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EDI Planning and Implementation Guide

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Foreword

Purpose

Electronic data interchange (EDI) is the computer-to-computer exchange of routine business information in a standard format. The Department of Defense (DoD) has recently launched a major initiative to implement EDI in all business areas. As part of that initiative, this *EDI Planning and Implementation Guide* is designed to both assist DoD activities in the preparation of EDI business plans and to educate DoD personnel on EDI matters.

Strategic Importance of EDI

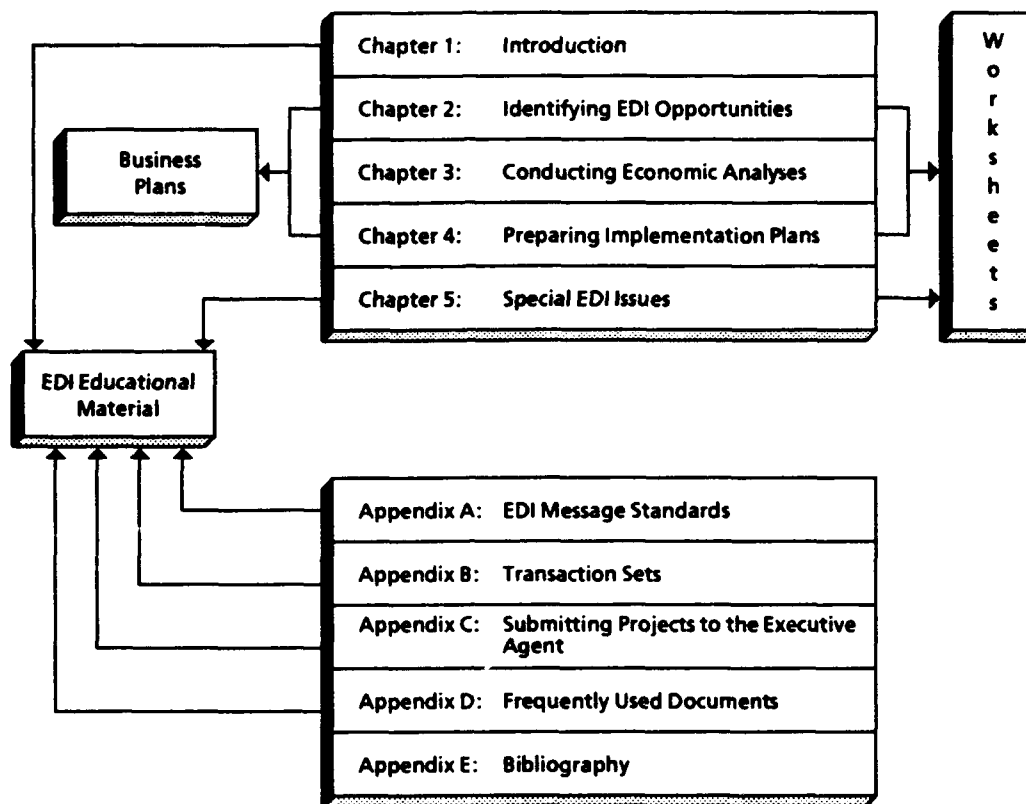
In recent years, many private-sector companies have reaped substantial benefits from automating their internal operations, such as accounting, order entry, purchasing, scheduling, and material processing. Those same companies are now focusing on automating their external operations using EDI and, in doing so, are reporting significant economic rewards – between \$2 and \$10 or more in direct cost savings for every document that they transmit electronically to their trading partners.

In spite of the magnitude of direct cost savings achieved through EDI, many proponents note that *the real benefits of EDI come from using it as a tool to simplify and improve business procedures*. As a consequence, they are reporting \$3 to \$5 in indirect cost savings for every \$1 in direct cost savings from various business improvements made possible by EDI, such as reduced inventories, improved competitive pricing strategies, enhanced auditing procedures, and streamlined operations.

The DoD has long recognized the economic and strategic advantages of EDI. Those advantages are becoming even more important as Defense spending levels off or declines. Defense Management Report Decision 941, *Implementation of Electronic Data Interchange in DoD*, states that DoD could achieve direct cost savings of \$548 million through FY99 for an investment of \$85 million by converting 16 of 2,100 forms and documents from paper to the electronic medium. It also prescribes that 92 percent of all DoD business transactions be transmitted using EDI by the fourth quarter of FY96.

Structure of the Guide

The figure below shows how each chapter and appendix in the Guide relate to each other and their roles in the development of business plans and the education of DoD personnel. Chapters 1, 5, and the appendices contain primarily educational material, while Chapters 2, 3, and 4 provide detailed guidance on preparing EDI business plans.



STRUCTURE OF THE GUIDE

Chapter 1 describes the role of DoD's Executive Agent for EDI and Data Protection, DoD's Electronic Commerce Program, the importance of EDI to that program, and the components of EDI business plans.

Chapters 2, 3, and 4 provide detailed assistance in preparing EDI business plans. Chapter 2 presents a methodology for determining an activity's most promising EDI opportunities. Chapter 3 offers guidance on putting together an economic analysis in support of the better opportunities, and Chapter 4 lays out an approach for developing EDI implementation plans.

Chapter 5 introduces a number of legal, security, and audit issues that DoD activities may face as they move forward with EDI applications. Finally, a series of appendices provide information on such EDI topics as the history and utility of EDI message standards, transaction sets that are relevant to DoD, submission of proposed EDI projects to the Executive Agent for approval and possible funding support, frequently used DoD documents, and a bibliography.

Acknowledgment

This Guide to planning and implementing electronic data interchange (EDI) within the Department of Defense draws extensively from *The EDI Project Planner*, published by EDI EXECUTIVE Publications, a subsidiary of EDI Strategies, Inc., 1639 Desford Court, Marietta, Georgia 30064. Although *The EDI Project Planner* focuses on commercial applications of EDI, the Department of Defense faces many of the same challenges as it replaces paper transactions with electronic transmission. Consequently, we make considerable use of the format and structure of *The EDI Project Planner*, with explicit permission from EDI Strategies, Inc., but tailor our presentation to Department of Defense applications.

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Purpose

This chapter presents background information on the Department of Defense's (DoD's) Executive Agent for Electronic Data Interchange (EDI) and Data Protection; DoD's Electronic Commerce Program and the role of EDI in that program; and the need for each DoD activity to prepare an EDI business plan to focus and guide implementation efforts.

Role of the Executive Agent

Although not new to DoD, the use of EDI received a major boost in May 1988 when then Deputy Secretary of Defense Taft directed DoD Components to make "... maximum use of electronic data interchange for the paperless processing of all business-related transactions..." He also charged the Assistant Secretary of Defense (Production and Logistics), ASD(P&L), with responsibility for establishing guidelines for "... acceptance of EDI as the normal way of doing business with DoD by the early 1990's."

