Electronic Data Interchange Program (EDIP)

EDI Standards Reference Guide

INPUT®

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Abstract

Over the past decade, the Electronic Data Interchange (EDI) community has developed and implemented several families of standards that govern the formats used for the electronic interchange of structured business data. These standards are defined as transaction sets, or electronic documents, for purchase orders, invoices, remittance advice, and other similar functions.

This Reference Guide covers current and emerging standards for EDI, as well as standards of historical importance and relevance to the present situation.

Electronic Funds Transfer and public and proprietary standards are reviewed, and the involved standards bodies and industry associations are identified.

An analysis of the differences between the most important North American standard, ANSI X12, and an emerging international standard called EDIFACT is provided, along with a preliminary examination of the technical, political, and economic issues underlying a planned convergence of these two standards.

The study contains 104 pages and 36 exhibits.

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Exhibits

Exhibits (Continued)

1 Introduction

A What Is EDI?

Electronic Data Interchange (EDI) is the interorganizational, computer-application-to-computer application, electronic interchange of structured business data (see Exhibit I-1). It is process-to-process communication in machine-readable formats; it overcomes differences between computer systems, their communications protocols, and their internal data formats.

EXHIBIT I-1

ELECTRONIC DATA INTERCHANGE

The Application-to-Application Exchange
of Intercompany Business Data
in Standard Formats

Over the past decade, the EDI community has developed, adopted, and implemented several families of standards that govern the formats used for this electronic interchange of structured business data. These standards are defined as transaction sets or electronic documents; there is one transaction set for a purchase order, one for an invoice, one for a remittance advice, etc.

The major standards families are:

- ANSI (American National Standards Institute) X12—A series of transaction sets developed and maintained for general business use. Although intended for cross-industry use, these standards are increas-

ingly serving as the basis for EDI implementation in specific industries or business functions.

- UCS (Uniform Communications Standard)—A series of transaction sets developed and maintained by the grocery industry to meet its specific trade practice requirements.

- TDCC (Transportation Data Coordinating Council)—A series of transaction sets developed and maintained specifically for transportation-related use (manifests, waybills, etc.).

- EDIFACT (EDI For Administration, Commerce, and Transport)—An emerging standard for international trade.

- Others—In addition, standards have been developed for specific industry segments. These standards will be reviewed in Chapter IV.

B

Scope

This Reference Guide covers current and emerging standards for Electronic Data Interchange, as well as standards of historical importance and relevant to the present situation.

Electronic Funds Transfer is also reviewed, focusing on standards and services that affect commercial business transactions.

Public and proprietary (industry-specific and company-specific) standards are reviewed and the involved standards bodies and industry associations are identified.

C

Methodology

- INPUT regularly interviews active and prospective users of EDI to determine market acceptance, activators, and inhibitors. The relevant findings of this primary research are reported in this study.

- Custom Research Projects—INPUT has participated in several custom EDI research projects. Although no proprietary information has been used in this guide, general information and the general industry knowledge gained has been included.

- EDI Expert Interviews—Telephone interviews were conducted with experts in the EDI standards community.

- Association Interviews—Interviews were conducted with senior management of industry and professional organizations involved in EDI.

- Product, Service, and Industry Analysis—INPUT collected and analyzed information on EDI standards and systems and conducted secondary research using many sources. Additionally, INPUT monitored industry publications, attended conferences, and secured other relevant research data.

D

Related Studies from INPUT

This study is one of a continuing series focused on EDI. Other reports published for the series include:

- *EDI Software Products: Issues, Trends, and Markets*
- *North American EDI Software Provider Profiles*
- *EDI Implementation Case Studies (Volumes I and II)*
- *North American EDI Services Market Analysis, 1988-1993*
- *North American EDI Service Provider Profiles*
- *Vertical Industry EDI Directions and Potentials*
- *EDI and Professional Services*
- *International EDI*
- *Federal Government EDI Initiatives*
- *Advanced EDI Services*
- *EDI and X.400*
- *EDI Intertrends—Western Europe*

II

Executive Overview

A

EDI Standards— A Sea of Acronyms

EDI standards exist in public, proprietary, and industry-specific implementations. Public implementations include ANSI X12 for general business documents. An example of an industry-specific standard is the grocery industry's UCS standard. An example of a company-specific standard is Sears' SENDEN system for supplier communications.

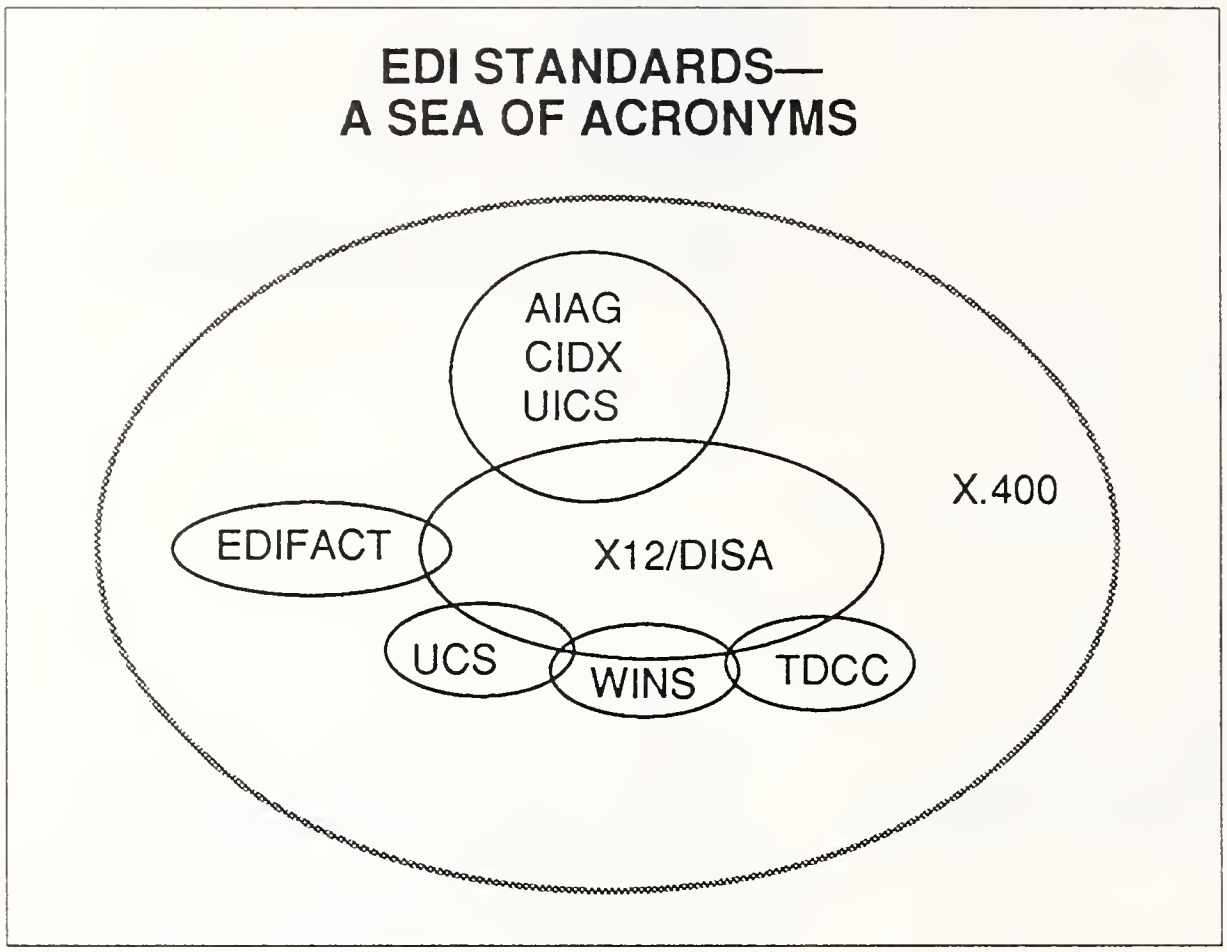
Standards have evolved to meet specific needs that would have previously called for proprietary development; these needs are now being met by the application of public standards. EDI standards are vehicles for defining the format and content of intercompany data streams.

Although similar, EDI is not E-Mail. There are fundamental differences in use and standards between E-Mail and EDI, especially concerning the control information and audit trails that are part of EDI. However, the X.400 Message Handling System, while primarily focused on E-mail, has implications for EDI.

Translation, the process of conversion between internal data base formats and standard formats, is becoming a less important issue as premise-based translation software has improved in price/performance and reliability.

As illustrated in Exhibit II-1, the EDI standards situation is a confusing picture. The sea of acronyms and overlapping organizations in EDI standards can cause confusion to the EDI novice. Users often have industry or professional organizations that can serve as a starting point for their EDI analysis.

EXHIBIT II-1



B

Several EDI Standards Dominate

There are several primary EDI standards, as shown in Exhibit II-2.

EXHIBIT II-2

SEVERAL EDI STANDARDS DOMINATE

ANSI X12	- Cross-Industry
TDCC/WINS	- Transportation, Warehousing
UCS	- Grocery

- ANSI X12—the Accredited Standards Committee of the American National Standards Institute's X12 organization develops general business document standards. The ASC X12 is managed by the Data Interchange Standards Association (DISA), which is the industry body representing U.S. interests in the development of EDIFACT, an evolving international standard.

- TDCC/WINS—TDCC (Transportation Data Coordinating Council), now called the EDI Association (EDIA), was the original EDI standards body, that created standards for freight documents and then for warehousing (WINS). The EDIA has recently formed the EDI Council of the USA to focus on user needs.

- UCS—The Uniform Code Council developed the Uniform Communications Standard (UCS) for the grocery industry. The standard is extending into other areas of store operation, such as Direct Store Delivery.

C

Industry/Company-Specific Standards

In addition to standards created for cross-industry use, there are several that are intended for more limited use, as shown in Exhibit II-3.

EXHIBIT II-3

INDUSTRY/COMPANY-SPECIFIC STANDARDS

- X12 variants
- Air transport, booksellers, insurance, etc.
- Big Three automakers
- K-Mart, etc.

- ANSI X12 implementation guidelines are being developed and maintained for the agricultural, apparel, chemical, electrical supply, electronics, health care, metals, office products, petroleum, telecommunications equipment, and utilities industries.

- ANSI X12 variants have also been developed for the automotive, petroleum, and printing industries. These variants are either being merged into ANSI X12 or frozen, with future transaction sets being developed using ANSI X12.

- Many industry groups have developed their own systems for the electronic interchange of business documents. Among these are the air transport, automotive aftermarket, book selling, hardware, health, insurance, iron and steel, petroleum, warehousing, and wholesale drugs industries.

- Specific companies have developed proprietary systems for competitive and efficiency reasons. These systems are being supplanted by ANSI X12-based systems. Among these companies are the Automotive Big Three, Baxter-Travenol, K-Mart, McKesson, and Sears.

Many proprietary systems were developed before sufficiently robust public standards existed (if any existed at all) for the need at hand. Companies and industry organizations are either freezing their proprietary systems or abandoning them altogether.

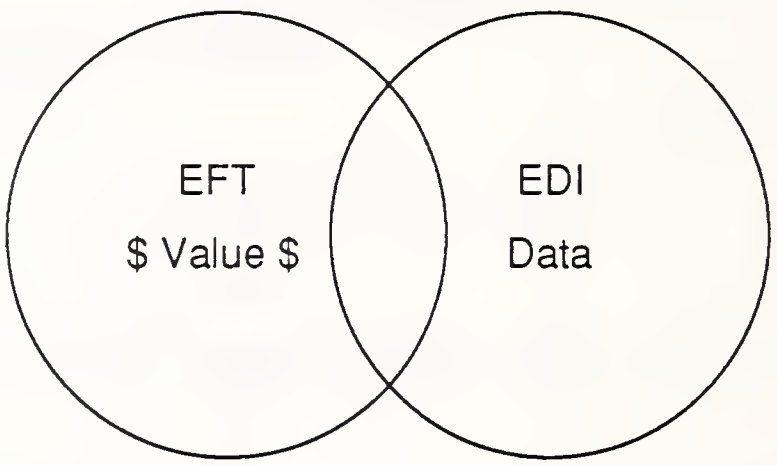
D

EDI and EFT Standards Are Becoming Interrelated

EDI addresses the transfer of information while Electronic Funds Transfer (EFT) addresses the transfer of value. These realms intersect with the remittance advice, which is increasingly being used to convey information (what the remittance is for) and value (the amount of the remittance). This intersection is illustrated by Exhibit II-4.

EXHIBIT II-4

EDI AND EFT ARE BECOMING INTERRELATED



The banking industry has developed several standards and systems for the transfer of value. Among these are: Banking Administration Institute (BAI) Lockbox standards, for payment information to commercial clients; Society for Worldwide Interbank Financial Telecommunications (SWIFT), for international transactions and payment instructions; Clearing House Interbank Payment System (CHIPS), for foreign exchange; and National Automated Clearing House Association (NACHA) for standards between banks and their automated clearing houses.

New formats are now beginning to be used to transfer EDI-compatible data with EFT value. Some of these are the Cash Concentration and Disbursement plus addendum (CCD+), Corporate Trade Exchange (CTX), and Corporate Trade Payment (CTP).

Banks and users are increasingly adopting EDI/EFT techniques to complete interchanges started with "pure" EDI transactions. However, the multiplicity of choices in EDI/EFT, as in "pure" EDI, is creating user confusion.

E

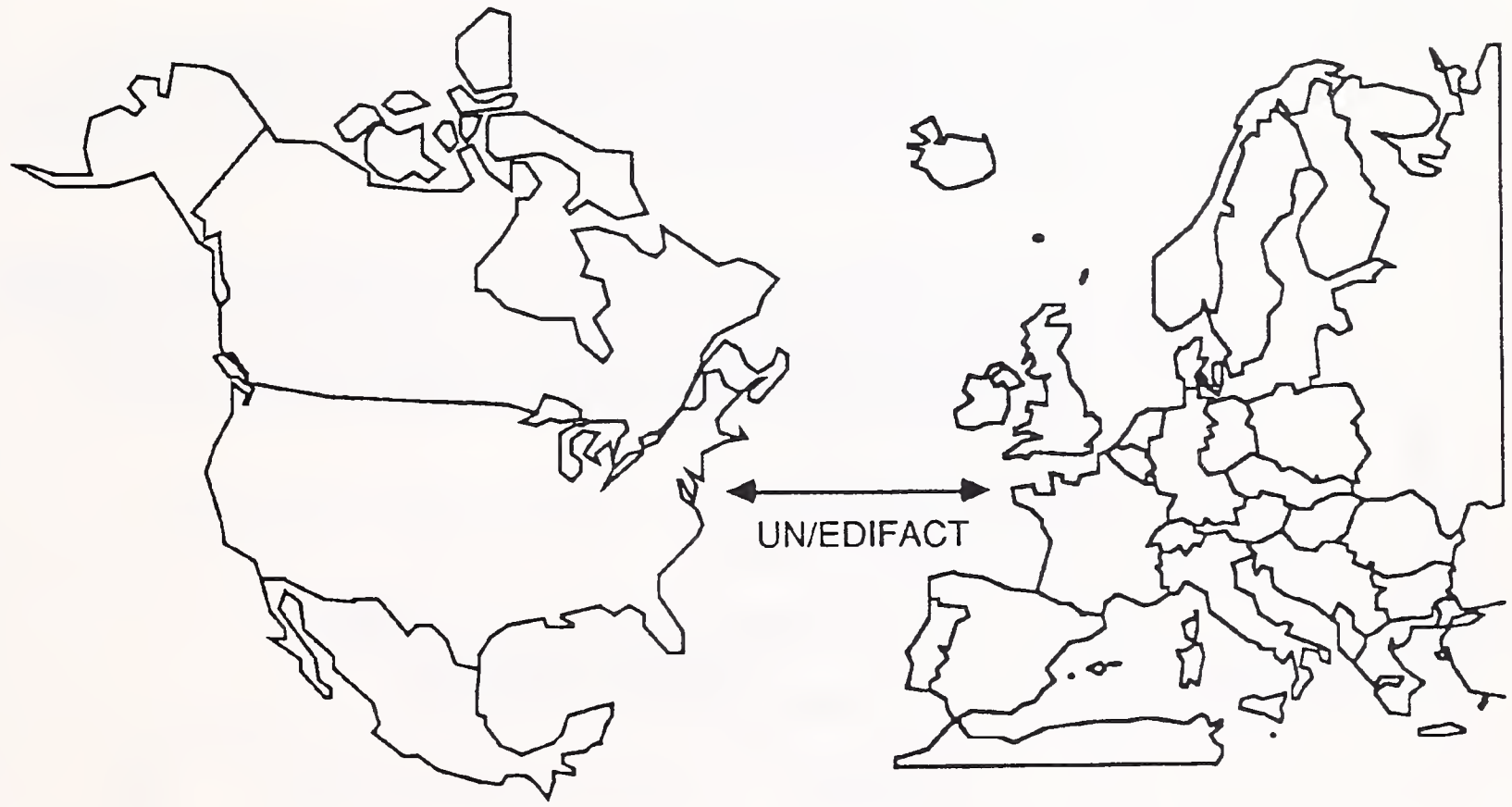
International EDI Standards Are Developing

The United Nations has chartered the UN/EDIFACT effort to develop international EDI standards. The international invoice was the first approved EDIFACT transaction. The purchase order and other transactions are in draft status as of this writing. The U.S. is officially represented by the Department of Transportation with contributions from ANSI X12 members; together they form the North American EDIFACT board.

As implied by Exhibit II-5, EDIFACT will concentrate on those transactions that are used in support of international trade.

EXHIBIT II-5

INTERNATIONAL EDI STANDARDS ARE DEVELOPING



The EDIFACT syntax or technical grammar is completely different from that of ANSI X12. This is a major reason why the process of interfusion of these EDI standards may take a long time.

Other EDI standards have developed in Europe. Among these are ODETTE (auto manufacturing), TDI (shipping), and TRADACOMS (domestic U.K.). There is little evidence of public EDI standards in the Pacific Rim; rather, proprietary, industry-specific, and ANSI X12 standards are used.

F

Related Standards Development

There are standards in areas ancillary to EDI. Recognizing the existence of these standards is important because they may relate to future EDI implementations.

- Graphics—The IGES standard has been developed for the exchange of Computer-Assisted Design and Manufacturing (CAD/CAM) data between systems. IGES will be supplanted over time by Product Data Exchange Specification (PDES), which will carry graphic and non-graphic data.

- X.400/X.500—Work is underway to develop protocols to carry EDI documents in X.400 electronic message envelopes; approval could come as early as 1990. The related X.500 standard defines directory services and interface protocols for system navigation by X.400-based message-handling systems.

- Bar codes—There is a fundamental linkage between EDI and bar codes, with the two technologies being used in tandem to implement advanced inventory control systems in the grocery, printing, and other industries.

- CALS (Computer-aided Acquisition and Logistics Support)—This is a full-scale effort by the U.S. Department of Defense to set standards for the submission and digital interchange of documents from defense contractors for all weapons systems that begin development after September, 1988.

The relationship of these areas to EDI is shown in Exhibit II-6.

EXHIBIT II-6

RELATED STANDARDS DEVELOPMENT

Graphics	-	CAD/CAM Files with EDI
X.400	-	Internetwork EDI within E-Mail envelopes
Bar Codes	-	Bar code data = EDI data
CALS	-	Digitized defense documents

G

The Future of EDI

INPUT believes it likely that EDIFACT, possibly incorporating the X.400 messaging standard, will eventually be used exclusively for international trade, while domestic EDI standards will merge. The survivors will likely be ANSI X12 and UCS and then, ultimately, ANSI X12 alone.

Business opportunities exist for the downloading of standards tables and configuration/setup tables as new services for third-party network service providers.

The need for better price/performance and functionality from EDI translation software will continue, although these needs are beginning to be addressed. Particularly necessary will be translation between X12 and EDIFACT.

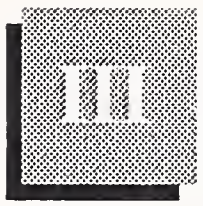
Users should not let the varied state of EDI standards delay implementation. Standards will continue to evolve and change; those waiting for things to settle will miss opportunities to improve efficiency in trading relationships and in related managed-information flows.

This view of the future of EDI is summarized in Exhibit II-7.

EXHIBIT II-7

THE FUTURE OF EDI

- EDIFACT/X.400
- Telecommunicated standards tabies
- Translation between X12 and EDIFACT
- Standards continue to evolve



EDI Overview

A The EDI Translation Process

Essential to the definition of EDI is that at some point, user data is translated between flat-file outputs to public or industry-specific standards, or between those standards.

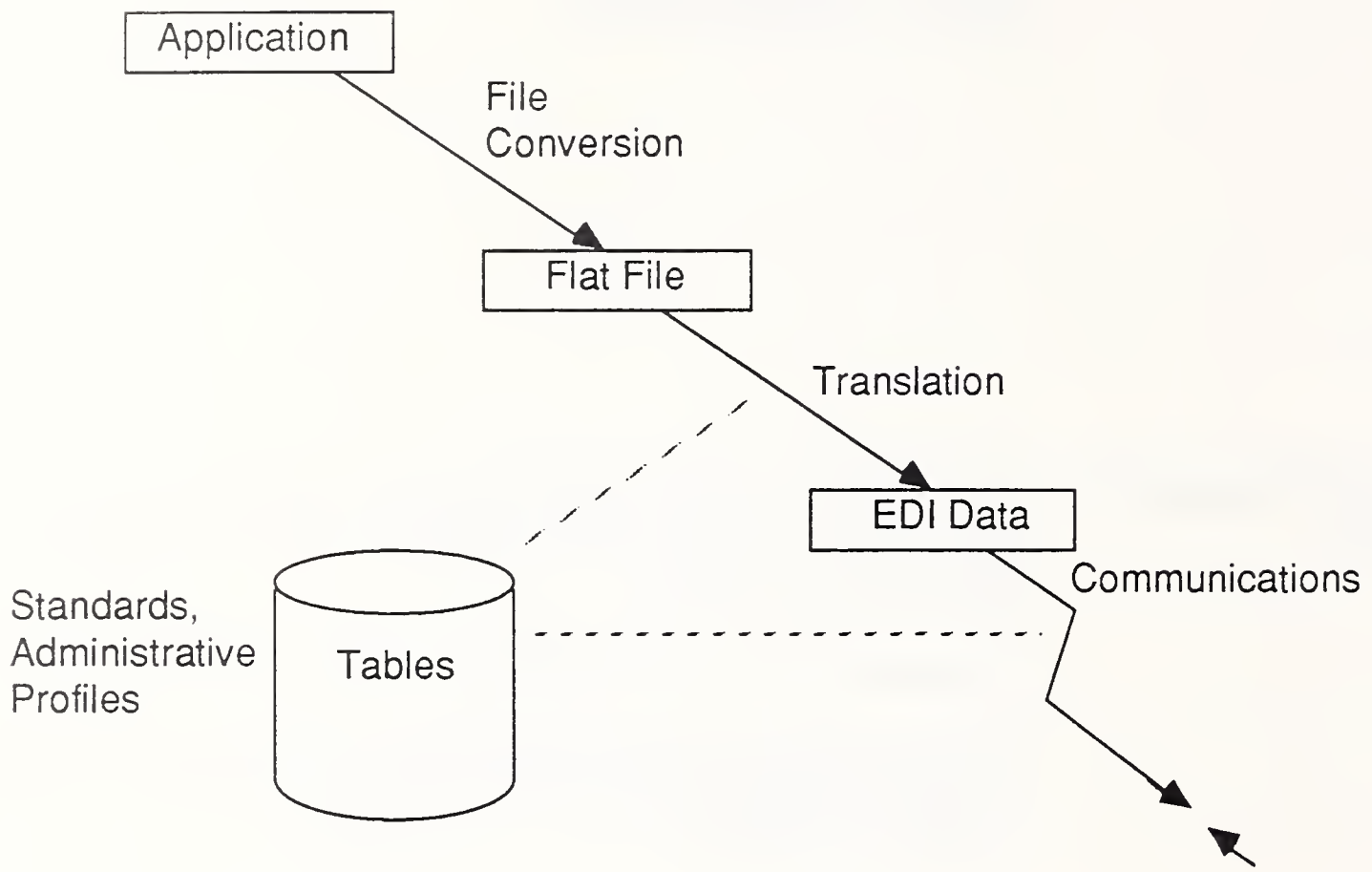
The process that converts application data into EDI data is as follows:

- File conversion software converts data from an application program (such as a purchasing system) into a fixed-length set of records contained in a flat file.
- The flat file is read into the translator, where it is converted into the desired EDI format.
- The converted data is then transported under the control of communications software, which handles network management, including speed, protocol, error checking/correction, and dialing options.
- Communications software handles the session on the receiver's side, with a file-conversion function putting data into the translator for reformatting into a structure acceptable by the recipient's application.
- Within the recipient's environment, the EDI data is passed out into the appropriate applications.

