had been recorded on a separate page after each interview, some were embedded within the prompts in the interview guide. This was especially true of the early interviews. Reported problems include the problems respondents voluntarily reported and any problems prompted by the issues addressed in the interview guide. (A distinction has been made between voluntary answers and prompted answers in reporting the results.) To facilitate this process, a sheet summarizing the data gathered from each interview guide was created. The researcher then transcribed the information provided by respondents (with the exception of the profile data) from the interview guide to the summary sheet. Figure 1 presents a sample of this summary sheet. The summary provided both a standardized representation of all the interviews and a short-hand reference to all of the major points made by the interviewee. Once all of the problems were identified, they were grouped into four general problem areas, categories which emerged when the nature and frequency of the problems were analyzed and interpreted.

Figure 1
Sample Summary Sheet

ID: # 27 Expert   food & grocery distributor   CAN

PROB 1: (volun) lack of EDI capability among trading partners
Cause: - lack of knowledge.: basic concepts, DUN nos.

PROB 2: different. versions of UCS standards
Cause: - cost of updates
           - lack of awareness among trading partners
Solution: - organization prepared to maintain 2 or 3 versions

**Solution for lack of senior management commitment: some (3-4) trading partners of
one organization asked the senior management of that organization for letters
describing EDI benefits to give to their vice presidents.**

**Organizational. and
personal preparation:** hired for expertise

What company did: - pilot
                     - produced implementation guide for suppliers
    consultation: not sure
    interface: not addressed
    exec support: yes
    inform: not addressed
    champion: yes
    financial support: not addressed

Could have done: not applicable (respondent was not there)

Training
Received: - none - hired for expertise
                - Questions 12-16 - not applicable
                - Questions 19, 21, 23, 25 - not addressed
                - Ques. 20 (security), Ques. 22 - no prob., Ques. 24- no present need

Desired   - business aspects (Q17) + ECR
                - standards (Q24)

Suggested Methods: - users groups, conferences (both useful)

Resources
Have   - manuals: translator., UCS
                - phone: VAN (good); trading partners
Desired   - none mentioned

Automated tools: - did not see use

Additional comments: none

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The problem areas, described in detail further in this chapter in the section dealing with interview results and summarized in Tables 10 through 15, are the following:

Problem Area 1: Problems Related to the Partnership Relationship;

Problem Area 2: Problems Related to Standards;

Problem Area 3: Problems Related to Intra-Organization Functioning;

Problem Area 4: Problems Related to Technical Issues.

Within these problem areas, three problems were reported most frequently:

1) Misuse of Standards;

2) Lack of EDI Capability Among Trading Partners;

3) Insufficient Senior Management Commitment to EDI.

These are also described in detail further in this chapter. Descriptions of the remainder of the problems reported, those mentioned by four or fewer respondents, can be found in Appendix C. Causes and actual and potential solutions reported by respondents for a particular problem are presented with each problem (for all of the above).

Creation of categories was literature-based, with the exception of the 'capability' issue (discussed further in this chapter), and to a lesser extent, misuse of standards. The terminology used in the EDI implementation process is sufficiently standardized that the placement of comments into categories was self-evident. When a respondent made a comment which was not clear to the interviewer, elaboration was immediately sought to ensure accurate representation of the ideas expressed.

The researcher then examined respondents' answers to each of the specific issues in the interview guide. She did this by going through each question and analyzing the frequency of the answers. The summary sheets described earlier were also used in this process. The results of this process are presented further in this chapter and are summarized in Tables 16 through 26. The sequence of presentation reflects the sequence of the questions in the interview guide.

The organizational and respondent profile data were compiled by counting the number of organizations and respondents which fell into each of the pre-determined categories of the profile questionnaire.

Descriptive statistics, numbers and percentages, based on the number of responses to a particular question, have been used to report the results. Because of the qualitative nature of the data, no inferential statistical tests were done on the data.

The results of the profile data can be found in the following section. Interview results for both the problem areas and the interview guide follow the description of the profile data.

Results were presented in a draft report to the sponsoring agency. The agency took it upon itself to edit the report and diffuse it.

Organizational and Respondent Profiles

Respondents were selected from source lists from the Institut EDI du Québec (IEDIQ), the Advanced Strategies Conference (ADV. STRAT.), the EDI Council of Canada (EDICC), the sponsoring agency's sources (OTHER) and the referrals provided by respondents when asked for names of direct users (REFER). A total of 99 potential respondents were called. Of these, 16 had bad numbers (no answer, a fax number instead of a phone number or the person identified in the voice mail did not match the name on the list and leaving a message would have been awkward). For three numbers, no message could be left because the person's voice mail indicated that the person was away indefinitely or on vacation and would not return before the survey completion deadline. Of the 83 organizations that were counted, interviews were conducted with **48 respondents from 43 organizations** throughout the United States and Canada resulting in a response rate of 58%. Organizations in the U.S. (14 in total - 33%) were located in

11 different states (Arizona, Illinois, Texas, Florida, New Jersey, Tennessee, Omaha,

Pennsylvania, North Carolina, Connecticut and Iowa) whereas Canadian organizations

(29 in total - 67%) were from only two provinces: Ontario, particularly from the Toronto

area where there is the highest concentration of EDI users in Canada, and Quebec. The

statistical breakdown for the calls and responses from each source is presented in Table 2.

Table 2
Statistical Breakdown of Calls and Interviews by Source

	IEDIQ	ADV. STRAT.	EDICC	REFER.	OTHER	TOTAL
No. of Potential Organizations:	12	31	33	9	14	**99**
Bad Numbers°:	4	6	4	1	1	16
Total Calls Counted:	8	25	29	8	13	**83**
Messages Not Left*:	1	0	1	1	0	3
Non-returned Messages:	0	10	6	2	2	20
Total Number of Contacts:	7	15	22	5	11	**60**
Contacts Not Interviewed†:	2	1	7	0	2	12
Number of Appointments Made:	6	14	17	5	11	**53**
Number of Respondents Who Were Not Available at Interview Time:	1	0	2	0	2	5
Number of Interviews:	**5**	**14**	**15**	**5**	**9**	**48**

° Bad numbers were unanswered after several rings (called twice); fax numbers instead of phone numbers; person's voice mail name did not match name on the list and leaving a message would have been awkward.

* No message was left at these numbers because person's voice mail indicated that the person was away indefinitely or on vacation and would not be back before survey completion deadline.

† Although contact was made with the person, an interview was not conducted because the person felt that their organization did not have enough EDI experience; that they did not want to be interviewed; they said they would call back to set a time and didn't or person was not available at interview time.

Questions addressing organizational and respondent profiles were included in the interviews in order to create a context for the data gathered about problems and solutions. It was felt that if the sample was largely made up of organizations and individuals with substantial EDI experience then the data would be more useful.

Organizational Profile

In order to construct an organizational profile, questions were asked about the degree to which EDI is established in these organizations, including the length of time EDI had been used in the organization, the stage of EDI implementation, the reasons for adopting EDI and the types of EDI transactions exchanged. Questions addressing industrial sectors, as well as organization operating structures and number of employees, were also posed.

EDI Experience

As can be seen from Table 3, all but two organizations had been using EDI for at least 1 year, and thirty (70%) had been using EDI for at least three years. Respondents who considered EDI to be well established in their organization explained that EDI was well integrated and functioning smoothly. Several respondents who reported that EDI was in the middle implementation phase explained that EDI was working well but that they did not consider the organization well established because the organization was not using EDI at its full potential.

Table 4 presents the list of reported reasons for implementing EDI. Note that respondents may have given more than one reason. The primary reason, cited for 22 organizations (51%) was "request of a client". This may be due to the fact that the sample surveyed included a high proportion of suppliers.

Table 3
Organizational EDI Experience

Total number of organizations: 43

No.	Length of Time Using EDI	No.	Implementation Phase
1	less than 6 months	7	early implementation
1	between 6 months and 1 year	9	middle implementation
7	between 1 and 3 years	27	well-established
9	between 3 and 5 years		
13	between 5 and 10 years		
8	more than 10 years		
2	don't know		
2	no answer		

To "become more efficient within the organization" was described as being more productive or solving certain internal problems. "Green benefits" were described as environmental reasons because EDI promises to reduce the amount of paper used.

In order to further establish the degree of an organization's EDI experience, respondents were asked to list the types of EDI transactions carried out by their organizations. The long list of reported transactions (Table 5) clearly suggests that EDI is alive and well among these organizations.

Table 4
Organizations' Reasons for Implementing EDI

No.   Reason

22____ Request of a client

6____ Cost Reduction

5____ To become more efficient within company

4____ To increase the timeliness and accuracy of information

4____ To stay competitive

3____ To better meet the needs of clients or customers

3____ As part of an overall business strategy

2____ Cycle time reduction

2____ To be innovative

2____ To conduct electronic transactions within the organization

2____ Industry pressure

1____ "Opportunity to work with sister divisions"

1____ To shorten lead time

1____ Acquisitions - one company acquired a company that was already doing EDI

1____ Internal trial project

1____ Economic renewal

1____ "Green benefits "

1____ Strategic procurement

Table 5
EDI Transactions Exchanged by Organizations

Invoices
- sending invoices (28)
- receiving invoices (16)
- carrier invoices (1)
- freight invoices (5)
- invoice status (1)
- utility invoices (1)

Purchase Orders
- receiving purchase orders (27)
- sending purchase orders (16)
- P.O. acknowledgments (9)
- P.O. change (4)
- P.O. change request (1)
- P.O. inquiries (1)
- P.O. status (1)

Pricing Transactions
- price chng. transac. (1)
- price lists (2)
- price sales catal. (2)
- promotion announ. (2)
- request for quote (1)
- sales reports (1)

Financial Transactions
- receiving payments (6)
- sending payments (3)
- statement transaction (3)
- taxes (4)
- unspecified finan. trans. (4)

Customs Transactions
- entry declaration (1)
- manifest (1)
- payment of duties (1)
- unspecified customs trans. (3)

Order Transactions
- order acknowl.(1)
- order inquiry (1)
- order status (1)

Shipping Transactions
- advance ship notices (9)
- bills of lading (3)
- freight payments (2)
- freight status (2)
- motor transport billing (1)
- receiving advice (1)
- reporting ship notices (1)
- ship orders (1)
- ship schedule (1)
- shipment status (2)

Inventory Transactions
- inventory advice (1)
- inventory exchange (1)
- inventory levels (1)
- point of sale (2)

Warehouse Transactions
- warehouse confirm. (1)
- warehse. inventory (1)
- warehse. ship advice (2)
- warehouse ship order (1)
- warehse stk. trans. recpt (1)

Production Transactions
- planning schedule (1)
- production scheduling (1)
- forecast data (2)

Product Transactions
- product data activity (2)
- product trans./resale report (2)

Other Transactions
- airline rep.-freight cost (1)
- change acknowl. (1)
- contracts (845) (2)
- electronic catalogues (1)
- functional acknowl. (7)
- procurement (1)
- remittance advice trans. (2)
- replenishment (1)
- statistics (1)
- store directory (1)
- text messages (1)
- updating client inf.. (1)
- internal transactions (2)

Purchase orders (P.O.s) and invoices were the most frequently used transactions. The transactions in Table 5 are arranged by group of transaction with the number of respondents mentioning it beside its name. Within each group, aside from those mentioned most frequently, the transactions are arranged alphabetically. The names of transactions are listed as given by respondents. In addition to this list, one respondent mentioned that his company was just beginning to use ECR (Efficient Consumer Response).

It is interesting to note that in terms of years of experience and number of transactions, the U.S. organizations that participated in the study were, as a whole, more advanced in their EDI use than were the Canadian organizations.

Industrial Sectors. A fairly broad spectrum of industrial sectors (listed in Table 6) is represented by the organizations in this study. Most of the organizations can be identified as suppliers, although some are both suppliers and customers and use EDI in both capacities.

Table 6
Industrial Sectors Represented by Organizations

Total number of organizations: 43

No.	Sector	No.	Sector
11	food and grocery	1	petroleum
9	manufacturing	1	education (university)
7	government	1	telecommunications
2	transportation	1	network communications
2	health care	1	metals
2	retailing	1	photographic distribution
1	textile/clothing	1	customs broker
1	automotive	1	banking

Respondents from three organizations in the food and grocery industry specified that their organizations were involved in distribution and five others identified their organizations as manufacturers. The other three did not specify. The distinction is noted because their status as manufacturers or distributors affects the way they use EDI, particularly with respect to what transactions they use.

The areas of retailing were personal products and automotive parts/hardware. Excluding food, the types of products manufactured were: leather goods, footwear, office equipment and supplies, tobacco, automotive parts, health care products, small appliances, photographic equipment and semiconductors.

It is important to note that government departments were treated as separate organizations. Areas of government were: customs, revenue, broadcasting and defense.

Operating Structures. A multiple unit operating structure was the most prevalent among the organizations surveyed. The majority of organizations (88%) were large organizations employing more than 1000 employees (Table 7).

Table 7
Organizational Operating Structure and Number of Employees

Total number of organizations: 43

No.	Organizational Operating Structure	No.	No. of Employees Worldwide
2	single site	3	between 200 and 500
12	multiple, special purpose sites	1	between 500 and 1000
19	main site and branch units	38	more than 1000*
7	government	1	don't know
1	multinational		
1	main site and divisions that are separate entities		* Reported figures for this category ranged from 3,500 to 85,000.
1	no answer		

Respondent Profile

Respondents were knowledgeable, well-informed and articulate. In general, they were friendly and willing to answer questions and volunteer information. Most expressed enthusiasm about EDI and their involvement with this new way of doing business.

Of the 48 respondents, 43 were original contacts and 5 had been referred by the original contact when asked for a direct user within the same company. The "direct users" who were referred held supervisory positions. During the course of the study, it was discovered that the terms 'direct users' and 'end users' were imprecise as EDI experts considered themselves direct users. The 'direct users' we had originally hoped to interview were the people directly affected by the organizational and occupational changes brought on by EDI. When asked for the names of such employees, several respondents answered that there were no 'real' direct users in their companies. Several respondents reported that EDI in their organizations was "transparent" or "unattended" or "highly automated". One respondent said that the order entry clerks did not know they were using EDI.

The questions posed with respect to the respondent profile were meant to ascertain the respondents' degree of EDI experience and to gather contextual information about their position in the organization. This was done by asking how long they had been working with EDI and how long they had worked in their current position and for their organization. All of the respondents were quite EDI literate and all but two had been working with EDI for at least one year. Table 8 presents a partial respondent profile.

A little more than half of respondents (52%) worked in the Information Systems (IS) department of their organization, although 4 worked in customer service. The department names (listed in Table 9) are presented as reported by respondents. It can perhaps be argued that some of these departments could be considered IS, however, when asked, respondents preferred not to use the IS label.

It is important to note that the departments listed in Table 9 include government departments which were treated as separate organizations. This may be slightly misleading because respondents answered by describing the name of their government department (defence, taxation, etc.) and not the department within that department (accounting, personnel, etc.). However, this information does not affect the results of the survey.

Table 8
Respondent Profile: Part 1

Total number of respondents: 48

No.	Length of time involved with EDI in organization	No.	Length of time involved with EDI in general
2	between 6 months and 1 year	2	between 6 months and 1 year
15	between 1 and 3 years	10	between 1 and 3 years
14	between 3 and 5 years	14	between 3 and 5 years
15	between 5 and 10 years	19	between 5 and 10 years
2	more than 10 years	3	more than 10 years

No.	Length of time in current position	No.	Length of time in organization
1	less than a year		
14	between 1 and 3 years	6	between 1 and 3 years
17	between 3 and 5 years	9	between 3 and 5 years
12	between 5 and 10 years	5	between 5 and 10 years
2	more than 10 years	18	between 10 and 20 years
1	does not apply	7	more than 20 years
1	no answer	3	no answer

Table 9
Respondent Profile: Part 2 (Organizational Departments)

Total number of respondents: 48

No.	Current Department	No.	Current Department
25	Information Systems	1	Communication Department
4	Customer Support/Service	1	Credit Department
2	EDI Specialist for Several Departments	1	Systems and Processes
2	Finance	1	Electronic Commerce Services
1	Electronic Data Services	1	Revenue/Taxation
1	EDI Services	1	Defence
1	Customer Service and Inventory Logistics	1	Procurement
1	Corporate Commercial Systems	1	Corporate Electronic Banking
1	Computer and Telecommunication Services	1	Information Management

1	No Answer

Interview Results: Problems Mentioned By Respondents

A total of 22 individual problems were reported by respondents. Table 10 presents a complete list of the problems. The numbers in parentheses indicate the number of respondents who mentioned this problem. These problems have been classified into four general problem areas:

Problem Area 1: Problems Related to the Partnership Relationship

Problem Area 2: Problems Related to Standards

Problem Area 3: Problems Related to Intra-Organization Functioning

Problem Area 4: Problems Related to Technical Issues

These problem areas are described in detail further in this chapter. It is interesting to note that, of 48 respondents, only 2 (4%) did not mention any type of problem with respect to EDI.

Three Major Problems

As can be seen from the number of respondents who mentioned the problems (Table 10), two specific problems emerge far ahead of all others. These are:

Problem 1.2/2.1: Misuse of Standards;

Problem 1.2: Lack of EDI Capability Among Trading Partners.

The first problem falls into Problem Areas 1 and 2 as it is a standards problem stemming from the partnership relationship. The second problem falls into Problem Area 1.

A third, anticipated problem, also surfaced:

Problem 3.1: Insufficient Senior Management Commitment to EDI.

This problem falls into Problem Area 3 because it deals with an internal organizational problem.

Detailed descriptions of the **three major problems**, including a general description, possible causes, and potential and actual solutions suggested by respondents, can be found further in this chapter, after the problem area descriptions. Actual solutions are solutions that organizations have implemented to prevent or overcome the problem. Potential solutions are solutions that respondents felt would be effective.

Descriptions of the remainder of the problems reported by respondents, each of which was reported by no more than 4 respondents and the majority of which by 1 or 2 respondents, can be found in Appendix C.

A distinction has been made between a problem which was reported voluntarily or through prompting. Prompting is defined as the questioning done by the interviewer about specific issues contained in the interview guide.

Table 10
A Complete List of Problems and Challenges Reported By Respondents

Problem Area 1: Problems Related to the Partnership Relationship

1.1 *Misuse of Standards* **(23)**

1.2 *Lack of EDI Capability Among Trading Partners* **(22)**

1.3 Threats From Trading Partners to Adopt EDI (2)

1.4 Reluctance of Trading Partners to Set Up Interconnects (2)

1.5 Reluctance of Trading Partners to Sign Legal Agreements (2)

1.6 Pricing Discrepancies Between Organization and Trading Partners (2)

1.7 Organization Receives "Misinformation" from Trading Partners (1)

1.8 Trading Partners Have Different Requirements (1)

1.9 No Automatic Way for Clients to Do The Work of a Broker (1)

1.10 Trading Partners Do Not Use the Same VAN (1)

Problem Area 2: Problems Related to Standards

2.1 *Misuse of Standards* **(23)**

2.2 Difficulty Deciding Which Codes to Use (1)

2.3 Problems with the Process of Developing and Changing Standards (1)

2.4 "There Is a Need to Adopt Generic Standards" (1)

2.5 Dealing with New Versions of Standards (1)

Problem Area 3: Problems Related to Intra-Organization Functioning

3.1 *Insufficient Senior Management Commitment To EDI* **(19)**

3.2 Resistance from Middle Management (2)

3.3 "Teaching People to Change" (1)

3.4 Coordinating Purchasing of Respective Groups Within the Organization (1)

Problem Area 4: Problems Related to Technical Issues

4.1 Lack of Support from Software Vendor (4)

4.2 Lack of Appropriate Software (2)

4.3 Integrating EDI Software Into Existing Systems (1)

4.4 Changing from P.C. to Another Platform (1)

Problem Areas

Problem Area 1: Problems Related to the Partnership Relationship

The subject of trading partners came up in 45 of the 48 interviews (94%). Of the 45, 39 (87%) mentioned some kind of challenge or problem related to partnership issues, (35 volunteered information, 4 described the problem when prompted). Table 11 illustrates these percentages.