In response to that charge, the ASD(P&L) designated the Defense Logistics Agency as DoD's Executive Agent for EDI and Data Protection and directed that the Executive Agent provide the leadership required to implement EDI throughout DoD. The Executive Agent responded by formulating a comprehensive program to fundamentally change DoD's business practices, from paper-based document processing to a totally electronic environment. The name for such an undertaking is "Electronic Commerce through EDI."

One of the Executive Agent's first initiatives under that program was to prepare a DoD-wide business case for Electronic Commerce. (See Hardcastle and Heard, September 1990, in the Bibliography.) The business case showed that over a 10-year period, DoD could achieve almost \$1.2 billion in direct and indirect cost savings by electronically processing just 16 documents. Those documents include several that are traditionally targeted for EDI in the private sector, such as purchase orders, invoices, bills of lading, and requests for quotations.

The Executive Agent followed the business case with a strategic plan (see Defense Logistics Agency, November 1990, in the Bibliography) to serve as a blueprint for setting priorities for DoD investments in Electronic Commerce. Shortly thereafter, DoD issued Defense Management Report Decision (DMRD) 941, which established a goal that 92 percent of DoD business transactions be transmitted using EDI by the fourth quarter of FY96.

To meet the DMRD goal, the Office of Defense Information, Executive Agent, and Military Services have been given resources to fund various EDI projects. Those resources are available to DoD activities that propose promising EDI

projects backed by solid business plans explaining associated costs and benefits. Appendix C explains the procedures for DoD activities to follow in submitting proposed EDI projects to the Executive Agent.

Electronic Commerce

Electronic Commerce is the integration of electronic mail, electronic funds transfer, EDI, and similar techniques into a comprehensive, electronic-based system encompassing all DoD business functions, including procurement, payment, supply management, transportation, and base operations. The thrust of DoD's Electronic Commerce Program is not just to automate manual processes, but to put in place the necessary systems, capabilities, and procedures that will enable DoD activities to fundamentally alter and improve the way they carry out their day-to-day business operations. Given its extensive accomplishments in the private sector, EDI is clearly the key to meeting that objective.

Electronic Data Interchange

Electronic data interchange is the computer-to-computer exchange of routine business information in a standard format. Private-sector firms are using EDI to process purchase orders, shipping notices, receipts, invoices, payments, and a variety of other business documents. In doing so, they are reaping a number of benefits, including reduced errors in data entry, decreased paper handling, reduced inventories, improved cash management, and shortened order times.

Several data exchange techniques are frequently mislabeled as EDI. Some of those techniques are described below, along with short explanations of how they differ from EDI.

Facsimile (FAX) transmission of a paper document from one FAX machine to another (see Figure 1-1) is not EDI. It requires someone to *interpret* the written data and *rekey* it into an applications system. Both of these functions, in addition to taking time, introduce errors into the processing of the data.

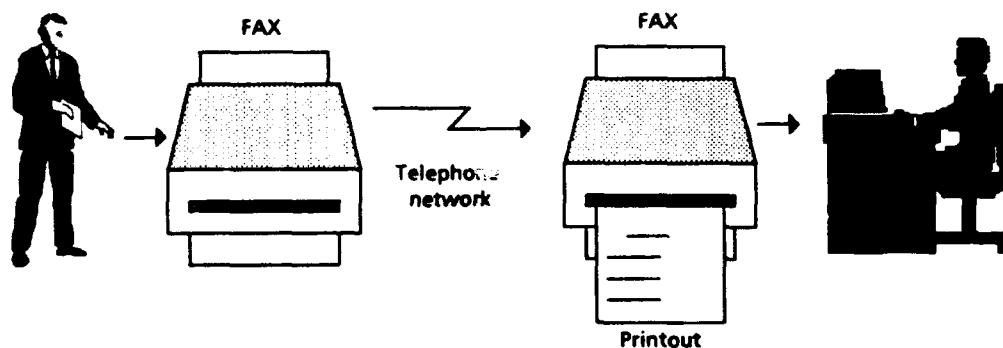


FIG. 1-1. FAX

Electronic mail (E-mail) eliminates the paper associated with FAX, but it still is not EDI. E-mail moves information directly from one computer to another, as shown in Figure 1-2. Nevertheless, the information moved by E-mail is unstructured and requires someone to *interpret the information and then rekey specific data elements* into an applications system for additional processing.

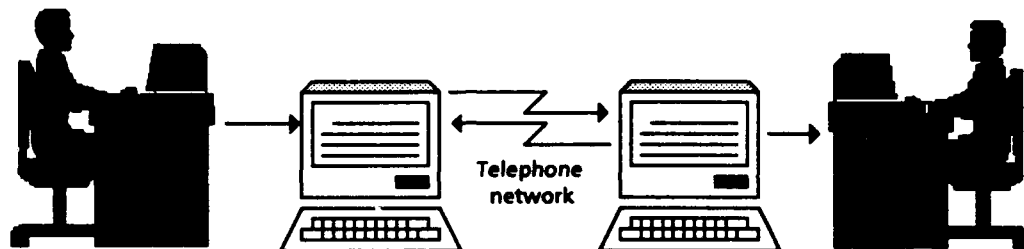


FIG. 1-2. E-MAIL

The use of *dedicated computer terminals* to link two or more activities also is not EDI because data is not being transmitted in a standard format (see Figure 1-3). Someone is still required to manually key data for transmission, subject to associated errors and time delays. Also, in many cases, someone at the receiving activity must *rekey that same data* into a format accepted by internal systems (again subject to errors and time delays).

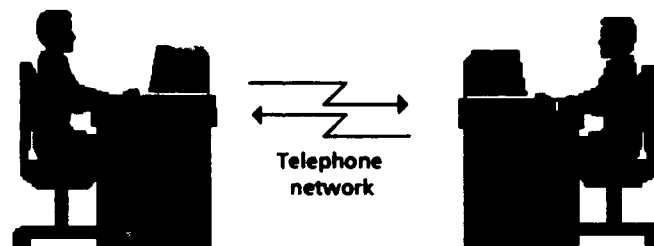


FIG. 1-3. DEDICATED COMPUTER TERMINALS

Exchanging data electronically with a single trading partner using non-standard data formats is a *proprietary form of EDI* (see Figure 1-4). Proprietary EDI yields some of the benefits of EDI and may satisfy a single trading partner relationship, but it cannot be readily extended to additional trading partners. As a result, proprietary EDI has limited application.