Exhibit III-1 is a schematic illustrating this process.

EXHIBIT III-1

THE EDI TRANSLATION PROCESS



1. EDI Translators Are Table-Driven

EDI software is table-driven, allowing for easy updates and maintenance.

- A table is an organized collection of data items. Each data item in a table is referenced by its position relative to all other items.

- A table may be a simple list of items. A table with both rows and columns is a two-dimensional table (often called a "flat file"). In actual practice, a table may have many more dimensions, determined by what the specific programming language permits.

- A general rule for a table is that each data item must have identical characteristics with every other item. For example, if the table contains numeric data, each data item must be limited to a maximum number of digits, and must have the radix point (separating the integral and fractional parts of a number) in the same relative position.

and accessing data. An internal table is stored ("hard-coded") within a program, while an external table is stored outside the program.

- The use of tables, sometimes called arrays, is known as parametric programming because the data items within these files and tables act as arguments (parameters), and are accessed by the program when needed.

- A primary advantage in parametric programming is the relative ease with which the program can be maintained.

- It is not necessary to revise a program when the values of these parameters change. It is usually much simpler to change values in the file or table.

2. EDI Software Tables Define Transaction Sets (Electronic Documents)

Transaction sets define data formats representing electronic equivalents of business documents. These transaction sets originated in industry-specific fixed formats, such as those developed for the automobile industry.

Transaction sets consist of various segments, which are intermediate units of information. Segments are labeled through identifiers, and their ends are marked with terminators. Segments may be repeated in a looping structure.

The smallest named item in the transaction set is a "data element," which can be a qualifier, a value, or a textual description. The data element has two main attributes: length and type. A Transaction Set Header (ST) is the first segment, which contains preliminary information pertaining to the entire document—date, company name, address, transaction number, and terms. A Transaction Set Trailer (SE) is the last segment.

X12 transaction sets can be sent together in a functional group, in which case the beginning of the group is identified by a "GS" header and the end is identified with a "GE" trailer.

Further, functional groups can be collected for transfer within an interchange envelope headed by an "ISA" header and ended with an "IEA" trailer.

These items, and others used by X12 transactions, are shown in Exhibit III-2.

Exhibits III-3 and III-4 show how EDI data represents a paper document.

In the mid-1970s, standards committees began to form more-flexible

EXHIBIT III-2

ANSI X12 STRUCTURE

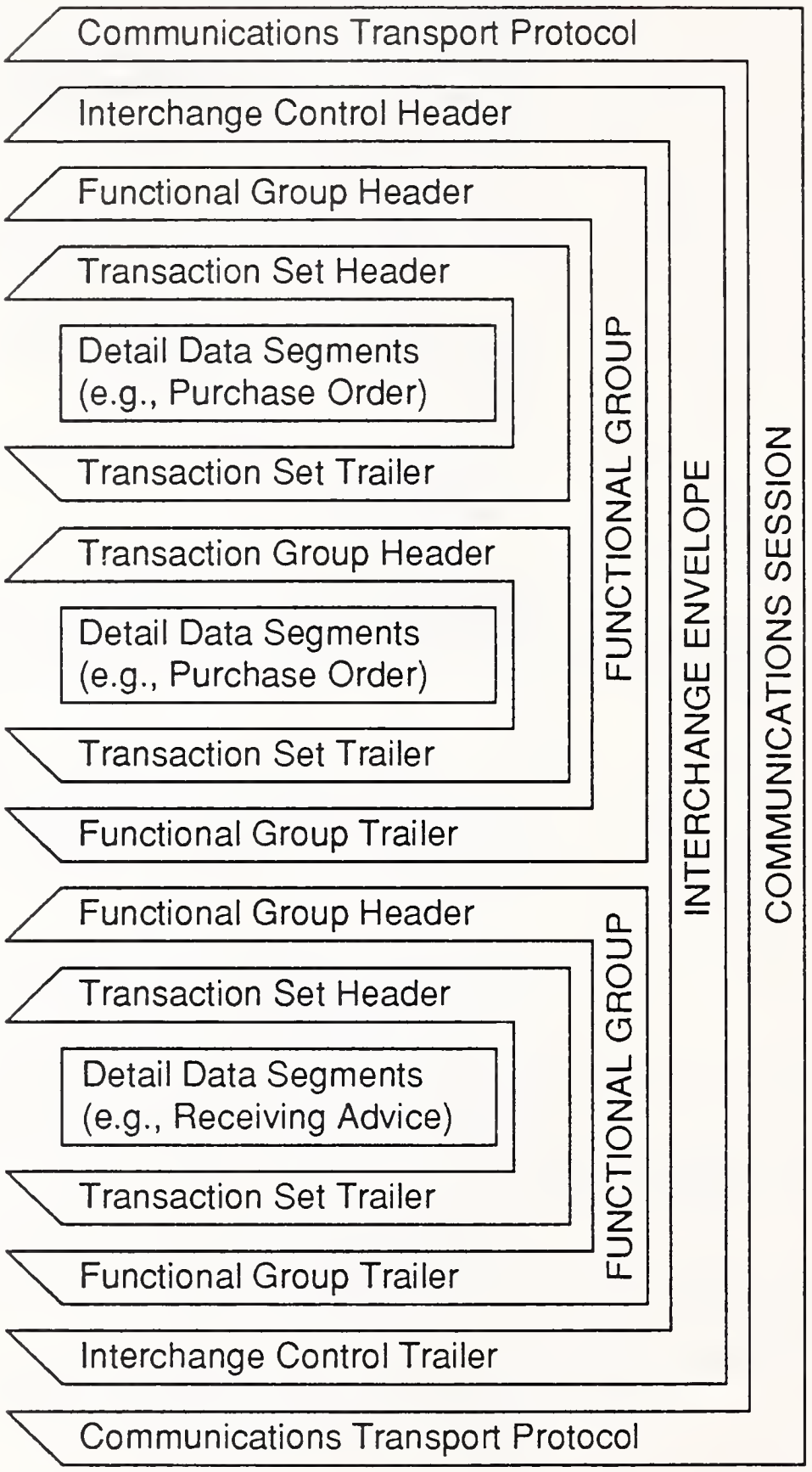


EXHIBIT III-3

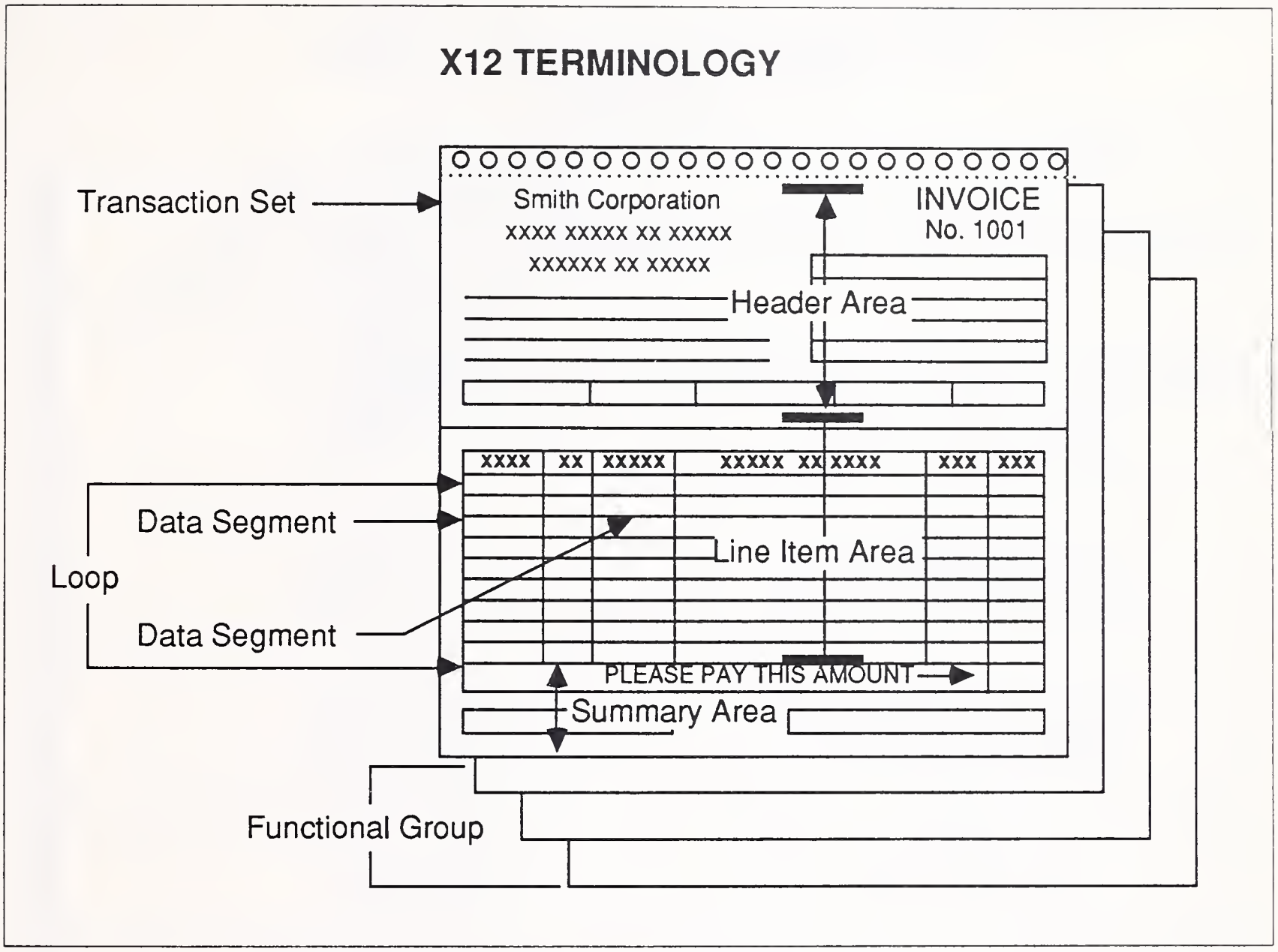


EXHIBIT III-4

EDI FORMAT VERSUS PAPER FORMAT (INVOICE)

ST*810*0001 N/L	TRANSACTION SET HEADER				
BIG*810713*1001*810625*P989320 N/L	Date 7/13/81 Order Date 6/25/81		Invoice No. - 1001 Cust. Order No. - P989320		
LS*100 N/L	LOOP HEADER				
N1*BT*ACME DISTRIBUTING COMPANY N/L N3* P.O. BOX 33327 N/L N4* ANYTOWN*NJ*44509 N/L	CHARGE TO ACME Distributing Company P.O. Box 33327 Anytown, NJ 44509				
N1*ST*THE CORNER STORE N/L N3* ^)! FIRST STREET N/L N4*CROSSROADS*MI*48106 N/L	SHIP TO The Corner Store 601 First Street Crossroads, MI 48106				
N1*SE*SMITH*CORPORATION N/L N3*900 EASY STREET N/L 48BIG CITY*NJ*15455 N/L	REMIT TO Smith Corporation 900 Easy Street Big City, NJ 15455				
LE*100 N/L	LOOP TRAILER				
IT9*01*03*2**10 N/L	TERMS OF SALE. . . 2% 10 days				
PER*DU*C.D. JONES*TE618/555-8230 N/L	CORRESPONDENCE TO C.D. Jones 618/555-8230				
LS*200 N/L	LOOP HEADER				
	QUANTITY	UNIT	NO.	DESCRIPTION	PRICE
IT1*3*CA*127500*VC*6900 N/L	3	Cse	6900	Cellulose Sponges	12.75
IT1*12*EA*4750*VC*P450 N/L	12	Ea	P450	Plastic Pails	4.75
IT1*4*EA*9400*VC*1640Y N/L	4	Ea	1640Y	Yellow Dish Drainer	.94
IT1*1*DZ*34000*VC*1507 N/L	1	Dz	1507	6" Plastic Flower Pots	3.40
LE*200 N/L	LOOP TRAILER				
CAD*N****CONSOLIDATED N/L	Via Consolidated Truck				
TDS*5111 N/L	INVOICE TOTAL PLEASE PAY THIS AMOUNT $51.11				
SE*24 N/L	TRANSACTION SET TRAILER				

standards that allowed use of standard generic transactions, such as purchase orders or, if desired, a customized transaction that could be easily translated and transmitted to a user of any other format.

The most important EDI standards organization is the ANSI X12 Committee, which defines the "generic" and dominant EDI standards.

X12 transaction sets can have variable-length fields that are 40-70% more efficient than fixed-length fields, resulting in significantly lower communications costs.

Exhibit III-5 lists several commonly used EDI transaction sets. This list, representing transaction sets developed by ANSI X12 as well as by other groups, is growing.

EXHIBIT III-5

EDI TRANSACTION SETS

110 TDCC - Air Invoice
203 TDCC - Bill of Lading
210 TDCC - Motor Freight Bill
214 TDCC - Shipment Status Message
404 TDCC - Shipment Information (Rail)
410 TDCC - Rail Freight Bill
810 ANSI - Invoice
820 ANSI - Payment/Remittance Advice
830 ANSI - Material Release
832 ANSI - Price/Sales Catalog
840 ANSI - Request for Quote
843 ANSI - Response for Request for Quote
850 ANSI - Purchase Order
855 ANSI - Purchase Order Acknowledgement
856 ANSI - Advance Skip Notice
860 ANSI - Purchase Order Change Request
861 ANSI - Receiving Advice
862 ANSI - Shipping Schedule
865 ANSI - Purchase Order Change Acknowledgement
870 ANSI - Order Status Report
875 UCS - Purchase Order
876 UCS - Purchase Order Change
877 UCS - Purchase Order Adjustment
880 UCS - Invoice
882 UCS - Statement
884 UCS - Shipment Advice
888 UCS - Item Maintenance
889 UCS - Promotion Announcement
890 UCS - Prepayment Adjustment Advice
891 UCS - Promotion Announcement Change
905 UCS - Remittance Advice
940 WINS - Warehouse Shipping Order
941 WINS - Warehouse Inventory Stats
942 WINS - Warehouse Activity Report
943 WINS - STK Transfer Shipment Advice
944 WINS - STK Transer Receipt Advice
945 WINS - Warehouse Shipping Advice
980 TDCC - Functional Group Totals
994 UCS - Administrative Message
997 ANSI - Functional Acknowledgement
999 TDCC - Acceptance/Rejection Advice

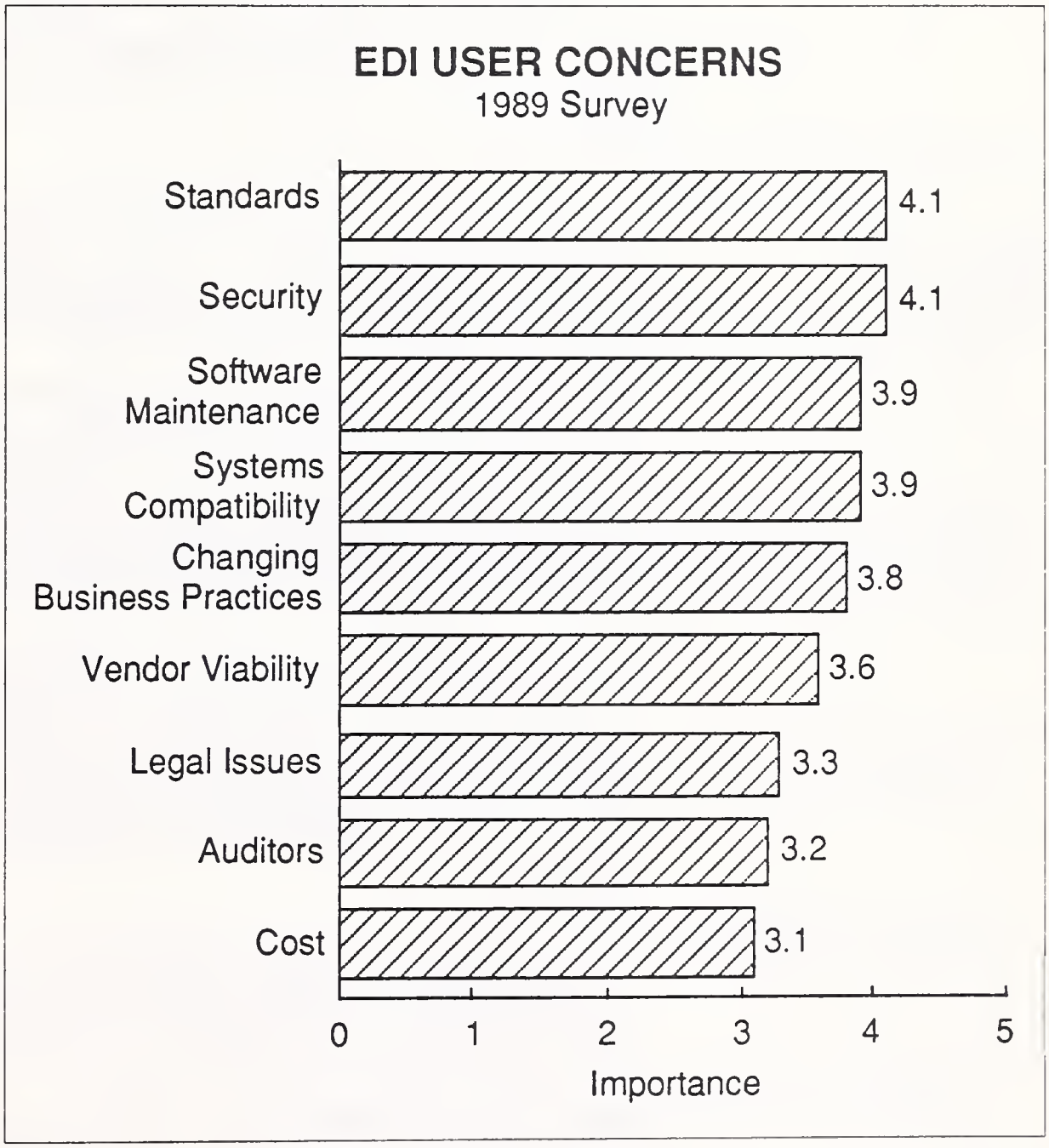
B

Standards—The Major User Concern

EDI involves several issues, including standards, control and financial responsibilities, business practices, cost issues, and security. These concerns can influence market acceptance and implementation success.

Exhibit III-6 reports the results of INPUT's user survey and ranks several concerns. As shown, EDI standards is the number-one issue concerning users, and the related software maintenance also rated high on the list of concerns.

EXHIBIT III-6



Users appear aware of pressure on proprietary and industry-specific formats to conform to public standards, and are uncertain about the migration plan of X12 to the international EDIFACT standards. There is also uncertainty about the appropriate roles of various EDI standards-making organizations.

INPUT believes that users are often dealing with partial information, a problem that this study hopes to address. Readers are also advised that INPUT, in conjunction with the EDI Association, will be examining the

international EDIFACT standard for a special study to be published in early 1990.

The perceived unsettled status of EDI standards is inhibiting some users from fully implementing the method, while the availability of cross-industry standards is having a countervailing effect, encouraging cross-industry trading and the overall growth of EDI.

The use of public standards by major corporations, particularly those with cross-industry trading relationships, is having a major impact in turning previously "academic" standards into standards applied to real needs.

C

Types of EDI Standards

Electronic Data Interchange is concerned with the communication of data that is normally entered on business documents. The standards that define these electronic documents are categorized as follows:

- Public standards. Public standards are generally used cross-industry and are developed and maintained by open organizations. Included in this category are organizations and standards such as The Electronic Data Interchange Association (formerly the TDCC) for transportation-related documents, and the Accredited Standards Committee X12 of the American National Standards Institute (ANSI X12).

- Industry-specific. These apply to a specific industry and are maintained by industry-specific groups. Included are organizations and standards such as the Uniform Code Council (the UCS standard) for grocery industry transactions, the Motor and Equipment Manufacturers Association (Transnet) for the automotive aftermarket, and the Air Transport Association (Specification 2000) for aviation supply ordering.

- Company-specific. These standards are developed by a company and used for a specific business goal, such as vendor communications. Examples include Sears, Roebuck (SENDEN) and K-Mart.

There are similar breakdowns in Electronic Funds Transfer (EFT). General business EFT standards are being developed and maintained by the National Automated Clearing House Association (NACHA); function-specific standards and systems such as SWIFT (Society for Worldwide Interbank Financial Telecommunications) and the New York Automated Clearing House (CHIPS) are managed by the named organizations. New formats merging EFT with EDI are emerging, as discussed in Chapter V.

D

Why Use Standards?

The question of why to use standards is perhaps more accurately stated as "Why use *public* standards?" Proprietary or internal standards have existed ever since two computers were interconnected, a file uploaded or downloaded, or a tape written on one system and read on another.

The history of EDI contains many standards implementations. In the petroleum industry, for example, proprietary (or private) standards were defined to fill specific needs for information transfer between organizations where public standards did not exist.

- Public standards have now evolved to meet these specific needs.
  - Petroleum industry technical experts stated at the TDCC Conference of December, 1987 that all future EDI implementations will use ANSI X12.
  - Internal systems (a manufacturer communicating with its distributors, for example) have been developed using X12 transaction sets. Previously, special-purpose formats would have had to be invented and maintained.
- System designers have found that development is quicker and life cycle costs (system development, maintenance, and upgrading) are reduced by using existing ANSI X12 standards coupled with off-the-shelf EDI software translators, as opposed to developing and maintaining special-purpose formats and translators.

E

EDI Is NOT E-Mail

Although some electronic mail proponents have claimed that there is virtually no distinction, INPUT believes there are very clear differences between EDI and E-mail:

- Electronic mail users, in practice, send only unformatted, "plain text" notes and letters to other companies, or they use content conventions agreed to only by the involved parties.
  - Formatted content requires standards for interpretation. Electronic mail does not have public content-related standards—EDI does.
- EDI transaction sets contain explicit control information for the development of audit trails, and to assure the integrity of the business data and business transactions being transmitted.
  - This control information is part of EDI standards at every level, including the communications envelopes. Electronic mail services have proprietary control systems, but usually only at their equivalent of the communications envelope.