Table 11
Number of Respondents Who Reported a Problem Related to the Partnership Relationship

Number of interviews where issue arose (of 48):	45	(94%)
Number of respondents who mentioned a problem:	40	(89% of 45)
		(83% of all resp.)
Number of these who volunteered the information:	34	(85% of 40)
Number who stated problem when prompted:	6	(15% of 40)

Respondents reported several problems that fall into this problem area which has to do with the "interchange" aspect of EDI. The most prominent of these problems were EDI capability and the misinterpretation or misuse of standards by trading partners. Indeed, 7 respondents mentioned both problems.

Problem Area 2: Problems Related to Standards

The subject of standards came up in 37 of the 48 interviews (77%). Of the 37, 26 (70%) mentioned some kind of challenge or problem related to standards, (20 volunteered information, 6 described the problem when prompted). Table 12 illustrates these percentages.

It is interesting to note that this problem area is almost completely a subset of the first problem area. However, four respondents reported problems associated with standards which were not related to a difficulty with their trading partners (these problems are described in Appendix C). For this reason problems relating to standards have been grouped into a separate problem area.

Table 12
Number of Respondents Who Reported a Problem Related to Standards

Number of interviews where issue arose (of 48):	37	(77%)
Number of respondents who mentioned a problem:	26	(70% of 37)
		(54% of all resp.)
Number of these who volunteered the information:	20	(77% of 26)
Number who stated a problem when prompted:	6	(23% of 26)

Problem Area 3: Problems Related to Intra-Organization Functioning

The subject of internal organizational functioning came up in all of the interviews (100%) in one form or another. There are several questions in the interview guide which deal with this area, most notably the questions addressing organizational changes and preparation. (Please see Appendix A.)

Some type of challenge or problem related to internal organizational functioning was mentioned by 21 respondents (44%), (6 volunteered information, 15 described the problem when prompted). Table 13 illustrates these percentages.

Table 13
Number of Respondents Who Reported a Problem Related to Intra-Organization Functioning

Number of interviews where issue arose (of 48):	48	(100%)
Number of these who mentioned a problem:	21	(44% of 48)
		(44% of all resp.)
Number of these who volunteered the information:	6	(29% of 21)
Number who stated a problem when prompted:	15	(71% of 21)

Problem Area 4: Problems Related to Technical Issues

The subject of technical issues came up in 23 of the 48 interviews (48%). Of the 23, 8 (35%) mentioned some kind of challenge or problem related to technical issues. All 8 volunteered the information. Table 14 illustrates these percentages.

Table 14
Number of Respondents Who Reported a Problem Related to Technical Issues

Number of interviews where issue arose (of 48):	23	48%
Number of these who mentioned a problem:	8	35% (17% of all resp.)
Number of these who volunteered the information:	8	100%
Number who stated a problem when prompted:	0	0%

The 3 Principal Problems

On the following pages are detailed descriptions of the 3 problems reported most frequently by respondents:

      1.1/2.1 Misuse of Standards (23)

      1.2   Lack of EDI Capability Among Trading Partners (22)

3.1 Insufficient Senior Management Commitment To EDI (19)

First Major Problem: Problem 1.1/2.1: Misuse of Standards

Number of respondents who mentioned this problem: voluntarily: 19

       when prompted: 4

Description. Respondents from 8 U.S. organizations and 14 Canadian organizations (2 respondents came from the same organization) reported this problem. This problem was reported by respondents from 7 industrial sectors (transportation, petroleum, manufacturing, textile, retail, food and grocery, and automotive).

According to respondents, suppliers are forced to develop different customer profiles to handle the different ways in which customers use or send information on transactions, particularly P.O.s. In order to comply with their customers' requests, suppliers must adapt and process the same information differently, which requires additional resources and is costly. Also, some systems will reject erroneous transactions. This forces suppliers to research problems, call the client and find out what happened - a very labour-intensive process. Even if the system does not reject the transmission, it can be time consuming to keep track of all of the different types of requirements. Furthermore, many respondents felt that the magnitude of this problem would increase as the number of trading partners increased. One supplier from the textile industry said that he wants to be able to cater to individual customer needs but sees a problem in maintaining all of the customer profiles electronically as the number of trading partners grows.

Respondents wanted to do EDI with their trading partners using the same version of standards in the same way. However, one respondent from a leading organization in the manufacturing of personal products had this to say on the subject: "There is a limit to how pushy you can be with a customer".

It should be stressed that most of the problematic transactions adhere to standards. The problem is that they do not all adhere in the same way.

Possible Causes. Respondents were asked what they believed to be the reasons for this problem. Their answers have been grouped into 6 categories and are listed below. The numbers in parentheses next to each category indicate the number of respondents whose answers reflected that category. It is possible that a respondent mentioned more than one cause.

1. Different Versions (12)

Trading partners use different versions of the standards, including different versions of P.O.s, forcing one trading partner, usually the supplier, to maintain more than one version. Respondents said they would like their trading partners to use the most recent version of standards, however, respondents did acknowledge that updates of standards can be costly, particularly for smaller companies.

Organizations sometimes had little choice but to use whatever version of standards their large customers were using, sometimes these were the company's proprietary standards, making it difficult to use the same versions as other trading partners. Indeed, one respondent reported that his organization was going through an "internal cleanup" with standards because it had begun by using a trading partner's proprietary standards and was now changing to ANSI X12.

2. Different Interpretations (10)

Another often cited reason for this problem was that even when trading partners were adhering to standards, and even when they were using the most recent version, their interpretation of the standards differed. Respondents mentioned that this usually occurred when trading partners used different transaction sets for the same information or when they misused fields, within a transaction set.

Respondents gave the following examples: 1) trading partners put two codes in one field when they should be/are separate items of information; 2) a trading partner insists that all invoice numbers contain only 6 digits (standards allow for 1-22 digits).

Respondents said that trading partners use different fields for different reasons. As one respondent said: "Different ways of interpreting standards reflect different ways of doing business."

3. Too Many Different Variables (8)

Respondents said that standards contained too many different variables and described standards as: "too lax", "too flexible", "overly-loose", "not tight enough", "no longer standards", "too permissive". These "latitudes" allowed trading partners to format certain fields in different ways. One respondent also felt that there are too many subsets of ANSI X12

4. No UPC or DUN Numbers on Transmissions (5)

Some trading partners do not use or do not update the UPC (Universal Product Code) or DUN numbers on their transmissions. One respondent felt that this was because entering UPC numbers was a time consuming process. Another mentioned that some customers preferred to use their own item or SKU numbers instead of UPC numbers.

5. Lack of Knowledge (2)

Two respondents felt that their trading partners were not sufficiently knowledgeable about standards and this led them to use standards incorrectly.

6. Other Possible Causes Cited

- Certain trading partners did not even use standards. (2)
- Trading partners sometimes initiate new transactions for which the organization has no code. (1)
- The existence of a "ZZ" qualifier, a "mutually defined" field (segment of P.O.) which can be used to accommodate information a trading partner wants to

include and or for which there is no standard, could be in part responsible for the way in which trading partners used standards. (1)

- Standards do not cover situations where one organization deals with products by weight and its trading partner deals with a product by quantity (in units). (1)

- Problem lies more with the application interface than with the translator. (1)

Actual and Potential Solutions. Respondents were also asked what solutions they envisioned for this problem. The solutions proposed by respondents are listed below. Some solutions have been implemented by the organizations while others are desired solutions. These solutions include those offered by respondents who did not report trading partners' use of standards as a problem for their own organizations.

1. Tools (9)

Nine respondents mentioned that the tools they had purchased or developed dealt adequately with this problem. Three other respondents made suggestions about possible tools. Below are descriptions of these tools.

- Respondents from five Canadian companies (transportation, manufacturing, automotive, and textile sectors have developed *customer profiles* (computer routines) to map trading partner information. However, they mention that this involves more work than if trading partners correctly used standards or included UPC numbers on transmissions.(5)

- Respondents from two companies (both food manufacturing) said that the company's *translation software* allowed for differences in P.O.s. (2)

- One respondent suggested that an automated tool that could indicate how each customer is mapped for each transaction (i.e. P.O.) would be useful. This tool would function as a sort of filter before information reaches the translator to verify that the customer has sent the transaction the way the customer normally

sends it (the number of segments and the order in which they are sent). This same tool should also be able to keep track of customer idiosyncrasies. (1)

- Electronically available standards. (1)

- An automated tool to advise of UPC changes and automatically distribute these changes, perhaps this could be done on a network and downloaded. (1)

2. Communication (9)

Several respondents said they simply research problems, call their partners and try to work it out. One respondent contacts his customers to ask them to upgrade their version of standards and another negotiates any special customer requirements. One organization sends faxes to advise its trading partners of changes in UPCs.

3. Education (8)

Eight respondents felt that their trading partners needed education with regard to this problem. This solution seems to be closely linked to communication as four of these respondents had also mentioned communication as a solution. One respondent felt that organizations should be more aware of the standards development process. One large organization assumes the role of educator by explaining the causes for the problem and the correct way of proceeding to its smaller and/or less experienced partners.

4. Standards Revision/Enforcement (6)

Several respondents suggested that standards themselves should be re-examined and perhaps modified in order to meet business needs. Two respondents reported that the *Food and Drug Users' Group* in Canada is trying to consolidate standards and convince its members to use information in a "more" standardized way. Below are additional points made by respondents.

- More work should be done to standards to cover all business processes. (1)

- Tighten standards - remove or reduce options. (1)

- Standards should have clear guidelines with respect to their use. (1)

- Trade associations should "police" UPC use more closely. (1)

Second Major Problem: Problem 1.2: Lack of EDI Capability Among Trading Partners

Number of respondents who mentioned this problem: voluntarily: 19

when prompted: 3

Description. This problem is twofold. First, respondents reported that their organizations are having difficulty establishing EDI trading partnerships with their suppliers or customers, particularly, but not necessarily, with smaller companies. These organizations would like to expand the number of their trading partners to reap greater benefits from EDI. They feel that increasing the number of trading partners will increase benefits and reduce costs. It is costly to maintain both EDI and paper systems to accommodate those trading partners who have not adopted EDI or are not sufficiently EDI-capable.

Increasing the number of trading partners will also allow organizations that want to experiment with new transactions greater freedom to do so as the initial investment for new transactions would be warranted.

Respondents also reported that although their trading partners are using EDI, they are not <u>sufficiently</u> EDI capable for all of the transactions that their organizations want to exchange with them. For example, one respondent from a food and grocery manufacturer reported that although some of his organization's trading partners use EDI for P.O.s, they will not use it for invoices. This prevents the organization from completing the P.O.-invoice cycle with EDI. Another respondent, from a government agency, mentioned that his organization's partners did not want to use EFT (Electronic Funds Transfer) via EDI and because EFT is the primary EDI transaction for this organization, this severely limits the degree to which the organization can benefit from EDI.

Of the 22 respondents who mentioned this problem, 4 represented U.S. organizations. These organizations were in the food and grocery, health care and manufacturing sectors. The Canadian organizations were in the following sectors:

transportation, government, manufacturing, textile, customs, food and grocery, banking, education, telecommunications and metals.

Possible Causes. Respondents were asked what they believed to be the reasons for this problem. Their answers have been grouped into 7 categories and are listed below. The numbers in parentheses next to each category indicate the number of respondents whose answers reflected that category. It is possible that a respondent mentioned more than one cause.

1. Lack of Knowledge (12)

Lack of knowledge was the most often cited reasons for lack of EDI capability. Respondents viewed this aspect in the following ways:

- Trading partners did not sufficiently understand EDI or do not understand it at all and do not know where to find resources. (10)

- Trading partner senior management is not sufficiently aware of what EDI is. (1)

2. Cost (9)

Cost was another major factor reported by respondents as a reason for the reluctance of some companies to adopt EDI. It is important to note that some respondents mentioned that the deterring factor might not be the actual cost of EDI but the cost that EDI is *perceived* to require. Respondents described possible obstacles to investing in EDI as:

- The instability of the present economic climate. (3)

- The cost of integrating EDI into existing business systems. (2)

- The fact that EDI requires a long-term investment before benefits can be realized and some organizations may not be convinced that EDI is worth the investment. (2)

- The cost of the numerous actions organizations must take to adopt EDI: set up trading partner agreements, rent VAN services, etc. (1)

- The cost of training. (1)

- Start-up and maintenance costs. (1)

3. Internal Organizational Conflict (7)

Seven respondents believed that some type of internal organizational conflict was responsible for the lack of trading partner capability. Below are the types of organizational conflict respondents thought existed among their trading partners.

- The reluctance or lack of support of trading partner senior management. (4) One respondent felt strongly that in order for EDI to work it has to be "mandated from the top". In one educational organization, EDI implementation was stalled because no one in the organization wanted to take the first step. It finally got underway due mainly to the encouragement of a very EDI capable supplier. Another respondent mentioned that although an organization adopted EDI, the project was given to the IS department without "push or promotion". (Senior management support is treated as an individual problem area further in this section text.)

- Fear of job loss, resistance, internal politics. (2)

- Organizations are experiencing difficulty in changing from a confrontational relationship to a cooperative one. (2)

- No EDI champion in organization. (1)

- Company representatives (from EDI-capable organizations) are not comfortable with EDI because they see it as technical and not part of their job and do not know how to sell it as a value added to their service or they cannot convince trading partners to adopt it. (1)

- EDI capable organizations have been to "timid" in their insistence that their suppliers use EDI. (1)

4. Degree of Integration (6)

Respondents reported that their trading partners were reluctant to modify their existing business approaches to adopt and fully integrate EDI. (4) One respondent said that some of his organization's trading partners used EDI as a "glorified Fax".

5. Technical Obstacles (4)

- Differences in level or sophistication of software between trading partners where one trading partner's software can perform transactions that the other partner's software cannot. (2)

- Lack of vendor support which discourages trading partners. (1) Respondent had experienced this problem himself.

- EDI is not sufficiently user-friendly. (1)

- Lack of software to help organizations get started with EDI. (1)

- Lack of electronic mail in organizations impedes communication. (1)

6. Rarer Transactions (3)

- Difficulty in finding trading partners to do EDI with industry-specific transactions (bill of lading in the transport industry) for example. (2)

- Difficulty in convincing trading partners, even highly EDI-capable organizations, to use EDI-EFT. (1)

7. Other Causes Cited

- The distance of some companies from large urban centres where there is a concentration of EDI users. (3)

- Trading partner hesitation in signing legal agreements. (1)

Actual and Potential Solutions. Respondents were also asked what solutions they envisioned for this problem. The solutions proposed by respondents are listed below. Some solutions have been implemented by the organizations while others are desired

solutions. These solutions include those offered by respondents who did not report trading partner capability as a problem for their own organizations.

1. Education/Training (17)

Education was seen as a solution to the problem of lack of EDI capability by seventeen (17) respondents. It is interesting to note that respondents not only cited education as a solution for the lack of knowledge but also as a solution for problems/causes described in all of the above categories.

Respondents suggested that education would be useful for trading partners (12), particularly for their senior management (4) and for employees in purchasing and sales (1). They suggested that the content of any education or training developed for trading partners should address the following aspects (7 respondents emphasized the importance of the business aspects):

- **basic concepts of EDI**;

- **business aspects** (the impact of EDI on an organization; costs and benefits of EDI; the long-term nature of an EDI investment; the concept of "re engineering" existing business systems and management approaches);

- **technical aspects** (translation software; the integration of EDI transactions into existing systems; about how to "roll out" EDI (go beyond pilot); where to find resources; exposure to different types of applications);

- **standards** (what they are, how to use them, and where to get the manuals).

Respondents (7) also felt that training might be useful for themselves or others in their own organizations in order to help improve the EDI-capability of their trading partners. Respondents felt that the content of such training should provide company representatives with a conceptual understanding of EDI and more general knowledge of what EDI can do to better promote it to trading partners. For themselves, respondents wanted to develop the necessary knowledge and skills, such as negotiation skills, to convince their trading partners to adopt or better integrate EDI. One respondent

mentioned that his own organization offers EDI seminars to its partners but not all attend. The challenge, according to this respondent, is finding a way to reach trading partners.

Educational Methods

In addition to the content of the training, seven respondents also suggested what they believed would be the most effective methods to deliver the training. One respondent emphasized that it was important for the training to be user-friendly and practical. Respondents mentioned the following methods:

- **implementation guide** with prioritized tasks or step by step procedures (3) Two of the companies have provided their trading partners with such a tool;

- **case studies**, particularly successful stories (2);

- **network or database** for smaller trading partners to help them find answers to their questions (1);

- **phone help** (1) This company already provides its trading partners with phone help (1);

- hands-on training, especially for technical aspects (1);

- **meetings and conferences** (1);

- **newsletter by industry** (1);

- **trade shows** (1);

- Manufacturers Association and Distributors Association have formed a **technology committee** to help their members better understand EDI (1);

- automated training- **CBT** (1). This health care organization also mentioned that it would be interested in sponsoring low-cost automated training for hospitals;

- **activities specifically designed for senior management**. Please see "Proposed Solutions" of Problem 3.1: Insufficient Senior Management Commitment to EDI.

2. "Turn-Key" solutions (5)

Five respondents mentioned turn-key solutions which they described as relatively inexpensive start-up programs that would enable partners to use EDI, possibly software developed by hubs and provided to trading partners. One company provides such a system on a PC to its trading partners. One large food and grocery organization selected a software package and used it to help partners get started with EDI. They did this by sending out employees to their suppliers and showing them how to set up EDI and explaining the basic concepts of EDI using this software which cost under $1000 U.S. Another respondent, from a financial institution, suggested that such a solution would be useful if integrated into existing application programs used by businesses and gave as an example ACCPAC, an accounting package, which he says is used by many small businesses.

3. Other Solutions Proposed

- A cultural shift is needed for some trading partners to adopt and/or integrate EDI. (3) One respondent said that organizations had to develop "best trade practices" that would benefit both partners.

- Organizations should obtain senior management commitment in funds, education, people and time. (3)

- Organizations should interface or integrate their applications with EDI as opposed to stand alone, in order to take full advantage of the benefits EDI has to offer. (3)

- For legal agreements - use the conditions on the back of a paper P.O. or simplify legal agreements. (1)

- Agree with trading partners to "walk through" maps to specify what pieces of transactions will be used. (1)

- One organization develops a marketing strategy for its clients (suppliers) to use with their clients. (1)

- Suppliers may be able to incite their customers to adopt EDI by offering them price breaks, discounts or favourable terms. (1)

- One large health care organization, a supplier, simply negotiates with its trading partners and tries to comply with their needs. (1)

- One respondent suggested that when large organizations with thousands of suppliers start using EDI in earnest, there will be a snowball effect as the partners of these organizations adopt EDI and in turn, insist that their partners do so as well. (1)

- Use Canada Post as a link between suppliers. (1)

- Secure help from financial institutions (for EDI-EFT). (1)

- Designate a project manager. (1)

Third Major Problem: Problem 3.1: Insufficient Senior Management Commitment To EDI

Number of respondents who mentioned this problem: voluntarily: 5
                                                      when prompted: 14

The specific issue of senior management commitment came up in 46 of the 48 interviews (96%). Of the 46, 19 (41%) mentioned some kind of challenge or problem related to senior management commitment. It should be noted that these figures do not include the respondents who related lack of senior management commitment to Problem 1.2: Lack of EDI Capability Among Trading Partners, described earlier. Respondents from 7 U.S. companies and 12 Canadian companies, in almost all sectors (retail, food and grocery, manufacturing, automotive, education, transportation, photographic distribution, network communications, government, health care, and telecommunications) reported a problem related to this issue. Respondents described different levels of the problem. Some respondents described it as an initial problem, others as a partial problem, and others as a serious problem. Table 15 illustrates these percentages.

Table 15
Number of Respondents Who Reported a Problem Related to Senior Management Commitment

Number of interviews where issue arose (of 48):	46	(96%)
Number of respondents who mentioned a problem within their organizations:	19	(41% of 46) (40% of all resp.)
Number of these who volunteered the information:	5	(26% of 19)
Number who stated a problem when prompted:	14	(74% of 19)
Number who mentioned it as a serious problem:	5	(26% of 19)
Number who mentioned it as an initial problem:	5	(26% of 19)
Number who mentioned it as a partial problem:	9	(47% of 19)
Number who related it to trading partner capability:	9	(20% of 46)

Description. Senior management commitment seems to be a complex issue and, according to several respondents, one that plays a major role in determining the degree of success an organization enjoys with EDI. Respondents from organizations where this was not a problem reported that executive support was crucial in the successful implementation of EDI and that without senior management backing, there would have been little cooperation from employees. One respondent reported that the organization's CEO personally promoted EDI's benefits. This, according to the respondent, was instrumental in succeeding with EDI. Respondents also mentioned that their senior management saw EDI as an opportunity.