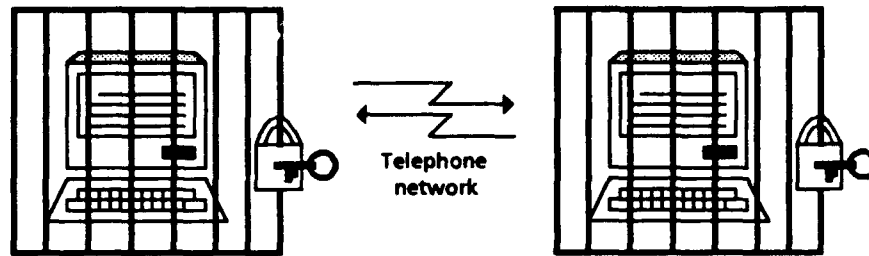


FIG. 1-4. PROPRIETARY EDI

In contrast to the above techniques, Figure 1-5 illustrates a typical EDI application between a DoD buying activity and its trading partners (in this case, a vendor, a receiving activity, and a bank). We highlight some of the features of this application below:

- The DoD buying activity generates an electronic purchase order and sends it (via a value-added network or VAN) to a vendor (1).
- The vendor ships the material to a receiving activity (depot, base, etc.) (2).
- The vendor generates an electronic invoice and sends it to the DoD buying activity (3).
- After receiving the material and inspecting it, the receiver sends an acceptance report to the DoD buying activity (4).
- After receiving the acceptance report, the buying activity (or, in some cases, a DoD Finance Center) sends the payment and a remittance advice (using electronic funds transfer) to its own bank (5).
- The buyer's bank electronically sends the payment and remittance advice through the Automated Clearinghouse (ACH) network (6) to the vendor's bank.
- The vendor's bank sends a paper copy of the remittance advice (describing the amount and purpose of the payment) to the vendor (7).

If the transactions in this EDI example are routine, they are processed entirely without human intervention or managerial approval (with the exception of the mailed remittance advice).

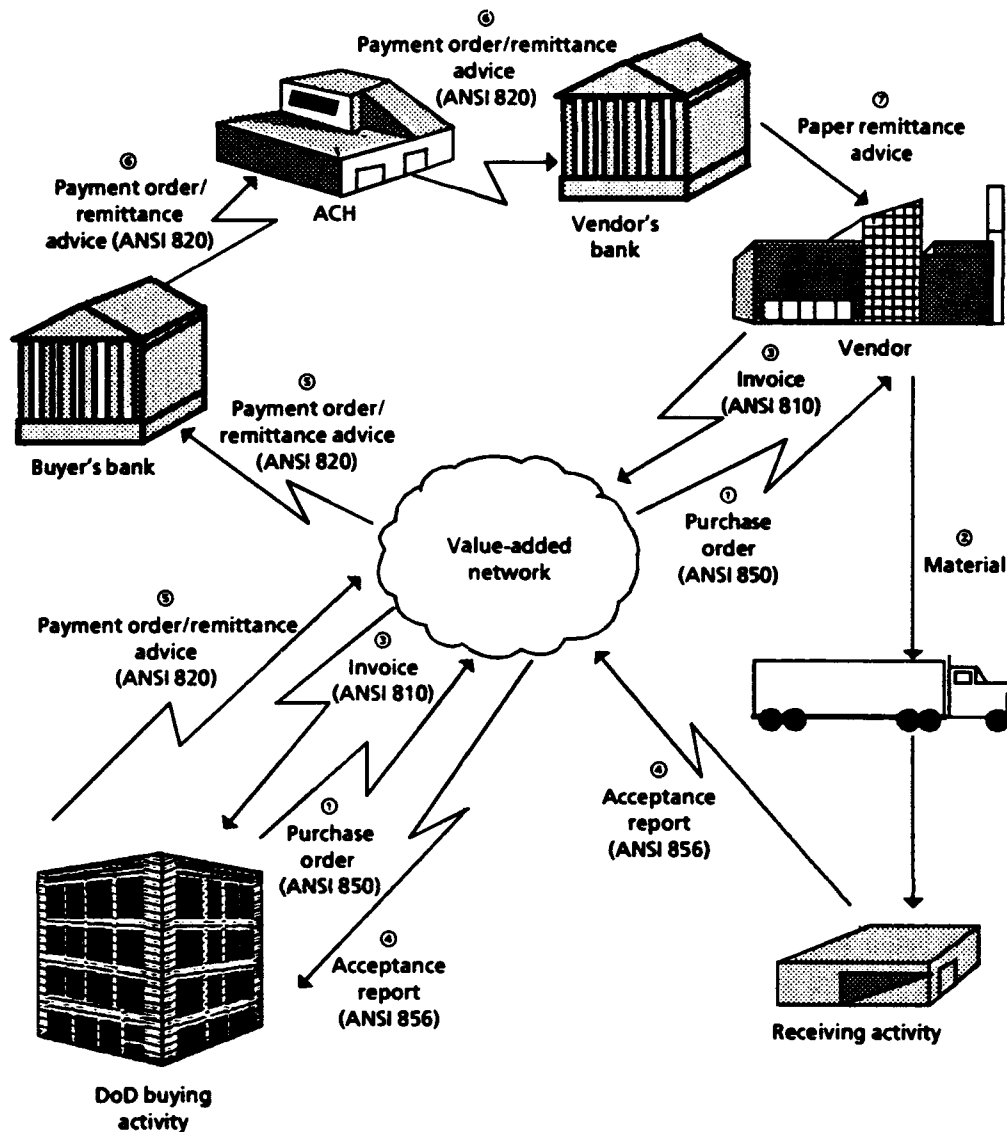


FIG. 1-5. TYPICAL EDI APPLICATION

The keys to this EDI application include:

- The availability of universally accepted data formats, frequently referred to as EDI standards or *transaction sets*, to exchange business information [American National Standards Institute (ANSI) standards are listed in parentheses in Figure 1-5]
- The accessibility of trading partners (i.e., vendors, carriers, banks, and DoD activities) to commercial VANs that receive, store, and transmit EDI transmissions
- The capability of all *trading partners* to automatically send, receive, and process purchase-order, shipment, and payment information.

The wide availability of EDI transaction sets stems primarily from the efforts of two standards groups: the Transportation Data Coordinating Council (TDCC)

and ANSI. Formed in the 1960s, the TDCC (now known as the Electronic Data Interchange Association) initially concentrated on developing standards for the transportation industry, but eventually branched out to develop standards for other industries as well. As a result of TDCC's successes, however, various companies and individuals recognized the need for generic standards that cut across industry lines. In 1979, ANSI formed the Accredited Standards Committee (ASC X12) to do just that – develop uniform standards for electronically exchanging business transactions with industries. Those standards are now widely used by U.S. industries. (EDIFACT, or EDI for Administration, Commerce, and Transport, is the international EDI message standard that is based largely on ASC X12 transaction sets.) Appendix B describes available EDI transaction sets that may be of value to DoD activities.

EDI Business Plans

In describing the role of DoD's Executive Agent for EDI, we noted that every prospective EDI project submitted for approval and funding needs to be supported by a business plan. Such a plan consists of the following three components:

- *An Opportunity Assessment* that identifies the paper documents that dominate an activity's workload; evaluates the capability of computer systems, both the activity's and all trading partners', to send, receive, and process EDI transactions; presents an understanding of the business effects of replacing specific paper documents with electronic transmissions; and, based on these results, formulates a list of promising EDI applications.
- *An Economic Analysis*, building upon an operating concept for each EDI application, that includes the calculation of direct and indirect cost savings, investment costs, and rates of return for each EDI application. The results of these calculations yield a list of potential EDI applications in order of priority.
- *An Implementation Plan* that identifies, sequences, and schedules all the events necessary to implement the activity's most promising EDI application.