F

Network Versus Software Translation

At some point in the computer application-to-computer application transmission process of EDI, data is translated or reformatted.

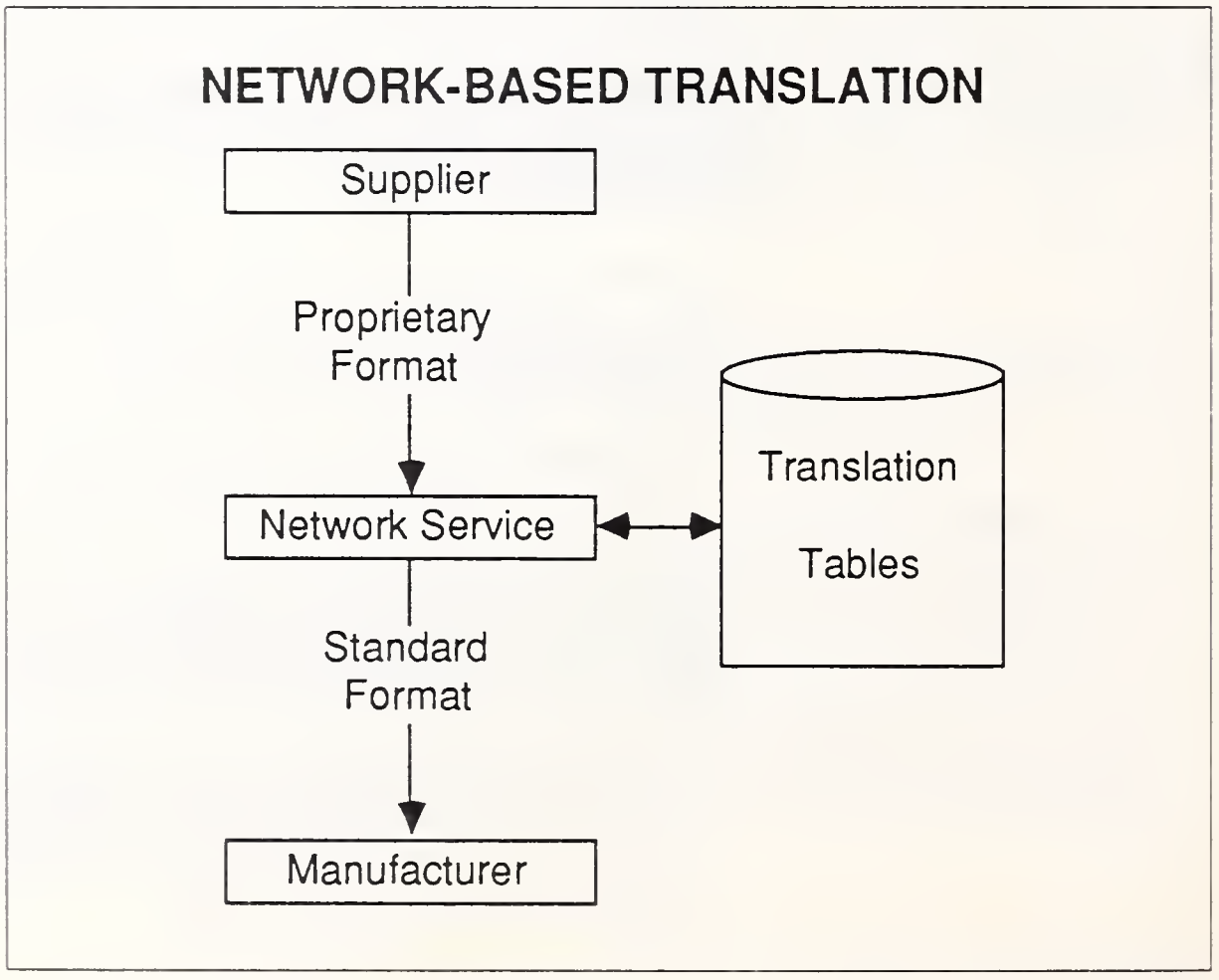
- At the most elemental level of translation, information must be taken from the sending company's internal data base and put into the appropriate EDI standard format.
- When received, this information must then be extracted by the receiving company and used to update its own internal data base.
- In some cases, intermediate (standard-to-standard) translation occurs as well.

Translation can be a service provided by an EDI third-party network service provider; it can be provided by premise-based software developed or procured for that function; or it may be imbedded as part of an application system. It can also be a combination of several of these services, depending on the needs of the trading partners.

1. On Network Translation

Network translation, illustrated by Exhibit III-7, is a value-added service provided by some third-party network service providers. It was a very critical function in the pioneering EDI implementations. Because of trends in premise-based software, this is not as critical a factor in third-party network selection as it once was.

EXHIBIT III-7



Network translation is performed for the following reasons:

- Translation can be between versions and levels of standards. All public EDI standards change on some schedule; if the user's premise system does not provide facilities for easily loading new versions/levels of the standards, or if multiple versions must be maintained because different trading partners are using different versions, users may want their network service provider to translate between the version/level they have implemented and the version/level used by their trading partners.

- Translation can be directly to/from internal data formats, to speed implementation when time is an important factor.

- On-network translation may be less expensive than buying a translator, given frequency of use and the number of trading partners.

- It may also be desirable to translate between public and proprietary standards on-network. A case in point is the automotive industry, where a single supplier may work with three or four manufacturers, and therefore be required to adhere to as many formats. On-network translation can ease this process.

  - Prior to the transition to Automotive Industry Action Group (AIAG)-endorsed EDI standards, auto manufacturers used a variety of proprietary formats.

  - The supplier's third-party network provided the value-added service of translating the AIAG-formatted Advanced Shipping Notice (for example) to the appropriate manufacturer's proprietary format before forwarding the transaction to the manufacturer. This relieved a major transaction set maintenance burden from the supplier.

For translation between public formats (as opposed to between internal and public formats) on an occasional or low-volume basis, on-network translation may be more cost-effective and/or convenient.

From the network's viewpoint, supporting on-network translation means being able to install and maintain multiple sets of standards, perform compliance checking to ensure adherence to a given standard, and have billing systems able to track translation services. This adds cost, but also adds value and an element of full service.

As the EDI market matures, and as acceptance of centralized standards grows, the need for on-network translation diminishes.

2. Premise (Software) Translation

Translation between a company's internal formats to a public standard is, for the most part, best accomplished via a modular, add-on EDI software package. This situation will gradually change as new applications are installed with integrated EDI translation or that create native files in EDI formats.

Premise-based translation, illustrated earlier by Exhibit III-1 and in which the translation software runs directly on the user's system, is becoming the norm. This is because:

- Premise-based translation software has improved so that it can now easily support multiple versions/levels, and can automatically translate between internal data structures and the appropriate standard based on:
  - Information in the EDI transaction set itself, when you are the recipient
  - Information on your trading partners that has been set into the translator's profile tables when you are the sender
- Prices for translation software, and applications software incorporating translation, have decreased and are comparable with other software purchases of similar complexity.
- Performance, reliability, and stability of translation software has improved significantly from the initial implementations.
- Increasingly, EDI capability is being directly integrated with the application system during the initial implementation, as opposed to the earlier multiphase approach, where the first phase was often network-based translation.

G

From Document to Data

Although the EDI literature (including this report) talks in terms of transaction sets that have their roots in paper documents, it is becoming more appropriate to talk in terms of data. This is especially true as the standard transaction sets have become more inclusive and various industry groups have begun to write implementation guidelines based on the data elements customarily used in business documents.

- By taking this approach, the standards become vehicles for defining the format, structure, and content of intercompany data streams, rather than paper documents. This trend will intensify as EDI becomes directly integrated into the information systems of participating companies.

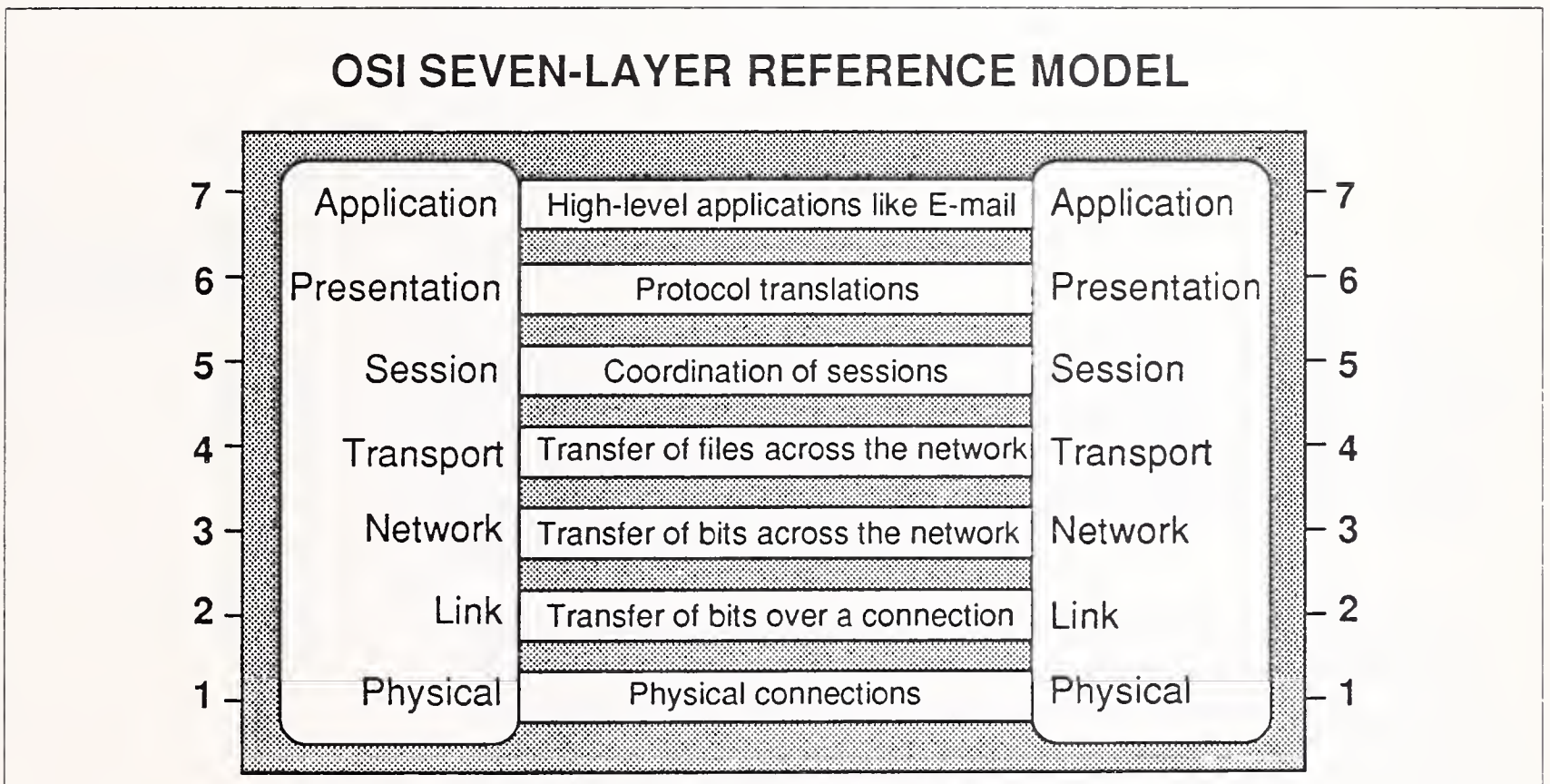
- The use of public standards for internal systems is a clear-cut example of this trend. The information being sent is purely a data file and, pre-EDI, would have been sent as one transmission and not as individual documents.

H

The OSI Model

ANSI X12 is relating its EDI standards to the International Standards Organization's Open Systems Interconnection (OSI) mode, as shown in Exhibit III-8.

EXHIBIT III-8



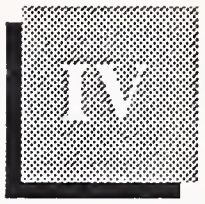
- OSI Layer 7, Applications, is where EDI transaction sets are converted to/from the internal formats of the computer system.

- OSI Layer 6, Presentation, is used for interstandards conversion (UCS to X12, EBCDIC to ASCII, etc.).

- Lower levels (Layer 5/Session, Layer 4/Transport, Layer 3/Network, and Layer 2/Link) of the OSI model are used to implement the necessary communications functions. Only UCS makes the functions at these layers directly part of its EDI standards.

The EDI novice, and to some extent the more sophisticated user, is likely to be confused by the wide range of standards related to EDI, and the overlapping organizations involved in developing and maintaining EDI standards. This study addresses this confusion; it is through education that clarity will result. Specific recommendations to users will be found in the concluding chapter.

The next chapter provides details on the variety of EDI standards, including those used by specific industries and individual companies.



Industry-Specific and Company-Specific EDI Standards

A

Dominant EDI Standards

1. TDCC/WINS

The Transportation Data Coordinating Council, now renamed the Electronic Data Interchange Association (EDIA), was the original EDI standards development body in the United States. EDIA started its pioneering work with the rail, motor, ocean, and air standards for the replacement of paper-based freight documentation. TDCC/EDIA is an open-membership, not-for-profit organization.

- TDCC, chartered by the International Association of Refrigerated Warehouses and the American Warehousemen's Association, also developed WINS, the Warehousing Industry Network Standard, to serve the needs of the public warehousing industry. WINS administrative support (secretariat) is now provided by the Uniform Code Council. INPUT expects that the WINS standards will, over time, be merged into UCS.

- The EDIA has formed a user group, the EDI Council of the USA (EDICUS), to focus user needs and influence vendor development of new software and services.

2. UCS

The Uniform Communications Standard (UCS), the EDI communications and transaction set standard for the grocery industry, is developed and maintained by the Uniform Code Council (UCC). The UCC developed the ubiquitous Universal Product Code (UPC) bar code standard. It is a not-for-profit organization composed of grocery industry participants.

The UCS standards are developed and maintained by a standards maintenance committee and by various project groups, such as the one currently developing standards for direct store delivery systems.

- Direct Store Delivery is a concept developed by Arthur D. Little (which proposed the original UCS EDI implementation) that began in early 1986.

- DSD applies a direct data exchange at the grocery's loading dock between a hand-held computer and/or a delivery truck computer to transfer shipment information that is then reconciled against the actual order. This is called DEX/UCS for Direct Exchange (as opposed to NEX/UCS for Network Exchange).

- Reconciliation is necessary because suppliers often substitute products, or ship products in addition to those ordered.

The UCC now provides Secretariat services for WINS and for the Voluntary Interindustry Communications Standard (VICS), an X12-based standards implementation set primarily used by apparel retailers.

3. ANSI X12

The American National Standards Institute's (ANSI) Accredited Standards Committee (ASC) X12 is charged with the development and maintenance of EDI standards for general business use. The secretariat of ASC X12 is the Data Interchange Standards Association (DISA), an open-membership, not-for-profit organization.

ASC X12 is organized into a series of subcommittees responsible for standards development and maintenance in their fields. ASC X12's current structure is shown in Exhibit IV-1.

- Subcommittees include Communications, Finance, Materials Management, Purchasing, Transportation, and Government.

- In addition, there are subcommittees covering Education and Implementation, Product Data, and Technical Assessment.

- In 1989, an Industry Standards Transition Subcommittee was added to facilitate the migration of industry-specific and pre-ANSI X12 standards (such as UCS and TDCC) to X12 specifications.

The process by which X12 transactions are developed is shown by Exhibit IV-2, while the process by which the standards are maintained, improved, and/or changed is shown by Exhibit IV-3.

EXHIBIT IV-1

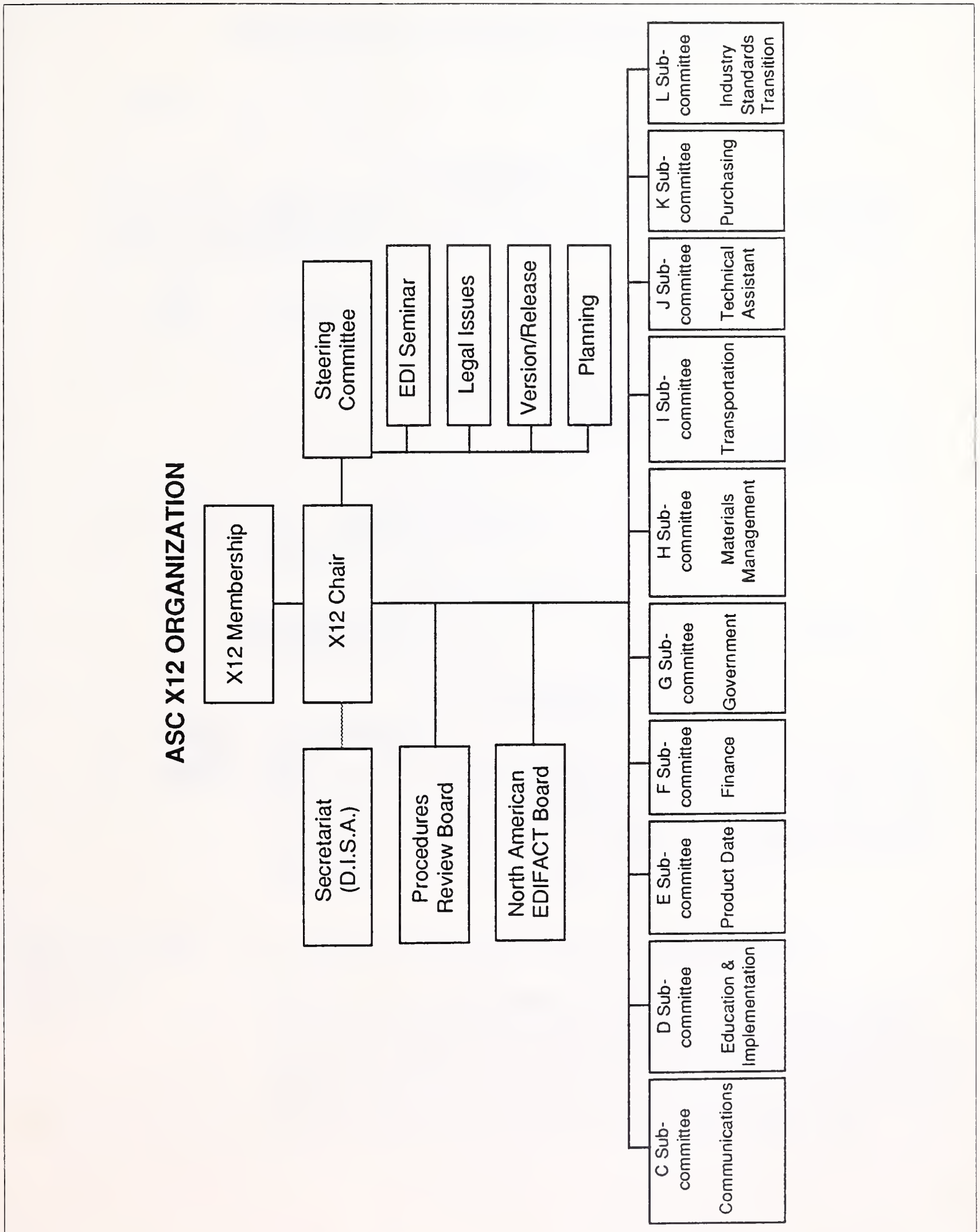


EXHIBIT IV-2

ASC X12 DEVELOPMENT FLOWCHART

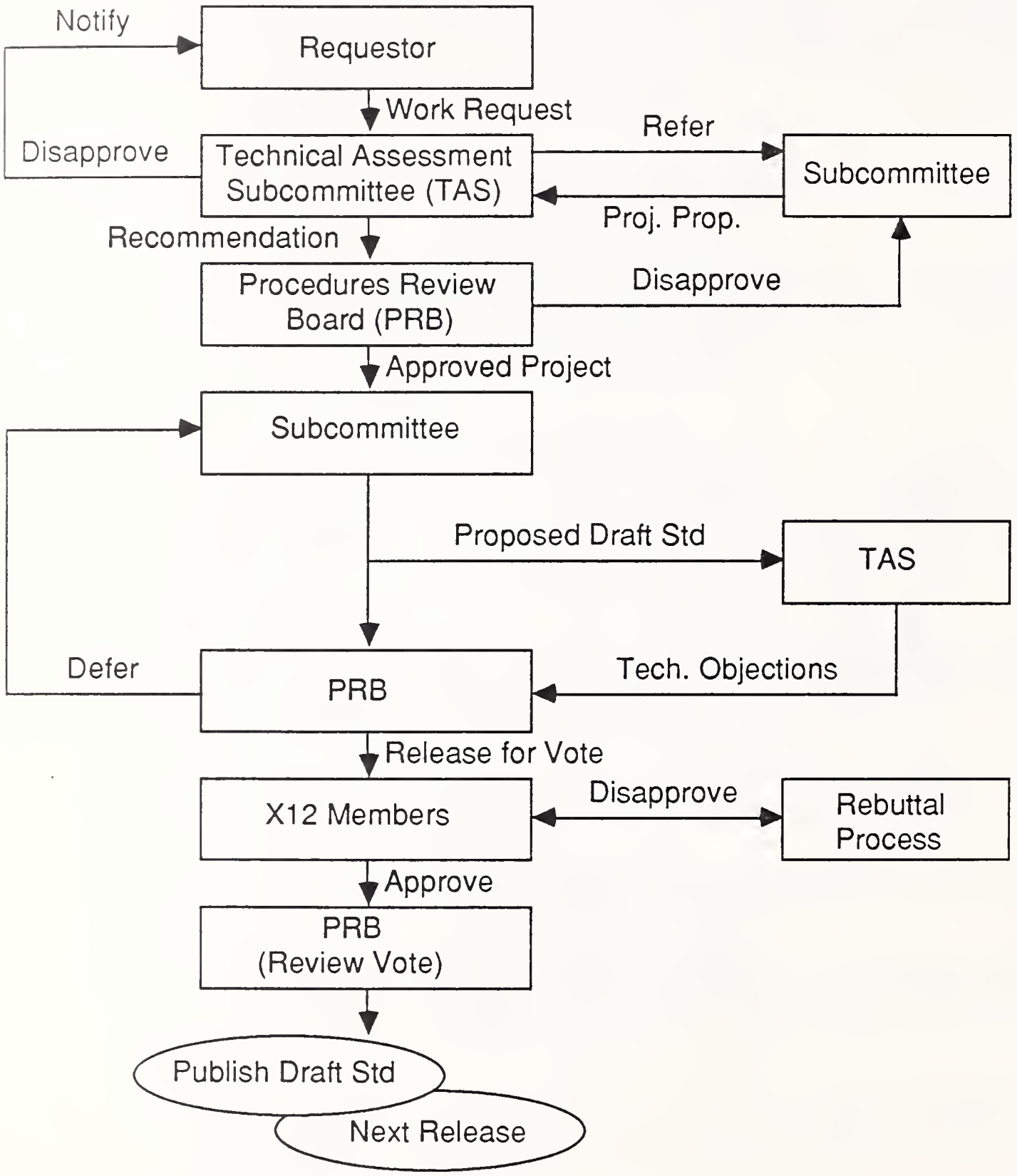
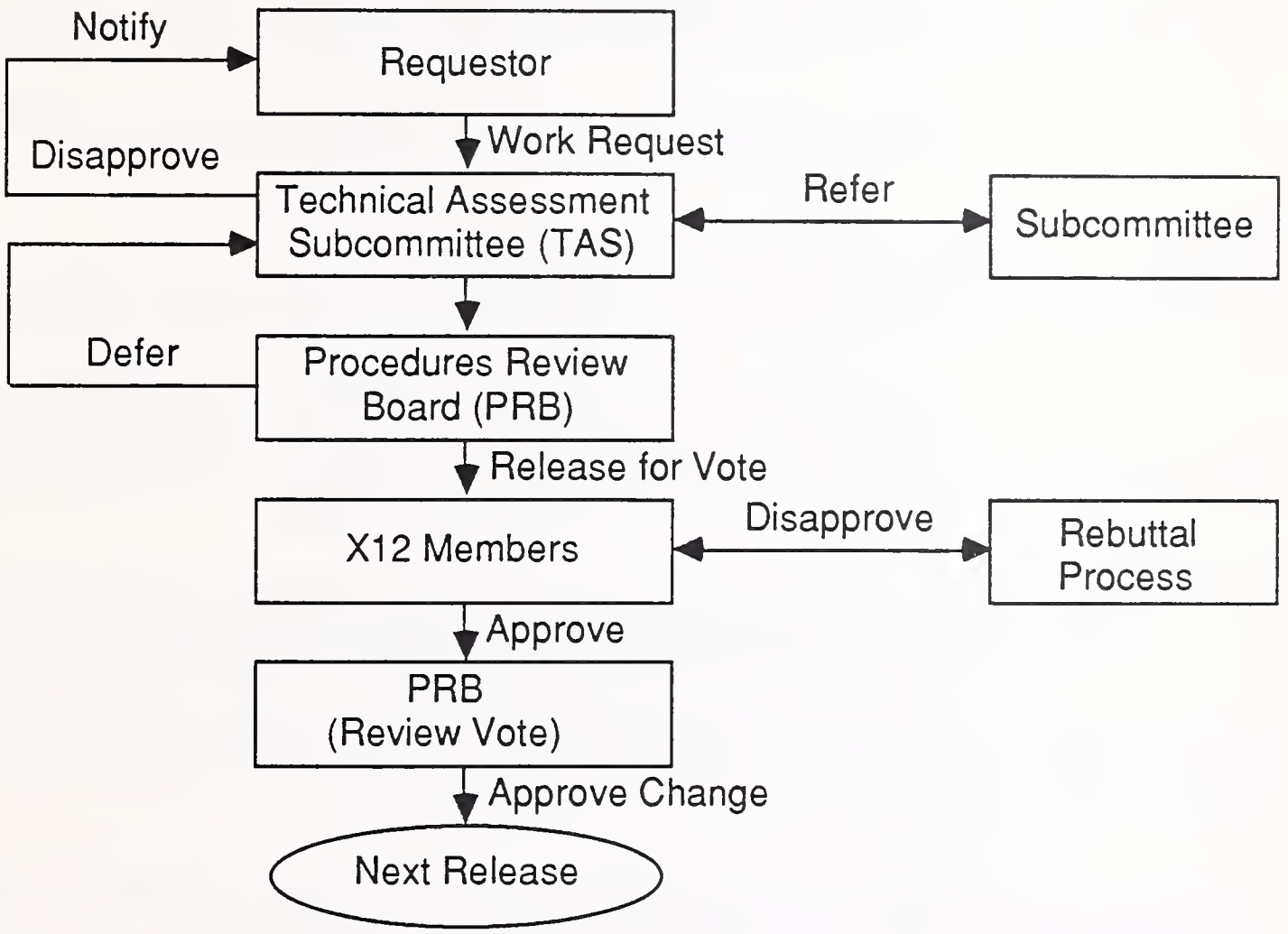