It is important to qualify that the respondents who reported this as an initial problem, also reported that senior management had been convinced of EDI's importance and was now committed to it. Also, some of the respondents who mentioned a partial problem, had received sufficient executive support but were worried about the future consequences of their senior management's lack of understanding, particularly about their

return on investment. These cases have been included here because respondents did express reservations about the extent of their senior management commitment.

Respondents felt that senior management commitment is important because there are fewer problems when EDI is seen by the different departments as being supported from the top, or as one respondent from the health care sector phrased it: "when senior management is driving the project". One respondent, from a large organization in the food and grocery sector, believes that the lack of senior management commitment accounted for most of the problems the organization had experienced with EDI (not having enough human resources for example).

Respondents felt that it was important for senior management to see EDI as a business issue in order to be able to take full advantage of its possibilities. Without senior management support, EDI is seen as a technical issue and not a business issue, making it the responsibility of the IS (Information Systems) department. This creates problems in inciting other departments within the organization to want to understand, use and promote EDI.

Possible Causes. Respondents were asked what they believed to be the reasons for this problem. Their answers have been grouped into 6 categories and are listed below. The numbers in parentheses next to each category indicate the number of respondents whose answers reflected that category. It is possible that a respondent mentioned more than one cause.

1. Lack of Understanding (10)

Respondents felt that their senior management had not understood or did not understand EDI, particularly the nature and scope of EDI, the costs and benefits involved and its impact on the way a company does business.

Several respondents felt that the lack of understanding stemmed from senior management viewing EDI as a purely technical issue and not as a business issue. One

respondent said that it seemed his organization's senior management saw EDI as "magic or something". In one organization, senior management views EDI as a technology that a customer wanted them to use and considers it a "necessary evil".

In organizations where senior management viewed EDI as a merely technical issue, EDI became a technical project and its full potential went unrealized.

2. Investment (6)

Respondents also believed that senior management was not convinced that EDI is worth the investment and that they are looking for short term benefits. Respondents also mentioned that due to the uncertainty of the present economic climate, senior management might have other priorities than investing in EDI.

3. Other Causes Cited

- Ownership changes. (1)
- Maintaining support was difficult due to changes in management and changes in EDI, the champion had to resell EDI each time there was a change. (1)
- Resistance of older senior managers. (1)

Proposed Solutions. Respondents were also asked what solutions they envisioned for this problem. The solutions proposed by respondents are listed below. These solutions include those offered by respondents who did not report the lack of senior management commitment as a problem for their own organizations.

1. Education (15)

Education was cited most often as a potential solution to this problem. Respondents suggested that education should not only be used to educate senior management about EDI but also to *convince* them that it was worthwhile. Respondents felt that education directed at senior management should address the following issues:

- **the nature of EDI**;

- **EDI costs** (networks, human resources) and **benefits** (particularly for customers);

- **problems that can be encountered**;

- **what EDI can do for the organization**;

- **how EDI relates to an organization's bottom line**;

- **the concept of re-engineering**;

- **the ways in which EDI affects business**;

- **ways of staying informed about EDI developments** (ongoing education).

Educational Methods

In addition to the content of the training, respondents suggested the following methods to reach senior management:

- **articles on EDI in business publications** (*Canadian Business*, *The Financial Post*, *Harvard Business Review*) or in their particular industry groups, dealing especially with subjects of relevance to senior management (ECR - Efficient Consumer Response, trading with large EDI users such as Wal-Mart and Sears (4);

- **case studies** including examples of successful organizations in the general business literature (2). One respondent suggested that case studies or the stories from other organizations could be presented in small groups;

- **presentations of EDI in terms of the organization's bottom line.** For example, one respondent took a list of 10 companies that wanted to trade with his organization using EDI to his senior management and showed them that another department other than IS should be dealing with the requests and that if the organization did not adopt EDI with these clients, they would lose their business. This action made senior management realize how important a business issue EDI had become to some companies. The classic example cited by respondents in Canada is Wal-Mart. (2)

- **EDI platform presented** by an agency such as the EDI World Institute **at events that senior managers attend.** Although respondents did not feel they were in a position to say what events their senior managers attended, suggestions of events included **trade association meetings** and **conventions.** (2)

- **presentations on the nature and benefits of EDI** to keep senior management informed about the status of ongoing projects. One organization reached its senior management in this way. (1)

- **live testimonials**, especially from the CEO of one EDI-capable company to the CEO of a company that does not have EDI, to present EDI as a business issue and how it works in the real world and to convince these organizations to stop treating EDI as another "techie toy" but as a business priority. (1)

2. Other Solutions Proposed

- Transmitting the conditions of payment clause on an invoice via EDI and offering discounts according to when an organization pays, might draw the attention of the "finance people". (1)

- Using statistics to show senior management how EDI has improved business and what impact it has had. He suggested a system to track EDI's performance in the organization. This respondent feels that this type of data is important because EDI benefits are not easily quantifiable. (1)

- Obtaining letters describing EDI benefits from the senior management of an organization that is a successful EDI user. These letters can then be used to help convince the senior management of the organization experiencing problems due to lack of executive commitment. One organization was asked for such letters from several of its trading partners. (1)

Interview Results: Issues Addressed in the Interview Guide

This section reports the results of the questions posed about the issues contained in the interview guide. The interview guide was used by the interviewer primarily to remind respondents of the issues. The guide, as explained in detail in Chapter 3, was developed based on issues culled from the literature.

The results for each section of the interview guide are described on the following pages. A brief introduction of the section, explaining the rationale for including the section, precedes the results. It is important to remember that due to the unstructured nature of the interview process, the length of time a respondent could afford to spend, and the priority given to the issues of concern to the respondent, not all issues were addressed in all interviews. The consequences of this are that the number of respondents' answers varies from issue to issue.

Section 1: Organizational and Personal Preparation

This section of the interview guide was intended to ascertain the degree and type of individual and organizational preparation prior to EDI implementation. It was felt that this information would not only provide a context for any problems that might emerge, but that it would also provide information about the preparation successful organizations underwent before implementing EDI. It was felt that such information would be useful to develop recommendations for organizations considering EDI implementation.

Because EDI's impact on an organization has been well documented, it was felt that it would be important to find out the ways in which organizations dealt with this impact. This involved finding out about individual and organizational changes, and the actions the organization took, or could have taken, to deal with EDI's impact.

Individual Changes. The change most often reported by respondents was that EDI became an added responsibility of their current position. The respondents for whom EDI represented a major responsibility were either EDI champions or had developed an EDI training program for other employees. EDI implementation also provided several respondents with opportunities for position changes within the organization, from becoming a member of a special EDI group to becoming head of EDI administration.

The individual changes reported by the respondents are summarized in Table 16. The columns on the right indicate the number of respondents who mentioned the change.

Table 16
Summary of Reported Individual Changes Due to EDI

Number of interviews where issue arose (of 48):	38	(79%)	
Changes	*No. of respondents*		
	Users	Experts	% of 38
• EDI became an added responsibility	0	13	34%
• EDI became a major responsibility (i.e. champion)	1	6	18%
• Respondents were hired for their experience	0	5	13%
• Internal position change due to EDI	0	5	13%
• EDI was a responsibility of a new position	1	1	5%
• Little or no change	2	3	13%
• Not applicable	0	1	3%

Organizational Changes. On the whole, the respondents who responded to this issue felt that EDI implementation had been a positive experience. One respondent

mentioned that because EDI was so "transparent and fully integrated" that the employees who produce the P.O.s do not know they are using EDI.

However, several respondents did mention that although implementation had proceeded smoothly, there had been certain problems. Among them were: an initial or complete lack of senior management commitment (see Problem 3.1: Insufficient Senior Management Commitment to EDI, described earlier in this chapter); a lack of appropriate software (see Problem 4.2: Lack of Appropriate Software in Appendix C; "bugs" in vendor software (see Problem 4.1 Lack of Support from Software Vendor in Appendix C). Only one respondent reported that implementation had not been smooth, that indeed it had been done under "panic and pressure" in order to survive.

Ten respondents stated that there had been no job loss due to EDI although positions had been eliminated, but, as one respondent said, employees felt EDI was now part of their jobs. He called it "not adding work, adding value". People were reassigned to other jobs and tasks such as key stroking and dealing with P.O.s, described as 'mundane' by respondents, were replaced by spending more time on ordering and selling. One organization increased the level of customer service so that the extra time available to employees could be applied to customer service. One respondent stated that EDI made the organization "redefine" people's jobs. However, one respondent said that people who would have been hired if the company used paper, were not hired. One minor challenge reported by two respondents was the fact that users had to be taught not to key in data.

Respondents stated that EDI's positive impact was felt through such things as a closer bond with trading partners, greater benefits (more accuracy and speed, less paper) and positive changes in the organization's business methods. Two respondents also mentioned that employees had become more computer literate and had developed new skills.

The organizational changes reported by the respondents are summarized in Table 17. The columns on the right indicate the number of respondents who mentioned the change. Some respondents reported more than one change.

Actions Taken by Organizations to Facilitate Implementation. Respondents were asked to describe the actions their organization took to facilitate implementation. Respondents felt that the actions taken had been effective. Actions have been classified into six categories. Table 18 summarizes these actions and detailed descriptions of the actions follow. Respondents may have reported more than one action.

Table 17
Summary of Reported Organizational Changes Due to EDI

Number of interviews where issue arose (of 48):	23	(48%)	
Changes	*No. of respondents*		
	Users	Experts	% of 23
• Implementation went smoothly	3	7	43%
• No reduction in staff due to EDI	2	8	43%
• EDI had a positive impact	2	3	22%
• Implementation was done under "panic and pressure"	0	1	4%
• Respondents were not present during implementation	1	2	13%

When considering the results for this issue, it is important to remember that information pertaining to the first category, 'Employee Consultation and Information', was also taken from the prompts on these subjects (Questions 3 and 6 of the interview guide). Positive responses to the prompts have been added to this category to avoid repetition and confusion. However, the results for these specific issues are summarized in Table 18.

Table 18
Summary of Responses Addressing Actions Taken by Organizations to Facilitate Implementation

Number of interviews where issue arose (of 48):		43	(90%)	
Actions		*No. of respondents*		
	Users	Experts	% of 43
1. Employee Consultation and Information	3	13	37%
2. Assistance to Trading Partners	2	5	16%
3. Business Approaches	0	7	16%
4. Technical Approaches	0	6	14%
5. Training/Education	1	2	7%
6. Other Actions Taken by Organizations	0	2	5%
• No Particular Action Taken	0	3	7%

1. Employee Consultation and Information (16)

Please note: This number does not include the 4 respondents who reported that the organization had informed only some employees and the respondent who mentioned that the organization had provided very little information. (See Table 19)

Organizations consulted their employees by asking for their input, taking into account their questions and doubts and identifying their requirements . Organizations informed their employees about EDI by explaining its impact and benefits. Below are the specific methods reported by respondents which organizations used to inform or consult their employees.

- Formed a team to receive employees' input and to inform them about EDI. (1)

- Presented a slide show on EDI to employees, explained benefits and provided relevant literature. (1)

- Assigned certain employees to become EDI literate. (1)

- Consulted all those involved in EDI within the organization. (1)

- Arranged meetings and seminars about the nature of EDI to inform all who would be affected in the organization. (1)

- Held ongoing meetings with employees to discuss implementation tactics. (1)

- Presented an EDICC video to employees and followed its recommendations. (1)

- Worked closely with unionized workers during implementation. (1)

- The vice president and manager of the division explained the impact of EDI to employees and how their jobs would be affected, this was followed by a presentation on EDI by the organization's EDI specialists. (1)

- Champion consulted users in different company divisions, worked with them on pilot projects to demonstrate benefits and used documented executive support to show benefits (1).

- Provided employees with testimonials from successful companies. This was rated as very useful by the respondent who mentioned it. (1)

- The vice president of one organization had communicated with the respondent personally and had informally explained what the organization planned to do with respect to EDI. (1)

2. Assistance to Trading Partners (7)

Because EDI capability among trading partners is of prime concern to organizations, several respondents reported that their organizations provided assistance to their trading partners. These actions took different forms. Below are the means reported by respondents taken by organizations to help their partners.

- Designated an employee to explain EDI use. (2):
    - designated an individual to reassure the more anxious trading partners about EDI use;

- the EDI champion met with trading partners individually ("one-on-one") to assure a "comfort level" with EDI. Sales staff accompanied him so that they would feel comfortable promoting EDI.

- Produced informative material (2):
  - produced an implementation guide for its suppliers;
  - produced brochures explaining EDI to customers in order to acquire more trading partners.

- Held meetings with clients and presented demos to explain EDI. (1)

- Emphasized the acquisition of trading partners and worked with trading partners to ensure their EDI capability. (1)

- Established a centralized service for EDI across a government ministry so that departments (often partners) that start up with EDI would not have to "re-invent the wheel". (1)

3. Business Approaches (7)

- Treated EDI as a business project (4):
  - senior management incorporated EDI into the organization's business plan, important says one respondent because otherwise it is difficult for senior management to understand that EDI is a major investment and that it requires time and a certain number of trading partners.
  - identified EDI primarily as a business project;
  - Believed EDI to be a good idea, prepared itself and was ready to seize the opportunity when a customer approached it to do EDI (implementation took 3 weeks, preparation, 4 years).

- Created an EDI team (3):
  - formed an EDI task force composed of people from 8 departments;
  - created a project team for EDI.

- Set objectives related to EDI for its divisions. (1)

4. Technical Approaches (6)

- Integrated EDI (3):

    - integrated EDI into its system by building an interface for each transaction internally. The respondent felt this was very important because this re-engineering allowed the organization to expand its EDI use to meet customer needs. The respondent also suggested this approach as one solution for the lack of EDI capability in some organizations (see Problem 1.2: Lack of EDI Capability Among Trading Partners, described earlier in this chapter);

    - developed an application to integrate each EDI document;

    - integrated EDI to make it completely transparent.

- Conducted a trial or a pilot with an EDI-experienced trading partner. (2)

- Provided company-specific EDI specifications. (1)

- Initiated implementation with one document and ensured that it worked. The respondent felt that implementation was smooth because of this. (1)

- Hired an external consultant to deal with technical aspects. (1)

5. Training/Education (3)

Below are answers from respondents with regard to this specific question. However, training and education were treated as separate issues. For more information about this issue, please refer to the issue 'Training Received' further in this section.

- Trained employees internally. (2)

- Sent the respondent to the EDI Forum. (1)

6. Other Actions Taken by Organizations (2)

- Provided internal experts with trade publications. (1)

- Set up "a little competition among the divisions" to promote EDI use internally. With newsletters the organization reports the number of transactions, partners acquired, etc., of each division. The respondent felt that

this incites divisions to do better, keeps them informed of their progress and their status among the other divisions with regard to EDI use. (1)

Consultation and Information as Specific Issues. Respondents who answered that consultation had been partial, stated that only some employees had been consulted. Employees in the IS (Information Systems) department and management were given as examples. It is interesting to note that 10 of the respondents who addressed this issue stated that their organizations had both consulted and informed employees. Table 19 summarizes respondents' answers for these issues.

Executive Support, Project Leadership and Financial Support. Table 20, summarizes respondents' answers for the remaining specific issues included in the interview guide (Questions 5, 7, 8): Executive Support, Project Leadership and Financial Support. The lack of executive support emerged as a major concern for respondents and is described in detail earlier in this chapter (See Problem 3.1: Insufficient Senior Management Commitment to EDI).

The majority of respondents reported that their organizations had appointed an EDI project leader or champion. Only one respondent mentioned that his organization had hired an outside consultant to set up the project. The consultant also trained the respondent who took over the project when the consultant left. Another organization had created a team to assume the project's leadership.

Three respondents felt that they had not received sufficient financial support. One respondent mentioned that there had been enough for basic start-up material (i.e. translator) but less so for re-engineering costs which the respondent described as the updating the organization was required to do to adopt EDI. Another respondent mentioned that although there was senior management support it was difficult to obtain funding because of the organization's other priorities and because a critical mass of

trading partners was necessary to justify such funding. The third respondent simply mentioned that it was difficult to obtain needed equipment.

Table 19
Summary of Responses to the Specific Issues of Consultation and Information

Consultation (Question 3)

Number of interviews where issue arose (of 48): 33 (69%)

Responses	Users	Experts	% of 33
	No. of respondents		
• Employees were consulted	2	10	36%
• Employees were not consulted	1	6	21%
• Only some employees were consulted	0	4	12%
• Uncertain whether employees were consulted	0	3	9%
• Not applicable*	1	6	21%

Information (Question 6)

Number of interviews where issue arose (of 48): 25 (52%)

Responses	Users	Experts	% of 25
	No. of respondents		
• Employees were informed	3	11	56%
• Employees were not informed	0	3	12%
• Very little information was provided	0	1	4%
• Uncertain whether employees were informed	1	0	4%
• Not applicable*	1	6	28%

*Respondents had not been working for the organization during implementation or were the sole users of EDI in the organization (the same 7 respondentswered not applicable for both consultation and information.).

Table 20
Summary of Responses to the Specific Issues of Executive Support, Project Leadership & Financial Support

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Executive Support *(Question 5)*

Number of interviews where issue arose (of 48):   46   (96%)

Responses	*No. of respondents*		
	Users	Experts	% of 46
• Full support	4	23	59%
• No support	0	5	11%
• No initial support	0	5	11%
• Insufficient support	0	9	20%

Project Leadership *(Question 7)*

Number of interviews where issue arose (of 48):   40   (83%)

Responses	*No. of respondents*		
	Users	Experts	% of 40
• Organization had a project leader	3	36	98%
• Respondent assumed leadership as one of many responsibilities	0	1	2%

Financial Support *(Question 8)*

Number of interviews where issue arose (of 48):   32   (67%)

Responses	*No. of respondents*		
	Users	Experts	% of 32
• Adequate financial support	3	26	91%
• Inadequate financial support	0	3	9%

Actions Organizations Could Have Taken. In addition to the actions that organizations took to facilitated implementation, respondents were asked to describe, in light of their experience, actions they felt their organizations could have taken. Six respondents mentioned actions they felt would have been useful. The first action was mentioned by two respondents while each of the others were mentioned by one respondent. Two respondents described more than one action. Respondents felt that their organizations could have:

- involved departments most affected by EDI (outside IS) in the planning and implementation process: (2)
- better defined roles and responsibilities during implementation, particularly business vs. technical roles; (1)
- supplied a list of prioritized tasks to be accomplished; (1)
- established a cross-reference system between what to do and the knowledge of how to do it effectively; (1)
- better identified the right person for the right job; (1)
- begun EDI on a larger scale, with more partners; (1)
- provided more training for executives; (1)
- better addressed management issues; (1)
- rovided more training on integration, particularly regarding what to send and receive. (1)

Seven respondents felt that their organizations had proceeded correctly and that there was nothing more they could have done. It is interesting to note that eighteen respondents did not mention any action when the question was posed. Table 21 breaks down respondents' answers to this question.

Table 21
Summary of Responses Addressing Actions Organizations Could Have Taken to Facilitate Implementation

Number of interviews where issue arose (of 48):   36   (75%)

Responses	*No. of respondents*		
	Users	Experts	% of 36
• No action necessary	2	5	19%
• Action desired	0	6	17%
• Uncertain of type of action	1	0	3%
• Nothing mentioned	1	16	47%
• Not applicable	1	4	14%

Training or Education Received by Respondents. In order to further ascertain the preparation respondents received prior to EDI implementation, respondents were asked questions regarding the type of training they received. Although it was initially intended that the interviewer ask whether the training received had been useful. who had provided it and what method(s) had been used to deliver the training. this was not always possible - the respondent may have continued speaking or spoken of something else. However. the interviewer did make an effort to bring up these aspects when circumstances allowed.