In Chapters 2, 3, and 4 of this Guide, we provide a detailed, step-by-step approach, complete with worksheets, to performing an EDI opportunity assessment, conducting an economic analysis of the most promising opportunities, and preparing an implementation plan for those opportunities that offer substantial economic advantage.

Chapter 2 Identifying EDI Opportunities

Purpose

This chapter presents a methodology for identifying an activity's most promising EDI opportunities. Making extensive use of worksheets, the methodology consists of five steps:

- Selecting key documents
- Assessing an activity's capability to support EDI applications
- Analyzing trading partner capabilities
- Determining effect of EDI on business practices
- Identifying best EDI opportunities.

At the conclusion of these five steps, an activity will have identified all documents that are promising candidates for replacement by EDI. Those documents then need to be subjected to a detailed economic analysis, following the methodology presented in Chapter 3, to ensure that the activity would actually benefit from such replacements.

Selection of Key Documents

Much of the savings from EDI occur because electronic processing of documents is less costly than manual processing. As a consequence, the number of times that an activity sends or receives a particular document (i.e., its volume) is the primary criterion in selecting documents for potential transmission by EDI. But volume is not the only consideration. The document also should be

- Used extensively throughout DoD
- Processed manually
- Handled by several departments within the activity
- Supported by an existing EDI transaction set.

Note: Although time-consuming, an activity may find it advantageous to create a new transaction set for selected high-volume documents that lack an EDI transaction set (see Chapter 4).

To aid in identifying the most promising EDI applications, activities should fill out Worksheet 2-1 for all paper documents or transactions under consideration. The first step in using that worksheet is to match each document or transaction with its EDI transaction set. You may wish to consult Appendices B and D when completing this worksheet. Appendix B contains a listing of all approved ASC X12 transaction sets as well as those under development. It

also attempts to match key DoD documents and reports with the appropriate transaction set. Appendix D describes the 16 key documents that were included in DMRD 941.

Next, the activity enters the estimated number of documents sent and received each year on the worksheet. If the total number of documents sent and received exceeds 100,000, place an *"E" for Excellent* in the volume rating column. If the total is between 10,000 and 100,000, assign a rating of *"S" for Satisfactory*. If the total is under 10,000, give it a rating of *"M" for Marginal*.

Note: Under some circumstances, however, documents assigned a M-rating may still warrant replacement by EDI because either they contain a large number of line items, or they are key to transmitting other, high-volume documents by EDI.

Capability of Internal Systems

Following identification of the best candidates for EDI, the activity should then assess its capability to send, receive, and process EDI documents internally. Activities that fail to achieve expected levels of EDI savings often neglect this important step.

Worksheet 2-2 is designed to aid an activity in assessing the capabilities of its internal systems. The worksheet is divided into two parts. The first part helps the activity construct an inventory of the internal systems used to process a document or category of documents such as the hardware platform, systems software, and applications programs. The second part focuses on any modifications required to those internal systems to accommodate EDI.

In completing Part II of this worksheet, activities are advised to refer to the document volumes presented in Worksheet 2-1, since volume may have a significant impact on hardware and system software requirements. The activity should also ask itself whether the proposed EDI application will have an impact on any other applications programs or software systems that may run on the same hardware platform as the proposed EDI system.

The objective of this analysis is to help an activity to quickly identify any major impediments to implementing EDI for the documents or categories of documents listed in Worksheet 2-1. A detailed analysis of EDI data requirements, although helpful, is not required at this stage.

At the bottom of the worksheet, the activity rates the EDI capability of its applications systems, using the following criteria:

- ***Excellent EDI capability.*** Internal systems usually merit such a rating if they require little or no modifications to enable them to send, receive, and process EDI transactions.
- ***Satisfactory EDI capability.*** These systems need substantial modification before they can become EDI-capable. Older DoD internal systems tend to fall into this category.
- ***Marginal EDI capability.*** A marginal rating is merited when a particular document (or category of documents) is not supported by an applications system, or if the existing applications system cannot

WORKSHEET 2-1 – INTERNAL SYSTEM PROFILE

Activity: _____

I. Internal Systems Inventory

Document (or Document Category): _____

Name of Applications Programs: _____

Year Developed: _____

Hardware: _____

Operating System: _____

Software: _____

Data Base Management System: _____

Supporting Systems: _____

Planned Enhancements: _____

Relevant EDI /Electronic Commerce Initiatives: _____

II. Internal Systems Assessment

(Note: Use document volumes presented in Worksheet 2-1 to answer the following questions)

Modifications Required to Implement EDI?

	<u>Yes</u>	<u>No</u>	<u>Enhancements required (or comments)</u>
Hardware platform	_____	_____	_____ _____
Software systems	_____	_____	_____ _____
Applications programs	_____	_____	_____ _____

EDI Capability Rating: E (Excellent)
S (Satisfactory)
M (Marginal)

receive or transmit electronic transmissions. As a consequence, the activity could not implement EDI in this area until it overcomes these obstacles.

Capability of Trading Partners

Each activity has two categories of trading partners: internal (i.e., other DoD activities) and external (i.e., commercial organizations). This distinction is important because the activity needs to estimate the investment required by its internal trading partners to implement EDI following the methodology presented in Chapter 3.

Worksheet 2-3 provides a form for profiling the capabilities of the activity's internal trading partners for each document identified in the Document Volume Worksheet (2-1). The Internal Trading Partner Profile Worksheet calls for a list of DoD activities with which the document is exchanged; the parent Military Service or Defense agency of those activities; the automated systems used by each activity; the capability of those systems to send, receive, and process EDI transactions; and the number of documents exchanged each year with that activity.

At the bottom of the Internal Trading Partner Profile Worksheet, the activity shows the number of trading partners required to reach a 70 to 80 percent implementation level (in terms of number of transactions) for that document. (Many private-sector firms use this range as the "critical mass" level for achieving the economies of scale associated with EDI.) Then, the activity applies the following criteria to assess the capability of its internal trading partners to exchange documents electronically:

- *Excellent*, if a small number of trading partners are required to reach a 70 to 80 percent implementation level and most of them are EDI-capable
- *Satisfactory*, if a moderate number of trading partners are required to reach that same threshold and most are EDI-capable
- *Marginal*, if either the number of required trading partners are numerous or most of the activity's trading partners are not EDI-capable.

Note: Depending on individual circumstances, DoD activities may differ in the way they define the terms small, moderate, and numerous with respect to trading partners. For example, high-volume activities with EDI-capable trading partners can usually accommodate a larger number of trading partners than small-volume activities without EDI-capable trading partners. As a general rule, however, the smaller the number of trading partners involved, the faster critical mass will be achieved. (See Chapters 4 and 5 for more information on soliciting trading partners).