EXHIBIT IV-3

ASC X12 MAINTENANCE FLOWCHART



ASC X12 is the U.S. body responsible for contributing to the United Nations work on EDIFACT (EDI For Administration, Commerce, and Transport), the emerging International EDI standard. The North American EDIFACT Board (NAEB), which advises the North American Rapporteur, is part of ANSI X12 as a task group (see Chapter VI, International EDI).

B

Industry-Specific X12-Related Standards

1. ANSI X12 Implementations

The development of X12-compatible EDI standards for new industries or functions is being done through guidelines in which the data elements used in the specific industry are identified and subsets of ANSI X12 that align the standard with industry practice are defined. These guidelines do not deviate from X12; rather, they express agreement about such things as which optional fields, allowed in the standard, will be used.

a. Agriculture

Two efforts are underway in this industry, both involving farm suppliers.

- AAEC (Association of Agrichemical Electronic Communication) is developing EDI standards for suppliers of agricultural chemicals.

- FEMA (Farm Equipment Manufacturers' Association) is developing EDI standards for "short line" farm equipment manufacturers.

b. Apparel

There are multiple activities in this industry's approach to EDI standards.

- SAFLINC (Sundries and Apparel Findings LINkage Council) is a subset of ANSI X12 for communications between apparel manufacturers and their suppliers of trims and findings. The American Apparel Manufacturers' Association is the secretariat.

- TAMCS (Textile Apparel Manufacturer's Communications Standards) is a subset of ANSI X12 approved by the Textile/Apparel Linkage Council (TALC) for product descriptions between cutters and fabric suppliers. The American Apparel Manufacturers' Association and the American Textile Manufacturers' Association jointly provide secretariat services.

- VICS (Voluntary Interindustry Communications Standards) supplies conventions for the use of ANSI X12 between apparel manufacturers and retailers. The UCC provides secretariat services.

c. Chemicals

The CIDX organization (for Chemical Industry Data Exchange) is developing guidelines for the use of ANSI X12 and TDCC standards in the chemical industry.

Unique requirements being addressed are industry-specific documents such as the Certificate of Analysis (COA) and the Certificate of Compliance, which are related to quality control test data. There are also electronic transactions covering special shipping needs such as material safety data sheets. These documents are legally required, and are widely used by transportation carriers, shippers, and internally by chemical companies themselves.

Due to hazardous materials requirements, a chemical company may ship acid diluted to 50% concentration, but charge for the product at 100% concentration. This is another industry-specific transaction called percent-solution billing that is covered by the standard.

d. Electrical Supply

The EDX organization (Electronic Data Exchange) is developing guidelines for the electrical industry. It is sponsored and managed by the National Electrical Manufacturers' Association, the National Association of Electrical Distributors, and the National Electrical Manufacturers' Association.

e. Electronics Manufacturing

The EIDX organization (for Electronics Industry Data Exchange) is developing guidelines for the use of ANSI X12 in the electronics industry. The American Electronics Association provides secretariat services.

f. Health Care

There are three primary initiatives in the X12-based EDI standards for this industry.

- The HIBCC (Health Industry Bar Code Council) is an organization coordinating ANSI X12 use in the health care industry.

- The HIDA (Health Industry Distributors' Association) has developed formats for chargebacks (rebates) and contract awards. These are transactions between wholesalers and pharmaceutical manufacturers.

- The NWDA (National Wholesale Druggists' Association) is developing ANSI X12 and UCS standards for extended forms of business transactions. It developed the original Ordernet system, operated by Sterling Software's Ordernet Services Division.

g. Metals

Industry-wide (iron, steel, and aluminum) EDI coordination is handled through the Joint Committee of the Metals Industry, formed by the Aluminum Association and the American Iron and Steel Institute.

- Aluminum—The ACCS (Aluminum Customer Communications System) was developed through the Aluminum Association. It has now adapted ANSI X12 formats to industry needs.

- Iron and Steel—The American Iron and Steel Institute (AISI) has established ANSI X12 formats for steel and aluminum industry products.

Transactions developed for the metals industry include the Report of Test Results, which reports inspection information, statistical process control measurements, and certificates of test or compliance results. These

transactions are required to satisfy a customer's product specification or process requirement.

Missing from EDI metals industry standards development work are the copper and brass industries. Observers believe that this is due to the relative lack of strong industry associations able to organize individual company participation in EDI developments.

h. Office Products

The Industry Committee on Office Product Standards (ICOPS) is a joint project of the National Office Product Association and the Wholesale Stationers' Association. It started EDI research in 1983 and began implementation in 1985 using ANSI X12 on the GE Information Systems EDI*Express system. Over eighty manufacturers, dealers, and wholesalers are in service.

i. Petroleum

PIDX (Petroleum Industry Data eXchange) is a task group within the American Petroleum Institute that is the focal point for ANSI X12 activities in the petroleum industry.

Future developments planned in oil industry EDI are formats covering exchanges of drilling information, production histories, test information reports, and the use of EDI/EFT for federal, state, and local tax payments.

j. Telecommunications Equipment

The TCIF (TeleCommunications Industry Forum) is developing guidelines for the use of ANSI X12 between purchasers, manufacturers, and suppliers of telecommunications equipment, products, and services. It is administered by the Exchange Carriers Standards Association.

k. Textiles

FASLINC (Fabric And Suppliers LINkage Council) is a subset of ANSI X12 for product descriptions between textile makers and their suppliers. The American Textile Manufacturers' Association provides secretariat services.

l. Utilities

The UIG (Utility Industry Group) is developing conventions for the use of ANSI X12 between the electric, gas, and water utilities and their vendors.

2. ANSI X12 Variants

A slightly different approach can be found in certain industries where EDI standards evolved and later moved into harmonization with the ANSI X12 formats.

a. Automotive

The AIAG (Automotive Industry Action Group) developed a set of standards as part of the adoption of Just-In-Time manufacturing for the automotive manufacturing industry. The standards focus on Material Release messages to suppliers and Advanced Shipping Notices to the manufacturer. AIAG standards are now part of ANSI X12.

b. Petroleum Industry

The industry has developed several ANSI X12 precursors and variants to solve specific industry problems. Among the variants are:

- JADE or JAEX (Joint Audit Date Exchange)—Developed by COPAS (Council of Petroleum Accounting Standards) to audit joint producing properties.

- JIBE (Joint Interest Billing Exchange)—Developed by COPAS for use in accounting for producing properties where several parties share ownership or an interest in the well's production.

- PipeNet—Developed by the American Petroleum Institute to test pipeline industry-specific transactions (nominations that are similar to a request for quotation, shippers' schedules, meter and gauge ticket readings, inventory notices and invoices, etc.), PipeNet adapts ANSI X12 transaction sets for its purposes.

c. Printing

EMBARC (Electronic Manifest BAR Code) EDI standards were developed by the Graphic Communications Association (GCA) for transmission of shipping manifest information from paper mills to printers. It is used in conjunction with bar code labels on the paper reels.

- The label is scanned and computer-matched with the reel's description sent using the EMBARC standard. Better inventory control and quality control is achieved.

- Further industry EDI implementations are being accomplished using ANSI X12.

Exhibit IV-4 lists several representative ANSI X12 standards implementations and variants.

EXHIBIT IV-4

ANSI X12 IMPLEMENTATIONS AND VARIANTS
Partial Listing

Subset	Industry
VICS	Apparel Retailers
CIDX	Chemical
EDX	Electrical
EIDX	Electronics
ICOPS	Office Products
PIDX	Petroleum
TCIF	Telecommunications
UIG	Utilities
AIAG	Auto Making

C. Industry-Specific Non-X12 Standards

Several industries have developed standards for use through a specific service provider. Often the formats used carry the name of the service.

1. Air Transport

Specification 2000 (formerly Spec 2000), is an EDI service and a set of formats for supply transactions in the air transport industry. It is administered by the Air Transport Association of America (ATA) using processing and network services from Aeronautical Radio Inc. (ARINC). Access is also available through the SITA (Société International de Télécommunications Aeronautique) network and telex.

The ATA has held discussions with the Aerospace Industries Association to compare Specification 2000 with ANSI X12 in order to resolve variances that cause some participants to maintain dual standards.

2. Automotive Aftermarket

TransNet was developed by the Motor and Equipment Manufacturers' Association (MEMA) to connect automotive aftermarket distributors with their suppliers. MEMA's Management Information Systems Group subsidiary provides service though GE Information Services. The association has recently introduced ANSINet, using ANSI X12 formats.

3. Bookselling

There are two active services in operation, Pubnet and BOS.

- Pubnet—Sponsored by the National Association of College Stores and the Association of American Publishers, Pubnet is initially targeting college book stores and has plans to expand to the commercial environment.

  - It is a hybrid system with interactive searches prior to electronic purchase.

  - The data base, in the Book Industry System's Action Committee (BISAC) format, resides on a GE Information Services host.

  - Orders are sent directly to the publishers, and the associated delivery instructions are routed to the appropriate warehouse.

- BOS (Booksellers' Order Service), was developed by the American Booksellers' Association and became operational in 1984. BOS operates through the Telenet packet network and allows electronic ordering from a range of publishers.

4. Hardware/Hard Goods

EAGLE, a service connecting building material distributors to hardware stores and home centers, is provided by Sterling Software's Ordernet Services and uses industry-specific data formats.

5. Health Insurance

EMCS (Electronic Media Claims Submissions) is a method used for sending claims to health insurance carriers using electronic versions (UB 82, HCFA 1500) of formats developed in support of Medicare claims processing. Network services are provided by the National Electronic Information Corporation (NEIC, a clearinghouse for insurance carriers), GTE Information Services, various Blue Cross/Blue Shield associations, and several insurance carriers.

6. Insurance

IVANS (Insurance Value-Added Network Service) is a nonprofit company established to facilitate communications between independent agents and member insurance carriers, using either company-specific formats or the IIR/ACORD (Insurance Institute for Research/Agent COmpany for Research and Development) formats for paper and electronic documents. Approximately one hundred host computers are connected, servicing 7,000 agents. Network services are provided by the IBM Information Network and Sears Technologies.

7. Iron and Steel

COMPORD (COMPuter ORDering) is a customer communications system developed in the 1970s by the American Iron and Steel Institute (AISI). Due to its complexity, COMPORD has not been widely accepted. Standards development is now under ANSI X12.

8. Petroleum

The petroleum industry has commissioned several systems, usually to solve a discrete industry problem, using proprietary formats. Among these is PetroEx, an EDI application using pre-ANSI X12 formats. PetroEx is provided by GE Information Systems as part of its PetroDex offering, a suite of industry-specific remote computing services.

9. Rail Transport

Car Locator Messages (CLMs) were developed by the National Industrial Transportation League (NITL) and the Association of American Railroads (AAR).

CLMs define message formats for communicating rail car logistics information. The standards are updated by NITL on a semiannual basis.

10. Warehousing

As discussed earlier, WINS (Warehouse Information Network Standard) was developed by the public warehousing industry and is in use at over 200 locations. It defines transactions to/from depositors (manufacturers). It is similar to UCS and is also administered by the Uniform Code Council.

11. Wholesale Drugs

The Ordernet standard and service was developed by the National Wholesale Druggists' Association (NWDA) in 1972 and provided by Informatics General. After a merger, the resultant Sterling Software's

Ordernet Services Division now also provides support for ANSI X12 and UCS standards in addition to the original Ordernet standard. Future standards development affecting this industry will use ANSI X12 or UCS.

Exhibit IV-5 lists some of these non-ANSI X12 standards.

EXHIBIT IV-5

INDUSTRY-SPECIFIC NON-X12 STANDARDS
Partial Listing

Format	Industry
SPEC 2000	Air Transportation
TransNet	Auto Aftermarket
Eagle	Hardware
UB82	Health Insurance
IIR/ACORD	Property/Casualty Insurance
PetroEx	Petroleum
NITL	Rail Logistics
WINS	Warehousing
Ordernet/NWDA	Wholesale Drugs

D

Company-Specific Standards

Early adopters of EDI often developed their systems prior to the availability of standardized formats. In some cases, a proprietary format was seen as expeditious ("I have enough to worry about without worrying about standards"). In other cases, a proprietary format was used for competitive advantage. In these cases, the format was seen as "locking in" a relationship and discouraging a customer from using another, incompatible system. Once the investment was made in one system, inertia worked against implementing another.

1. Automotive Big Three—General Motors, Ford, and Chrysler

Starting in the late seventies, each of the Big Three developed proprietary-format systems for communications with their suppliers. These systems continued until 1983 when the industry, through the Automotive

Industry Action Group (AIAG), embraced the ANSI X12 formats, with AIAG's standards committee developing and maintaining the actual transaction set standards to meet the automotive industry's needs. Subsequently, this work was also moved to ANSI X12.

Currently, the Big Three are migrating to ANSI X12 from their proprietary systems. Transition has been slowed by the existing investment in proprietary systems and the availability of premise-based software that supports the various proprietary and public standards.

The fastest adopters of ANSI X12 have been companies such as Navistar and Mack Truck, which had not developed proprietary systems.

2. Baxter-Travenol—ASAP (Analytical Systems Automated Purchasing)

ASAP was initially a private system to facilitate ordering by some 6,300 customers. Currently, the system is being expanded to support ordering of hospital supplies other than Baxter's, and through the GEIS network. A service called ASAP*Express has been introduced.

3. K-Mart Corporation

K-Mart's system, introduced in 1976 using proprietary formats, has over 800 suppliers and transportation carriers connected. It also supports UCS and will adopt ANSI X12 in the near future. Its apparel group has adopted ANSI X12 rather than use its parent's proprietary formats.

4. McKesson Corporation

This pharmaceuticals, health, and beauty aids distributor introduced its private system and standards (called Economost) in 1970. Today, it is used by some 14,000 retail druggists for order entry.

5. Sears, Roebuck—SENDEN (SEars National Data Exchange Network)

This is a proprietary network started in 1967 for supplier communications with Sears. In January 1989, Sears announced that SENDEN will be technically frozen. The 800 suppliers using it are being encouraged to use Sears' new network service, STEDI (Sears Transport EDI), offered by Sears Communications Company. STEDI, starting full service in the summer of 1989, will be an open third-party network offering with full interconnection to other networks.

Company-specific EDI standards are shown in Exhibit IV-6.

EXHIBIT IV-6

COMPANY-SPECIFIC STANDARDS
Partial Listing

Format	Industry
K-Mart	Retail
McKesson	Retail
SENDEN	Retail

E

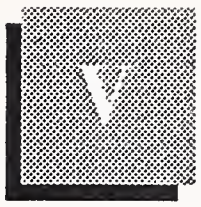
Trends in Standards Use

Many of these proprietary standards were developed because there were no public standards available at a time of need. The examples of Sears and the petroleum and printing industries show that there is a pronounced trend toward the use of ANSI X12.

- Some, like Sears, will de facto abandon their proprietary standards.
- Others will keep proprietary standards for existing applications but will use ANSI X12 for all applications incorporating EDI, and for new trading partners.

INPUT believes that this will lead to the eventual decommissioning of these proprietary standards as ANSI X12 transaction sets increase in number, and as the maintenance burden associated with proprietary standards increases.

The next chapter examines the relatively new area of EDI/EFT formats.



EDI/EFT Standards

A

Relationship between EDI and EFT

Buying and selling relationships involve inquiring, bidding, ordering, shipping, invoicing, and similar activities conducted directly between the two trading partners. The process culminates with a financial exchange that not only involves the trading partners, but their banks.

Whereas Electronic Data Interchange (EDI) is the transfer of information regarding the first set of activities, Electronic Funds Transfer (EFT) is the transfer of value regarding the latter activity—the financial exchange. Financial institutions have several mechanisms for accomplishing this transfer of value, starting with paper money and checks, but also encompassing several electronic systems with their sets of standards.

B

Banking Standards

1. Bank Administration Institute (BAI)

The BAI has developed Electronic Lockbox standards for communication between banks and commercial customers. Lockbox services are provided as a bank service for the direct receipt and deposit of payments to these customers' accounts. These payments may be for rent, telephone bills, credit cards, etc.

- The bank receives the payment directly through a post office box in the name of its client.
- It deposits the payments directly to its client's account and then notifies the client about what amount was paid, and by whom.
- These notifications are increasingly made electronically, using the BAI Lockbox formats. Many accounts receivables systems directly accept and apply these BAI Lockbox-formatted payment notifications. INPUT

believes that this special application will remain in its present form indefinitely.

2. Clearing House Interbank Payment System (CHIPS)

CHIPS is a payment system used for foreign exchange transactions. It is operated by the New York Automated Clearing House for its members and other banks on the system. It involves communication of payment and related data and end-of-day settlements.

3. The National Automated Clearing House Association (NACHA)

NACHA has developed standards under the ANSI X9 (banking) committee for electronic financial communications between banks and the Automated Clearing Houses (ACHs). NACHA uses Fedwire, the underlying communications network for bank clearinghouse communications. Fedwire is operated by the Federal Reserve System.

Three ANSI X9 standards are of particular interest to EDI:

a. Cash Concentration and Disbursement (CCD)

CCD is a format developed to allow a company to transfer funds from its depository accounts to its concentration account.

- CCD's application has subsequently been extended to intercompany payments.

- Because it only allows a short, unstructured, administrative message, the standard is not suitable for corporate trade payments (it cannot list invoices covered by the payment, for example).

- In 1988 the Federal Government started a program called Vendor Express to pay its vendors electronically using a new format called CCD Plus, abbreviated either CCD+ or CCDX. It allows a ninety-four character addendum that can be used to list invoice numbers, adjustments, etc.

b. Corporate Trade Payment (CTP)

CTP was introduced in 1983 for business-to-business payments.

- CTP allows up to 4,990 records to be appended, with each record containing the invoice payment detail that normally accompanies payments.

- Because of incompatibility with ANSI X12, lack of encryption or authentication capabilities, and special software requirements, use of CTP has been slow to develop.

c. Corporate Trade eXchange (CTX)

Implemented in 1987, CTX was jointly developed by NACHA and ANSI X12. It essentially replaces the CTP with an ANSI X12 remittance advice wrapped in a NACHA envelope that allows it to pass through the ACH network.

These three standards are compared in Exhibit V-1.

EXHIBIT V-1

EDI/EFT FORMATS

CCD+	-	Single addendum
CTP	-	Structured, multiple addenda
CTX	-	Free-form X12-compatible addenda

4. Society for Worldwide Interbank Financial Telecommunications (SWIFT)

A cooperative society, SWIFT was formed by banks in 1973 to develop a standardized interbank system for the electronic transmission of international financial transaction messages and payment instructions. It has over 2,300 users in over fifty countries and has begun to add brokerage houses (and exchanges) to its network. Standards exist for three categories of transaction:

- Trading Messages, including buy/sell orders, confirmations, and purchase advices
- Settlement Messages, including payments, confirmation of receipt or delivery
- Miscellaneous Messages, including request for amendment, certificate and serial numbers, request for payment, free-form text, etc.

Additional message types addressing securities were available in September, 1989.
INPUT believes that these standards will continue to exist into the foreseeable future, with interfusion between NACHA and ANSI X12 formats occurring where the functions being performed overlap. The major banking standards organizations are listed in Exhibit V-2.