In the interview guide, training was addressed in Questions 10 through 26. Respondents were first asked to freely describe the training they had received and if they seemed hesitant. the interviewer used Questions 12 through 26 as prompts. However, depending on the respondent's answer to the voluntary question. the prompts were sometimes deemed inappropriate. This sometimes occurred when, for example, respondents stated that they needed no further training, seemed reluctant to provide the

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information, or seemed pressed for time. These differences in gathering data created a certain inequality in the responses. Instead of reporting on each separate issue and what respondents didn't say, it was felt that it would be more useful to report what respondents actually said, regardless of whether the answer was voluntary or as a result of a prompt.

The prompts in this section were also used in this way to inquire about training respondents would like to receive and about problems they had encountered with respect to a specific issue. In the results that are reported below, answers given as a result of prompts have been integrated into the categories created from the respondents' voluntary answers. This has been done to avoid confusion and repetition. It is important to note that the same has been done regarding the training or education desired by respondents. However, problems described by respondents were treated differently (these are described earlier in this chapter and in Appendix C).

The training and education respondents reported receiving have been grouped into three general categories. Almost all (96%) of the respondents who addressed this issue mentioned receiving some kind of education or training. Table 22 summarizes this training and detailed descriptions of the training follow. Some respondents mentioned more than one type of training. The numbers in parentheses next to a particular type of training indicate the number of respondents who mentioned that item.

Table 22
Summary of Responses Addressing Training or Education Received

	Users	Experts	% of 46
Number of interviews where issue arose (of 48):	46	(96%)	
No. of respondents			
Respondents who received training	5	39	96%
Respondents who did not receive training	0	2	4%
Training Received			% of 44
1. In house/On-the-job	4	25	66%
2. Courses and Seminars	1	26	61%
3. Conferences and Forums	0	18	41%

1. In-House and On-The-Job Training (29)

In-house and on-the-job training were cited most often by respondents as the types of training they had received. Indeed, several respondents said that most of what they had learned about EDI had been on-the-job and through hands-on experience. Respondents who reported receiving this type of training had found it very useful.

This training and education took the following forms:

- Reading on one's own, generally from manuals (7). One respondent stated that he had "read like hell".

- Technical training (4):

    - from the IS department on how to use EDI software;

    - on the organization's mapping product;

    - standards, software.

- Formal in-house training (4):

    - seminars and meetings;

    - train-the-trainer program;

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        - train-the-trainer program;

        - training from consulting/software firm;

        - training from head office.

- "Hands on". (3)

- Learning from co-workers. (2) One respondent had learned from his supervisor and had found this very effective.

- On-the-job from the EDI consultant hired to set up EDI, rated as invaluable. (2)

- Through research necessary to develop training for other employees. (1)

- Through pilots in different divisions. (1)

Some organizations provided internal training as needed. In one organization, with new applications, one division developed an expertise in one particular application and then shared its knowledge with the other divisions. However, the respondent noted that the drawbacks to this approach were that it took time and people were not always free to attend training.

2. Courses and Seminars (27)

Respondents had also attended courses and seminars. Respondents were generally satisfied with the courses they had attended and considered them useful. These courses addressed the following topics:

- basic courses, including EDICC courses dealing with introductory concepts which one respondent felt was a good introduction. These courses were rated useful; (13)

- technical aspects (mapping; translator, rated as good); (3)

- standards (one offered by the EDICC, not considered useful by one respondent); sessions on ANSI X12 offered by DISA (Data Interchange Standards Association); (2)

- VICS (Voluntary Interindustry Communications Standards) training; (2)

- implementation courses (from EDICC), rated very useful by one respondent; (1)

- Gentran classes; (1)

- re-designing/re-engineering processes; (1)

- refresher courses offered by the EDICC; (1)

- management system integration from IEDIQ (Institut EDI du Québec); (1)

- methods of setting up with trading partners, considered useful. (1)

Respondents attended courses offered by various groups and organizations. In Canada, the most frequently mentioned was the EDICC (EDI Council of Canada). Respondents were quite enthusiastic about user groups. Courses were offered by:

- EDICC; (7)

- user groups, considered good and useful; (5)

- trading partners, considered useful; (2)

- IEDIQ; (2)

- EDI Group; (2)

- VANs, considered useful; (1)

- vendors; (1)

- petroleum industry; (1)

- EDIWI (EDI World Institute); (1)

- Gartner Group, considered very useful and forward thinking. (1)

3. Conferences and Forums (18)

Respondents had also attended EDI conferences and forums. These included EDI Group conferences, the EDICC Annual Forum, the Advanced Strategies conference and a treasury management conference.

Respondents were generally positive about conferences. A few mentioned that conferences were a good way to meet other EDI users and offered useful opportunities to interact with partners. Respondents also said that conferences were a good opportunity to hear how others had solved problems and to realize that, as the respondent phrased it, "at least we're not alone". One respondent mentioned that conferences "opened his eyes" to

what EDI is. However, one respondent did find conferences lacking in educational quality, mentioning that they were merely occasions where people could exchange stories.

Training or Education Needed or Desired by Respondents. Respondents were asked to freely describe the type of EDI-related training and/or education they desired or felt they needed. As with the issue of training received, the interviewer used the specific issues in Questions 12 through 26 as prompts if respondents seemed hesitant.

Almost half (21) of the respondents to whom this question was addressed stated that they saw no further need of training for themselves. The majority of these respondents said they felt comfortable with their EDI knowledge. Several said that their organizations provided training as needed. One respondent mentioned that he wanted only periodic updates and one stated that although she felt no need for further training she would still be interested in attending activities where EDI users shared their stories. (Respondents also suggested what they believed to be the most useful educational method; these are detailed further in the text.) It is important to remember that many of the respondents interviewed were EDI experts or champions. Indeed, one respondent mentioned that he could teach EDI-related material and another mentioned that she now gave EDI presentations. It is interesting to note that none of the four users who answered this question reported needing or desiring training.

However, 34 respondents mentioned desiring some type of training. Of these, 25 respondents desired or felt they needed training or further training for themselves. One respondent said that the training he had received had been effective but that there was simply so much to learn. The type of training or education most frequently mentioned by respondents dealt with the various aspects of the business component of EDI. This was followed by training or education to develop techniques to set-up or acquire trading partners. Various forms of technical training were also mentioned. Respondents also felt

organization could benefit from further training. (Descriptions of the training suggested for others have been documented in the proposed solutions for Problem 1.2: Lack of EDI Capability Among Trading Partners), Problem 1.1./2.1: Misuse of Standards and Problem 3.1: Insufficient Senior Management Commitment to EDI, described earlier in this chapter).

Table 23
Summary of Responses Addressing Needed or Desired Training

	Users	Experts	% of 46
Number of interviews where issue arose (of 48): 46 (96%)			
No. of respondents			
• Respondents who felt no further need of training for themselves	4	17	41%
• Respondents who desired training (general)	1	33	74%
			% of 34
• Respondents who desired training for themselves	0	25	74%
• Respondents who desired training for others	1	18	56%
Training/Education Needed or Desired for Self and/or Others			
1. Business Aspects of EDI	0	19	56%
2. Training/education for Trading Partners	0	11	32%
3. Techniques to Set Up/Acquire Trading Partners	0	8	24%
4. Technical Aspects	0	7	21%
5. Training/education for Senior Management	0	7	21%
6. Training for Other Employees in the Organization	1	6	21%
7. Standards	0	5	15%
8. Legal Aspects	0	4	12%
9. Security Issues	0	4	12%
10. Auditing	0	2	6%
11. Other Training Desired	0	2	6%

The content of the training desired by respondents has been classified into 11 categories which are summarized in Table 23 and detailed below. A summary of the training methods most desired by respondents to deliver this training as well as their reasons for choosing these methods follow the content descriptions. Some respondents mentioned more than one type of training. The numbers in parentheses next to a particular type of training indicate the number of respondents who mentioned that item.

1. Business Aspects of EDI (19)

Nineteen of the twenty-five respondents (76%) who desired training for themselves expressed a desire for training, or further training, with respect to the business aspects of EDI. Below are the descriptions of the desired content for such training.

- Management approaches: (8)
    - ECR (Efficient Consumer Response); (3)
    - re-engineering and redesigning processes to take advantage of EDI; (2)
    - QR (Quick Response); (2)
    - TQM (Total Quality Management); (1)
    - introductory business management issues; (1)
    - concept of electronic commerce; (1)
    - EDI as a business strategy. (1)
- Costs and benefits of EDI, particularly how to properly analyze. (4)
- New transactions: (4)
    - how to integrate them into business; (2)
    - impact of new transactions. (1) The respondent desired to know more about how other organizations implement these and suggested written case studies or seminars as useful methods if accompanied by written material;
    - EFT transactions; (1)
- Potential of EDI, particularly what it can and cannot do for an organization. (3)

- Specific business practices of organizations, including the way businesses that use EDI are runorder to better understand reasons for customer special requests. (2)

- Organization's implementation plan (some sort of document). (2)

- EDI's impact on an organization's internal functions and business practices. (1)

- Understanding data flow. (1)

2. Training/Education for Trading Partners (11)

(See also Problem 1.2: Lack of EDI Capability Among Trading Partners and Problem 1.1/2.1: Misuse of Standards, described earlier in this chapter.)

The types of education and training respondents thought would benefit their organizations' trading partners are listed below.

- Business aspects of EDI: (5)

    - re-engineering;

    - costs and benefits of EDI;

    - impact of EDI.

- Reasons for adopting EDI. (2)

- Exposure to other applications. (2)

- Basic concepts. (2)

- Better understanding of standards. (1)

3. Techniques to Set Up/Acquire Trading Partners (8)

(See also Problem 1.2: Lack of EDI Capability Among Trading Partners, described earlier in this chapter.)

The training respondents felt they required in this category dealt primarily with methods to set up with trading partners or to acquire more partners. Respondents were interested in acquiring the following skills and knowledge:

- Negotiation skills to help convince partners to use EDI; (1)

- How to sell or market EDI better to partners; (1)

- How to set EDI up faster with trading partners. This respondent did not relate this to capability; (1)

- How to convince partners to use EDI; (1)

- How to manage and communicate with partners, whether 10 or 1000; (1)

- How to deal with trading partners who go through a VAN; (1)

- How to facilitate trading partner involvement; (1)

- How to acquire more partners, sector-specific. (1)

4. Training/Education for Senior Management (7)

(Please see the solutions proposed for Problem 3.1: Insufficient Senior Management Commitment to EDI)

Seven respondents felt that their senior management could benefit from training or education with respect to the business aspects of EDI, particularly:

- EDI's impact on an organization's internal functions and business practices; (2)

- costs and benefits; (2)

- what EDI does and what it can do; (1)

- training to convince senior management to adopt EDI. (1)

5. Technical Aspects (7)

Of the 25 respondents who desired training for themselves, six (21%) desired some type of technical training (one of the seven in the total desired training more for his department than for himself). The content of the technical training desired varies greatly from respondent to respondent. Only EDI software, particularly translation software, was desired by more than one respondent. Below are the descriptions of the content respondents desired with respect to technical training.

- EDI software: (4)

    - specifics of translator software;

    - other organizations' experience with translation software;

- what software is available, how to choose it and how to properly identify the organizations' needs.

- Types of transaction sets. (1)

- How to test that EDI is working properly. (1)

- EDI problem solving. (1)

- Mainframe training. (1)

- GENTRAN seminar. (1)

6. Training/Education for Other Employees in the Organization (7)

- For company representatives: conceptual understanding of EDI and a more general understanding of what EDI can do to better promote it to trading partners. (2)

- For EDI analysts: more about standards and data mapping. (1)

- Training for customer service department: trading partner relations; better understanding of EDI; actions to take when a P.O. is rejected. (1)

- For middle managers (see Problem 3.2: Resistance from Middle Management, in Appendix C). (1)

- For staff in remote sites: to coordinate purchasing efforts. (1)

- For new employees: introductory concepts through periodic presentations. (1)

- For department: standards (see Category 7); legal aspects (see Category 8), security (see Category 9) and auditing (see Category 10).

7. Standards (5)

- Codes: how to use. (1)

- X12, EDIFACT. (2)

- For department. (1)

8. Legal Aspects (4)

Three respondents desired training regarding this issue for themselves while the other believed it would benefit employees in general. It is important to note that, in the

interviews where this issue was addressed, the legal aspects of EDI were generally not part of the respondent's responsibilities but of a legal department.

9. Security Issues (4)

Security did not seem to be an important concern for most respondents. One respondent mentioned that he felt that the VAN translator his organization was using had good security. However, one respondent believed training regarding this issue would benefit employees in general and three respondents desired training regarding this issue for themselves. One of these desired more specific, type of training, namely, how to establish an electronic signature on a tax return and how to verify the legality of such a signature particularly when the signature comes from a 3rd party.

10. Auditing (2)

One respondent desired training for himself while the other wanted his department to benefit from training regarding this issue. It is important to note that this issue was not addressed when it was evident that the respondent did not deal with auditing.

11. Other Training/Education Desired (2)

- More about the basic concepts of EDI. (1)
- More local industry specific courses (trucking). (1)
- One respondent desired an interactive course with trading partners to explore the flow of information and which transactions are related (i.e., P.O. and invoice) and also to understand why certain information is necessary and what transaction sets exist. (1)

Educational Methods

In addition to the content of the training, respondents (19 experts and one user) also described the educational methods they felt would be most useful to deliver the types of training they desired. These do not include the methods suggested specifically for senior management and trading partners (Please see Problem 1.2: Lack of EDI Capability

Among Trading Partners and Problem 3.1: Insufficient Senior Management Commitment to EDI.)

Conferences were by far the most frequently desired vehicle to receive training and education. It is interesting to note that respondents who reported not needing further training for themselves also made suggestions for educational methods, especially activities where there are opportunities to share ideas with people from other companies using EDI. (These answers have not been included in Table 23.) Indeed, this theme of meeting other EDI users, whether they be clients or suppliers, was frequently given as a reason, particularly by those respondents who mentioned conferences or seminars, as preferred educational methods.

The following methods were mentioned. The numbers in parentheses indicate the number of respondents who mentioned the method.

1. Conferences and Forums (12)

Respondents who mentioned conferences felt that conferences were useful because of the opportunities they offered for interaction with EDI users. Respondents felt that users' EDI stories were especially useful, particularly to be able to anticipate problems. One respondent described these as "war stories" while another described them as "horror stories"- descriptions of things that can go wrong.

Respondents also believed that conferences provided a good way to stay informed, particularly when these were within budget. One respondent suggested a forum.

2. Case Studies (5)

Respondents felt case studies would be useful to better understand the steps taken by EDI-capable organizations, the problems and challenges they faced, the means they used to solve these and the elements to which they attribute their success. One respondent pointed out that case studies could be read and kept for later consultation.

3. Seminars (4)

Respondents' reasons for mentioning seminars were similar to those of the respondents who mentioned conferences - that they offered opportunities to meet others. One respondent said that he would like these 'others' to be clients. Another pointed out that seminars would be useful if accompanied by written material. It is important to note that only one of these respondents also mentioned conferences as a preferred educational method.

4. Courses (2)

One respondent mentioned desiring a more formal course in a classroom setting to learn, as he phrased it the "how to" while the other desired courses as updates.

5. Internal Training (2)

Two respondents mentioned the following types of internal educational methods:

- meetings;

- periodic internal presentations;

- newsletters or memos as updates regarding how company is doing with respect to EDI.

6. Other Educational Methods Suggested (3)

- Opportunities to network. (1)

- Videos. (1)

- Written material. (1)

Respondents also mentioned the people, groups and organizations from which they desired to receive training or education. These are described below.

- **User groups (4)**

    User groups were enthusiastically depicted as being very useful by the respondents who mentioned them. One Canadian respondent mentioned the Food and Drug User Group and The GE User Forum as being particularly effective. And one respondent is helping to set up an EDI users group in his

town. He finds this would be beneficial, useful and educational because EDI

users will come together to share problems and solutions. The group will also

invite specialists to talk about different issues. One respondent suggested user

groups would be useful for trading partners.

- **EDI Agencies** such as EDIWI and EDICC.

  One respondent stated that he would like more guidance or training from such

  agencies to help him resolve certain issues and problems. (1)

- **VANs** (1)

- **Trading partners** (1)

- **Peers** (1)

Section 2: On-the-job Problem Solving

This section of the interview guide was intended to acquire information about the

resources available to, and desired by, respondents to solve EDI-related problems. At the

request of the sponsor, a special section dealing with automated tools was included in the

interview guide.

Available Resources. As with training, respondents were first asked to freely

describe the resources available to them and the interviewer used prompts, particularly as

examples of types of resources, if respondents seemed hesitant. The prompts addresses

five specific resources: manuals, job-aids, on-line help, telephone help and human

resources. Table 24 summarizes the availability of the resources respondents reported

having and detailed descriptions follow. Some respondents mentioned more than one

type of resource.

It is important to note that three respondents did not specify particular resources.

One of these respondents mentioned that he had no problem accessing information, whether from documents, people or other sources, while the others reported that they had "all necessary resources" or a "host of resources".

Table 24
Summary of Responses Addressing Available Resources

Number of interviews where issue arose (of 48):	44	(92%)	
	No. of respondents		
	Users	Experts	% of 44
Respondents who mentioned having resources	0	42	95%
Respondents who did not mention resources	0	2	4%
Available Resources			% of 42
1. Manuals	4	23	64%
2. Phone Help (External)	0	21	50%
3. Internal Human Resources	2	18	48%
4. On-Line Help	3	10	31%

1. Manuals (27)

Manuals were the resource respondents most frequently mentioned having. Respondents generally found manuals useful although one respondent did criticize the X12 manual as being poorly organized. Below is a list of the types of manuals respondents mentioned.

- Technical manuals: (11)
    - translator. One respondent rated his as "not great"; (5)

- standards, including ANSI X12 and UCS (Uniform Communications Standards); (4)

- from software company; (1)

- field reference manual explaining procedures for certain situations or problems, considered very useful by the respondent. (1)

- Magazines: (2)

    - Computer World; (1)

    - EDI World, rated as useful. (1)

- IEDIQ manual. (1)

- Manuals developed internally, rated useful. (1)

- Brochures. (1)

2. Phone Help (External) (21)

Phone help was considered to be quite a useful and helpful resource by seven of the respondents who mentioned having it. Below is a list of the help-providing sources mentioned by respondents.

- Vendors, usually the translator company. (9) One respondent felt this was a useful resource.

- Networks, usually a VAN. (8) Network help included hotlines (1-800 numbers) and help desks. One respondent rated this resource as good while another considered it helpful.

- Trading partners, considered very helpful by one respondent. (4)

- Personal contacts outside organization. (3) One respondent stated that he knew many people he could call.

- IEDIQ. (2)

- User Groups. - (2) These were considered "extremely beneficial" by one respondent because of the opportunity to share with colleagues. Another respondent singled out the Food and Drug User Group.

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- An expert at an affiliated organization, considered extremely useful. (1)

- EDICC, considered extremely useful. (1)

- Consultant. (1)

3. Internal Human Resources (20)

The available human resources respondents reported having ranged from one other person to a department of 50 EDI experts. These included internal help desks, multidisciplinary teams, EDI management teams, specialized EDI groups, the organization's IS department which one user described as "useful and easy". One respondent also mentioned the organization's home office where she said people were always helpful.

4. On-line Resources (13)

Respondents reported having the types of on-line resources listed below.

- Computer Based Training (CBT). (4) One respondent mentioned that the organization was "just getting into CBT" but did not elaborate. One organization develops its own CBT and provides it free to hospitals. One respondent mentioned that his organization was developing CBT.

- Standards on disk from the EDICC. (2)

- Inquiries about EDI. (2) One respondent felt this was a useful resource.

- Internally developed specialized software (2). Respondents explained that they had developed their own software to meet their organizations' needs. One respondent developed software to conduct business with financial institutions. The other respondent did not specify type of software. (Please see Problem 4.2: Lack of Appropriate Software in Appendix C.)

- E-mail. (1)

- CD of manual. (1) The respondent found this resource useful because information could be quickly and easily accessed.

- VICS on disk. (1)

- Translator's own on-line help. (1)

- Simulator which simulates EDI transactions without an outside organization. (1)

- A common source of suppliers for all purchasing sites within organization, in progress. (1)

- EDI database. (1) The respondent stated that his organization was developing such a resource but did not elaborate.