The External Trading Partner Profile Worksheet (see Worksheet 2-4) is similar to that used for internal trading partners. However, instead of identifying the applications systems used by the activity's external trading partners, the worksheet provides a column to indicate if the organization is EDI-capable. The activity can obtain this information either directly from the trading

WORKSHEET 1-3 - INTERNAL TRADING PARTNER PROFILE

Document: _____ Activity: _____

DoD trading partner	Military Service/ Defense agency	Automated system	EDI capability		Number per year	
			Yes	No	Sent	Received
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
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			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		

Number of trading partners required to achieve a 70 – 80 percent implementation rate (critical mass): _____

Trading partner rating: E S M (E = Excellent; S = Satisfactory; M = Marginal)

WORKSHEET 2-4 - EXTERNAL TRADING PARTNER PROFILE

Document: _____ Activity: _____

Company	Location	EDI capability		Number per year	
		Yes	No	Sent	Received
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
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		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>		

Number of trading partners required to achieve a 70 – 80 percent implementation rate (critical mass): _____
 Trading partner rating: E S M (E=Excellent; S=Satisfactory; M=Marginal)

partner or from other sources such as the *EDI Yellow Pages: Business Partner Directory*, September 1991 – August 1992 (see Appendix E, Bibliography).

Review of Business Practices

In determining whether or not a document is a good EDI opportunity, each activity needs to consider its specific business practices. For example, before making payment on an invoice, many activities require a record of acceptance showing that delivery has occurred and that the material received is not defective. If invoices are received electronically and acceptance notices are received manually, the number of late payments could actually increase rather than decrease with EDI. Although legal and security requirements also can impede implementation of EDI at some activities, they are addressed separately in Chapter 5 of this Guide. (Drake et al., April 1990 and June 1991 in the Bibliography, provide an extensive discussion of EDI legal and regulatory issues.) In fact, many private-sector companies have found that they cannot make effective use of EDI without changing their internal business practices.

To aid in identifying business practices that may affect replacement of a particular paper document with EDI, Worksheet 2-5 provides a checklist of questions. Those questions are designed to surface any unique business practices of the activity that must either be accommodated by the EDI application or modified before implementation begins.

After answering the questions on the Business Practices Worksheet, the activity assigns a rating to each document based upon the effects of its business practices on replacing that document with electronic transmissions. The following criteria are suggested: *Excellent* – no significant business issues exist; *Satisfactory* – some business issues exist, but they should not seriously impede implementation; *Marginal* – one or more major business issues need to be resolved before the activity can begin implementation.

Summary of EDI Opportunities

Upon completion of the Business Practices Worksheet, the activity is now prepared to summarize its findings on EDI opportunities, using Worksheet 2-6.

For each document, the activity lists the corresponding EDI transaction set; the volume rating from the Document Volume Worksheet (2-1); the EDI capability rating of the internal systems from the Internal System Profile Worksheet (2-2); the ratings for both the internal and external trading partners (Worksheets 2-3 and 2-4); and the business practices rating from the Business Practices Worksheet.

Using this information, the activity then assigns an overall opportunity rating to each document. Although highly subjective, the following approach is one way to construct a composite rating: Assign an overall rating of *E (Excellent)* if an EDI transaction set exists and the document receives three or more individual excellent ratings; a rating of *S (Satisfactory)* if an EDI transaction set exists and the document receives one or two individual excellent ratings; a

WORKSHEET 2-5 – BUSINESS PRACTICES

Document: _____ Activity: _____

CHECKLIST

TRANSACTION SETS

- Does an EDI transaction set (see Appendix B of the Guide) exist for this document? Yes No
- If yes, does the transaction set accommodate all the information that the activity traditionally sends? Yes No
- If no, is the extra information necessary? Yes No
- Is it available from other documents? Yes No

NOTE: If a transaction set needs to be modified, the activity should contact the Executive Agent, who would then initiate the process for requesting a change.

INFORMATION FLOWS

- Does the processing of this document (i.e., the flow of paper) within the activity need to be changed to accommodate an electronic environment? Yes No
- What steps in that processing can be eliminated or consolidated by not using a paper document? _____

- What steps need information from other documents before they can be satisfied? _____

- Is that information vital? Yes No
- Are those other documents received or sent by EDI? Yes No If yes, Received Sent
- If no, should they be received or sent by EDI? Received Sent

SPECIAL REQUIREMENTS

- Does the document have any special processing, handling, legal, or security requirements? Yes No
- Are those requirements necessary? Yes No
- How are these requirements satisfied in a paper environment? _____

- How could they be satisfied in an electronic environment? _____

Business practices rating: E S M (E=Excellent; S=Satisfactory; M=Marginal)

WORKSHEET 2-8 – EDI OPPORTUNITIES

Activity. _____

Document	Transaction set	Rating																		
		Document volume			Internal systems			# trading partners						Business practices			Overall			
								Internal			External									
		E	S	M	E	S	M	E	S	M	E	S	M	E	S	M	E	S	M	

Business practices rating: E S M (E=Excellent; S=Satisfactory; M=Marginal)

rating of *M (Marginal)* if no EDI transaction set exists or the activity has major shortcomings in two or more categories.

After completing the EDI Opportunities Worksheet, the activity will have a good perspective on those documents that are candidates for EDI. We suggest that all documents receiving either an E or an S rating be subjected to an economic analysis following the methodology presented in Chapter 3.

Purpose

This chapter presents a methodology for assessing the economic effects of replacing the paper documents identified in Chapter 2 with electronic transmissions. Again, we make extensive use of worksheets to guide the activity in applying the methodology. The methodology concludes with the preparation of an EDI priority list, which forms the basis for development of EDI implementation plans in Chapter 4.

Note: The Office of Defense Information has recently developed an abbreviated Functional Economic Analysis (FEA) form that must be completed by activities requesting funding for FY92 automation projects through either the Executive Agent or the Corporate Information Management (CIM) program. That form, along with supporting documentation, is contained in Appendix C. The FEA requires DoD activities to submit, for each automation project, estimates of the activity's baseline operating costs, along with the investment required and benefits generated by the proposed automation project throughout its expected life.

The methodology described in this chapter will assist activities in completing the Investment and Benefit sections of the abbreviated FEA form. To finish the FEA form, the activity must also supply an estimate of its baseline operating costs over the project life cycle. Please contact the Executive Agent or the Office of Defense Information for more details concerning the abbreviated FEA or any new FEA formats that may emerge in the future.

Estimating Benefits

The benefits that result from implementing EDI can be divided into two categories: direct and indirect. We describe each of these categories in more detail below.

Direct Benefits

Although DoD has no single set of procedures for processing and distributing the approximately 2,100 paper forms that it uses to conduct business, those forms share a number of common processing operations. These include distribution (making copies of documents and distributing them among users); mailing; sorting, reconciling and auditing; data entry, which occurs several times if the same information is entered into more than one computer system; error resolution (checking for and correcting mistakes); storage and retrieval; and, for some documents, placement of procurement orders by

telephone. Since EDI eliminates most of these operations, we consider the associated savings to be direct benefits.