EXHIBIT V-2

BANKING STANDARDS ORGANIZATIONS

- Bank Administration Institute (BAI)
- Clearing House Interbank Payment System (CHIPS)
- National Automated Clearing House Association (NACHA)
- Society for Worldwide Interbank Financial Telecommunications (SWIFT)

C

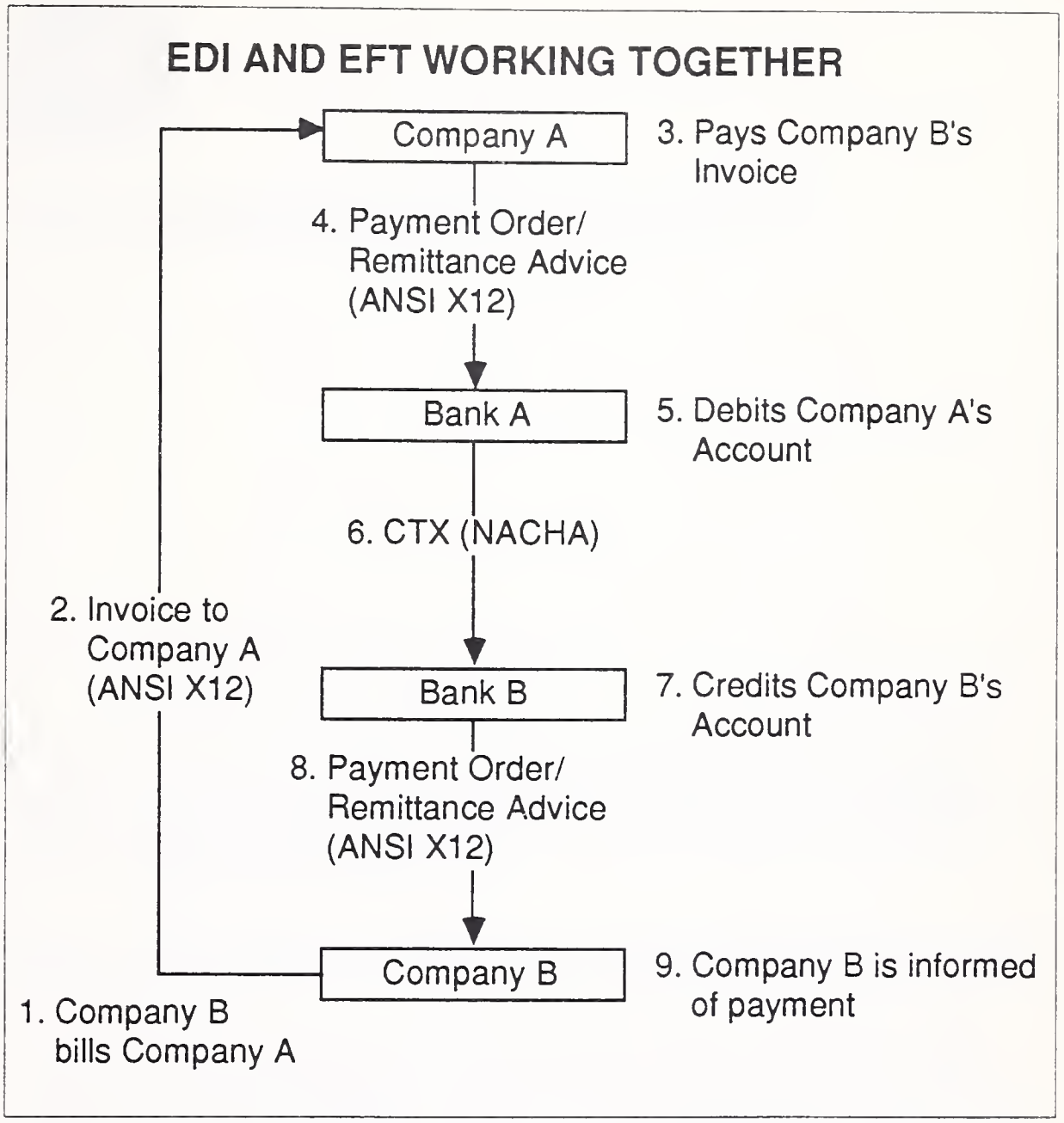
How EDI and EFT Work Together

Generally, EDI is company-to-company, company-to-bank, or bank-to-company; EFT is bank-to-bank. One key area where these sets of standards (and the underlying lines of communication) interact to deliver a service is in the payment cycle, as shown in Exhibit V-3.

- Company A receives an ANSI X12 invoice from Company B. Company A then generates an ANSI X12 payment order/remittance advice and transmits it to Company A's bank;
- Company A's bank, upon receiving the payment order/remittance advice:
  - Wraps it in a NACHA envelope and forwards the resultant Corporate Trade Exchange (CTX) document to Company B's bank through the Automated Clearing House system; and
  - Debits company A's account for the amount of the payment order;
- Company B's bank unwraps the envelope and
  - Forwards the payment order/remittance advice to Company B; and
  - Credits Company B's account for the amount of the payment order.

To ensure that these two sets of standards work together is the responsibility of the joint X9/X12 Committee on ACH standards.

EXHIBIT V-3

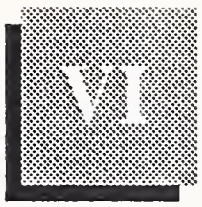


D

EDI/EFT Standards Interfusion

The Electronic Data Interchange and Electronic Funds Transfer realms intersect at the remittance advice, which contains information (what the remittance is for) and value (the amount of the remittance). Combined work in both standards arenas will lead to fusion between EDI and EFT, especially as banks begin to aggressively pursue the business data processing tasks associated with EDI that lead to and from EFT.

The next chapter examines the emergence of international EDI standards, specifically those designed for international trade.



International EDI Standards

A

EDI in International Trade

1. International Trade Complexity

The general reasons for using EDI (domestically and internationally) include the time value of information, cost avoidance, better inventory control, and benefits realized through the integration of EDI data and corporate information processing.

There are even more compelling reasons to use EDI internationally due to complex trade document requirements and complicated relationships.

- In addition to the principal trading partners, there are transportation carriers, freight forwarders, brokers, banks, insurers, and customs and other government agencies, as illustrated by Exhibit VI-1.

- These multiple parties often reuse some of the data originally entered by another participant in a trading transaction, or add data to the record.

The costs of managing and controlling the paperwork associated with these multiple interfaces inhibit profitability and slow the process of international trade.

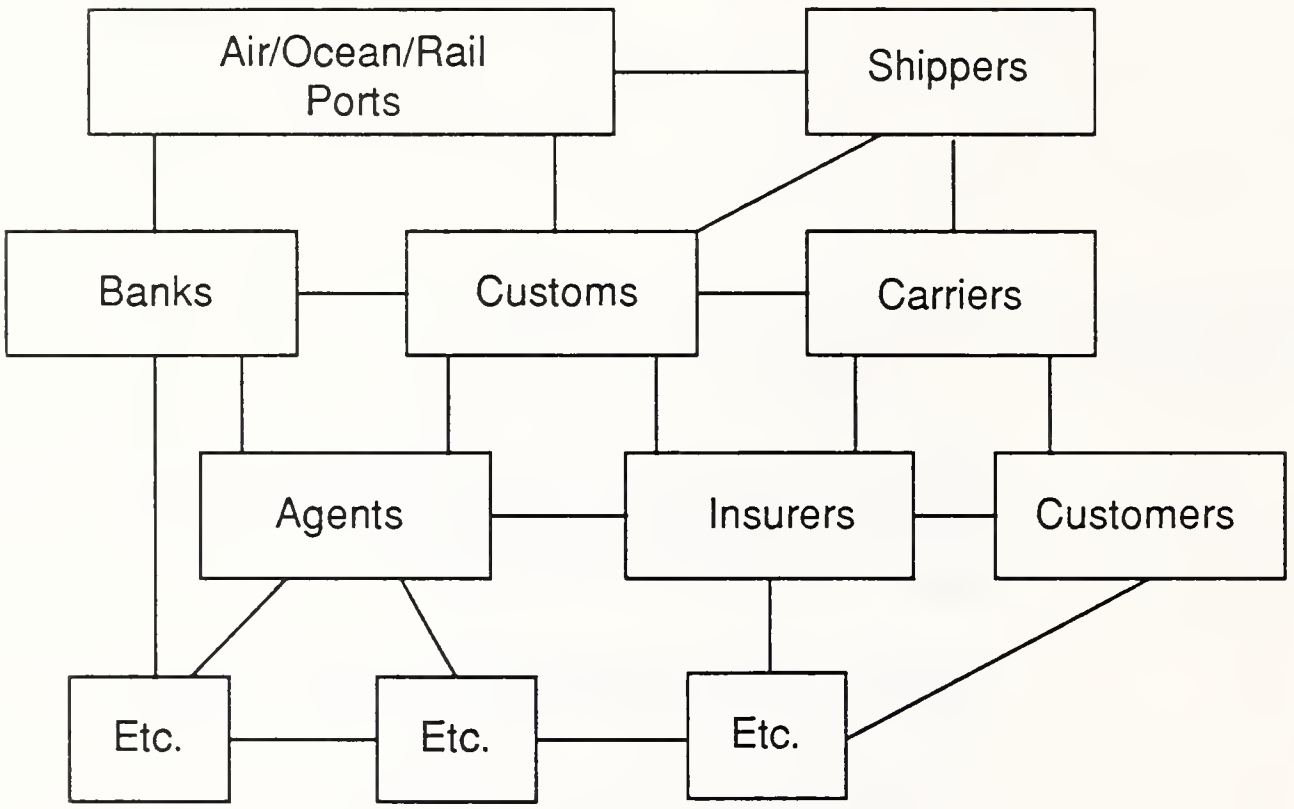
- The costs of international documentation to U.S. shippers has been estimated at $8 billion annually, and $40 billion annually worldwide, representing some 7 billion original trade documents, plus copies, each year.

- Estimates vary, but for a single shipment of goods, as many as 28 different organizations may be involved, with over 40 documents between them: bills of lading, letters of credit from banks to exporters, manifests, etc. The total cost in paperwork for each consignment is between $300 and $400.

- Errors are also a factor. Approximately half of all issued letters of credit contain clerical errors. Errors in other trade documentation can delay a shipment, adding storage costs and impacting the downstream manufacturing, distribution, and sales chains.

EXHIBIT VI-1

COMPLICATED TRADE INTERFACES



Complicated international trade procedures and policies are ripe for operational improvements to reduce costs while meeting the information needs of all concerned parties. Electronic distribution speeds document processing, an important factor in an age when a shipment may arrive prior to its paperwork due to high-speed transportation.

2. EDI Use Is Growing Internationally

INPUT believes that the use of EDI in international trade will continue to grow substantially. Implied in this statement is the use of EDI standards across borders and in the various functions that support international trade.

There are EDI activities underway in most parts of the world. As with the U.S., European countries (specifically Great Britain) are using EDI in support of domestic trade. In other areas, EDI is being implemented primarily for international trade.

3. Ports Worldwide Are Automating

Port automation systems incorporate automated cargo clearance systems that use electronically submitted data. Examples include the Port of New York and New Jersey ACES system, the Miami International Cargo System (MICS), the Port of Baltimore's ACROSS, and the Port of Antwerp's Systems Electronic and Adapted Data Interchange (SEAGHA). There are many others around the world.

The development of EDI in Hong Kong and Singapore is specifically for the support of the international trading communities within those territories.

4. Major Transportation Companies Use EDI

International carriers are implementing EDI to provide customers with shipping information that replaces paper correspondence and telephone customer service. American President Companies (Oakland, CA) is implementing EDI arrangements with its major customers, including a Japanese automaker, that allow the manufacturer to manage just-in-time auto assembly at its U.S. plants.

5. Government Agencies Are Getting into the Act

The U.S. Customs Agency has installed automated systems to facilitate cargo clearances and to handle other functions. The Customs Cooperation Council, an international body with representatives from several hundred countries, has gone on record as supporting the developing international standard EDIFACT (discussed below) for trade documentation.

The U.S. Department of Transportation has also endorsed EDIFACT, while saying that market forces will determine which standards are used. The European Commission (Common Market) has directed that EDI be based on international standards.

6. Banks Are Getting into the Act

Several banks, through their Export Trading Company subsidiaries, have introduced EDI services (such as Electronic Letters of Credit) to facilitate international trading. EDI/EFT services are also being applied in this area.

7. Services and Software Providers Are Involved

The major EDI third-party networks are now providing, or planning, international EDI services through a variety of agents, alliances, technol-

ogy licenses, and their own facilities. EDI software providers are building into their products the capability of supporting international EDI standards.

For an in-depth review of international EDI, the reader is referred to the INPUT reports *International EDI* and *EDI Intertrends—Western Europe*.

It is against this backdrop that standards designed primarily for international trade use have been introduced.

B

UN/EDIFACT

In January 1988, the United Nations formally chartered UN/EDIFACT to develop international EDI standards. Although discussions and organizational efforts began earlier, the EDIFACT Steering Committee and working groups became active at that time.

EDIFACT standards take the form of United Nations Standard Messages (UNSMs), which are analogous to transaction sets. The first UNSM, the International Invoice, was approved in 1988 and the second UNSM, Purchase Order, was introduced as a draft.

- EDIFACT traces its roots to an initiative by the United Nations' Economic Commission for Europe (UN/ECE) to merge the Europe-developed Guidelines for Trade Documentation Interchange (UN/ECE GTDI) and ANSI X12. Early writings on EDIFACT in fact refer to it as ECE/EDIFACT.

- The acronym EDIFACT was subsequently coined in 1986 by the UN/ECE, and Rapporteurs for North America, Western Europe, and Eastern Europe were appointed in 1987.

- Because the United Nations and its constituent bodies such as EDIFACT are treaty organizations, the United States is formally represented by the U.S. Department of Transportation (DoT), which has stated that "ANSI X12 will contribute to the development and maintenance of UN/EDIFACT standards for the United States." DoT also stated its "support for continued development and maintenance of ANSI-X12 standards."

- ANSI X12 contains the North American EDIFACT board (NAEB) and supports the North American Rapporteur, the person responsible for coordinating technical EDIFACT standards development and maintenance in North America. The Rapporteur works with technical experts here and in other countries.

C

Migration of X12 to EDIFACT

The X12 organization is inherently domestic in its focus and constitution, while EDIFACT is inherently international in its outlook. This means that EDIFACT will focus on messages used in international trade.

EDIFACT was intended to replace discrete European and North American standards; however, there is clearly work to be done.

- Although there has been discussion of a migration from ANSI X12 to EDIFACT, INPUT believes it may take up to a decade for the development of a single set of standards.

- INPUT believes that both sets of standards will develop in parallel during the interim. Companies and industry groups will choose between them based on their business needs, the requirements of their trading partners, the basic nature of their commerce, and the availability of suitable transaction sets.

D

EDIFACT Compared to ANSI X12

Although it is intended to be a convergence of X12 and a European EDI standard, the EDIFACT syntax, or technical grammatical rules, is completely different from ANSI X12.

EDIFACT starts with different data element glossaries (the basic definition of the data contained in the transaction sets). It uses compound data elements while ANSI X12 allows only one item of information in a data element. There are also different communications envelopes employed by the two standards.

ANSI X12 prepared an analysis itemizing the differences between the ANSI X12 message format and EDIFACT. The document offered thirty specific syntax-design changes (17 for ANSI X12 and 13 for EDIFACT) that would allow the two to converge. Below is a brief synopsis of the differences between the two standards.

- Character Sets: ANSI allows more types of characters than does EDIFACT. Of particular note is the absence of international currency signs in EDIFACT—including the dollar ($) sign, which ANSI allows.

- Control Characters: Control characters delimit portions of the message and identify, for example, when a segment or data field begins and ends.

  - ANSI has three control characters; EDIFACT has five, with a potential for six.

  - One of EDIFACT's control characters specifies decimal fields, which are useful in cross-border EDI where currency values are used.

EDIFACT also assumes default values for its control characters, which ANSI does not.

- Data Elements: ANSI defines six kinds of data elements; EDIFACT defines three.
  - ANSI's data elements are: real decimal, implied decimal, string, date, time, and identifier.
  - EDIFACT's data elements are: alphabetic, numeric, and alphanumeric. EDIFACT allows element values to be simple or composite. The composite is a group of distinct but related values in a single element.
  - Both syntaxes have fixed- and variable-length data elements.
- Segments: X12 segments are delimited by a 2- or 3-digit label at the beginning and a single control character at the end of the segment, whereas EDIFACT uses a composite data element that identifies the segment and may state the number of repeating data elements in it.
  - EDIFACT's segment is terminated by a single control character.
  - EDIFACT's syntax has no counterpart to X12's "conditional" data element —a data element whose existence depends on the value or existence of another data element.
  - The number of data elements allowed to appear in each standard's syntax is fixed by the segment's definition, but may vary in use.
- Transaction sets/Messages: The difference between the two syntaxes in the overall design of transaction sets is small.
  - Both syntaxes require the user to place segments in a predefined sequential structure.
  - Transaction sets in both standards are composed of a message header, a trailer, and one or more data segments. The major difference is that X12 requires a beginning segment in addition to the header, trailer, and data segments.
- Functional Groups: The X12 syntax is more precise than EDIFACT in this area.
  - X12 requires transaction sets of similar functions (e.g., purchase orders, shipping notices, etc.) to be grouped into functional groups. An X12 functional group is designated by a header and a trailer.

- Although EDIFACT stipulates a functional group (also designated by a header and a trailer), it does not require its use. Furthermore, the EDIFACT documentation does not specifically define "similar functioning transaction sets."

- Control Segments: The two structures for interchange control are syntactically dissimilar although both convey the same basic semantic content.

The ANSI X12 analysis made some specific technical recommendations on how each standard can be changed to ease convergence. Although the technical changes may be easily made, the political and emotional aspects of convergence present a more difficult challenge.

E

The EDIFACT Debate

Note: INPUT is conducting new research on EDIFACT for a special study commissioned by TDCC/The EDI Association. The findings are scheduled for release in late 1989. The examination below will serve as a preliminary analysis of the relationship between two major EDI standards.

Within North America there have been heated discussions regarding the relative merits of ANSI X12 and EDIFACT. These discussions go beyond the technical similarities and differences to the political and cultural. Two conflicting predictions are made by those engaged in the discussion:

- One view states "ANSI X12 now; EDIFACT in five years," implying that it will take that long for EDIFACT to develop a sufficient number of transaction sets or UNSMs to be useful for most users.

- The other view is more vocal: "X12 now, EDIFACT never!"

There have been equally vocal concerns heard in Europe, where users have adopted Tradecoms and ODETTE standards (discussed below).

F

Pros and Cons of EDIFACT

ANSI X12 has built upon previously existing standards (e.g., TDCC) and has a range of readily available transaction sets. Its procedures have been fine-tuned to be considerate of, and to take into account, industry needs. EDIFACT development and maintenance procedures differ from those used by ANSI, and this difference is causing confusion among users.

EDIFACT is very rich and adds more overhead to individual messages than ANSI X12 requires. However, companies testing EDIFACT (typically multinationals) say that the syntax and messages support complicated international trade procedures better than do previously existing standards.

Some critics have argued that EDIFACT development is going too slowly; observers note, however, that the syntax received the fastest ISO approval of any submitted standard, and that within the context of international standards development, things are going rather rapidly.

Others have argued that EDIFACT development is going much too fast, and that their interests are not being represented. Supporters maintain that development is proceeding at its natural pace, and that timing may be important (in part due to the anticipated 1992 creation of a unified European state), but users' interests have been solicited and input is being provided through the appropriate channels. If users feel their interests are not represented, the fault is their own—they were asked for suggestions.

Some European supporters of EDIFACT have stated that Europeans are tired of seeing the U.S. rule the standards world. U.S. critics say that the Europeans are being uncooperative and vain in their attempts to push a European-derived standard on the rest of the world.

Supporters of ANSI X12 maintain that those promoting EDIFACT are attempting to re-invent the wheel, and that X12 can serve international needs admirably. ANSI X12 supporters point to the adoption of X12 by several nations (Australia, Korea, and others) as proof. Others believe that having two standards (ANSI 12 and EDIFACT, or Tradacoms and EDIFACT) is better than having ten standards. They note that transportation-related interests (ports, carriers) are seeking to base their EDI implementations on EDIFACT, which is seen as truly international.

EDIFACT is viewed as advantageous to companies involved in international business; the proof is the adoption and participation in pilot testing by Dutch-based Phillips, U.K.-based Imperial Chemical Industries (ICI), and multinational Texas Instruments. EDIFACT's push, say the critics, is intended to put North American businesses at a disadvantage in the competitive international trade arena.

Critics say that EDIFACT is not a "true" international standard, since only Europe and North America are represented; conspicuously absent from the deliberations are participants from the Pacific Rim, specifically the Far East. However, Pacific Rim observers have attended meetings, and EDIFACT missions have been sent to the Far East to "spread the gospel" and recruit participation. Unique cultural considerations have prevented the naming of a regional Rapporteur; rather, representatives of individual countries will be invited to participate.

Further confusing the picture is the fact that some European users have jumped the gun by creating new, but not formally adopted, messages based on the EDIFACT syntax. These messages are termed EDIFACT-compliant.

Whereas some cynics think that the discussion, heated and otherwise, is only to make good press, INPUT's research has found users very confused about their investment in *any* EDI standard. Although users may fear that an investment in either standard may be wasted if the other wins the debate, the true risk is immobilization—doing nothing and thereby forgoing the benefits EDI can offer.

The pros and cons of EDIFACT are summarized in Exhibit VI-2, with each set of issues categorized.

EXHIBIT VI-2

EDIFACT PROS AND CONS

ANSI View	EDIFACT View	Type of Issue
Built on previous work	Different procedures cause confusion	Technical
Many available transactions	Supports international trade better	Business
EDIFACT is "going too slow"	Received fast ISO approval	Political
"EDIFACT is going too fast"	User interest has been solicited	Functional
Europeans are being vain	U.S. has ruled the standards world too long	Emotional
EDIFACT "reinvents the wheel"	EDIFACT is truly international	Political
EDIFACT intends to put North American trade at a disadvantage	Not true	Economic
EDIFACT is missing Far East input—it is not international	Far East participation is actively being pursued	Political

The true risk to users is doing nothing!

INPUT's upcoming special study on EDIFACT will further examine these and other issues and concerns and suggest a course of action for users and standards-making bodies.

G

Other International EDI Standards

As indicated, European users have developed EDI standards for domestic and international trade. Some of these standards are industry- and country-specific (such as VDA used by the West German auto industry). At this date, a few European standards stand out.

1. TRADACOMS

TRADACOMS is a domestic United Kingdom EDI standard developed by its Article Number Association. The ANA has responsibilities similar to those of the American Uniform Code Council. TRADACOMS has been in use since 1982 and will have over 2000 users by the end of 1989. There are no plans to merge this standard into EDIFACT.

2. TDI (Trade Data Interchange)

TDI is a European standard for international shipping. Its formal name is UN/ECE Guidelines for Trade Data Interchange (UN/ECE GTDI) and is sometimes referred to as UN/TDI. It is one of the direct roots of EDIFACT.

3. ODETTE (Organization for Data Exchange Through Telecommunications in Europe)

ODETTE is a Pan-European EDI standard used by European automotive manufacturers.

4. TEDIS (Trade Electronic Data Interchange Systems)

TEDIS is program of the Council of the European Communities (CEC), which started in 1987. TEDIS is primarily used in the travel industry.

5. Japan Chainstore Association

Although the concept of EDI is now developing in Japan, EDI and EDI-like functions are being accomplished using company-specific or industry-specific standards. An example of the latter is the Japan Chainstore Association format (JCA).

H

Summation of International EDI Standards

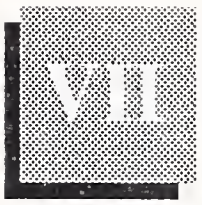
The availability of domestic North American and Pan-European standards, coupled with the controversy over EDIFACT, means that despite high levels of interest by government agencies involved in international trade, and despite the support of multinational corporations that are

testing EDIFACT transactions because of their unique business needs, EDIFACT will likely remain a standard used exclusively for international trade. However, there are exceptions—it has been reported that users in the nascent Italian EDI market are adopting EDIFACT for domestic trade use.