Desired Resources. After having asked about available resources, the interviewer asked respondents to describe the types of resources they would like to have at their disposal. Respondents were not prompted unless they seemed hesitant.

Please note that although several respondents cited on-line resources as desirable, the descriptions of these have been combined with respondents' answers concerning automated tools. This has been done to avoid repetition and confusion. The questions dealing with automated tools followed the questions relating to desired resources and could have reminded respondents of another type of resource. This possibility was evidenced when respondents stated they felt no desire for other tools but did mention some type of use for automated tools when queried.

Table 25 summarizes the resources respondents reported wanting and detailed descriptions follow. Some respondents mentioned more than one type of resource. (For reference purposes, the number of respondents who voluntarily mentioned needing or desiring on-line resources has been included in Table 25.) Some respondents mentioned more than one type of resource.

It is interesting to note that thirteen respondents felt no need for further resources. Indeed, when asked about resources, one respondent said that he considers his company to be one of the leaders in EDI, one that has the most expertise, creates standards and develops EDI. Another respondent mentioned that resources were developed internally

or acquired as needs arose. Twelve respondents did not mention any type of resource when asked.

Table 25
Summary of Responses Addressing Desired Resources

	No. of respondents		
Number of interviews where issue arose (of 48):	41	(85%)	
	Users	Experts	% of 41
Respondents who desired resources	0	16	39%
Respondents who saw no need for further resources	2	11	32%
Respondents who did not answer the question	2	10	29%
Desired Resources			
			% of 16
1. Internal Human Resources	0	9	56%
2. On-Line Resources	0	5	31%
3. Other Resources	0	4	25%

1. Internal Human Resources (9)

Nine respondents answered that their organization could benefit from more people working with EDI. These included technical people in general, people for programming, people to work on implementation, and a part-time EDI coordinator . One respondent felt that an employee who could keep up to date with what is happening in industry and report relevant information about EDI back to the organization would definitely be an asset to the organization. One respondent dreamt of having access to someone who is an expert in EDI. She described this person as "someone who knows everything about EDI".

2. On-Line Resources (5)

Please see the introduction to desired resources and the results of questions concerning automated tools for descriptions.

3. Other Resources (4)

- Information on transactions related to transportation. The respondent did not specify what form this information should take. (1)

- X12 reference map - not on line. (1)

- Written material. (2) One respondent stated that she wanted books dealing with functions for systems and functions for business and the other desired publications such as EDI World. One respondent said that with written material he could take his time and refer back.

Automated Tools. Respondents were asked whether they felt automated tools would be useful in EDI training or education. The interviewer gave the following automated tools as examples: expert systems, data bases and computer based training (CBT). Although there are prompts in the interview guide for different areas of application for automated tools, these prompts were rarely used.

Table 26 summarizes the types of automated tools described by respondents and descriptions of these tools follow. As mentioned previously, the descriptions of the on-line resources desired by respondents have been included here. Also, respondents may have described more than one type of tool.

A distinction has been made between a respondent seeing a _need_ for an automated tool, usually within his or her organization, and seeing a _use_ for such a tool.

Although 11 respondents originally stated that they saw no _use_ for such tools, five of these qualified their responses. Their answers included possibly using automated tools to help trading partners adopt EDI in areas such as mapping and standards. Their answers have been included in the descriptions of the desired tools listed below. It is,

however, interesting to note that one respondent explained that she felt no use for automated tools because she preferred manuals and contact with people.

Table 26
Summary of Responses Addressing Automated Tools

	Users	Experts	% of 37
Number of interviews where issue arose (of 48):	37		(77%)
No. of respondents			
Respondents who saw no <u>need</u> for such tools	3	4	19%
Respondents who saw no <u>use</u> for such tools	0	6	16%
Respondents unsure of the use of such tools	0	1	3%
Respondents who did not answer question	0	1	3%
Respondents who desired automated tools	0	22	59%

Desired Types of Automated Tools			% of 22
1. Reference Tools	0	10	45%
2. Communication Tools	0	7	32%
3. Technical Tools	0	6	19%
4. Educational Tools	0	4	13%
5. Other Tools	0	3	9%

Among the respondents who saw no <u>need</u> for automated tools, one respondent admitted such tools could be interesting but that they could not be generic because, the respondent felt, they could not address particular needs of an organization. One respondent reported that a "group of people at headquarters was looking at expert systems".

One respondent who thought a bulletin board would be a useful type of automated tool, mentioned that many of her organization's EDI tools are automated and developed in-house.

One respondent mentioned that he was unsure of the use for such tools but emphasized that they would have to be simple as there is already too much to implement. He suggested that they take the form of E-mail related to EDI.

1. Reference Tools (10)

- Standards: (5)

    - EDI data dictionary explaining codes and up to date with standards;

    - electronically available standards;

    - on line help for changes in standards;

    - tool (unspecified) with information about standards; (1)

    - ANSI X12 manual on line, organized by transaction. (1)

- Manuals: (2)

    - ANSI X12 standards manual on line, organized by transaction; (1)

    - whole library of EDI manuals on line. (1)

- Directory, on-line or on a network, listing organizations who do EDI describing how long they have been doing it and the types of transactions they exchange. (1)

- Resources important to specific industries, such as the National Federal Colour and Size Handbook, should be more easily available. (1) The respondent felt that it would be excellent if such resources could be placed on a network.

- Network or database for EDI queries. (1) The respondent feels this might be useful for smaller suppliers or customers because she feels they have many questions and don't know where to find the answers.

- A database containing information on the policies of other companies regarding security and legal issues.

2. Communication Tools (7)

- Bulletin board. (4) Two respondents mentioned that this type of tool would be useful to share ideas, problems and solutions about EDI.

- A tool to help manage trading partner relationships. (1) The respondent was not sure how useful this could be.

- A tool to advise trading partners of UPC changes and automatically distribute these changes. (1) The respondent suggested that this could be done on a network and downloaded.

- A tool for organizational policy. (1) The respondent thought such a tool might be useful in terms of addressing what can be done with EDI but he was unclear as to how and added that the organization's EDI policy was incomplete.

3. Technical Tools (6)

- A mapping tool. (3) One respondent suggested an expert system. One respondent desired a tool to indicate how each customer is mapped for each transaction. This tool would function as a sort of filter before information reaches the translator to verify that customer has sent the transaction as per his or her usual way (usual sequence and number of segments). This tool should also be able to track customer idiosyncrasies.

- Electronic notification of rejected documents. (1)

- A tool to document flow of EDI data. (1)

The same respondent wanted the three types of tools listed below.

- A traffic analysis program that would track shipments; from whom, when, volume of transactions and polling schedules.

- Translator updates.

- A tool to make tests when changing transactions or versions.

4. Educational Tools (4)

One respondent mentioned that his organization was open to automated training. Another mentioned that automated tools might be useful in a corporate training function but was unsure as to how. The other respondents had more specific uses for automated tools:

- A tool to learn how to map business documents according to standards;

- A tool to educate trading partners about legal agreements. (See also Problem 1.5: Reluctance of Trading Partners to Sign Legal Agreements in Appendix C).

5. Other Tools (3)

- One respondent suggested that some type of automated tool could be used to help users in non-urban areas where there is a low concentration of EDI users. He did not elaborate.

- Two respondents thought perhaps that such tools could be used as turn key solutions to help trading partners adopt EDI. (Please see Problem 1.2: Lack of EDI Capability Among Trading Partners, described earlier in this chapter.)

Conclusion

This chapter has presented the details of the results of the needs assessment. It is important to emphasize, that in reporting the results, respondents' replies were used almost verbatim. As can be seen from the results, the needs assessment yielded a great deal of information regarding the challenges organizations are facing with respect to EDI implementation. The following chapter discusses the implications of the results.

Chapter 5

DISCUSSION

Through this needs assessment, EDI users were given the opportunity to report real problems, describe causes grounded in current organizational contexts and propose solutions which they themselves feel would be useful and, perhaps more importantly, acceptable to those who would be involved in such solutions. If indeed a need is a gap between what is and what should be, or between an actual and an optimal situation, and if that gap can be called a problem, then the needs assessment approach described in the preceding chapters accomplished what it was intended to do, namely, to uncover the problems associated with EDI implementation.

The needs assessment also had the purpose of identifying opportunities for educational intervention. In this respect it was also successful.

This chapter compares the results (reported in Chapter 4) to what has been found in the literature, particularly for the three main problems. It also discusses the implications of the results and outlines recommendations for the content and the types of educational solutions which should be considered for the three major problems reported in the results. These recommendations are drawn from the respondents' replies regarding not only the problems and solutions they described but also the information they supplied with respect to the actions their organizations have taken to facilitate implementation, the training they received and would desire as well as the resources they feel would be useful.

When interpreting the data, it should be noted that the sample was limited to respondents and organizations experienced in EDI and may not reflect the kinds of problems that organizations new to EDI might encounter.

Results vs. the Literature

Needs Assessment Literature

In accordance with the needs assessment literature, this project identified and documented problems, solicited ideas and opinions, and sought causes and solutions. It differed from the literature in that it was not focused on a particular organization and therefore could not consider such factors as organizational climate and corporate culture. It crossed organizational boundaries and industrial sectors to identify problems associated with a common phenomenon (EDI implementation). No references were found in the literature describing this type of multi-organizational needs assessment. This approach to needs assessment was used as a first phase to provide a more global perspective than the needs assessments described in the literature. The second phase would focus more narrowly on a specific organization and, using the results of this needs assessment as a basis, gather information specifically related to needs of that organization.

As a decision-making tool this needs assessment provided the information to begin considering possible interventions. Not only do the results clearly indicate that education is an appropriate solution for several aspects of the reported problems, they also indicate the areas in which knowledge is lacking. The needs assessment also fulfilled its task of revealing potential solutions other than training.

The literature focuses primarily on individual performance although Rosenberg (1988) does mention organization performance. This project was concerned with organization performance with respect to the way an organization uses EDI and the way in which its trading partners use it. The needs identified were of the type identified by Burton and Merril (1977, cited in Lee and Roadman, 1991) as 'felt needs' because they represent what the individuals consulted felt was needed to solve the problems.

EDI Literature

General Comparisons

The results of this needs assessment confirm many of the assertions and predictions made in the EDI literature, particularly the problems due to a lack of senior management commitment and the need for education.

The information gathered to create the organizational profiles concur with the literature that both large and small organizations from a variety of industrial sectors use EDI and that numerous types of documents are exchanged.

Certain of the advantages and disadvantages of EDI described in the literature, such as increased speed, reduction in errors and duplication of data, were also reported by respondents. The results also concur with the literature with respect to the long-term nature of the investment and the costs EDI.

Many of the organizations in the survey introduced EDI in accordance with an implementation plan. Some however, were forced into reactive positions by partners and had to scramble to implement. This aspect has also been documented in the literature.

The results also confirm the nature of the barriers to implementation and success factors found in the literature. The most prominent of the barriers were a lack of education, a lack of senior management commitment, a lack of commitment from partners, treating EDI as a technology and not as a business issue and integration differences. The most frequently cited or reported success factors were education, senior management commitment and strong relationships with trading partners.

The results differ greatly from the predictions made by the literature regarding the impact of the changes due to legal issues and security issues. The results suggest that these issues are not a priority for respondents. Many respondents mentioned that the software they were using dealt adequately with security needs and that legal issues regarding EDI were the domain of the legal department. This suggests that respondents

in the sample were not aware of the legal implications of EDI and that in order to obtain more information regarding this issue, it is recommended that employees involved with legal issues be consulted.

The literature predicted many internal changes and although the results show that there have been changes, these do not seem to have had the impact described in the literature. The results do indicate, however, that, as described in the literature, EDI does affect many different departments within an organization.

With respect to the impact on employees, the results indicate that the fears of job loss described in the literature, although understandable, are not grounded in reality. No organization reported job losses, however positions were eliminated or changed. Several respondents mentioned that employees now had the opportunity to do work which was more challenging. This was also described in the literature. Not mentioned in the literature, but often reported in the results, was the fact that for certain employees, EDI became merely an added responsibility.

EDI Literature and the Three Major Problems

The three major problems reported in the needs assessment were the following:

1) Misuse of Standards;

2) Lack of EDI Capability Among Trading Partners;

3) Insufficient Senior Management Commitment to EDI.

Standards. The focus of the literature dealing with standards is to promote standards as a facilitating feature of EDI. Little is mentioned about the different versions and the many ways of interpreting and using standards. The literature does, however, recognize standards as a complex issue and addresses the confusion surrounding the use of standards and the standard setting process. Despite this, few details are given with respect to the implications for organizations and, specifically, possible interventions,

although education is briefly mentioned but not dwelled on. The literature addressing problems with standards does, however, suggest solutions in terms of modifying the standard setting process.

The results bring this issue to the forefront and provide a great deal of information about the possible causes for the misuse of standards. Although the results agree with the literature that it is crucial to use standards correctly, respondents also report that standards are difficult to use and are no longer as 'standard' (not proprietary) as they are described in the literature.

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Capability. The literature seems to assume that not only will all partners be EDI capable, but that they will be capable to the same degree. The literature also assumes that any problems will be due to developing relationships and not to lack of capability. The issue of capability, except in terms of encouraging other firms to adopt EDI, is rarely mentioned. As the second major problem, partner capability is clearly an important issue. This also indicates that without this capability, there is little basis to form the strong relationships predicted and approved of in the literature.

Senior Management Commitment. In this area, the results confirm all the warnings of the literature. Both suggest that securing senior management commitment is important in order to ensure the success of EDI in an organization. Both also report that a lack of senior management commitment is a barrier to successful EDI implementation and that education is needed to correct this situation.

The Partnership Aspect as a Problem Source. The first two problems stem from what can be called the 'partnership aspect'. The results clearly suggest that it is the "interchange" aspect of EDI that is at the source of the problems associated with its implementation. It is this aspect which most distinguishes EDI most from other forms of electronic communication (modem, fax, etc.). With the advent of EDI, organizations are

now being forced to work in partnership and are ill prepared for this new way of conducting business.

The partnership aspect was touted in the literature as a new and wonderful way of doing business. The literature describes these new relationships as opportunities to create stronger bonds. What emerged in the needs assessment data, however, was very different (only one respondent reported this). Although the literature does warn that EDI requires a form of partnership that is vastly different from traditional partnerships and that organizations must be prepared for the changes, little is said about the nature of these changes and what problems will be associated with these new partnerships. Predictions of harmonious and collaborative trading between and among organizations using EDI were put forward and depicted as essential for the effective and profitable use of EDI. The needs assessment has revealed, at least for the participating population, that, to a greater or lesser degree, the partnership is far from being a picture of harmony and collaboration. The results suggest that even highly capable EDI organizations have difficulty with the concept of partnership. However, the results do confirm the desirability and necessity of collaboration between partners in order to take full advantage of EDI's promise of greater profits and fewer costs.

The literature does provide good suggestions for strengthening partnerships once a partnership is established, such as understanding the other firm's business environment and accommodating differences (see Barber 1993; Heflin, 1992), but fails to describe how an organization can maintain these approaches as the number of its trading partners grows. The results indicate that this is an area of concern - that as the number of trading partners grows, it will be increasingly difficult to maintain this sort of understanding, particularly as trading partners themselves change.

The literature also does not address the often hierarchical relationship between partners, namely, that of customer and supplier. Respondents from organizations who are primarily suppliers often reported that their organizations complied with customer

requests even when those requests were not in keeping with what one respondent called "best practices". One of the examples described was that of a supplier having to use the client's proprietary standards in order to be able to exchange EDI transactions with that partner. The literature, incidentally, treats proprietary standards as a thing of the past.

The third major problem, Insufficient Senior Management Commitment to EDI, although primarily an internal organizational problem, can also be linked to the partnership relationship in that a lack of commitment suggests a refusal or an inability to accept the partnership implications of EDI. These range from allowing internal business practices to be scrutinized by partners to being obliged to alter existing systems to effectively use EDI.

Implications for Training and Education

In identifying the problems and challenges currently being faced by organizations using EDI, the needs assessment revealed several opportunities where training and education could be applied to solving the three main problems. Lack (or gaps) of knowledge, skill and/or motivation are problems for which education and training are appropriate solutions.

This section examines the possible gaps in knowledge, skill and motivation that may be at the source of each of the three major problems. These gaps were identified through respondents' answers. Recommendations for interventions, based on what respondents reported, follow.

Gaps in Knowledge/Skills

The gap created by the first problem, Misuse of Standards, exists in that the actual situation is one where partners use standards erroneously or use different versions. The

optimal situation would be where all partners use standards in the same way, with the same version. This is a twofold problem: a) if users knew more about standards and understood why they should be used a certain way, it would likely help bridge this gap; and b) if the standards setting and revision processes were less complex, standards would probably be easier to understand, use and keep up with, this would also help bridge the gap. Interventions for training and education would probably focus on the users. However, standard setting committees and other such bodies might also benefit from understanding the difficulties users are experiencing.

The actual situation of the second problem, Lack of EDI Capability Among Trading Partners, is that partners are reluctant to use EDI or that their EDI capability is not well-developed. The optimal situation would be where partners use EDI as an integrated part of their business transactions, with the possibility of increasing their capability when necessary. Again, an understanding of the nature of EDI, and of the partnership relationship among users, would help eliminate this problem.

The final problem, Insufficient Senior Management Commitment to EDI, exists because the actual situation is that senior managers of certain organizations have not given EDI their support by not treating it as a business issue. Because of this, EDI has been given a technical status and its development within these organizations has been thwarted. The optimal situation would be that senior management fully support EDI so that it can become an integral part of the organization's business methods. This would also clearly communicate to the organization's staff that EDI is important and not merely a new technical tool. If senior managers knew more about EDI, particularly as a business approach, they would be in a better position to give it their support.

Recommendations

The recommendations that follow are drawn from respondents' answers to the issues addressed during the interviews, particularly those answers concerning what respondents reported wanting and needing. For example, several respondents mentioned that conferences would be a good way to learn more about EDI and while some respondents may not have been thinking in terms of using conferences as a preferred type of educational intervention, the frequency of their responses suggests that this type of intervention should certainly be considered and has therefore been recommended.

Four Areas of Intervention

Although non-educational interventions may be envisaged to help solve these problems, and indeed may be used in conjunction with educational interventions, the opportunities for using education to progress from actual to optimal situations exist in four areas for the three main problems. These areas are:

1) Motivation;

2) Comprehension;

3) Application;

4) Evolution.

These four areas emerged during the process of analyzing the data; it was found that the reported gaps in knowledge associated with the main problems could be classified into these areas. As defined below, they represent a complete educational approach, though each one can also be used independently. The use of one or more will depend on the needs of the target population.

For organizations new to EDI, these areas can be considered consecutive phases of educational intervention in a general education program. However, for organizations

more advanced in the use of EDI, the areas can be adopted as needed. Each of these areas is described below in terms of what the area signifies, the types of educational interventions suitable to that area and the facilitators best equipped to provide the education. Where appropriate, opportunities for educational interventions as part of non-educational interventions have also been described.

Because all three problems share common educational needs, recommendations have been classified by area, not by problem. Apart from senior management, and to a lesser degree, sales staff, the results do not clearly identify particular individuals or groups of individuals in organizations for which educational interventions should be developed. In the description of the four educational areas, recipients most likely to benefit from this type of education have been identified.

It is important to note that although training may be interpreted as a more specific form of education, no distinctions were made between the two terms and throughout this study they were and are used interchangeably. This is due to the fact that respondents did not distinguish between the two terms.

Motivation

The results indicate that organizations lack the motivation to adopt EDI, to upgrade their existing systems and to use standards in uniform ways. One of the reasons senior management does not support EDI is due to a lack of motivation. This lack of motivation seems to stem from perceptions that EDI might not be worth the investment, that the costs might be too high, that EDI is too complicated to implement and requires too many changes. Organizations must be convinced that EDI is worth adopting, particularly as a long-term investment.