Table 3-1 lists these processing operations along with three estimates of projected savings (on a per-document basis) that could result if DoD replaced the manual processing with EDI. (The savings figures are based upon engineered work standards developed by the Defense Finance and Accounting Service – Indianapolis Center; see *A Business Case for Electronic Commerce*, Hardcastle and Heard, September 1990, in the Bibliography.) The estimates are based upon the complexity of the operations being eliminated. For example, a highly complex document will be more expensive to process than a medium- or low-complex document.

Using the savings estimates in Table 3-1, we computed the direct savings of replacing 16 frequently used DoD documents with EDI. Table 3-2 lists the 16 documents, while Table 3-3 shows the savings. (Appendix D provides a brief description of the uses of those documents.) The savings range from a low of \$0.69 for each Voucher Stub and Check replaced by EDI to a high of \$6.07 for every Material Inspection and Receiving Report.

Worksheet 3-1 is provided to aid in determining the direct benefits or cost savings from replacing specific documents with EDI. For each document, the activity lists the number processed each year. If the document is included in Table 3-3, the activity may use the total direct cost savings shown in that table as the worksheet entry in the "Cost savings/document" column. The "Total savings per year" is then obtained by multiplying the annual volume by the savings per document. If the document is not listed in Table 3-3 or if it is processed in a unique manner, the activity may need to develop its own estimate of direct cost savings per document using variations of the data presented in Table 3-1.

Indirect Benefits

Many private-sector companies have found that EDI can result in significant savings in addition to those resulting from replacing manual processes with electronic transmissions. They cite reductions in inventories, improvements in customer service, and streamlined operations as additional, yet indirect, benefits of EDI. The DoD is likely to experience many of those same benefits, as well as others, such as improved quality control, enhanced contract management and auditing, increased price discounts, and reduced interest payments. These indirect benefits typically result from changes in business practices made possible by EDI.

Although the indirect benefits from EDI have the potential to be substantially larger than the direct benefits, they are more difficult to estimate. Some studies indicate that the indirect savings may exceed direct savings by a factor of three (see Arthur D. Little, April 1980, in the Bibliography). In others, such as DoD's EDI program for transportation, the indirect-to-direct benefits ratio is estimated to be a more modest 1.8 to 1.

The Indirect Cost Savings Worksheet (Worksheet 3-2) allows an activity to summarize the indirect benefits that may result from electronically transmitting specific documents. In addition to listing the cost savings, the activity

TABLE 3-1
DIRECT COST SAVINGS THROUGH EDI

Operation	Activity	Comment	Savings per document		
			Low complexity (\$)	Medium complexity (\$)	High complexity (\$)
Document distribution	Separate documents, make copies, route to mail room, prepare address labels, and stuff envelopes	Costs increase with complexity of operation	0.02	0.04	0.06
Mailing	Place material in envelopes and apply stamps	Costs increase with number of documents requiring single envelopes	0.11	0.16	0.26
Document receipt	Receive, open, sort, date, stamp, and route	Costs increase with complexity of sorting	0.01	0.02	0.03
Document processing	Match, reconcile, audit, and general document processing	Costs increase with complexity of document and volume of data	0.15	0.26	0.41
Document preparation and control	Examine and prepare document for data entry	Costs increase with complexity of document	0.13	0.21	0.47
Data entry	Enter data in system	Costs increase with volume of data	0.06	0.17	0.68
Error resolution	Research and correct errors, and prepare correspondence	Costs increase with volume of data	0.05	0.07	0.09
Document storage and retrieval	Log, separate, sort, microfilm, box, file, and retrieve documents	Costs increase with filing and microfilming requirements	0.10	0.16	0.28
Telephone procurement	Purchase materials or services	Costs increase with percent of telephone solicitations	1.78	3.50	5.33

**TABLE 3-2
FREQUENTLY USED DoD DOCUMENTS**

Application area/document	Title
Procurement/Contract Administration DD Form 250 DD Form 1155 SF 18 SF 18 SF 30 SF 30 SF 129 SF 1443	Material Inspection and Receiving Report Order for Supplies and Services Request for Quotations (Written) Request for Quotations (Telephone) Amendment of Solicitation/Contract Modification (Local) Amendment of Solicitation/Contract Modification (Non-Local) Solicitation Mailing List Application Contractor's Request for Progress Payments
Transportation SF 1103, SF 1113 SF 1169, SF 1113 SF 1203, 619/619-1, SF 1113 — MT 364R	Freight GBL, CBL, and Public Voucher Government Travel Request and Public Voucher Personal Property GBL, Statement of Accessorial Services Performed, and Public Voucher Voucher Stub and Check Standard Tender
Supply/Maintenance SAV 926 SF 361 SF 364 SF 368	Monthly Report of Repairables Transportation Discrepancy Report Report of Discrepancy (Supply) Product Quality Deficiency Report
Fuels DD Form 1898	Aviation Fuels Sales Slip

Note: DD=Department of Defense; SF=Standard Form; MT=Military Tender; SAV=Standard Aviation; GBL=Government bill of lading; CBL=commercial bill of lading.

TABLE 3-3
DIRECT COST SAVINGS FOR FREQUENTLY USED DoD DOCUMENTS
(Dollars)

Activity	Document								
	DD 250	DD 1155	SF 18 (written)	SF 18 (tele)	SF 30 (local)	SF 30 (non-local)	SF 129	SF 1443	SF 1103/SF 1113
Document distribution	—	0.04	—	—	0.04	0.06	—	0.04	0.06
Mailing	—	0.26	—	—	0.26	0.26	—	0.11	0.16
Document receipt	0.16	0.07	0.02	—	0.07	0.14	0.02	0.02	0.08
Document processing	1.82	0.82	0.26	—	0.82	1.53	0.26	0.41	1.04
Document preparation and control	2.25	0.76	0.47	—	0.76	1.41	0.47	0.34	0.89
Data entry	1.19	0.57	0.17	—	0.57	0.92	0.17	0.17	0.97
Error resolution	0.49	0.32	0.07	—	0.32	0.29	0.07	0.12	0.26
Document storage and retrieval	0.16	0.68	—	—	0.68	0.38	—	0.16	0.16
Telephone procurement	—	—	—	3.50	—	—	—	—	—
Total	6.07	3.52	0.99	3.50	3.52	4.99	0.99	1.37	3.62

Activity	Document								
	SF 1169/SF 1113	SF 1203/SF 1113	Voucher Stub/Check	MT 364R	SAV 926	SF 361	SF 364	SF 368	DD 1898
Document distribution	0.06	0.06	0.02	0.06	0.04	0.06	0.06	0.04	0.02
Mailing	0.11	0.16	0.26	0.16	0.16	0.52	0.42	0.52	0.11
Document receipt	0.03	0.09	—	0.09	0.01	0.03	0.08	0.04	0.02
Document processing	0.78	1.45	0.41	0.78	0.26	0.67	0.82	0.41	0.41
Document preparation and control	0.52	1.36	—	0.68	0.60	0.39	0.68	0.34	0.21
Data entry	0.18	1.14	—	0.97	0.68	0.06	0.34	0.17	0.17
Error resolution	0.15	0.31	—	0.26	0.09	0.05	0.14	0.07	0.09
Document storage and retrieval	0.16	0.32	—	—	0.16	0.16	0.16	0.16	0.28
Telephone procurement	—	—	—	—	—	—	—	—	—
Total	1.99	4.89	0.69	3.00	2.00	1.36	2.22	1.75	1.31

should describe in the "Comments" column how it will achieve those benefits. Supporting analyses may need to accompany the completed worksheet.