It is worth noting that countries now adopting EDI, particularly those in the Pacific Basin, have generally implemented X12 and TDCC formats because they offer a full set of
most-needed transactions, and because there are currently few approved EDIFACT messages.

However, although embracing existing formats, users in these areas (such as Australia, New Zealand, Korea, and Hong Kong) have signaled their intentions to adopt EDIFACT when it is available for their needs.

The next chapter examines non-EDI standards that will likely play a part in future EDI systems and services.



Related Standards Development

Although EDI standards deal with business transactions such as purchase orders and invoices, standards are necessary in other areas such as computerized graphics and general electronic messaging. Developments in these application areas will likely have an impact on EDI, as this chapter illustrates.

Readers are also referred to the INPUT reports *Advanced EDI Systems and Services* and *EDI and X.400* for more detail on most of these areas.

A

Graphics Interchanges

The merger of images—such as computer-assisted design and manufacturing (CAD/CAM) files—with EDI will support design, specification, and blueprint exchanges between trading partners.

Graphics capabilities in association with EDI will be increasingly relevant in several industries such as apparel, aerospace, federal government (specifically defense), specialty manufacturing, and electronics.

To date, only one third-party network has productized graphics exchange capabilities in an EDI context—GE Information Services (Design*Express). EDI software vendor Supply-Tech (Southfield, MI) has approached the movement of graphics and non-EDI data in a software solution that wraps an EDI envelope around the included data.

Two graphics standards take primary importance in graphics interchange, at least in North America. European graphics standards of interest are described in INPUT's *Advanced EDI Systems and Services* report.

1. Initial Graphic Exchange Standard (IGES)

IGES is a standard supported by the Automotive Industry Action Group (AIAG), among others, for the exchange of computer-aided design

(CAD) data between systems. Some limitations exist, especially regarding inconsistent vendor interpretations, large file sizes, and restriction to graphic-only data. INPUT believes that IGES will be supplanted over time by PDES (see below).

2. Product Data Exchange Specification (PDES)

PDES is an emerging standard supporting both geometric and nongeometric data such as tolerances, manufacturing features, material properties, surface finish, etc. The standard is being developed by the National Bureau of Standards (NBS, now the National Institutes of Standards and Technology or NIST) and the International Standards Organization (ISO). It is expected to be available in 1990.

PDES, Inc., consisting primarily of government contractors, is chartered to refine PDES and to make products available.

B

Messaging (X.400/ X.500) Standards

The Consultative Committee for International Telegraph and Telephone (CCITT) is an arm of the International Telecommunications Union, a treaty organization under the United Nations. Membership is open to national agencies (the PTTs) and Recognized Private Operating Agencies (RPOAs), such as AT&T, Western Union, etc.

In 1984, the CCITT approved the X.400 series of recommendations for message handling systems. These recommendations were updated in 1988 and the X.500 series for directory systems was approved at the same time.

CCITT Recommendations X.400 (message-handling systems) and X.500 (directory systems), are designed for Layers 4 (transport), 5 (session), 6 (presentation), and 7 (application) of the Open Systems Interconnection (OSI) model of the International Standards Organization (ISO). They define the standardized service elements and interface protocols required to develop and operate interconnected electronic mail systems and services. They can offer a very high level of functionality.

1. Benefits of X.400

From a business viewpoint, X.400's five main benefits are:

- Ability to serve as a highly reliable gateway so that messaging systems from different vendors can exchange information in a standardized environment

- Ability to allow companies to communicate with customers and suppliers without forcing everyone to use the same messaging system, and without compromising internal security

- Ability to allow companies to develop a private network that links computers from multiple vendors

- Ability to allow companies to plan and implement messaging systems on a decentralized basis across different networks without compromising compatibility

- Ability to evolve into a single network architecture for a wide variety of noninteractive business applications, including personal messaging, document distribution, funds transfer, data base information transfer, financial planning across multiple locations, and Electronic Data Interchange (EDI).

2. X.400's Benefit to EDI

X.400's most important benefit, relative to EDI, is its architecture, which allows multiple applications to operate over a single network in much the same way that a paper-based postal system handles a wide variety of different mail types.

- X.400 is an ideal means of not only carrying X.400 documents, but also doing so in a manner that will lead to integrated information exchange networks.
- Such networks are an attractive concept to virtually every business and governmental organization in North America.

The currently available communications protocols for the lower layers are CCITT X.25 for packet-switched networks, and CCITT X.21 for circuit-switched networks. INPUT believes that as Integrated Services Digital Networks (ISDN) become more broadly available, they will replace these communications protocols as the underlying layers of the OSI model.

The X.400 series of recommendations is mainly concerned with the envelopes of the transmitted documents, contrasting with the various EDI standards that are mainly concerned with the content of the documents.

3. Basic Structure of X.400

X.400 has two major subsystems: the Message Transfer Agent (MTA) and the User Agent (UA).

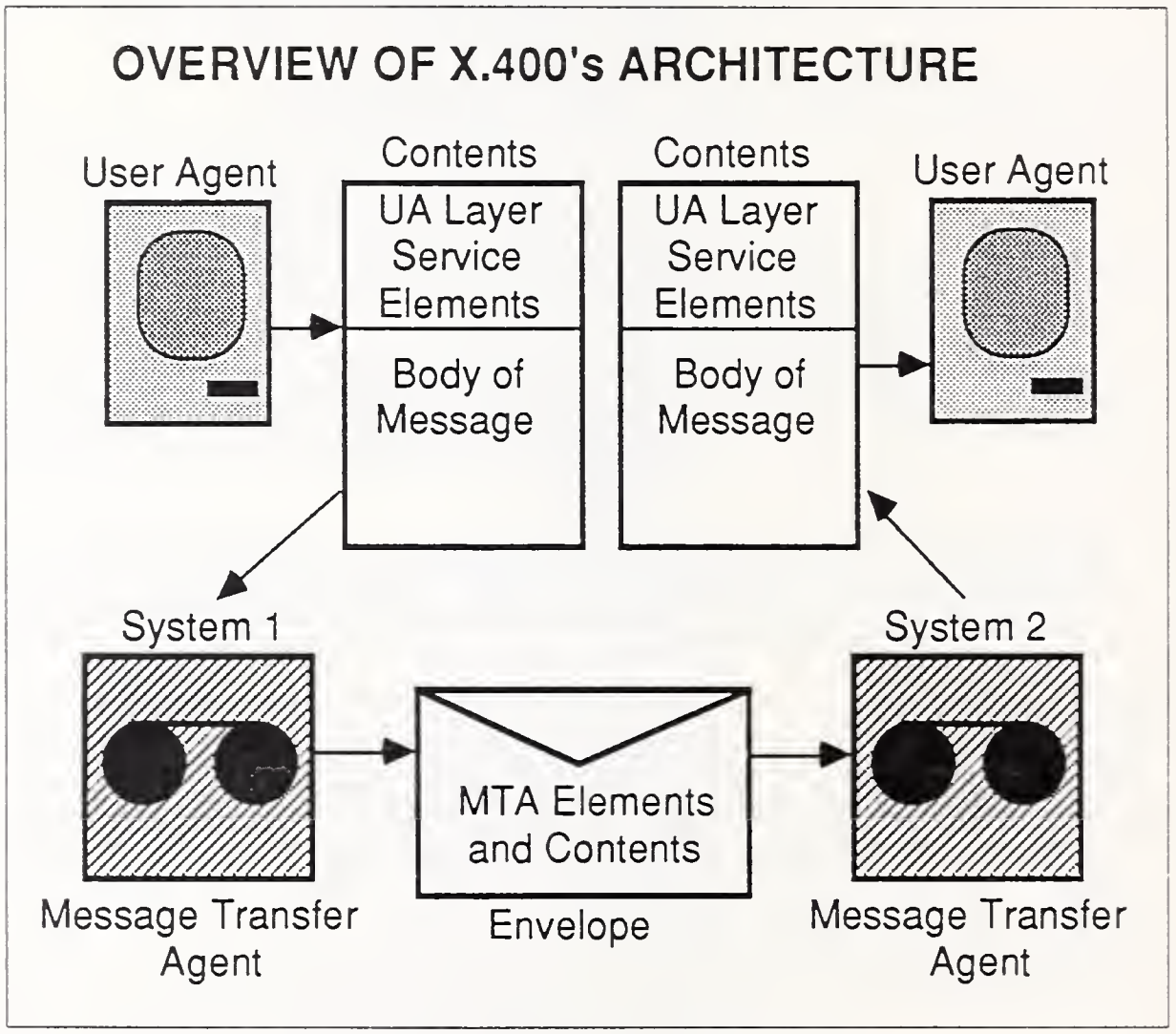
- The Message Transfer Agent handles the delivery of messages to other Message Transfer Agents or to User Agents within the original MTA's own sphere of influence.

- The User Agent represents the users, accepts messages on users' behalf, keeps track of the mailboxes, presents messages to users, and allows messages to be created.

The Message Transfer Agent and the User Agent constructs are separated in OSI's 7th layer, with the User Agent layer operating above the Message Transfer Agent layer. In this way, the multiple User Agent layers can be developed to work with a single Message Transfer Agent layer, which is critical for the development of a User Agent designed for EDI.

Exhibit VII-1 shows an overview of X.400's architecture.

EXHIBIT VII-1



4. Message Structure in X.400

An X.400 message has three parts: Message Transfer Agent service elements, User Agent service elements, and the body of the message.

- The User Agent service elements and the body constitute the contents of the message, whereas the Message Transfer Agent service elements constitute the envelope.

- Service elements control how the information is handled by both the Message Transfer Agent and User Agent.

- The Message Transfer Agent service elements control the transfer of messages independently from their contents.

- The User Agent service elements contain the actual header of the message, which specifies the sender, recipient(s), subject, and other options associated with creating and presenting a message. The User Agent service elements created for interpersonal messaging, for example, contain the to, from, carbon copy, and subject fields of the message, along with delivery instructions—such as the message's urgency, time of transmission, and importance.

- The body of the message contains the information being communicated. X.400 can handle ASCII information, or voice, graphic, video, or other formatted data streams. It even has the ability to handle multiple body parts within the same message.

5. X.400's Exchange Protocols

The 1984 version of X.400 has three protocols associated with transmitting messages between different message-handling systems: P1, P2, and P3. The three protocols are structured methods that allow the body of the message and the service elements associated with the Message Transfer Agent and User Agent to be exchanged between different systems.

- P1 describes how two Message Transfer Agents exchange information.

- P2 describes how two User Agents exchange information.

- P3 describes how a remote User Agent exchanges information with a Message Transfer Agent.

In the 1988 version, a fourth protocol, called P7, was created. P7 describes how a remote User Agent exchanges messages with a message store designed to temporarily hold messages.

- The message store and P7 were developed when it was determined that P3 did not have enough features to support remote personal computers signing on to mail systems with a peer-to-peer protocol.

- As a result, P3 will fade into obscurity and P7 will become the method by which personal computers and local-area networks dial into Message Transfer Agents to exchange messages in a peer-to-peer fashion.

More details about X.400 can be found in the INPUT report, *EDI and X.400*.

6. X.400 and EDI

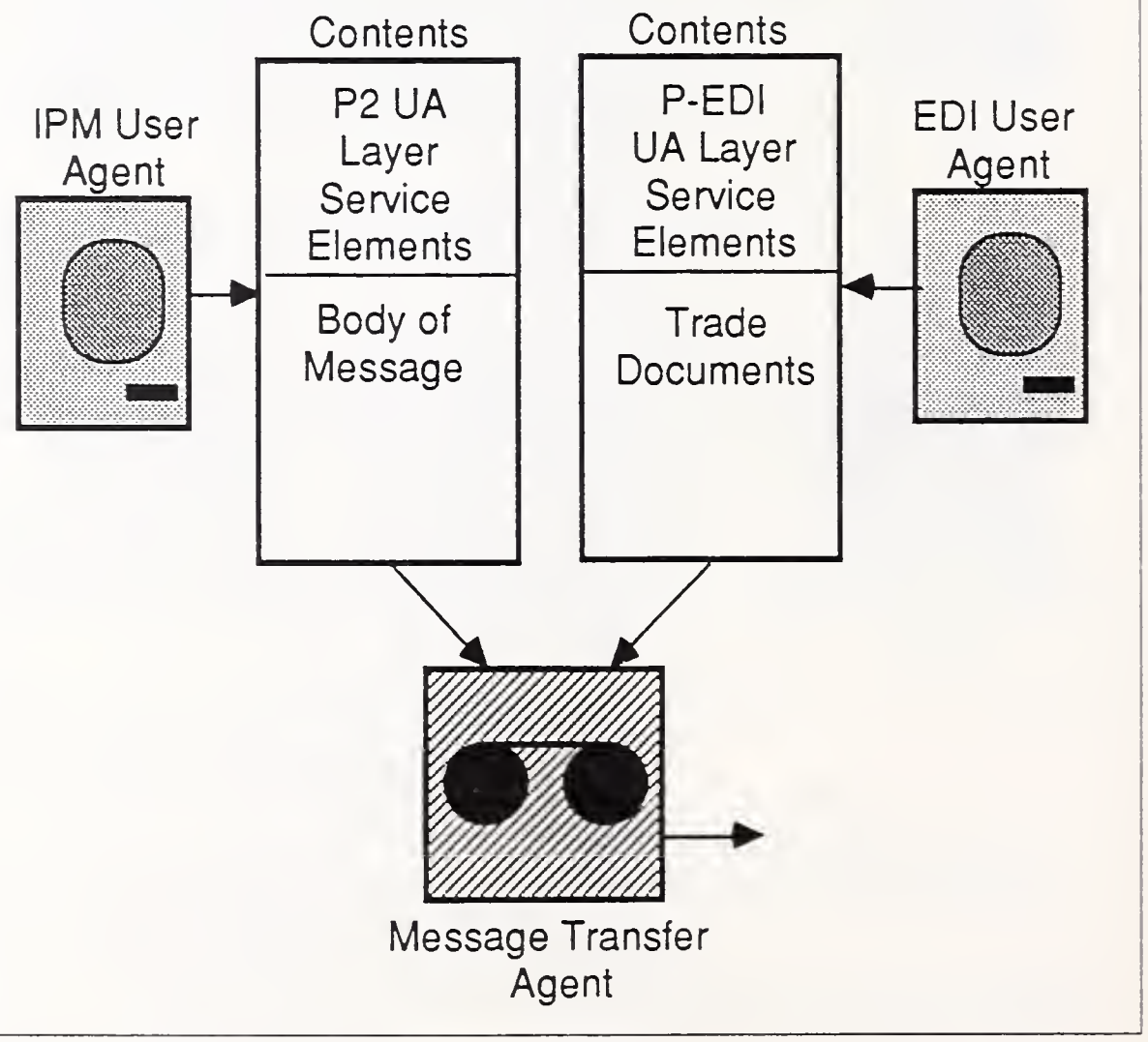
Currently, CCITT work is underway to define the protocol for an "EDI body-type," informally referred to as P_{EDI}. Approval is possible as early as 1990, under the CCITT's accelerated approval procedures.

- Interfusion of X.400 and EDI will follow this path, with EDI documents being defined as one or more body types within an X.400 envelope. This integration is shown in Exhibit VII-2.

- From this perspective, the current ANSI X12 work on extended Communications envelopes (ISB, ISC, etc.) can be viewed as a necessary interim measure to develop for today's needs the necessary functionality that will come directly with the X.400 extensions for EDI described above.

EXHIBIT VII-2

EDI AND X.400 INTEGRATION



The X.500 series of recommendations defines the standardized service elements and interface protocols required to develop and operate interconnected electronic directory systems and services, offering a very high level of functionality.

- The directories will contain routing information in addition to the addressee's electronic mail address.

- This information will be used for navigational purposes by networks of interconnected message-handling systems to ensure that a document is correctly routed to the addressee's message-handling system.

- The addressee can be a host computer or a specific computer application system.

C

Bar codes

The relationship between bar codes and EDI is fundamental. Bar code technology is being increasingly used to implement advanced inventory control systems by providing an electronic means to tie the physical product to its description in an EDI document. Some examples follow:

1. Grocery Industry

It is no accident that the same organization (the Uniform Code Council) developed both the Uniform Product Code (UPC) and the Uniform Communications Standard (UCS). This is how these technologies merge:

- The checkout scanner records item sales from the package's bar code. The system automatically updates the store inventory. When stock on hand gets below a predetermined threshold, a UCS Purchase Order is generated.

- The Purchase Order is electronically sent to the wholesaler, whose computer generates the appropriate "pick" list to fill the order; and

- The order is shipped to the store, where the receiving dock scans the case bar code and updates the inventory on hand.

2. Printing Industry

This industry had a need to improve inventory and quality control. This is accomplished in the following manner:

- The Electronic Manifest is received in advance of the goods. This manifest contains a complete description of the paper to be received and its bar code labelling.

- When the paper is received, its attached bar code label is scanned and the manifest information, already stored from its electronic receipt, is updated to show physical receipt. At this point, the electronic description is tied to the physical paper roll. Its use will be tracked, keeping inventory records accurate, and its quality can be evaluated for future purchase decisions.

3. Textile Industry

FASLINC has defined bar code standards as part of its QR (Quality/ Quick Response) program to improve the speed with which suppliers can respond to fabric producers' demands. By marking packages with human and machine-readable product number labels, producers will link product consumption to electronic reordering.

D

Computer-aided Acquisition and Logistic Support (CALS)

This emerging set of standards represents a full-scale effort by the U.S. Department of Defense to set standards for the submission and interchange, in digital form, of documents from defense contractors.

- These documents range from product manuals and engineering drawing information to manufacturing information.
- To do this, standards are being developed for protocols, data bases, texts, documents, illustration, and imagery.
- These standards function at Layers 6 (presentation) and 7 (application) of the ISO's OSI model.
- CALS implementation has been specified for all weapons systems that began development after September, 1988. An industry organization, the Digital Information Interchange Task Group, is participating in CALS developments.

CALS has two phases:

- Phase I focuses on data interchange. It incorporates Standard Generalized Markup Language (SGML), IGES, Standard Page Description Language (SPDL), EDI (ANSI X12), and other currently existing standards.
- Phase II will focus on an SQL integrated data base environment as well as true data communications (initially, CALS will be supported by magnetic tape).

For a broader view of the federal government's EDI activities, see the INPUT report *Federal Government EDI Initiatives*.

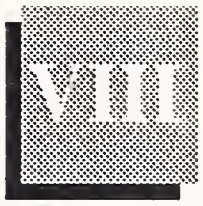
Exhibit VII-3 examines these standards areas and their implications for EDI.

The next chapter looks at the future of EDI standards, identifies market needs, and concludes this report.

EXHIBIT VII-3

RELATED STANDARDS AND EDI

Standards Area	Implications for EDI
Graphics	CAD/CAM files can be interchanged with EDI transactions
X.400/X.500 E-Mail	Enveloping EDI data, provides navigation for internetworking
Bar Codes	Bar code data becomes EDI data
CALS	Digitizes data, text, image, etc. for interchange



The Future of EDI Standards/Recommendations

A Standards Interfusion

This report has already stated that WINS will merge into UCS, and efforts are underway to merge the TDCC/EDIA and X12/DISA organizations, or, at the least, to redefine the roles of the two organizations. ANSI X12, through DISA, will take the lead in standards-setting and maintenance, whereas the EDIA will focus on education and public awareness.

As noted earlier, a transitional subcommittee has been established by X12 to bring several older standards into the X12 family of standards.

INPUT believes that future EDI standards interfusion will take the following path:

1. Proprietary

No new proprietary standard systems are being developed, and the existing proprietary users are implementing ANSI X12 for any enhancements to their systems and for new trading partners. For all intents and purposes, interfusion has occurred through migration from proprietary to public standards.

2. Insurance

The insurance industry does not just communicate with its agents exclusively; it communicates with its suppliers, shippers, bankers, etc., as do other business sectors. INPUT believes that interfusion between the IIR/ACORD standards and ANSI X12 will occur within the next two years, after the necessary coordination mechanisms have been put in place. This interfusion will occur in the mortgage banking areas first, for applications such as title insurance applications.

3. Banking

The banking industry has begun to integrate its EDI (NACHA and other) standards with its customers' EDI (ANSI X12) standards. For areas of banking that involve communications with (or on behalf of) customers, the relevant standards will interfuse over the next two years.

4. EDIA/TDCC and ANSI X12

INPUT believes that in a relatively short time, two U.S. sets of standards will emerge—one for general business (combining ANSI X12 and TDCC) and one for the grocery industry (combining UCS and WINS). This consolidation is being driven by the increasing burden of coordination between overlapping sets of standards.

5. UCS and X12

The Uniform Code Council, developer and maintainer of UCS and now WINS, is also the secretariat for VICS, a set of formats used for linking apparel manufacturers to retailers using ANSI X12. VICS may be the camel's nose under the tent that will lead to complete interfusion of UCS and X12. For this reason, and because food manufacturers have to implement both UCS and X12, INPUT predicts that interfusion will occur in two to five years.

6. X.400 and EDIFACT

The final interfusion will be to a single worldwide standard incorporating ANSI X12, EDIFACT, and CCITT X.400 in a unified family of protocols, standards, and networks.

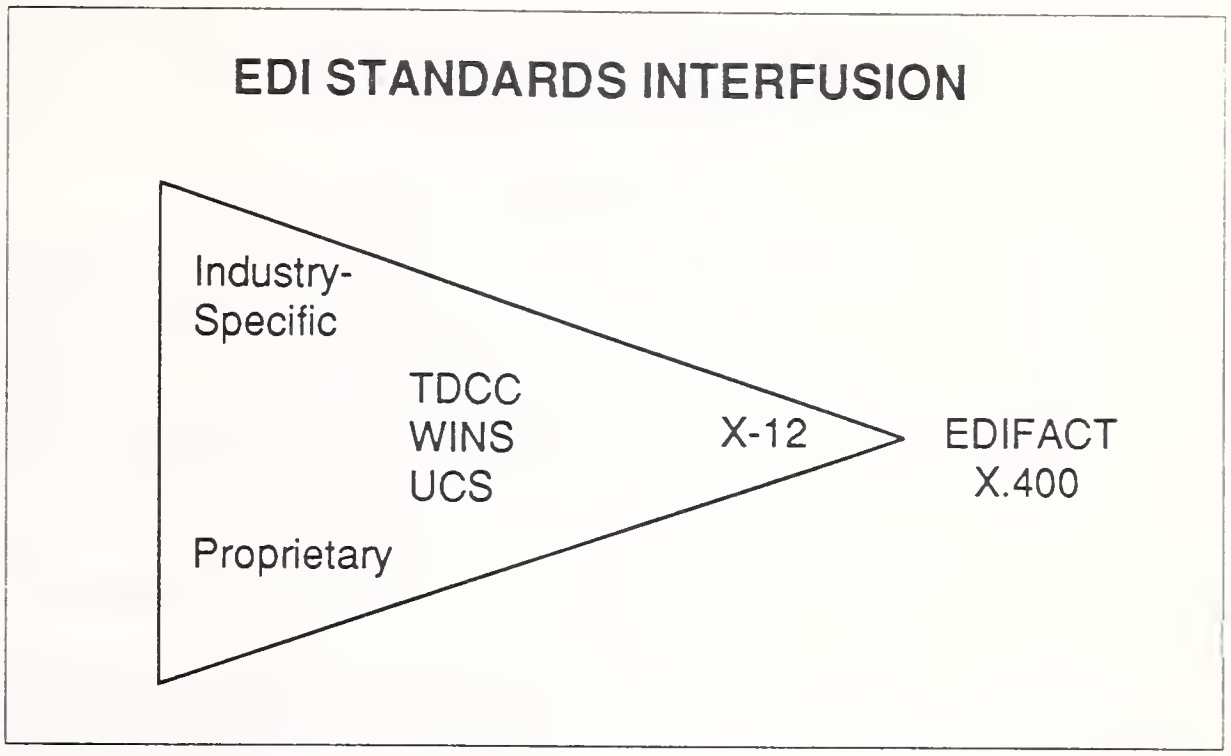
- This final interfusion will begin in Europe, accelerated by the integration of the European community scheduled to occur at the end of 1992, and spread to the remainder of the world over the next decade.