These fears and apprehensions are not completely unfounded. However, they are, as the results suggest, perhaps based on misinformation and erroneous perception. As with the introduction of any new technology, idea or system, change is difficult and there

is usually a period of uncertainty. Fear of change, resistance and fear of investing in an unknown venture are all understandable reasons for the reluctance shown by certain organizations in adopting EDI. Indeed, these reasons were cited by respondents as possible causes for the main problems. It is true that EDI requires change but the results suggest that organizations reluctant to do EDI do not have a thorough understanding of this change and the investment it requires. There should therefore be some effort made to motivate organizations to consider EDI, to transform the skepticism into optimism.

Education is an appropriate intervention when there is a lack of motivation (Rossett, 1987), particularly to explain the benefits of a new system. It can also serve to ease employees apprehensions by providing them with a clear understanding of what is entailed and what is expected of them. As Reed writes: "Explaining why EDI is important to the company and all employees will go a long way toward motivating those involved" (1991, p. 21).

Motivation implies a change of attitude and educational interventions designed to incite organizations to adopt EDI should focus primarily on affective concerns by:

- enumerating the benefits of, and reasons for, investing in EDI;

- situating the potential EDI-capable organization within the broad perspective of all EDI-capable organizations so that a new EDI user can understand the partnership role of his or her organization;

- emphasizing the inevitability of eventually adopting EDI within the context of the ability to survive in a global economy;

- allaying any apprehensions or reservations organizations may have by outlining the implementation process and the implications of EDI.

Education to promote motivation should be a component of the interventions chosen to solve each of the three major problems.

This education should be addressed directly to employees who would be affected by EDI in organizations who wish to adopt EDI. Senior management would also benefit from this type of education.

Types of Educational Interventions . Several respondents mentioned the use of success stories as an effective method of convincing organizations to adopt EDI. Although few details were given by respondents, such accounts should trace the story of an organization's successful EDI experience. Each story should include a brief introduction to EDI, the reasons the organization had for implementing EDI, the organization's background, the organizational and tech-ical changes it had to undergo to make EDI work, the problems it faced, the solutions it found or developed to overcome these problems and the benefits it now reaps due to EDI. Emphasis should be placed on what EDI can do for an organization.

Prominent senior employees should recount the stories live and in person. The stories could form the basis for more structured discussions or workshops within the context of an event such as a convention where there are opportunities to meet others who are considering adopting EDI. This approach would deliver the content by structured means, assuring that the information is transmitted. It would also address the affective aspects of motivation through the stories and it would comply with respondents' desire for such activities.

Educational activities aimed to motivate, such as those described above, could also form part of a general business event. Respondents suggested trade shows or trade association meetings. Organizations are likely to have a certain trust in their trade associations and would probably know other members. This would place EDI in a familiar context and within the same industry.

Respondents could work with written case studies, reflecting the live success story. Work books could be designed where participants could create and fill in a potential

scenario for their own organizations. In this way, they would return to their organizations well equipped to begin the implementation process or to convince their senior management of its importance.

Opportunities for education would also exist to develop train-the-trainer types of education for these groups. Indeed, because EDI benefits for an organization increase with the number of partners, many respondents desired training for themselves or others in their organization to assist them in convincing their partners to adopt or better use EDI.

Facilitators. This type of education could be delivered by the staff of EDI capable partners, by trade associations, by EDI agencies. However, it would be preferable that facilitators belong to organizations in the same industrial sector. This would help increase the confidence of potential users in the facilitators.

If participants are senior managers, the success stories should come from the CEO of a successful and prominent company and there should be greater emphasis on issues of primary concern to senior management such as investment and the implications to business practices.

Educational interventions aimed at motivating potential users should not take the form of a "sales job" in the sense of selling services or products. For this reason, VANs and vendors have been excluded from the list of potential facilitators. However, they could collaborate or help sponsor such interventions.

Non-Educational Interventions. Motivation may also be increased through non-educational approaches such as offering incentives and through written articles. One respondent suggested that incentives could be offered by larger partners to motivate smaller partners to adopt EDI. Although the type of incentive program would depend largely on the organizations involved, opportunities for education exist to sensitize the

larger organizations to the concerns of their smaller partners. An incentive scheme could be rendered more effective if developed in conjunction with motivational education.

Potential users could be attracted to motivating events by well-designed and well-targeted articles promoting EDI and such events in business and trade publications. Such articles could be used to begin the motivation process by arousing curiosity and sustaining interest. They would focus primarily on attracting the user to the event rather than informing the user about EDI.

Although some organizations are already 'motivated' to use EDI because their partners are using it, being forced to implement EDI might cause resentment. This was the case with some of the organizations in the study. Some of these organizations kept their EDI use to a strict minimum and were unwilling to further explore EDI's functions. It is important to change the quality of the motivation so that organizations view it as an opportunity, not as 'a necessary evil' as one respondent phrased it.

Comprehension

Motivation is the basic step. Closely related is the understanding, or comprehension, of what EDI is, what it costs and where it can lead. Frightened by buzzwords such as "re-engineering", key individuals within organizations may have shied away from taking the time to fully understand the nature and implications of EDI.

One of the goals of an educational intervention in the area of comprehension should be to demystify EDI. It should help new EDI users avoid feeling "lost in the high tech shuffle" as one respondent phrased it. Individuals who participate in such interventions should come away with a fundamental understanding of:

- the nature of EDI as a concept, a technical innovation and a business approach;
- the real costs of doing EDI, particularly start-up and implementation costs;
- the benefits of doing EDI;

- the nature and functioning of a partnership, particularly of the roles of the partners;

- implementation - step-by-step procedures and what resources it requires;

- standards - what they are, how they are used and why they exist;

- the types of EDI transactions;

- the concept of re-engineering - why it is important, how to plan for it;

- EDI's impact on the organization in terms of staff allocation, departments it affects or can affect.

These aspects were synthesized from respondents' answers concerning the type of training and education they had found helpful or would have liked to receive or wanted their partners to receive.

After participating in such an intervention, participants should feel quite familiar with EDI in theory and should be able to take concrete steps toward implementation within their respective organizations. Individuals from already capable EDI organizations will be better able to understand EDI's functioning in the organization. Education to understand EDI should be a component of the interventions chosen to solve each of the three major problems.

As with motivation, this type of education should be addressed directly to employees who would be affected by EDI in organizations who wish to adopt EDI. Senior management would also benefit from this type of education. However, depending on the level to which an employee is involved with EDI, certain subject areas may be excluded. For example, if an employee is not at all involved with the financial aspects of EDI, it may not be necessary for this person to be familiar with start up and implementation costs.

More in depth education for participants specializing in a certain aspect of EDI can also be envisioned. For example, more advanced courses about re-engineering could be given to managers.

Organizations who are more advanced in EDI implementation can also benefit from the comprehension aspect should they wish to deepen and broaden their understanding of EDI.

Types of Educational Interventions. Structured workshops on a specific topic and case studies would be perhaps the best delivery methods for this type of education. The workshops would not only provide the necessary content but would also offer participants the opportunity to interact with others. Respondents demonstrated a certain desire to find out how other users were dealing with the problems and challenges they are facing. or have faced. and to hear their "horror stories", as one respondent described them. Activities to interact with other EDI users can be an excellent means to strengthen the partnership relationship. Indeed. such activities would help to situate organizations among their partners.

The case studies would allow participants to concretize the theory as well as provide them with a possible plan to bring back to their respective organizations. Case studies should address the steps taken by an organization to implement EDI. Participants can read them. work on and with them, and keep them for consultation. They can also be used as models to help participants develop a scenario for their own organizations.

The educational interventions chosen for the comprehension aspect of EDI should be objective-oriented and tightly structured.

Facilitators. As with motivation. facilitators could include the staff of EDI capable partners, trade associations and EDI agencies. User groups, found very useful by respondents. could also provide this type of education. User groups also tend be more local, more accessible and less inhibiting than a formal convention. Facilitators should be experienced EDI users themselves and should have a particular expertise in the subject

they teach, i.e. standards. Prominent speakers, known for their vast EDI experience or business expertise, could support such interventions.

Opportunities for education would also exist to develop train-the-trainer types of education for the chosen facilitators.

Application

Once users have acquired a fundamental understanding of EDI, they must put the theory into practice. In other words, they must implement it. This includes the technical issues as well as the redesigning issues which affect an organization's business systems.

The educational interventions which address this aspect should help users apply the theory covered in the 'comprehension' aspect. The content remains basically the same although the emphasis is on application.

Based on respondents' answers regarding problems, causes, solutions, and useful and desired training, education applied to the area of application should allow users to be able to:

- calculate the real costs of doing EDI, particularly start-up and implementation costs, for their organizations;

- acquire, set up with, and interact with partners, particularly a large number of partners whose requirements may vary;

- implement step-by-step procedures and secure the necessary resources;

- use standards in acceptable and uniform ways;

- exchange different types of EDI transactions;

- re-engineer its business systems to fully benefit from EDI;

- take concrete actions (consultation and information) to prepare staff and all affected departments for EDI's impact on the organization.

Essentially, this type of intervention should render the organization EDI capable. For an organization new to EDI, this capability should have the potential to expand in

accordance with the capability of its partners and the demands of a rapidly evolving technology as well as rapidly changing economy.

Educational interventions for application should be addressed to users who are in the implementation process. Because EDI implementation is a continuous endeavor, the application aspect is not limited to beginners. Depending on the degree to which an organization is established in its organization process, it can benefit from this type of intervention.

This type of education should be addressed directly to employees who will be involved in the implementation process. Senior management would benefit from those aspects addressing costs, re-engineering and staff preparation.

More advanced education for participants specializing in a certain aspect of EDI can also be envisioned. For example, more advanced courses dealing with standards could be offered to individuals who are responsible for standards in their organizations. This might be true of larger organizations where work and responsibilities are often compartmentalized.

Organizations who are more advanced in EDI implementation can also benefit from the application aspect should they wish to improve their EDI capability. In light of the problems with partnership, the aspect of acquiring and interacting with trading partners might be particularly useful as might the aspects dealing with standards and re-engineering.

Types of Educational Interventions. A large number of respondents mentioned that the training they had found most useful had been on-the-job training. The ideal delivery method for education addressing application would therefore be on the job, on site at the organization. This training would take individuals responsible for implementing EDI in the organization through the steps of implementation.

This type of intervention could be supported by such tools as simulations which allow organizations to simulate EDI transactions without an outside organization, similar to an internal pilot project Although in general respondents were not enthusiastic with respect to automated tools and those who did see a use for them often qualified their answers, several did see the possibility of using automated tools as references for standards, legal issues and possibly as on line help. Such tools could be used to support educational interventions designed for the area of application. Step-by-step implementation manuals could also be designed to support this type of educational intervention.

In keeping with respondents' desire for opportunities to interact with other EDI users, seminars and/or workshops could be organized by local user groups. This could be used as support to the one-on-one teaching. This type of delivery would address the same issues as the on-the-job approach. The step-by-step implementation manuals described in the preceding paragraph would be useful in such teaching.

As with the other aspects, opportunities for education would also exist to develop train-the-trainer types of education for the chosen facilitators.

Respondents also mentioned turn-key solutions to assist organizations in starting with EDI. Opportunities for education would exist for such solutions either to teach potential users to use such programs or to design a training manual to help users, or both. The disadvantage to such a tool lies in the possibility that organizations might not be able to evolve in their use of EDI if they adopt the tool without conducting an analysis of their business systems. The crucial re-engineering aspect of EDI might be ignored.

Facilitators/Collaborators. Facilitators should be individuals who have a well-grounded experience in EDI implementation, both from a technical and a business perspective. A facilitator would assume the role of a tutor by overseeing the implementation process while providing the necessary information to the users.

Facilitators could be hired from EDI agencies, from the staff of highly capable organizations, EDI consulting companies, software companies and possibly VANs.

Several respondents mentioned that their organizations already provided implementation help to their smaller partners by designating employees to reassure them and answer their questions. Certain of these larger companies also produce guidelines and informative material. Educational opportunities exist to assist these organizations, and others, in this area. Respondents also mentioned both vendors and VANs as good sources of information for implementation procedures. Once the process of implementation is established, these suppliers could also provide help via the phone (as many already do) to their customers.

EDI agencies, if not participating as facilitators, should certainly be consulted in terms of developing the training, particularly with respect to the conformity of standards and transactions.

Evolution

Because EDI is an evolving approach to business, there must be some method of 'continuing education' or continuous help for organizations whose EDI implementation is fairly well established. Many respondents mentioned that EDI implementation is an ongoing process that seems destined to continue as business approaches change. Organizations must therefore have a means of keeping up to date with new EDI developments both from a technical standpoint and a business one.

From responses given by experienced respondents, educational interventions which address evolution should focus on the development of EDI within the broad scope of a global economy and should deal with such aspects as:

- new transactions (i.e. ECR- Efficient Consumer Response, EFT- Electronic Funds Transfer);
- new business applications for EDI;

- changes in standards;

- accounts of recent accomplishments by organizations who have found new ways to benefit from EDI;

- developments in the technology, including new products, systems and services.

Educational interventions for evolution should be addressed to employees who are involved in EDI in organizations where EDI is fairly well-established. The results indicate that the trend for these organizations, at least for those in this sample, is to move beyond the technical aspects to business aspects in order to exploit EDI's full potential.

Senior management would benefit from this type of education, particularly with respect to keeping abreast of the latest developments and their implications for business.

Types of Educational Interventions. In keeping with respondents' desire for activities which offer the opportunity to interact with other EDI users, ongoing education should be an aspect of EDI seminars, forums and conventions. Workshops dealing with new applications could also be designed to provide more formal education.

Ongoing help can also be established via phone help lines to EDI experts. Although this approach would not provide contact with many users, it would provide human contact. Such a situation would offer educational opportunities to train experts. Automated tools designed as references for issues such as standards, legal aspects, technical details and transaction details, could be developed to provide readily accessible information to an individual working as an EDI expert.

Facilitators. Seminars, forums and conventions could be organized by EDI agencies, user groups, trade associations or any group or organization interested in promoting EDI. EDI experts who provide help over the phone could be from the staff of an EDI agency, a large trading partner, a VAN or a vendor.

Additional Educational Opportunities

The results indicated that the types of specific technical training desired varied greatly from respondent to respondent, depending perhaps on the needs of the organization. Such training should be developed on an organization by organization, or perhaps, industry by industry, basis.

The results pertaining to legal aspects and security issues suggest that organizations were not overly concerned with these issues. Many respondents reported that their organization's legal departments dealt with legal issues and security was taken care of by software designed to deal with security problems. However, opportunities for education might exist in organizations who need a high level of security, such as financial institutions and certain government agencies. This education could either be used to train employees to use sophisticated security software (as yet undeveloped it seems) and to provide basic knowledge of security issues.

Although the results indicate that respondents did not feel that automated tools would be useful to deliver training or education, there might be opportunities to train EDI experts in the use of such tools if these are developed to provide help to EDI users.

Final Remarks

North American companies have traditionally operated as individual and separate entities, with the spirit of competition instilled into their very fabric. The reluctance or inability of certain organizations to adopt EDI, increase their EDI capability, upgrade their existing business systems to optimize EDI or use standards uniformly, reflects this traditional approach.

Organizations must come to terms with the fact that they can no longer work autonomously and in relative isolation if they are to .enefit fully from EDI, or even if

they are to survive in a business environment where EDI is quickly becoming the preferred way of doing business.

Organizations are by now, for the most part, familiar with technologies. The results clearly suggest that it is not the fact that EDI is a new technology that is at the source of the main problems, but that it is a new technology that requires, indeed demands, important changes in the ways organizations conduct business. Until EDI, these technologies were installed within an organization and the company could adopt whatever means it chose of doing its business as long as the final product met the customer's requirements. EDI permeates various departments of an organization and organizations must not only learn to operate in a partnership, they must also examine, and possibly modify, their internal business practices to benefit from EDI. As one respondent stated: "EDI is an *enabling technology*, it offers organizations a chance to take a look at their business processes, it offers opportunities for change."

In addition, because the nature of EDI is such that its optimal use requires organizations to use it in the same ways with the same standards and that all trading partners use it to the same degree, these internal business systems are now being subjected to the scrutiny of larger, more EDI capable partners. What was sacred and private, is now public. In light of this, it is small wonder that there are problems with the partnership aspect of EDI.

The results of this needs assessment not only clearly indicate that there is a lack of EDI understanding among organizations who use, or are considering using, EDI but that this lack is an important cause for the main problems reported, particularly those associated with the partnership aspect of EDI.

Because this needs assessment, which is but the first step in the process of developing useful education, involved many organizations in different industrial sectors (unlike most needs assessments which are done within a single organization), specific solutions will differ depending on such factors as the target population, the industrial

sector, and the specific nature of the problem. An organization who wishes to use training and education as solutions must also consider the ways in which these interventions will be most effective in the overall organizational context. This may mean combining them with other types of interventions. Organizations, however, may wish to consider the words of Baltzer: "Training is the cornerstone that makes it possible to successfully implement information technologies within our organizations" (1991, p.17).

The recommendations outlined in this chapter are based on the results which indicated a lack of knowledge and motivation and were formulated specifically for training and education. Education in the four areas described earlier (Motivation, Comprehension, Application, Evolution), will help close the EDI performance gaps that organizations are currently experiencing. This education is necessary to ensure that EDI is demystified, understood and used.

Although the results provide a great deal of information regarding possible causes and solutions, only general types of educational interventions can be proposed at this stage. It is recognized, however, that other causes and solutions were reported and suggested and that these must also be considered when developing useful interventions.

According to Holland et al. (1992a), our understanding of the effects of EDI on organizations is limited and more research must be done. It was the purpose of this needs assessment to contribute to such research. As noted earlier, needs assessment is usually done within an organization and no literature-based examples of a cross-organizational, cross-industry approach were found. In addition, the traditional approach to needs assessment begins by examining a broader level and gradually focusing inward whereas the approach in this needs assessment began by focusing on a single area of concern and then branching outward. Perhaps the key to its success was the fact that this thesis examined a single, albeit complex, issue.

This study demonstrated that the techniques of needs assessment can be adapted to develop an effective means of gathering data regarding problems and opportunities across

a wide range of organizations. Because EDI implementation is a complex issue, and because it does not affect every organization, or every industry, in the same way, the various perspectives obtained through this form of needs assessment have provided a general picture of the current state of EDI implementation. In this era of global economy, shrinking markets and rapid technological advance, such an approach to needs assessment could become a useful model for identifying the shared needs and concerns of organizations dealing with, or trying to deal with, the changes inherent in these new ways of doing business.

REFERENCES

Alreck, P.L. & Settle, R.B. (1985). The survey research handbook. Homewood, IL.: Richard D. Irwin.

Baker, R. (1991). EDI: What managers need to know about the revolution in business communications. Blue Ridge Summit, PA: TAB Professional ad Reference Books.

Baltzer, J.A. (1991). People and process: Managing the human side of information technology application. (Professional Paper Series #7). Boulder, CO: CAUSE. (ERIC Document Reproduction Service No. ED338224).

Barber, N.F. (1990). Implementing EDI beyond connectivity: The management challenge of the '90s. EDI Forum, 3 (1990 Issue), 44-53.

Barber, N.F. (1991, September). Re-engineering and EDI: Part 1 - different assumptions. EDI World, 1 (9), 5-6.

Barber, N.F (1992, May). Where's the beef? EDI World, 2 (5), 16-17.

Barber, N.F. (1993, July). Trading partnership programs. EDI World, 3 (7), 10, 14.

Barkan, T. (1991, July). The first steps in EDI education. EDI World, 1 (7), 18, 19, 21.

Benjamin, S. (1989). A closer look at needs analysis and needs assessment: What ever happened to the systems approach? Performance & Instruction, 28 (9), 12-16.

Boland, A.S. (1989). Justifying an EDI implementation. EDI Forum, 1 (1), 138-143.

Borg, W.R. & Gall, M.D. (1989). Educational research: An introduction (5th ed.). New York: Longman.

Brinkerhoff, R.O. (1986). Expanding needs analysis. Training & Development Journal, 40 (2), 64-65.

Brooks, J.E. (1992). Organizing for EDI success: Breaking down the barriers. EDI Forum, 5 (1), 71-76.

Brown, M.G. & Schwartz, J.E. (1988). What to fix when everything's broken. Performance & Instruction, 27 (4), 6-12.

Budke, W.E. & Kerka, S. (1988). Human performance technology. (ERIC Digest No. 74). Washington, DC: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED296122).