Life-Cycle Cost Savings

The activity is now ready to compute an estimated stream of savings for each document over the expected life of the EDI project. Worksheet 3-3 is provided to aid in estimating that stream of savings. For each document, the activity lists the direct and indirect savings totals from Worksheets 3-1 and 3-2. The sum of those values gives the annual savings from EDI *if 100 percent of the documents are transmitted electronically*. Of course, 100 percent implementation for any document is highly unlikely because some trading partners may not send enough documents to warrant an investment in EDI. For those trading partners, the activity will continue to use paper.

Many organizations find that 80 percent of their business transactions are conducted with 20 percent of their trading partners. Called the 80/20 rule, it focuses an activity's attention on its high-volume trading partners because they will yield the greatest return on investment.

After obtaining its critical mass level, the activity determines the number of years it will take to reach that level. An activity may use a variety of techniques to develop an estimated rate of implementation for each document; one simple method is to query several activity personnel and then average their rates.

An activity typically should allow at least 5 to 6 years to achieve its target implementation goal. Most private-sector companies plan for an implementation rate of less than 15 percent during the first 2 years of an EDI project, primarily because of the time required to procure hardware and software, develop EDI conventions, and make the necessary enhancements to internal applications systems and operating procedures.

Once the activity has decided on a rate of implementation, it multiplies the annual savings by each year's implementation rate over the duration of the project. We suggest a 10-year life cycle for most EDI projects, but an activity may select shorter or longer life cycles. The yearly savings are then added over the duration of the project to produce the total life-cycle savings expected for that document, shown as the total of the annual savings in Worksheet 3-3.

Upon completing an EDI Life-Cycle Savings Worksheet for each prospective document, the activity combines the results on the Total Life-Cycle Savings Worksheet (Worksheet 3-4). That worksheet, when completed, shows the total expected savings from EDI and the amount that each document contributes to the total by year.

Developing Operating Concepts

Once the activity estimates the total life-cycle savings for each document, it then formulates an operating concept that outlines how it will replace the flow of paper with electronically transmitted information. The operating concept should depict the information flows between the activity and its trading partners, along with the technical configuration (hardware,

WORKSHEET 3-2 - INDIRECT COST SAVINGS

Document: _____ **Activity:** _____

Indirect Benefit: Reduced inventory **Cost Savings: \$** _____

Comments: _____

Indirect Benefit: Streamlined operations **Cost Savings: \$** _____

Comments: _____

Indirect Benefit: Enhanced auditing and accounting **Cost Savings: \$** _____

Comments: _____

Indirect Benefit: Increased use of payment discounts **Cost Savings: \$** _____

Comments: _____

Indirect Benefit: Reduced interest payments **Cost Savings: \$** _____

Comments: _____

Other Indirect Benefit: **Cost Savings: \$** _____

Comments: _____

Other Indirect Benefit: **Cost Savings: \$** _____

Comments: _____

Other Indirect Benefit: **Cost Savings: \$** _____

Comments: _____

WORKSHEET 3-3 – EDI LIFE-CYCLE SAVINGS

Document: _____ Activity: _____

Annual Savings:

Direct: \$ _____ Indirect: \$ _____ Total: \$ _____

	Implementation rate	Annual savings
Year 1	_____ %	\$ _____
Year 2	_____ %	\$ _____
Year 3	_____ %	\$ _____
Year 4	_____ %	\$ _____
Year 5	_____ %	\$ _____
Year 6	_____ %	\$ _____
Year 7	_____ %	\$ _____
Year 8	_____ %	\$ _____
Year 9	_____ %	\$ _____
Year 10	_____ %	\$ _____
Total	—	\$ _____

WORKSHEET 3-4 - TOTAL LIFE-CYCLE SAVINGS

Activity _____

Year	Document:	Document:	Document:	Document:	Total
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Total					

software, and telecommunications) required to transmit and receive that information. The operating concept serves as a basis for estimating the activity's EDI investment costs.

Figure 3-1 shows an example of information flows between an activity and its trading partners, and the EDI transaction sets supporting those flows. Figure 3-2 depicts an EDI technical configuration that accommodates the information flows shown in Figure 3-1. Although we do not highlight the EDI translation software, it resides on the EDI host, as does the software for routing transactions to the appropriate applications systems (if required).

In these examples, we separated the information flows from the technical configuration to clearly depict the purpose and value of each step. The activity, however, may elect to combine the information flows and technical configuration into a single diagram and consolidate several documents into a single operating concept, provided those documents support a single mission.

Note: The activity should contact the Executive Agent to discuss unusual technical configuration issues.

Estimating Investment Costs

The investment costs of any EDI initiative fall into one of six categories:

- Hardware
- Software
- Telecommunications
- Systems integration
- Program management
- Implementation support.