- It will take this long because of the large set of existing standards that will need to be converted from X12 to EDIFACT, and from currently used European standards (such as Tradcoms and ODETTE) to EDIFACT.

One barrier, the CCITT's four-year cycle, will drop, with the CCITT expected to move to a perpetual approval cycle similar to that of the International Standards Organization.

These standards interfusion predictions are illustrated by Exhibit VIII-1.

EXHIBIT VIII-1



B

Communications Standards

To date, only one EDI standard (UCS) specifies the communications methods to be used in an interchange. Subcommittees of the ANSI X12 organization are evaluating the need for communications specifications; INPUT does not believe these specifications are needed.

Users are aware of the pilot projects involving Integrated Services Digital Network (ISDN) standards.

- ISDN is a series of CCITT recommendations for a single network providing users with digital (modemless) capabilities on the regular telecommunications network.
- ISDN provides for the integration and simultaneous transmission of voice, data, and video services. Voice is digitized in ISDN, as it is currently on T-1 networks, with multiplexing techniques applied to separate the channels.
- ISDN is expected to replace the current analog network in most major North American cities by the mid-1990s.
- By reducing the communications circuit (and modem) costs for EDI, ISDN will facilitate the proliferation of EDI to small and mid-sized market segments.

C

Opportunities in EDI Standards

1. Network Services Opportunities

Opportunities exist for established and new entrants to differentiate their services to the advantage of themselves and their customers, especially in conjunction with premise-based software (see the INPUT reports *North*

American EDI Service Market Analysis and *North American EDI Service Provider Profiles*).

a. Downloading Standards Tables

Today, software is commonly downloaded through public bulletin board services and corporate systems. E-mail services have file transfer capabilities. The technology now exists to download new or revised transaction sets, perhaps as a transaction set itself. INPUT sees this as a service that third parties and premise-based software developers can introduce to make life easier for themselves and their customers.

b. Downloading Configuration/Setup Tables

Current EDI translation software operates nearly automatically except in one area —the setup or modification of trading partner and communications-related information profiles. INPUT sees this shortcoming as offering two opportunities:

- For hub-and-spoke (manufacturer with suppliers, distributor with customers) EDI applications, premise software for the hub, working in conjunction with premise software at the spokes, can maintain and distribute tables for direct updating.
- For many-to-many EDI applications (as found in the grocery industry, for example), an enhanced network service, working in conjunction with premise software, can maintain and distribute these tables.

2. Premise-Based Software Opportunities

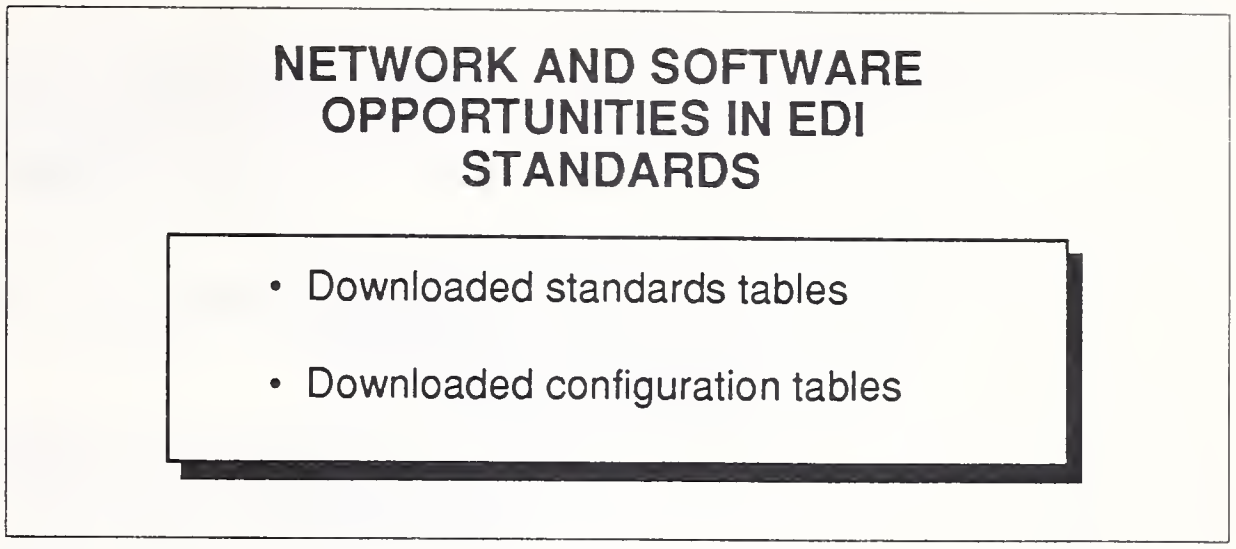
Generally, software has to continue to improve its price/performance and its ease of use and efficiency.

Fortunately, INPUT's research shows that 80% of the active EDI users surveyed reported that it was easy to upgrade their software to new versions of the standards.

Software vendors will need to provide updates to the standards on a cycle consistent with user needs.

These software and network service provider opportunities are summarized in Exhibit VIII-2.

EXHIBIT VIII-2



3. Professional Services Opportunities

Business has hardly begun to scratch the surface of EDI, especially in regard to the integration of EDI with the underlying business systems in use today. As the INPUT study *EDI and Professional Services* reports, professional services can succeed by focusing on three major areas that relate to EDI and other standards:

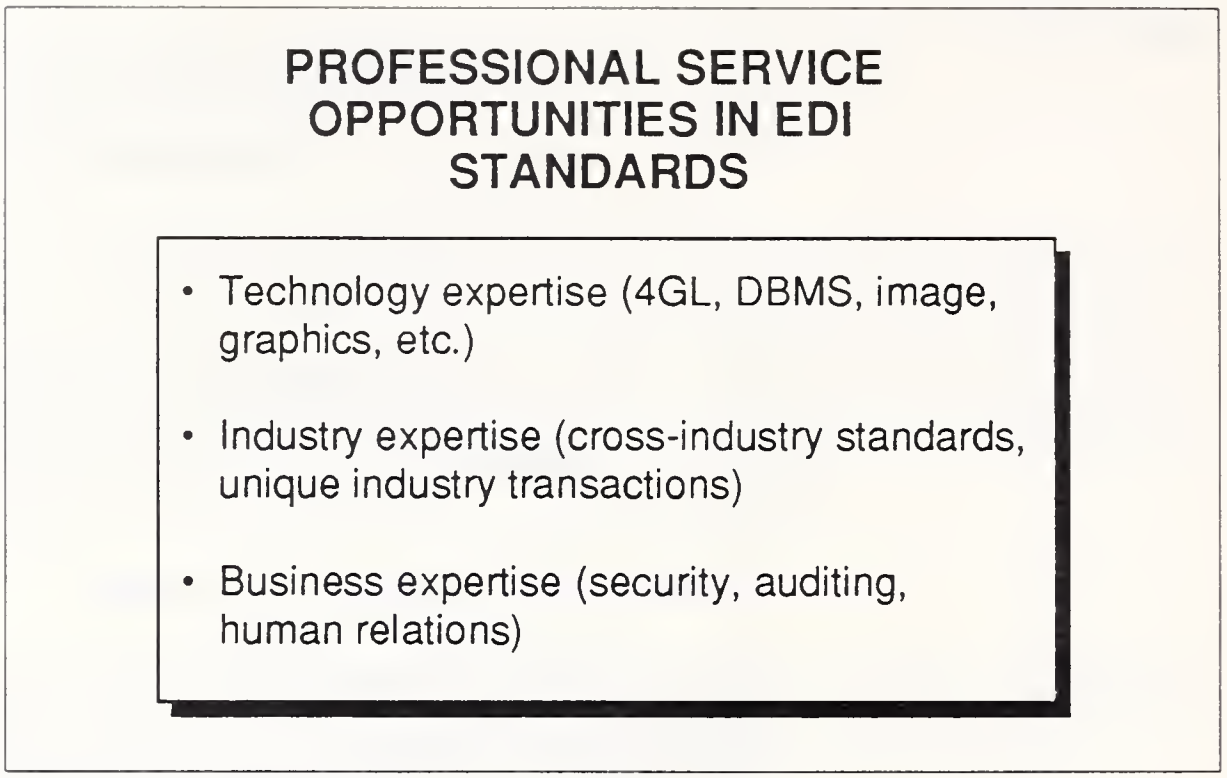
- Technology—New software products such as distributed relational data base management systems, 4GL, expert systems, and workstation systems; new computer products from IBM, DEC, Unisys, etc.; imaging and graphics systems, in general office systems as well as in manufacturing; full integration of EDI with enterprise systems; interactive EDI, or active cooperation between two systems involved in data interchange; and interpretation of the EDI standards.

- Industry and cross-industry implementations that determine what standards can be used in complex business environments—Cross-industry, several opportunities exist: integrated insurance and ANSI X12, for shipping insurance and for mortgage banking; international trade (see the INPUT report *International EDI*); construction; state and local government and education; and customer service. These areas are in need of technical assistance in adapting existing generic standards to specific needs.

- Related business opportunities—Several areas of traditional professional services practices are extended when EDI is incorporated, and they often have implications for PS firms that understand the related standards issues. Among these are: system security expertise for physical and financial security of EDI data (especially important with the recent computer virus and Trojan horse experiences); EDI auditing, where the paper trail now becomes electronic; and human relations/personnel counseling that addresses the changing roles brought on by automation (purchasing agents become buyers).

Professional service opportunities are summarized in Exhibit VIII-3.

EXHIBIT VIII-3



4. Standards Organization Opportunities

The various associations that deal with individual industries, and those that deal with a cross-industry discipline such as EDI, have several opportunities to assist users in the realm of EDI standards.

- Education and Training—This is perhaps the most obvious opportunity area, one that most organizations have approached.

- General Business Awareness—The biggest obstacle to adoption of EDI is not confusion over EDI standards, but a lack of understanding and appreciation of the technique itself. INPUT has been recommending that a public awareness and education campaign positioning EDI in terms of global competitiveness and productivity be launched cooperatively by industry.

- Political Cooperation—Standards associations can work to overcome their political "turf" battles and independent cultures to coordinate their standards development efforts. This can perhaps be accomplished through existing EDI standards organizations or, if necessary, through a neutral "super organization" that addresses the general business requirements of the standards, while leaving industry-specific organizations to work within the established structures to address unique needs.

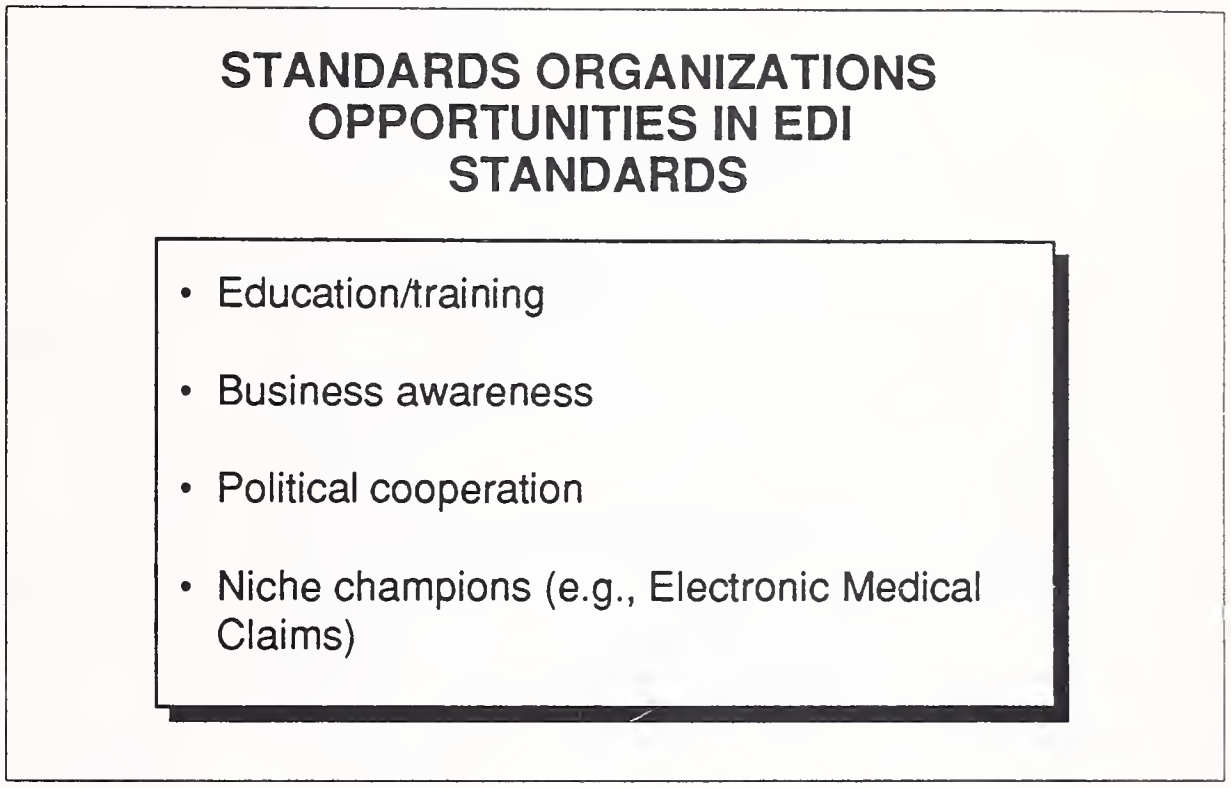
The ANSI 12 organization has started work to deal with this dynamic by establishing a transitional subcommittee to bring now-unique formats into the dominant X12 environment.

- Develop niche champions—INPUT is specifically referring to the apparent lack of a strong industry association working to resolve the

issues related to electronic medical claims. Other industries would also gain through more-energetic advocacy by their associations.

These recommendations are summarized in Exhibit VIII-4.

EXHIBIT VIII-4



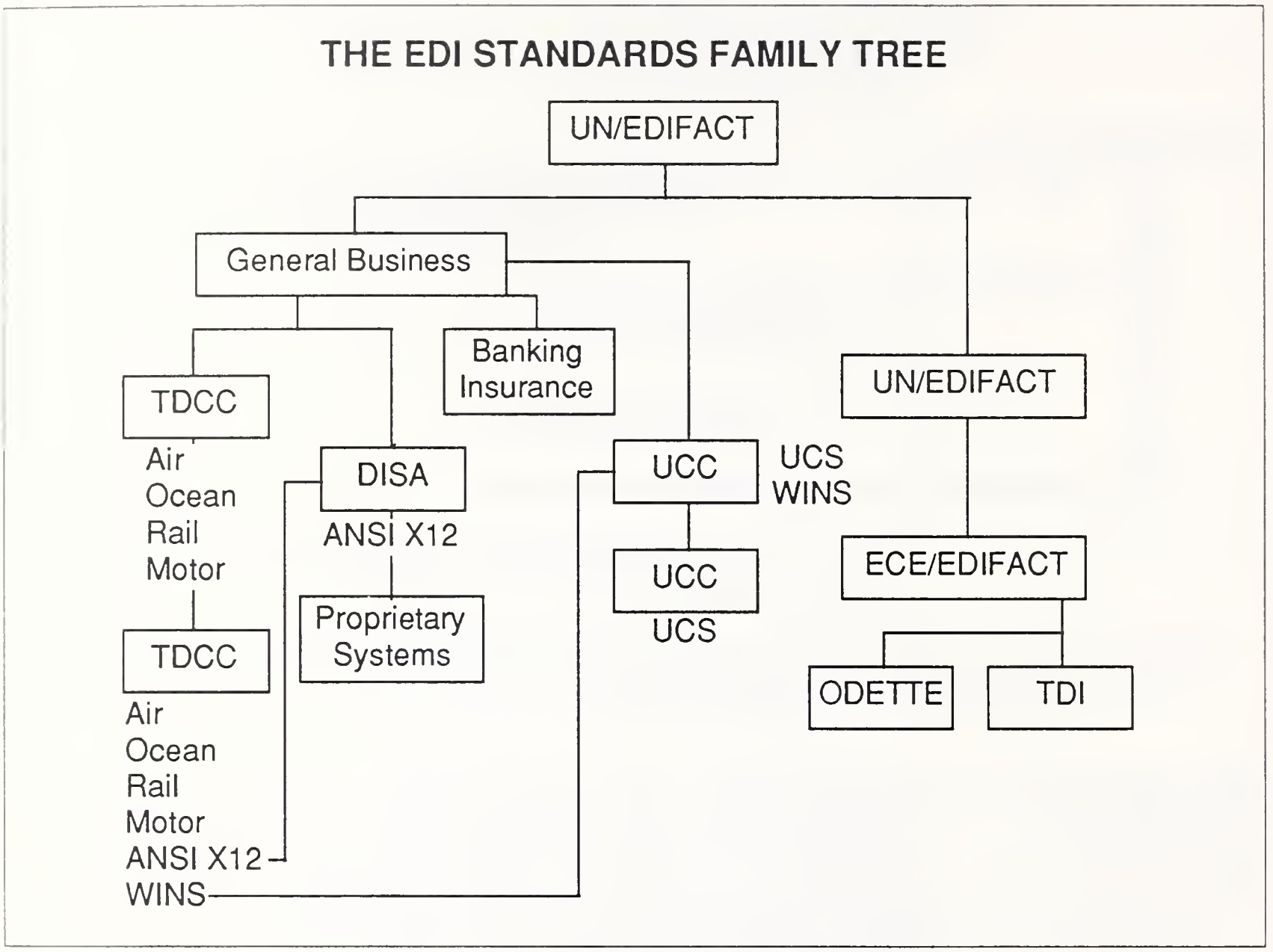
C

Prescription for a Confusing Picture

To the EDI novice and user, confusion seems to be a natural state. This state is brought about by the sea of acronyms (PIDX, CIDX, EIDX, EDX, etc.), the overlap between organizations (apparel manufacturers have an interest in four implementation guidelines—TAMCS, FASLINC, SAF-LINC, and VICS), and parallel names for the same group of standards (ANSI X12, ASC X12, and DISA).

Exhibit VIII-5 shows the relationships among EDI standards.

EXHIBIT VIII-5



This confusion can be cleared up by some simple actions on the part of the EDI novice:

- Read and re-read this *EDI Standards Reference Guide* and other available reference material (see the list of INPUT's related reports in Chapter I) and subscribe to newsletters such as INPUT's *EDI Reporter*.

- Contact your industry's trade or professional associations (refer to the appendixes of this guide). See what they are doing in EDI and participate in their sections that focus on EDI. Don't worry that you don't know anything—they will welcome you with open arms.

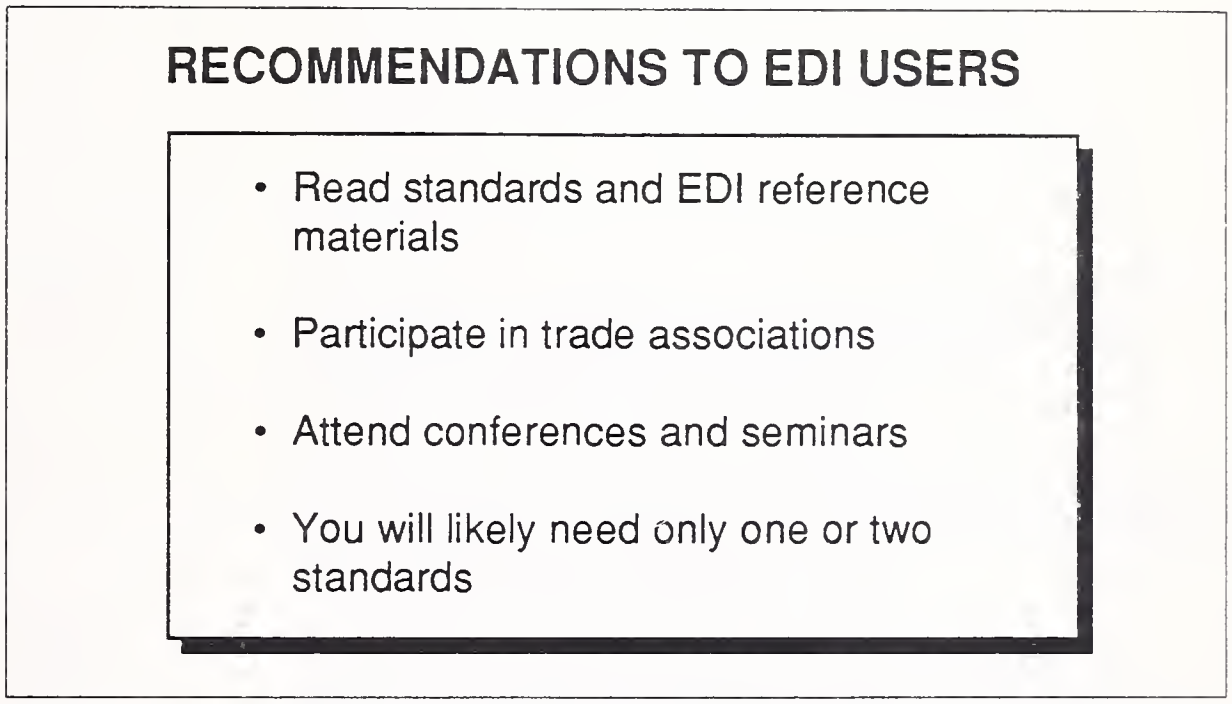
- Attend your industry's conferences, especially those that focus on automation or EDI, or go to the EDIA/TDCC conference (held every December) and the ANSI X12 conference (held every Spring).

- Attend the periodic introductory seminars sponsored by various EDI organizations and groups.

It is likely that most users will need to be concerned with only one, or perhaps two standards: ANSI X12 and an industry subset of X12. If the user's organization is involved in international trade, then EDIFACT will also be a factor.

These recommendations are summarized in Exhibit VIII-6.

EXHIBIT VIII-6



D

Conclusions

EDI has existed in a set of niches to the side of most mainstream systems development. There are legitimate reasons why this has occurred, but in any case, this separation is in the past.

The present situation is that EDI is recognized as a legitimate business tool to solve business problems. Almost as importantly, leading EDI users are recognizing what is not right at present:

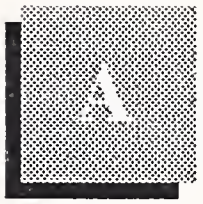
- The proliferation of overlapping standards
- The duplication of networks (E-mail and EDI)
- The shortage of implementations in which EDI is fully integrated with the underlying business systems it should enhance

Users are doing something about these situations through their volunteer efforts in standards-making and maintenance bodies, through self-education, and through development and training in their own organizations.