Burton, J.K. & Merrill, P.F. (1977). Needs assessment goals, needs and priorities. In L. J. Briggs (Ed.), Instructional design principles and application (pp. 21-45). Englewood Cliffs, NJ: Educational Technology Publications.

Calderwood, L. (1991, February). Electronic data interchange: A giant strides out. Materials Management and Distribution, 19-21.

Carr, C. (1991). How performance happens (and how to help it happen better) -- part 8: Know-how. Performance & Instruction, 30 (7), 28-32.

Carter, J.R., Monczka, R.M., Clauson, K.S. & Zelinski, T.P. (1989). Education and training for successful EDI implementation. EDI Forum, 1 (1), 89-93.

Chan, S., Govindan. M., Picard, J.Y., Takach, G.S. & Wright, B. (1991). EDI for managers and auditors. Etobicoke, ONT: EDI Council of Canada.

Converse, J.M. and Presser, S. (1986). Survey questions: Handcrafting the standardized questionnaire. Beverly Hills, CA: Sage Publications.

Dalton, G. (1989). The relationship between EDI and E-mail. EDI Forum, 1 (1), 30-33.

De Vaus, D.A. (1990). Surveys in social research (2nd ed.). London: Unwyn Hyman.

Dillman, D.A. (1977). Mail and telephone surveys: The total design method. New York: John Wiley & Sons.

Dillman, D.A. (1987). Elements of success. In D.E. Johnson, L.R. Meiller, L.C. Miller & G.F. Summers (Eds.). Needs assessment: Theory and methods (pp. 188-209). Ames, IA: Iowa State University Press.

Dodge, R.E. (1987). Getting started with a needs assessment: A nuts and bolts approach for putting one together. Performance & Instruction, 26 (6), 16-20.

Dookheran, F. (1990). End-user computing: The myth and the reality. Computing Canada, 15 (25), 42.

Emmelhainz, M.A. (1990). Electronic data interchange: A total management guide. New York: Van Nostrand Reinhold.

Emmelhainz, M.A. & Emmelhainz, L.W. (1992). EDI and TQM: Mutual means to superior performance. EDI Forum, 5 (1), 22-25.

Farhoomand, A.F. (1992). A snapshot of electronic data interchange in the 1990s. EDI Forum, 1 (5), 27-29.

Fink, A. & Kosecoff, J. (1985). How to conduct surveys: A step-by-step guide. Newbury Park, CA: Sage Publications.

Fowler, F.J. Jr. (1984). Survey research methods. Beverly Hills, CA: Sage Publications.

Geis, G.L. (1986). Human performance technology: An overview. In M.E. Smith (Ed.), Introduction to performance technology (V.1) (pp. 1-20). Washington, DC: National Society for Performance and Instruction.

Geis, G.L. & Coscarelli, W. (1987). Why do educational technologists teach when they shouldn't? And how can we teach them not to? Educational Technology, 27 (9), 31-36.

Gilbert, T. F. (1978). Human competence: Engineering worthy performance. New York: McGraw-Hill.

Gordon, J. (1992). Performance technology: Blueprint for the learning organization? Training, 29 (5), 27-32, 34, 36.

Harless, J. (1992). Whither performance technology? Performance & Instruction, 31 (2), 4-8.

Heflin, R. (1992, November). Real partnerships. EDI World, 2 (11), 16.

Heflin, R. (1993, March). EDI: A major business function? EDI World, 3 (3), 9.

Holland, C., Lockett, G. & Blackman, I. (1992a). Planning for electronic data interchange. Strategic Management Journal, 13, 539-550.

Holland, C., Lockett, G. & Blackman, I. (1992b, October). Electronic data interchange implementation: A comparison of U.S. and European cases. International Information Systems, 15-37.

Hutchison, C. (1990). A performance technology process model. Performance & Instruction, 29 (3), 1-5.

Institut EDI (1992). L'utilization de l'échange de documents informatisés (EDI) au Québec: Rapport de l'enquête. [The utilization of electronic data interchange (EDI) in Quebec: Survey report]. Montreal, QC: Author.

Jackson, D. (1988). Preparing the organisation for EDI. In M. Gifkins & D. Hitchcock (Eds.), The EDI handbook: Trading in the 1990s (pp. 149-155). London: Blenheim Online.

Jenkins, G. & Lancashire, R. (1991). The Canadian electronic data interchange handbook: A quick read on EDI. Etobicoke, ONT: EDI Council of Canada.

Jenkins, G. & Lancashire, R. (1992). The EDI implementation handbook: A quick introduction to EDI implementation. Etobicoke, ONT: EDI Council of Canada.

Jilovec, N. (1993, November). On-going EDI education. EDI World, 3 (11), 20-23.

Kaufman, R. (1972). Educational system planning. Englewood Cliffs, NJ: Prentice-Hall.

Kaufman, R. (1982). Identifying and solving problems: A system approach (3rd ed.). San Diego, CA: University Associates.

Kaufman, R. (1983a). A holistic planning model. Performance & Instruction, 22 (8), 3-12.

Kaufman, R. (1983b). Planning and organizational improvement terms. Performance & Instruction, 22 (8), 12-15.

Kaufman, R. (1984). Improving organizational impact. Performance & Instruction, 23 (8),

Kaufman, R. (1985a). Needs and motives. Performance & Instruction, 24 (10), 1.

Kaufman, R. (1985b). Linking training to organizational impact. Journal of Instructional Development, 8 (2), 23-29.

Kaufman, R. (1985c). Needs assessment, needs analysis, objectives, and evaluation. Performance & Instruction, 24 (6), 21.

Kaufman, R. (1986a). Assessing needs. In M.E. Smith (Ed.), Introduction to performance technology (V.1) (pp. 25-59). Washington, DC: National Society for Performance and Instruction.

Kaufman, R. (1986b). Obtaining functional results: Needs assessment, needs analysis and objectives. Educational Technology, 26 (1), 24-27.

Kaufman, R. (1987). A needs assessment primer. Training & Development Journal, 41 (10), 78-83.

Kaufman, R. (1991a). Trainers, performance technologists, and environmentalists. Performance Improvement Quarterly, 4 (2), 69-76.

Kaufman, R. (1991b). Toward total quality 'plus'. Training, 28 (12), 50-54.

Kaufman, R. & Bowers, D. (1990). Proactive and reactive planners: An even closer look at needs analysis and needs assessment. Performance & Instruction, 29 (5), 7-10.

Kaufman, R. & English, F.W. (1979). Needs assessments: Concept and application. Englewood Cliffs, NJ: Educational Technology Publications.

Kaufman, R., Mayer, H. & Butz, R. (1984). An active participation article: Defining and classifying the organizational elements. Performance & Instruction, 23 (4), 22-25.

Kaufman, R. & Stolovitch, H. (1991). Planning, perspectives, creativity and control. Educational Technology, 31 (2), 51-54.

Kaufman, R. & Valentine, G. (1989). Relating needs assessment and needs analysis. Performance & Instruction, 28 (10), 10-14.

Kerr, M. (1993, July 19). EDI getting attention, but still lacking implementation. Computing Canada, p. 31.

Kimberly, P. (1991). Electronic data interchange. New York: McGraw-Hill.

Kuh, G.D. (1982). Purposes and principles for needs assessment in student affairs. Journal of College Student Personnel, 23 (3), 202-208.

Lampe, S. (1986). Getting the most out of needs assessments. Training, 23 (10), 101, 102, 104.

Lapointe, J.J. (1992). La conduite d'une étude de besoins en éducation et en formation: Une approche systémique. [Conducting a study of needs in education and training: A systemic approach]. Québec, QC: Presses de l'université du Québec.

Lauzon, Y. (1991). The state of EDI in Quebec. EDI Forum, 1 (4), 149-153.

Lauzon, Y. & Botting, C. (1993, April). Just the facts: 1992 survey of EDI in Canada. EDI Forum, pp. 18-23.

Lavery, F. (1991, September). The importance of EDI education. EDI World, 1 (9), 9, 13.

Lavery, F. (1992, May) Is the standard-setting process out of control? EDI World, 2 (5), 9-11.

Lavery, F. (1993, July). The independence of electronic commerce and EDI. EDI World, 3 (7), 15, 18, 19.

Lee, W. W. & Roadman, K.H. (1991). Linking needs assessment to performance based evaluation. Performance & Instruction, 30 (6), 4-6.

Mager, R. F. (1986). Foreword. In M.E. Smith (Ed.), Introduction to performance technology (V.1) (pp. ix-xi). Washington, DC: National Society for Performance and Instruction.

Mager, R.F. & Pipe, P. (1984). Analyzing performance problems (2nd. ed.). Belmont, CA: Lake Publishing Company.

Mattimore- Knudson, R. (1983). The concept of need: Its hedonistic and logical nature. Adult Education, 33 (2), 117-124.

Mayer, H. (1986). Alternative approaches and guidelines for conducting needs assessments. Canadian Journal of Educational Communications, 15 (2), 117-123.

McKillip, J. (1987). Needs analysis: Tools for the human services and education. Beverly Hills, CA: Sage.

McWilliams, B. (1992, October). The electronic connection. Enterprise, pp. 31-35.

Novack, K.M. (1991). A true training needs analysis. Training & Development Journal, 45 (4), 69-73.

Olshfski, D. & Joseph, A. (1991). Assessing training needs of executives using the Delphi technique. Public Productivity and Management Review, 14 (3), 297-301.

Oppenheim, A.N. (1992). Questionnaire design, interviewing and attitude measurement (New ed.). London: Pinter Publishers.

Oravec, J.R. (1993, Jan.). Ten tips for managing your way to EDI success. EDI World, 3 (1), 32, 35, 37.

Patrick, G. (1988). The challenges of EDI decision making. In M. Gifkins & D. Hitchcock (Eds.), The EDI handbook: Trading in the 1990s (pp. 229-237). London: Blenheim Online.

Peters, T. (1992). Liberation management: Necessary disorganization for the nanosecond nineties. New York: Alfred A. Knopf.

Pitts, J.M. (1992, November). Let's change our processes with EDI. EDI World, 2 (11), 19.

Reed, R. (1991, July). EDI and human resource interface: Problem or opportunity? EDI World, 1 (7), 20-21.

Robinson, C.K. (1992, May). EDI standards development: Getting from point A to point B. EDI World, 2 (5), 25-27.

Rockart, J.F. & Short, J.E. (1989). IT in the 1990s: Managing organizational independence. Sloan Management Review, 30 (2), 7-17.

Rosenberg, M.J. (1988). The role of training in a performance-oriented organization. Performance & Instruction, 27 (2), 1-5.

Rosenberg, M.J. (1990). Performance technology: Working the system. Training, 27 (2), 42 48.

Rossett, A. (1986). Commentary: Analyzing, assessing, and disambiguating whatchamacallit. In M.E. Smith (Ed.), Introduction to performance technology (V.1) (pp. 60-67). Washington, DC: National Society for Performance and Instruction.

Rossett, A. (1987). Training needs assessment. Englewood Cliffs, NJ: Educational Technology Publications.

Rossett, A. (1989). Assess for success. Training & Development Journal, 43 (5), 55-59.

Rossett, A. (1990). Overcoming obstacles to needs assessment. Training, 27 (3), 36-41.

Rossett, A. (1991). Job aids in a performance technology world. Performance & Instruction, 30 (5), 1-6.

Rossett, A. (1992). Analysis of human performance problems. In H.D. Stolovitch & E.J. Keeps (Eds.), Handbook of human performance technology: A comprehensive guide for analyzing and solving performance problems in organizations (pp. 97-113). San Francisco, CA: Jossey-Bass Publishers.

Rummler, G.A. (1987). Determining needs. In R.L. Craig (Ed.), Training and development handbook: A guide to human resource development (3rd ed.) (pp. 217-247). New York: McGraw-Hill.

Rummler, G.A. & Brache, A.P. (1992). Transforming organizations through human performance technology. In H.D. Stolovitch & E.J. Keeps (Eds.), Handbook of human performance technology: A comprehensive guide for analyzing and solving performance problems in organizations (pp. 33-49). San Francisco, CA: Jossey-Bass Publishers.

Rusk, H.J. (1992, May). Standards: The orderly way to do EDI. EDI World, 2 (5), 6.

Sankar, Y. (1991). Management of technological change. New York: John Wiley & Sons.

Stolovitch, H.D. and Keeps, E.J. (1992). What is human performance technology? In H.D. Stolovitch & E.J. Keeps (Eds.), Handbook of human performance technology: A comprehensive guide for analyzing and solving performance problems in organizations (pp. 3-13). San Francisco, CA: Jossey-Bass Publishers.

Stone, B.K. & Hill, N.C. (1993, November). Top management education: Key to EDI success. EDI World, 3 (11), 4, 28.

Stufflebeam, D.L., McCormick, C.H., Brinkerhoff, R.O. & Nelson, C.O. (1985). Conducting Educational Needs Assessment. Boston, MA: Kluwer Nijhoff.

Takach, G.S. (1991). The Canadian perspective. In S. Chan, M. Govindan, J.Y. Picard, G.S. Takach & B. Wright (Authors), EDI for managers and auditors (pp. 102-111). Etobicoke, ONT: EDI Council of Canada.

Turnbull, P. (1988). The impact of EDI upon business organization. In M. Gifkins & D. Hitchcock (Eds.), The EDI handbook: Trading in the 1990s (pp. 11-23). London: Blenheim Online.

Turoff, R. (1991). Trainingspeak. Training & Development Journal, 45 (12), 22, 25.

Walker, R. (1988). Maintaining the UK's competitive edge. In M. Gifkins & D. Hitchcock (Eds.), The EDI handbook: Trading in the 1990s (pp. 3-10). London: Blenheim Online.

Westgaard, O. (1992). On ghosts and needs assessment. Performance & Instruction, 31 (9), 9.

Wheble, B. (1988). Creating legal relationships with trading partners. In M. Gifkins & D. Hitchcock (Eds.), The EDI handbook: Trading in the 1990s (pp. 126-138). London: Blenheim Online.

Wircenski, J.L., Sullivan, R.L. & Moore, P. (1989). Assessing training needs at Texas Instruments. Training & Development Journal, 43 (4), 61-63.

Wolvelaere, C. van & Tannenwald, P. (1991, November 4). Focusing on steps for success. Industry Week, 240 (Supplement: Electronic Data Interchange), (21), 4, 6, 8, 12, 16.

Zemke, R. & Kramlinger, T. (1982). Figuring things out: A trainer's guide to needs and task analysis. Reading, MA: Addison-Wesley.

Appendix A

INTERVIEW GUIDE

Education and Training Needs in EDI Implementation

Introduction to guide

- Essentially, what we want to do is to find out about
    - how EDI affected your job (if it did)
    - **what kind of problems you experienced or are experiencing**
    - **what you think can be done about these problems**
    - what your organization did to facilitate EDI implementation
    - whether you received training and what kind
    - what resources are available to you when you work with EDI

SECTION 1 - Organizational and Personal Preparation

1. To begin, I would like to ask you if your job was affected in any way as a result of EDI implementation (e.g., able to work more efficiently, given new responsibilities)? No   Yes, in what way? _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Let's focus on what your organization did, or might have done, to make EDI implementation easier. What sorts of things did it do or could it have done?

Questions:	- To what degree did your organization ....
	- How important do you think this action is to successful implementation? Why?
	- If you're not in a position to know or feel that you cannot answer, just answer Don't Know.

2. Did_____

_____
_____
_____
_____

Could have done _____

_____
_____
_____
_____

	Degree	Importance
3. consult you/coworkers about the planning or implementation of EDI?	1 2 3 4 DK	1 2 3 4 DK

_____
_____
_____
_____

| 4. consult employees about interface design? (software organization uses to access EDI) | 1 2 3 4 DK | 1 2 3 4 DK |

_____
_____
_____

| 5. provide executive support? | 1 2 3 4 DK | 1 2 3 4 DK |

_____
_____
_____

| 6. inform employees regarding how EDI would affect their jobs? | 1 2 3 4 DK | 1 2 3 4 DK |

_____
_____
_____

7. designate a project leader?　　　　　　　1　2　3　4　DK　　1　2　3　4　DK

_____

_____

_____

_____

_____

8. provide adequate financial support?　　　1　2　3　4　DK　　1　2　3　4　DK

_____

_____

_____

_____

_____

9. Other　　　　　　　　　　　　　　　　1　2　3　4　DK　　1　2　3　4　DK

_____

_____

_____

_____

_____

We would also like to ask you about the training or education you received to prepare you for EDI implementation. We want to know what topics you received training in, if it was useful and what kind of training you feel would be useful.

10. What kind of training did you receive?

_____
_____
_____
_____
_____

11. What kind of training would you have liked or would like to receive ?

_____
_____
_____
_____

```
Questions:   - Did you receive training in this topic?
             - How would you rate this training? (If rated poorly, ask why.)
             - Who provided the training? (see list)
             - What training method(s) was used? (see list)
             - How important was/is this topic to your job?
             - During which implementation phase did you receive training?
```

12. Introductory concepts of EDI   Training: Yes   No -- Desired

   Comments: _____   ?Rating: 1 2 3 4 DK
   _____   Provider: 1 2 3 4 5 __
   _____   Method: 1 2 3 4 5 6 7 8__
   _____   Importance: 1 2 3 4 DK
   _____   When?   1 2 3 4 DK

   _____
   _____

13. Your organization's plan for EDI   Training: Yes   No -- Desired
    implementation   ?Rating: 1 2 3 4 DK
    Comments: _____   Provider: 1 2 3 4 5 __
    _____   Method: 1 2 3 4 5 6 7 8__
    _____   Importance: 1 2 3 4 DK
    _____   When?   1 2 3 4 DK

    _____
    _____

14. EDI's impact on your department   Training: Yes   No -- Desired
    Comments: _____   ?Rating: 1 2 3 4 DK
    _____   Provider: 1 2 3 4 5 __
    _____   Method: 1 2 3 4 5 6 7 8__
    _____   Importance: 1 2 3 4 DK
    _____   When?   1 2 3 4 DK

    _____
    _____

15. EDI's impact on your organization's   Training: Yes   No -- Desired
internal functions (e.g., invoicing, auditing)?Rating: 1   2   3   4   DK
Comments: _____ Provider: 1   2   3   4   5 __
_____ Method: 1   2   3   4   5   6   7   8 __ _
_____ Importance: 1   2   3   4   DK
_____ When?   1   2   3   4   DK

_____

16. EDI's impact on your organization's   Training: Yes   No -- Desired
business practices (Total Quality Mgnt,   ?Rating: 1   2   3   4   DK
Just in Time)   Provider: 1   2   3   4   5 _
Comments: _____ Method: 1   2   3   4   5   6   7   8
_____ Importance: 1   2   3   4   DK
_____ When?   1   2   3   4   DK

_____

17. Range of possible EDI applications   Training: Yes   No   Desired
(e.g., from automating invoicing to   ?Rating: 1   2   3   4   DK
supporting TQM)   Provider: 1   2   3   4   5 _
Comments: _____ Method: 1   2   3   4   5   6   7   8
_____ Importance: 1   2   3   4   DK
_____ When?   1   2   3   4   DK

_____

18. Other _____ Training: Yes   No   Desired
Comments: _____ ?Rating: 1   2   3   4   DK
_____ Provider: 1   2   3   4   5
_____ Method: 1   2   3   4   5   6   7   8
_____ Importance: 1   2   3   4   DK
_____ When?   1   2   3   4   DK

_____

Now I am going to focus on more specific EDI implementation issues.

Additional question:	How frequently do you deal with this issue in your job?

19. Costs and benefits
(how to calculate implementation costs)
Comments: _____
_____
_____
_____
_____

Training:	Yes	No -- Desired
?Rating:	1 2 3 4 DK	
Provider:	1 2 3 4 5 ___	
Method:	1 2 3 4 5 6 7 8 ___	
Importance:	1 2 3 4 DK	
When?	1 2 3 4 DK	
Frequency:	1 2 3 4	

20. Security issues (encryption, encoding,
message authentication)
Comments: _____
_____
_____
_____
_____

Training:	Yes	No -- Desired
?Rating:	1 2 3 4 DK	
Provider:	1 2 3 4 5 ___	
Method:	1 2 3 4 5 6 7 8 ___	
Importance:	1 2 3 4 DK	
When?	1 2 3 4 DK	
Frequency:	1 2 3 4	

21. Auditing (electronic auditing trail)
Comments: _____
_____
_____
_____
_____

Training:	Yes	No -- Desired
?Rating:	1 2 3 4 DK	
Provider:	1 2 3 4 5 ___	
Method:	1 2 3 4 5 6 7 8 ___	
Importance:	1 2 3 4 DK	
When?	1 2 3 4 DK	
Frequency:	1 2 3 4	

22. Technical aspects
Comments: _____
_____
_____
_____
_____

Training:	Yes	No -- Desired
?Rating:	1 2 3 4 DK	
Provider:	1 2 3 4 5 ___	
Method:	1 2 3 4 5 6 7 8 ___	
Importance:	1 2 3 4 DK	
When?	1 2 3 4 DK	
Frequency:	1 2 3 4	

23. Relationship with trading partners
(how to deal with, implications)
Comments: _____
_____
_____
_____
_____

Training:	Yes	No -- Desired
?Rating:	1 2 3 4 DK	
Provider:	1 2 3 4 5 ___	
Method:	1 2 3 4 5 6 7 8 ___	
Importance:	1 2 3 4 DK	
When?	1 2 3 4 DK	
Frequency:	1 2 3 4	

24. Standards (ANSI, EDIFACT)   Training: Yes   No -- Desired
    Comments: _____   ?Rating: 1   2   3   4   DK
    _____   Provider: 1   2   3   4   5 ___
    _____   Method: 1   2   3   4   5   6   7   8 ___
    _____   Importance: 1   2   3   4   DK
    _____   When?   1   2   3   4   DK
    _____   Frequency: 1   2   3   4

    _____
    _____

25. Legal aspects (electronic signature,   Training: Yes   No -- Desired
    authorization issues, t. p. agreements) ?Rating: 1   2   3   4   DK
    Comments: _____   Provider: 1   2   3   4   5 ___
    _____   Method: 1   2   3   4   5   6   7   8 ___
    _____   Importance: 1   2   3   4   DK
    _____   When?   1   2   3   4   DK
    _____   Frequency: 1   2   3   4

    _____
    _____

26. Other _____   Training: Yes   No -- Desired
    Comments: _____   ?Rating: 1   2   3   4   DK
    _____   Provider: 1   2   3   4   5 ___
    _____   Method: 1   2   3   4   5   6   7   8 ___
    _____   Importance: 1   2   3   4   DK
    _____   When?   1   2   3   4   DK
    _____   Frequency: 1   2   3   4

    _____
    _____

SECTION 2 - On-the-job Problem Solving

Aside from training, we would also like to know what resources are available to you when you need to solve a problem related to EDI on the job.

Questions:	- What resources are available?
	- How useful are they? Why?
	- What resources would you like to have (have had)? Why?

	Available	Usefulness	Desired
27. Manuals Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
28. Job-aids/Quick references Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
29. On-line help Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
30. Peer/supervisor Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
31. Telephone help line Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
32. Other _____ Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK
33. Other _____ Why?	Yes No	1 2 3 4 DK	1 2 3 4 DK

34. What additional resources do you feel would be useful? Why?

One of the things we are exploring is the possibility of using on-line help options as tools in EDI training and education. We're looking at whether these options could be of assistance to organizations using EDI and in what ways they could be useful.

As you may be aware, they are becoming increasingly sophisticated. They can include things like expert systems which can help in decision making, databases which are used to access information, and tutorials (Computer based training) to teach and train .

> Questions: - Do you see any use for them to help you solve problems related to EDI?
> - How useful do you think they would be?
> - How would you use them?

35. Are there any areas or topics where you see such tools as being useful to solve problems related to EDI? Use?

_____

_____

_____

_____

	Usefulness
Areas	
36. Hardware integration	1 2 3 4 DK
Use?_____	
_____	
37. Software integration	1 2 3 4 DK
Use?_____	
_____	
38. EDI interface	1 2 3 4 DK
Use?_____	
_____	
39. Standards	1 2 3 4 DK
Use?_____	
_____	
40. Security	1 2 3 4 DK
Use?_____	
_____	
41. Legal	1 2 3 4 DK
Use?_____	
_____	
42. Trading partner relationships	1 2 3 4 DK
Use?_____	
_____	
43. Integrating EDI with your organizations management	1 2 3 4 DK
practices (e.g., TQM, Just in Time)	
Use?_____	

_____

44. Performance management   1 2 3 4 DK
    (e.g., performance appraisal, remuneration, advancement)
    Use?_____

    _____

45. Other: 1 2 3 4 DK
    Use?_____

    _____

46. From your experience with EDI and its implementation, can you suggest anything
    that could be done to help companies and individuals use EDI more efficiently and
    profitably?

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

47. Is there anything you would like to add?

    _____
    _____
    _____
    _____
    _____

Appendix B

ORGANIZATIONAL AND RESPONDENT PROFILE QUESTIONNAIRE

PROFILE COVER

Name: _____

Title: _____

Org: _____

Phone: _____

FAX: _____

Source:
    _____ Advanced strategies list
    _____ EDI Quebec list
    _____ EDI Council of Canada list
    _____ Personal reference   Use Name?: Yes No

        Name: _____
        Title: _____
        Dept.: _____
        Org: _____

Right time? Yes No Appointment _____

Send copy of results? Yes No
Address:

    _____
    _____
    _____
    _____

References:
    Senior Manager: _____
        Phone: _____
    Middle Manager: _____
        Phone: _____
    End user: _____
        Phone: _____

Use Name?: Yes No

Introductory Questions (to establish rapport prior to questioning)

1. How long as your organization been using EDI?
   __ less than 6 months   __ between 6 mos. & 1 year   __ between 1 & 3 years
   __ between 3 & 5 years   __ between 5 & 10 years   __ more than 10 years _____
   __ don't know

2. How far along in the implementation process is your company?
   __ early implementation   __ pilot?
   __ middle implementation
   __ well-established

3. How long have you worked or been involved with EDI?
   in organization:
   __ less than 6 months   __ between 6 mos. & 1 year   __ between 1 & 3 years
   __ between 3 & 5 years   __ between 5 & 10 years   __ more than 10 years _____

4. in general:
   __ less than 6 months   __ between 6 mos. & 1 year   __ between 1 & 3 years
   __ between 3 & 5 years   __ between 5 & 10 years   __ more than 10 years _____

Introduction to Profile
I just have a few quick background questions to ask you about your job and your company.

Background Questions

5. How long have you occupied your **current** position?

   __ less than 1 year   __ between 1 & 3 years   __ between 3 & 5 years
   __ between 5 & 10 years   __ more than 10 years

6. What department do you currently work in?

   __ administration   __ information systems   __ finance   __ purchasing
   __ sales/marketing   __ human resources   __ other _____

7. How long have you worked for your organization?

   __ less than 1 year   __ between 1 & 3 years   __ between 3 & 5 years
   __ between 5 & 10 years   __ between 10 & 20 years   __ more than 20 years

8. What category(ies) best describes your organization?

   __ banking   __ transportation   __ food/grocery   __ textile/clothing
   __ automotive   __ communications   __ agriculture   __ government
   __ health care   __ electronics   __ manufacturing   __ insurance
   __ retailing   __ other _____

9. Approximately how many people does your organization employ worldwide?

___ less than 25   ___ between 25 & 50   ___ betw. 50 & 100   ___ betw. 100 & 200
___ betw. 200 & 500 ___ betw. 500 & 1000 ___ more than 1000 ___ don't know

10. What were your organization's reasons for implementing EDI? (Check all that apply.)

___ request of a client   ___ to better meet the needs of clients or customers
___ request of a supplier ___ as part of an overall business strategy
___ to be innovative   ___ to conduct electronic transactions within the organization
___ to stay competitive   ___ other _____   ___ don't know

11. For which transactions does your organization use EDI? (Check all that apply.)

___ sending purchase orders   ___ receiving invoices ___ sending payments
___ receiving purchase orders ___ sending invoices   ___ receiving payments
___ internal transactions within your organization _____
___ other transactions _____

12. Which of the following describes your organization's operating units?

___ single site   ___ multiple, special purpose sites   ___ main site and branch units
___ other _____

Appendix C

DESCRIPTIONS OF LESS FREQUENTLY MENTIONED PROBLEMS

Descriptions of the problems not described in the main body of this document as well as possible causes and solutions suggested or implemented by respondents are reported in this appendix. The numbers in parentheses next to an item indicate the number of respondents who mentioned that item.

Problem Area 1: Problems Related to the Partnership Relationship

Additional problems related to the partnership relationship are listed and described below. These problems were each reported by one or two respondents.

1.3 Threats From Trading Partners to Adopt EDI (2 voluntarily)

1.4 Reluctance of Trading Partners to Set Up Interconnects (2 voluntarily)

1.5 Reluctance of Trading Partners to Sign Legal Agreements (1 voluntarily, 1 prompted)

1.6 Pricing Discrepancies Between Organization and Trading Partners (2 voluntarily)

1.7 Organization Receives "Misinformation" from Trading Partners (1 voluntarily)

1.8 Trading Partners Have Different Requirements (1 voluntarily)

1.9 No Automatic Way for Clients to Do the Work of a Broker. (1 voluntarily)

1.10 Trading Partners Do Not Use the Same VAN (1 voluntarily)

Problem 1.3: Threats From Trading Partners to Adopt EDI (2)

Description. Threats from trading partners (clients) to integrate EDI, or "mandates" as one respondent called them, resulted in a lack of time to properly integrate EDI for two organizations.

It is interesting to note that lack of proper integration was cited as a cause for insufficient trading partner capability. These two organizations represent two examples of this phenomenon and, ironically, the blame rests on the capable partner.

Solution. The organizations "made" the time and were sometimes able to negotiate extensions.

Problem 1.4: Reluctance of Trading Partners to Set Up Interconnects (2)

Possible Causes.

1. One respondent feels that it is necessary to know a lot about the trading partner's network before setting up an interconnect.

2. One respondent said that some prospective customers have a "private network" and refuse to interconnect with a VAN. To the organization, this represents spending additional time for these customers and can result in delays in receiving information.

Potential Solution. One respondent thought education would be useful to help make trading partners more aware of which fields of the ISA (outermost envelope or interchange segment used for routing purposes) are important. (Some VANS do not care what version of ISA envelope is being used while others consider it invalid if a character is not written in a certain place and will reject it and the company will never know what happened to the transmission.) The respondent mentioned that this is being worked on using two codes: 242 (data status tracking) and TA3.

Problem 1.5: Reluctance of Trading Partners to Sign Legal Agreements (2)

Description. One respondent felt that legal agreements are important and to avoid misunderstandings his organization has adopted and modified the EDICC model. However, this respondent said that current trading partners were reluctant to have such agreements. Another respondent reported that her organization experienced difficulty

establishing legal agreements with its trading partners. According to the respondent, legal agreements were sent to trading partners but then "disappeared" in their legal department. One of the two respondents pointed out that the organization has no difficulty in establishing legal agreements with new trading partners, only existing trading partners.

Possible Cause. One respondent believes the reason for this problem is that trading partners are accustomed to doing business with the organization in a certain way and see no need for legal agreements.

Potential Solution. One respondent suggested an automated tool to educate trading partners about legal agreements.

Problem 1.6: Pricing Discrepancies Between Organization and Trading Partners (2)

Note: Both respondents were from the same organization in the food and grocery sector.

Description. Customers prepare a P.O. with prices they expect to receive but the supplier does not arrive at the same price.

Possible Causes.

1. Respondents feel this may be due to the fact that customers fail to update information.

2. One respondent thought one cause might be that a salesperson may make a deal and not enter the details soon enough in the system. Respondents mentioned that salespeople have been doing their jobs for a long time and that change seems to be difficult.

Actual Solution. One of the respondents calls the customer to find out why there is a discrepancy, although she would prefer a software program capable of tracking this problem.

Problem 1.7: Organization Receives "Misinformation" from Trading Partners (1)

Description. The respondent felt that he was receiving incomplete information from trading partners about the nature of EDI.

Cause. The respondent mentioned that trading partners have "story lines" that they give out and are not open to exploring alternative solutions.

The respondent did not suggest a solution to this problem.

Problem 1.8: Trading Partners Have Different Requirements (1)

Description. The respondent said that although customers are using EDI, some customers have specific requirements and will attach notes describing these. This requires additional resources and cross-references, particularly when part numbers differ. Customer requirements can include special quality clauses or even a change in product (a more customized product). For the latter reason, and because the respondent did not mention a problem with standards, this problem has not been included in problem area related to EDI standards.

Although this problem has been included with other problems in the partnership relationship, it seems that it is possible that the nature of EDI might be at fault. However, from the respondent's comments, it is unclear whether this problem occurs because EDI is currently incapable of dealing with requests for customized products or because clients do not know now to use it to express their preferences. The respondent did mention that her organization had no problem dealing with distributors who buy a standard product at a standard price.

The respondent did not suggest a solution to this problem.

Problem 1.9: No Automatic Way for Clients to Do the Work of a Broker (1)

Description. An organization has discovered that some clients want to bypass a broker and deal directly with wholesaler but are not prepared to do the administrative

work of the broker which involves following promotions and obtaining discounts. Clients then become upset when they do not receive the discounts they are accustomed to receiving. Clients cannot provide their promotional information on P.O.s. There does not seem to be a way that clients can do the work of a broker automatically.

The respondent did not suggest a solution to this problem.

Problem 1.10: Trading Partners Do Not Use the Same VAN (1)

Description. One respondent pointed out that it is more expensive for trading partners to use different VANS (a 50% surcharge) than if partners use the same VAN. He felt there was a lack of interconnectivity between VANs. Despite the fact that the organization has thousands of clients, it cannot force them to use a certain VAN.

Potential Solution. The respondent stated that EDI should be more like E-Mail - messages should come to the user automatically. Also, the respondent's organization, a government department, is using X-400 primary, an administrative domain, which puts the department on a "peer" level with the VANS.

Problem Area 2: Problems Related to Standards

Additional problems related to standards are listed and described below. These problems were each reported by one respondent.

2.2 Difficulty Deciding Which Codes to Use (1 prompted)

2.3 Problems With the Process of Developing and Changing Standards (1 voluntarily)

2.4 "There Is a Need to Adopt Generic Standards" (1 prompted)

2.5 Dealing with New Versions of Standards (1 voluntarily)

Problem 2.2: Difficulty Deciding Which Codes to Use (1)

Description. The respondent mentioned that sometimes she had difficulty deciding which codes to use.

Cause. This was due to the fact that pack sizes (number of units) have the same UPC number but are of different sizes.

Actual Solution. The respondent reported that her organization had made arrangements with their clients to deal with such problems.

Problem 2.3: Problems with the Process of Developing and Changing Standards (1)

Description. The respondent felt that the process of developing and changing standards is too "cumbersome" and takes too long and that the needs of large companies differ from those of small companies. She mentioned that as a large company, her organization must use both ANSI X12 and EDIFACT to satisfy its partners.

Potential Solution. The respondent felt that there should be only one standard so that her organization, in her words, "could move ahead".

Problem 2.4: "There Is a Need to Adopt Generic Standards."(1)

Description. The respondent made this statement when prompted on the subject of standards. He gave no further details.

Problem 2.5: Dealing with New Versions of Standards (1)

Description. The respondent mentioned that he found it difficult to deal with new versions of standards.

Cause. Updated versions of standards contain extra characters and larger fields.

Solution. The respondent must build a "mechanism" to allow for the extra characters. although respondent understands that certain fields in new versions may be

longer and that there is not much that can be done, he felt that receiving advance notice of upcoming changes would be helpful.

Problem Area 3: Problems Related to Intra-Organization Functioning

Additional problems related to intra-organization functioning are listed and described below. These problems were each reported by one or two respondents and one respondent mentioned 2 different problems in this area (3.2 and 3.4).

    3.2   Resistance from Middle Management (1 voluntarily, 1 prompted)

    3.3   "Teaching People to Change" (1 voluntarily)

    3.4   Coordinating Purchasing of Respective Groups Within the Organization (1 voluntarily)

Problem 3.2: Resistance from Middle Management (2)

Description. Two respondents, both from Canadian organizations, one from government and the other from the telecommunications industry felt that EDI implementation was not proceeding as well as it could due to resistance from middle management. For one organization, a government department, the middle managers in question worked for other departments with which this department would like to exchange EDI transactions.

Possible Causes. One respondent felt that because of their work load, middle managers do not make EDI a priority. The other respondent believed this problem might also be due to a fear of change and loss of status on the part of middle managers.

Potential Solutions. One respondent felt that training for middle managers, particularly in the form of case studies, would be useful. Because he was thinking of a situation specific to his organization, he suggested that these case studies should describe companies that have used a coordinated approach in the operations area.

The other respondent mentioned that the training his organization had provided to middle managers had not been successful and he felt that bringing in an external consultant might be more effective than trying to solve the problem internally.

Problem 3.3: "Teaching People to Change" (1)

Description. One respondent from an American manufacturing company said that it had been a challenge to teach people to make the transition to EDI, particularly in the Customer Service (C.S.) department, where EDI is used most.

Cause. Resistance from employees.

Solution. Ironically, questions and resistance from employees (particularly from older C.S. agents), forced the people responsible for EDI to work on and improve the EDI system in the organization, this resulted in a more efficient EDI system. The respondent added that her organization had been concerned with the reactions of its employees.

Problem 3.4: Coordinating Purchasing of Respective Groups in the Organization (1)

Description. One respondent from a Canadian telecommunications company reported that the organization was experiencing difficulty coordinating the purchasing of different groups using EDI within the organization.

Cause. The respondent felt that this problem was due mainly to the decentralized nature of the company.

Potential Solution. The respondent mentioned that although these groups understand what EDI is, it is important to make them more aware of EDI, and to give it a high priority in order to develop a bank of common suppliers and also to coordinate the timing of purchases.

Problem Area 4: Problems Related to Technical Issues

Additional problems related to technical issues are listed and described below. These problems were each reported by one or two respondents, with the exception of Problem 4.1 which was reported by 4 respondents.

  4.1   Lack of Support from Software Vendor (4)

  4.2   Lack of Appropriate Software (2)

  4.3   Integrating EDI Software Into Existing Systems (1)

  4.4   Changing from P.C. to Another Platform (1)

Problem 4.1: Lack of Support from Software Vendor (4)

Description. Respondents from one American and three Canadian organizations from the metals, manufacturing and education sectors reported this problem. One respondent felt that vendors were not sufficiently knowledgeable about their products and she was forced to solve problems without their help. Another respondent received incorrect documentation from a vendor. One respondent felt that this was a relatively minor problem that could be worked out. One respondent felt strongly that this lack of support had limited the number of potential trading partners for his organization, but he did not elaborate.

It is interesting to note that one of the respondents also cited it as a potential cause for lack of EDI capability among trading partners. He mentioned that a lack of vendor support could discourage trading partners.

Solutions. Although respondents did not offer specific solutions, one respondent felt that the problem could eventually be worked out. Another respondent mentioned that the vendor had changed when the organization purchased new software.

Problem 4.2: Lack of Appropriate Software (2)

Description. Respondents from Canadian organizations in government and customs brokerage reported this problem. One respondent said that he had to develop his own internal software in order to conduct business with financial institutions.

The second respondent found that existing security software was inadequate for high level security needs.

Actual Solution. The respondent who was concerned with security currently disconnects system, puts information on a disk and starts again.

Problem 4.3: Integrating EDI Software into Existing Systems (1)

Description. One respondent from an American company in the food and grocery industry reported this problem. It is difficult and costly to upgrade EDI software (to add to or maintain what is in place), particularly as the number of trading partners grows.

Although the respondent mentioned the problem as a technical problem within his own organization, it is interesting to note that this problem, due to the cost and integration factors, could be interpreted as a cause for trading partner capability.

Respondent did not offer a solution to this problem.

Problem 4.4: Changing from P.C. to Another Platform (1)

Description. One respondent from a Canadian company in the food and grocery industry reported this problem Respondent said that the organization was experiencing difficulty changing from a P.C. based platform to another type of platform, but did not elaborate.

Cause. The respondent felt that it was due to a transaction set called WINS .

Solution. The organization is in the process of putting their host application into a UNIX translator and respondent felt this would solve the problem.