The future will see the integration of EDI into the whole range of business systems, with standards interfusion as much a beneficiary of this

trend as a causative agent. The ability to send and receive all business communications through one gateway and one unified network will cause reduction in network costs.

The integration of EDI with business systems will produce business economies through the elimination of manual operations and the better audit trails and tests that will be practical for the first time.



Appendix: Glossary of EDI-Related Terms

AAEC	Association of Agrichemical Electronic Communication - An organization developing EDI standards for the suppliers of agricultural chemicals.
ACCS	Aluminum Customer Communications System - Developed through the Aluminum Association, it has adapted ANSI X12 formats to industry needs.
ACH	Automated Clearing House - A regional center for interbank collections and settlements using electronic records.
ACORD	Agent COmpany for Research and Development - Developers, with the IIR, of formats for paper and electronic documents used in the insurance industry. These standards are used in IVANS.
AIAG	Automotive Industry Action Group - An industry organization formed to improve the competitiveness of the American automotive industry. It was an early developer of EDI standards.
AISI	American Iron and Steel Institute - The organization establishing EDI standards for steel and aluminum industry products.
ANSI	American National Standards Institute - A nonprofit organization chartered to develop and maintain voluntary American national standards. It is the U.S. representative to the International Standards Organization.

ANSINet	An ANSI X12 system developed by the Motor and Equipment Manufacturers Association (MEMA) to connect automotive aftermarket distributors with their suppliers.
ARINC	Aeronautical Radio INC. - A not-for-profit organization, owned by airlines, that provides communications services to the airlines.
ASAP	Analytical Systems Automated Purchasing - Baxter-Travenol's private system to facilitate ordering.
ASC X12	Accredited Standards Committee - The organization charged by ANSI with the development and maintenance of ANSI X12 standards.
ASCII	American Standard Code for Information Interchange - The standard 7-bit code used for alphanumeric character representation.
BOS	Booksellers Order Service - Developed by the American Booksellers Association to allow electronic ordering from a range of publishers.
CALS	Computer-aided Acquisition and Logistic System - A U.S. Department of Defense initiative to set standards for the submission and interchange, in digital form, of documents from defense contractors.
CCD	Cash Concentration and Disbursement - An ACH format for intracompany and intercompany payment transactions.
CCDX	An expanded CCD transaction used for the U.S. government's Vendor Express payment system.
CCITT	Consultative Committee for International Telegraph and Telephone - The organization, part of the International Telecommunications Union, that establishes recommendations for international communications standards.
CEC	Council of the European Communities.
CIDX	Chemical Industry Data Exchange - The EDI program for the chemical industry.
COMPORD	COMPuter ORDering - A customer communications system developed in the 1970s by the American Iron and Steel Institute.

COPAS	Council of Petroleum Accounting Standards - The organization responsible for an early petroleum industry EDI system.
CTP	Corporate Trade Payment - An ACH transaction format that contains payment advice information.
CTX	Corporate Trade Exchange - An ACH transaction format that contains the ANSI X12 Remittance Advice.
DISA	Data Interchange Standards Association - The not-for-profit membership organization that provides secretariat service to ASC X12.
DoD	U.S. Department of Defense.
DSD	Direct Store Delivery - The grocery industry system where suppliers deliver directly to retail outlets rather than to warehouses. It is the focus of recent EDI development activity in the grocery industry.
EBCDIC	Extended Binary Coded Decimal Interchange Code - The IBM standard 8-bit code used for alphanumeric character representation.
ECE	The United Nations' Economic Commission for Europe.
Economost	The McKesson Corporation's proprietary system for communicating with retail druggists for order entry.
EDI	Electronic Data Interchange - The interorganizational computer application-to-computer application, electronic interchange of structured business data.
EDIA	Electronic Data Interchange Association - The new name of the TDCC.
EDICC	EDI Council of Canada - The umbrella EDI organization in Canada.
EDICUS	EDI Council of the USA - A user group chartered to promote the concept of EDI within the business environment.
EDIFACT	EDI For Administration, Commerce and Trade - The United Nations EDI standard.
EDX	Electronic Data Exchange - The EDI standards for the electrical supply industry.

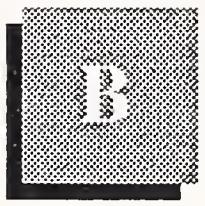
EFT	Electronic Funds Transfer - A generic term for electronic payment. Any system for moving funds between bank accounts at different depository institutions.
EIDX	Electronic Industry Data Exchange - The EDI standards for the electronic industry.
EMBARC	Electronic Manifest BAR Code - The paper industry's EDI standard for the electronic transmission of shipping manifests from mill to printer.
EMCS	Electronic Media Claims Submissions - A service used for submitting claims to health insurance carriers, using electronic versions of formats developed in support of Medicare claims processing.
FASLINC	Fabric and Apparel Suppliers LINkage Council - The organization setting EDI standards for this segment of the textile industry.
FAX	Facsimile - A system for the electronic transmission of document images.
Fedwire	The U.S. Federal Reserve System's wire transfer system.
FEMA	Farm Equipment Manufacturers Association—An industry association developing EDI standards for the "short line" farm equipment manufacturers.
GCA	Graphic Communications Association - The paper industry group responsible for the EMBARC standard.
GTDI	Guidelines for Trade Data Interchange - A European standard for international shipping. Its formal name is UN/ECE GTDI and is sometimes referred to as TDI or UN/TDI.
HIBCC	Health Industry Bar Code Council - An organization coordinating ANSI X12 use in the health care industry.
HIDA	Health Industry Distributors Association - An industry group developing EDI standards for charge backs and contract awards.
ICOPS	Industry Committee on Office Product Standards - A joint EDI project of the National Office Product Standards and the Wholesale Stationers' Association.

IGES	Initial Graphic Exchange Standard - A standard, supported by the Automotive Industry Action Group (AIAG) among others, for the exchange of computer-aided design (CAD) data between systems.
IIR	Insurance Institute for Research - The organization that developed (with ACORD) formats for paper and electronic documents. These formats are used in IVANS.
ISO	International Standards Organization - The organization responsible for developing voluntary international standards.
IVANS	Insurance Value Added Network Service - A not-for-profit organization that provides communications between independent agents and member insurance carriers, using either company-specific formats or the IIR/ACORD formats.
JADE	Joint Audit Date Exchange - Developed by COPAS (Council of Petroleum Accounting Standards) to audit joint producing properties.
JAEX	See JADE.
MEMA	Motor & Equipment Manufacturers' Association - A trade association for automotive aftermarket manufacturers.
MSC	Management Systems Council - The section of the American Trucking Associations that develops and maintains EDI standards for the motor freight industry.
NACHA	National Automated Clearing House Association - A national association of regional ACH clearing house associations that coordinated ACH rules and standards.
NAEB	North American EDIFACT Board - The rapporteur advisory and support team of the EDIFACT rapporteur for North America (part of ANSI X12).
NEIC	National Electronic Information Corporation - A clearing house for insurance carriers that provides a service supporting Electronic Media Claims Submissions (EMCS).
NWDA	National Wholesale Druggists' Association - The trade association that developed Ordernet, the EDI service for the pharmaceutical industry.

ODETTE	Organization for Data Exchange Through Telecommunications in Europe - An EDI standard used by European automotive manufacturers.
OSI	Open Systems Interconnection - A structure, based on a seven-layer model developed by the ISO, for computer communications systems.
PDES	Product Data Exchange Specification - An emerging standard supporting both geometric and nongeometric (tolerances, manufacturing features, material properties, surface finish, etc.) data.
PetroDex	An EDI application for the petroleum industry using proprietary formats.
PetroEx	A set of industry-specific remote computing services for the petroleum industry.
PIDX	Petroleum Industry Data eXchange - A task group within the American Petroleum Institute that is developing EDI standards for the petroleum industry.
PipeNet	Pipeline industry-specific transactions (nominations, schedules, ticket readings, etc.), adapted by the American Petroleum Institute from ANSI X12.
PTT	Post, Telegraph, and Telephone - A generic name for a government agency responsible for operating a nation's communications services and systems.
Pubnet	An EDI service sponsored by the National Association of College Stores and the Association of American Publishers. It is a hybrid system with interactive searches prior to electronic purchase.
Rapporteur	An individual expert appointed for specific objectives. The person chartered to organize and coordinate standards development work for a given area of responsibility and for delivering the work product to the chartering body.
RFP	Request For Proposal.
SAFLINC	Sundries and Apparel Findings LINkage Council - The organization setting EDI standards for this segment of the textile industry.

Secretariat	The administrative department of an organization; an organization that supplies administrative services to another body. The UN Secretariat, with a Secretary-General, supplies administrative services to the United Nations, an International Treaty organization composed of national entities.
SENDEN	SEars National Data Exchange Network - A proprietary network for supplier communications with Sears, Roebuck.
SITA	Société International de Télécommunications Aeronautique - An international not-for-profit organization that provides communications services to the world's airlines.
SQL	Structure Query Language - A language for data base inquiry.
STEDI	Sears Transport EDI - An EDI service offering by Sears Communications Company. It is an open third-party network offering with full interconnection.
TALC	Textile Apparel Linkage Council - A standards body in the textile industry.
TAMCS	Textile Apparel Manufacturer's Communications Standards - An EDI standard approved by TALC for product descriptions between cutters and fabric suppliers.
TCIF	TeleCommunications Industry Forum - A standards body developing guidelines for EDI in the telecommunications industry.
TDCC	Transportation Data Coordinating Committee - The original U.S. trade association dedicated to fostering EDI.
TDI	Trade Data Interchange - A European standard for international shipping. Its formal name is UN/ECE Guidelines for Trade Data Interchange (UN/ECE GTDI) and is sometimes referred to as UN/TDI.
TEDIS	Trade Electronic Data Interchange Systems - A program of the Council of the European Communities (CEC) started in 1987.

TRADACOMS	A domestic United Kingdom EDI standard developed by its Article Number Association. There are no plans to merge this standard into EDIFACT.
TransNet	The EDI system for connecting automotive aftermarket distributors to manufacturers.
UCC	Uniform Code Council - The not-for-profit organization developing standards for the grocery industry.
UCS	Uniform Communications Standard - The EDI standard developed by the UCC for the grocery industry.
UIG	Utility Industry Group - Organization setting EDI standards for the electric, gas, and water utilities.
UNSM	United Nations Standard Message - The EDIFACT term for a transaction set.
UPC	Uniform Product Code - The bar code standard for the grocery industry.
UtilEDI	Utility EDI - EDI standards for use between the electric, gas, and water utilities and their suppliers.
VICS	Voluntary Interindustry Communications Standards - EDI standards between apparel manufacturers and retailers.



Appendix: EDI-Related Standards Organizations

AAEC (Association of Agrichemical Electronic Communications)
c/o Transportation Data Coordinating Committee
225 Heineckers Lane
Suite 550
Alexandria, VA, 22314
(703) 838-8042

ACCS (Aluminum Customer Communications System)
c/o Aluminum Corporation of America
1501 ALCOA Building
Pittsburgh, PA, 15209
(412) 553-2891

AIAG (Automotive Industry Action Group)
26200 Lahser Road
Suite 200
Southfield, MI, 48034
(313) 358-3570

AIR (Transportation Standards for Air Freight)
Transportation Data Coordinating Committee
225 Heineckers Lane
Suite 550
Alexandria, VA, 22314
(703) 838-8042

ANSI X12 (General Business)
Accredited Standards Committee (ASC) X12
19630 Club House Road
Gaithersburg, MD, 20879
(301) 670-0811

Data Interchange Standards Association (DISA)
1800 Diagonal Road
Suite 355
Alexandria, VA, 22314
(703) 548-7005

Aerospace Industries Association ANSI X12
c/o LTV Aerospace and Defense Company
P.O. Box 225907
Dallas, TX, 75265
(214) 266-4313

Government Project Team
c/o Price Waterhouse
One American Center
Suite 2000
Austin, TX, 78701
(512) 476-6700

International Project Team
c/o Price Waterhouse
200 East Randolph Drive
Chicago, IL, 60601
(312) 565-1500

CIDX	(Chemical Industry Data Exchange) c/o DuPont Company 1007 Market St. Mellon Bank # 1412 Wilmington, DE, 18998 (302) 774-2425
EAGLE	(Hardware Industry Standards) c/o OrderNet Services 1651 NW Professional Plaza Columbus, OH, 43220 (614) 459-7600
EDICC	(EDI Council of Canada) 5401 Eglington Avenue West Suite 103 Etobicoke, ON, CANADA (416) 621-7160
EDX	(Electronic Data Exchange) 2101 L Street, NW Suite 300 Washington, DC, 20037 (202) 457-8413

EIDX (Electronics Industry Data eXchange)
American Electronics Association
5201 Great American Parkway
Suite 520
Santa Clara, CA, 95054
(408) 987-4200

Electronics Industry Data Exchange Association
c/o Hewlett-Packard
8000 Foothills Blvd.
Roseville, CA, 95678
(916) 786-8000

EMBARC (Electronic Manifest BAR Code)
Graphic Communications Association
1730 North Lynn Street
Suite 604
Arlington, VA, 22209
(703) 841-8160

FASLINC (Fabric and Apparel Suppliers LINkage Council)
c/o American Textile Manufacturers Association
1801 K Street, NW
Suite 900
Washington, DC, 20006
(202) 862-0518

HIBCC (Health Industry Business Communications Council)
5110 N. 40th Street
Suite 120
Phoenix, AZ, 85018
(602) 381-1091

MOTOR (Transportation Standards for Motor Freight)
American Trucking Associations MSC
2200 Mill Road
Alexandria, VA, 22314
(703) 838-1721

NACHA (National Automated Clearing House Association)
1901 L Street, NW
Suite 640
Washington, DC, 20036
(202) 659-4343

NIT League (Standards for Car Locator Messages)
National Industrial Transporation League
1090 Vermont Avenue, NW
Suite 410
Washington, D.C. 20005
(202) 842-3870

OCEAN (Transportation Standards for Ocean Freight)
Transportation Data Coordinating Committee
225 Heineckers Lane
Suite 550
Alexandria, VA, 22314
(703) 838-8042

PIDX (Petroleum Industry Data eXchange)
American Petroleum Institute
1220 L Street, NW
Washington, DC, 20005
(202) 682-8000

PipeNet (Pipeline Transactions)
American Petroleum Institute
1220 L Street, NW
Washington, DC, 20005
(202) 682-8000

RAIL (Transportation Standards for Rail Freight)
Association of American Railroads
50 F Street NW
Washington, DC, 20001
(202) 639-2100

Standards Maintenance Committee
c/o Union Pacific
1416 Dodge Street
Omaha, NE, 68179
(402) 271-4174

SAFLINC (Sundries and Apparel Findings LINkage Council)
c/o American Apparel Manufacturers Association
2500 Wilson Boulevard
Arlington, VA, 22201
(703) 524-1864

SIMPROFRANCE
61 Rue de L'Arcade
75008 Paris, FRANCE
293-0302

SITPRO
Almack House
26/28 King Street
London SW1 Y6QW, UNITED KINGDOM
930-0532

TAMCS
(Textile Apparel Manufacturers' Communications Standards)
c/o Haggar Apparel Co.
6113 Lemmon Avenue
Dallas, TX, 75209
(214) 352-8481

TCIF
(TeleCommunications Industry Forum)
c/o Exchange Carriers Association
5430 Grosvenor Lane
Suite 200
Bethesda, MD, 21814
(301) 564-4505

TDCC
(The EDI Association)
225 Heineckers Lane
Suite 550
Alexandria, VA, 22314
(703) 838-8042

TEDIS
(General Business Committee of the European Community)
DG XIII
200 rue de la Loi
B-1049 Brussels, BELGIUM
(322) 235-7330

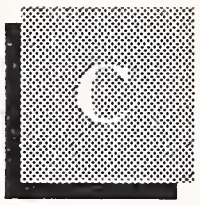
TRANSNET
(Motor and Equipment Manufacturers Association)
Management Information Systems Group
300 Sylvan Avenue
Englewood Cliffs, NJ, 07632
(201) 569-8500

UCS
(Uniform Communications Standard)
Uniform Code Council, Inc.
P.O. Box 1224
Dayton, OH, 45401
(513) 435-3870

UTILedi
(Utilities Industries EDI)
c/o Consumers Power Co.
212 West Michigan Avenue
Jackson, MI, 49201
(517) 788-0890

VICS (Voluntary Interindustry Communications Standard)
c/o Levi Strauss & Co.
1155 Battery Street
San Francisco, CA, 94111
(415) 544-4187

WINS (Warehouse Information Network Standards)
c/o Merchants Refrigerating Co.
2050 Lapham Drive.
Modesto, CA, 95353
(209) 578-3991



Appendix: Industry Associations Involved in EDI

Aerospace/Air Transport

Aerospace Industries Association of America
1250 Eye Street, NW
Washington, DC, 20005
(202) 371-8400

Air Transport Association of America
1709 New York Avenue, NW
Washington, DC, 20006
(202) 626-4000

Agricultural

Farm Equipment Manufacturers' Association
243 North Lindbergh Boulevard
St. Louis, MO, 63141
(314) 991-0702

Apparel

American Apparel Manufacturers' Association
2500 Wilson Boulevard
Arlington, VA, 22201
(703) 524-1864

Textile-Apparel Linkage Council (TALC)
c/o Haggar Apparel Co.
6113 Lemmon Avenue
Dallas, TX, 75209
(214) 352-8481

Voluntary Interindustry Communications Standard (VICS)
c/o Levi Strauss & Co.
1155 Battery Street
San Francisco, CA, 94111
(415) 544-4187

Automotive

Automotive Industry Action Group (AIAG)
26200 Lahser Road
Suite 200
Southfield, MI, 48034
(313) 358-3570

Motor and Equipment Manufacturers' Association (MEMA)
300 Sylvan Avenue
Englewood Cliffs, NJ, 07632
(201) 569-8500

Banking

National Automated Clearing House Association (NACHA)
1901 L Street, NW
Suite 640
Washington, DC, 20036
(202) 659-4343

National Corporate Cash Management Association
P.O. Box 7001
Newtown, CT, 06470
(203) 426-3007

Electronics

American Electronics Association
5201 Great American Parkway
Suite 520
Santa Clara, CA, 95054
(408) 987-4200

Electronic Industries Association
1722 Eye Street, NW
Washington, DC, 20006
(202) 457-4900

National Electronic Distributors' Association
35 E. Wacker Drive
Suite 320
Chicago, IL, 60601
(312) 558-9114

General Business

Council of Logistics Management
2803 Butterfield Road
Suite 380
Oak Brook, IL, 60521
(312) 574-0985

Data Interchange Standards Association (DISA)
1800 Diagonal Road
Suite 355
Alexandria, VA, 22314
(703) 548-7005

International Customer Service Association
111 E. Wacker Drive
Suite 600
Chicago, IL, 60601
(312) 644-6610

National Association of Credit Management
520 8th Avenue
New York, NY, 10018
(212) 947-5070

National Association of Purchasing Management
P.O. Box 22160
Tempe, AZ, 85282
(602) 752-6276

National Industrial Distribution Association
1900 Arch Street
Philadelphia, PA, 19103
(215) 564-3484

National Retail Merchants' Association
100 West 31st Street
New York, NY, 10001
(212) 244-8451

Grocery

Food Marketing Institute
1750 K Street, NW
Suite 700
Washington, DC, 20006
(202) 452-8444

Grocery Manufacturers of America
1010 Wisconsin Avenue, NW
Suite 800
Washington, DC, 20007
(202) 337-9400

International Association of Chain Stores
3800 Moore Place
Alexandria, VA, 22305
(703) 549-4525

National-American Wholesale Grocers' Association
201 Park Washington Court
Falls Church, VA, 22046
(703) 532-9400

National Food Brokers' Association
1010 Massachusetts Avenue, NW
Washington, DC, 20001
(202) 789-2844

National Grocers' Association
1825 Samuel Morse Drive
Reston, VA, 22090
(703) 437-5300

National Soft Drink Association
1101 Sixteenth Street, NW
Washington, DC, 20036
(202) 463-6752

Uniform Code Council, Inc.
P.O. Box 1224
Dayton, OH, 45401
(513) 435-3870

Health Industry

Health Industry Business Communications Council (HIBCC)
5110 N. 40th Street
Suite 120
Phoenix, AZ, 85018
(602) 381-1091

International Trade
EDI Council of Canada (EDICC)
5401 Eglington Avenue West
Suite 103
Etobicoke, ON, CANADA
(416) 621-7160

General Business Committee of the European Community (TEDIS)
DG XIII
200 rue de la Loi
B-1049 Brussels, BELGIUM
(322) 235-7330

National Trade Facilitation Council/National Commission on International Trade Documentation (NCITD)
350 Broadway
Suite 205
New York, NY, 10013
(212) 925-1400

North American International EDI Users' Group (NAIEUG)
c/o Sea-Land Corp.
P.O. Box 1050
Elizabeth, NJ, 07207
(201) 820-7669

SIMPROFRANCE
61 Rue de L'Arcade
75008 Paris, FRANCE
293-0302

SITPRO
Almack House
26/28 King Street
London SW1 Y6QW, UNITED KINGDOM
930-0532

Metals

Joint Committee of the Metals Industry (Aluminum)
c/o Aluminum Corporation of America
1501 ALCOA Building
Pittsburgh, PA, 15209
(412) 553-2891

Joint Committee of the Metals Industry (Iron and Steel)
c/o Bethlehem Steel Corporation
701 E. Third St.
Suite 521E
Bethlehem, PA, 18061
(215) 694-2072

Office Products

National Office Products Association
301 N. Fairfax Street
Alexandria, VA, 22314
(703) 549-9040

Wholesale Stationers' Association
3166 Des Plaines Avenue
Des Plaines, IL, 60018
(312) 297-6882

Petroleum

American Petroleum Institute
1220 L Street, NW
Washington, DC, 20005
(202) 682-8000

Council of Petroleum Accounting Societies

Energy Telecommunications and Electrical Association
P.O. Box 795038
Dallas, TX, 75379
(214) 578-1900

Pharmaceuticals

National Wholesale Druggists' Association
105 Oronoco Street
Alexandria, VA, 22314
(703) 684-6400

Printing

Graphic Communications Association
1730 North Lynn Street
Suite 604
Arlington, VA, 22209
(703) 841-8160

Railroads

Association of American Railroads
50 F Street NW
Washington, DC, 20001
(202) 639-2100

Telecommunications

Telecommunications Industry Forum (TCIF)
c/o Exchange Carriers' Association
5430 Grosvenor Lane
Suite 200
Bethesda, MD, 21814
(301) 564-4505

Textiles

American Textile Manufacturers' Association
1801 K Street, NW
Suite 900
Washington, DC, 20006
(202) 862-0518

Transportation

National Industrial Transportation League
1090 Airmont Avenue, NW
Suite 410
Washington, DC, 20005
(202) 842-3870

TDCC - The EDI Association
225 Heineckers Lane
Suite 550
Alexandria, VA, 22314
(703) 838-8042

Trucking

American Trucking Associations
2200 Mill Road
Alexandria, VA, 22314
(703) 838-1721

Utilities

American Public Power Association
2301 M Street, NW
Washington, DC, 20037
(202) 775-8300

Edison Electric Institute
1111 19th Street, NW
Washington, DC, 20036
(202) 778-6400

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

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