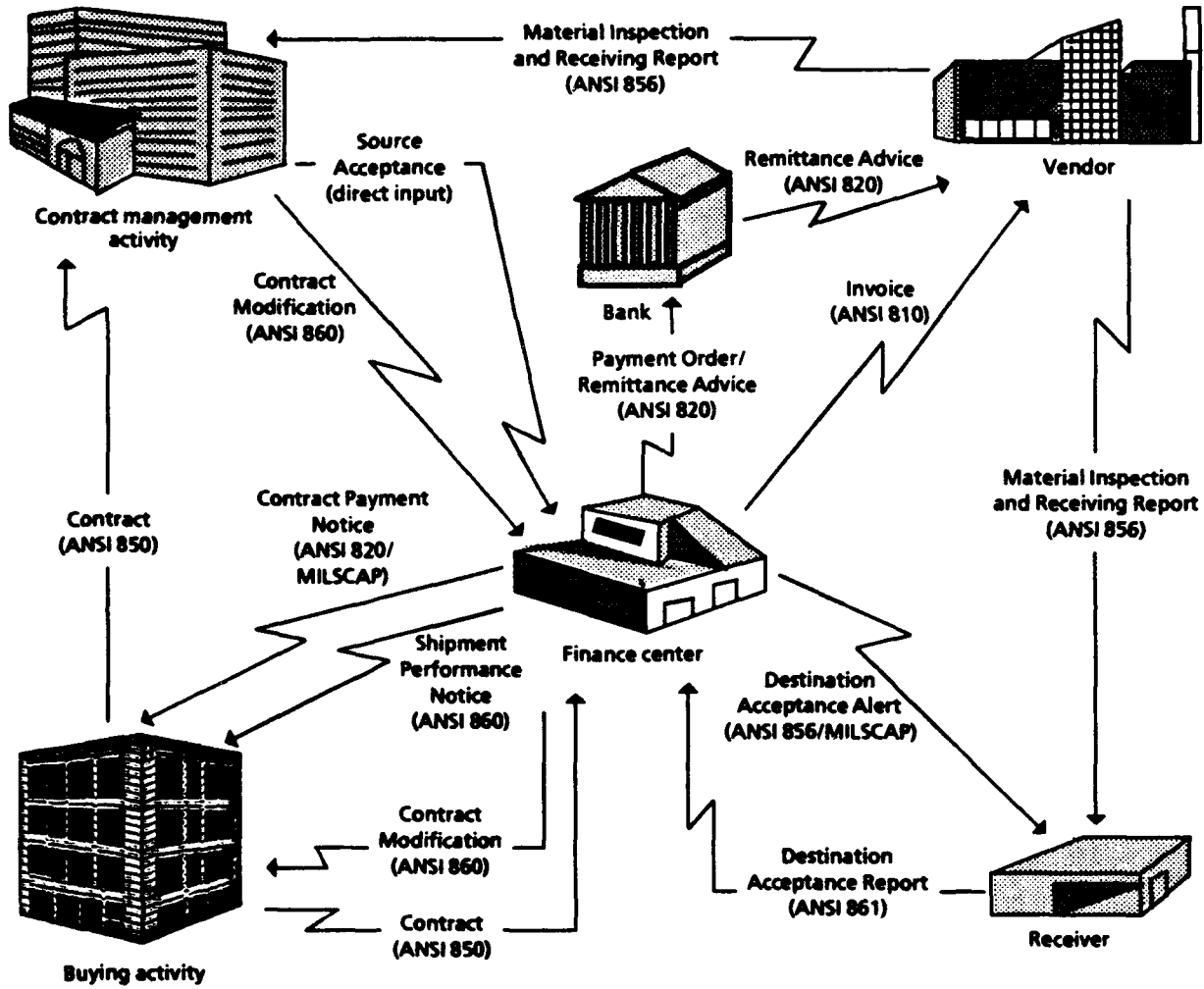
We discuss each of these cost categories below.

Note: The Executive Agent for EDI is investigating the development of a standard EDI hardware, software, and telecommunications platform. Please contact the Executive Agent for more information about the status of that platform.

Hardware

The technical configuration portion of the operating concept determines most of the hardware investment costs. Private-sector companies typically use either a front-end or a host configuration. In the front-end configuration, EDI translation software resides on either a minicomputer or microcomputer. That computer passes EDI files to and from the applications system software, which is resident on a different computer (usually a mainframe). In a host configuration, the EDI translation software resides on the same computer as the applications software.

In a front-end configuration, we suggest that the activity budget \$5,000 for a microcomputer and at least \$30,000 for a minicomputer. (The cost of a



Note: MILSCAP = Military Standard Contract Administration Procedures.

FIG. 3-1. EXAMPLE - EDI INFORMATION FLOWS

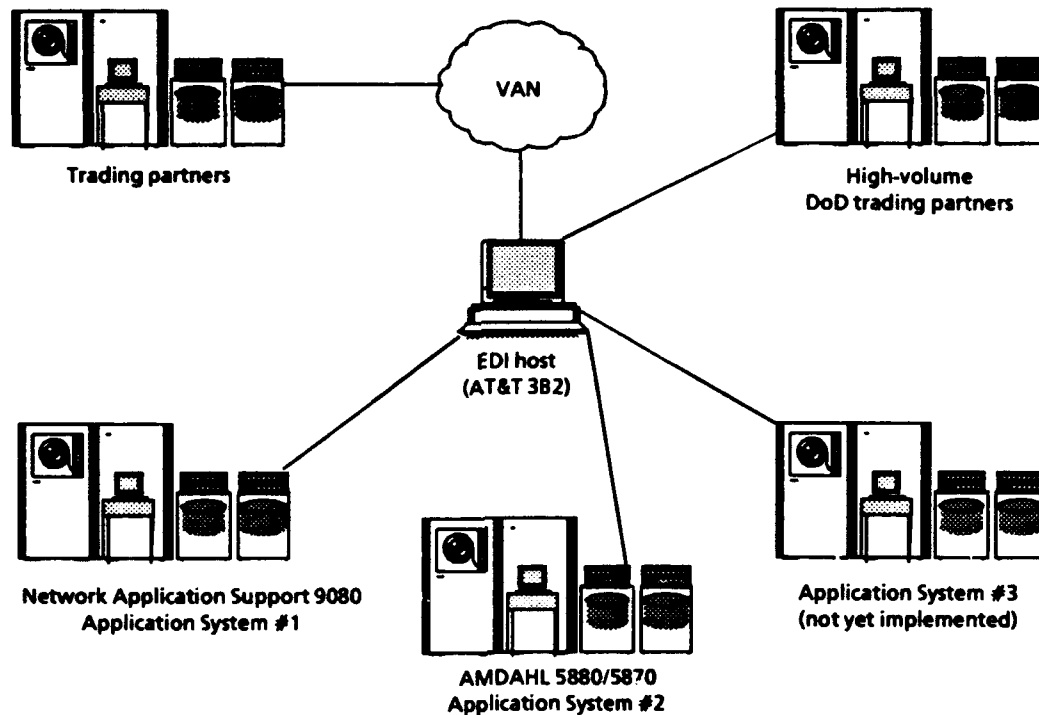


FIG. 3-2. EXAMPLE – EDI TECHNICAL CONFIGURATION

minicomputer could be substantially higher depending on the activity's specific storage requirements.) Some operating concepts could even require more than one computer.

The choice of hardware depends upon a number of considerations: volume (number of EDI transactions per day); processing speed, including that of translation software; and storage requirements, such as archiving a large number of documents.

Note: The activity should consult a computer specialist when determining its hardware requirements.

Software

A basic EDI system has three software components: translation software, communications software, and mapping software. We describe these software components in more detail below.

Translation Software

The principal purpose of EDI translation software is to format flat files of data to and from ANSI X12 standard transactions. Currently, over 60 micro-computer and 30 minicomputer translation software packages appropriate for DoD use are commercially available. Choosing the most appropriate translation software package for a particular DoD activity, however, can be a complicated process given the many features included in those packages. (See *A Guide to EDI Translation Software, 1991 Edition*, by Frohman, January 1991,

in the Bibliography for a more definitive discussion of EDI translation software.)

The cost of translation software is primarily a function of the hardware that supports the application. For a microcomputer-based application, translation software costs between \$1,000 and \$5,000, while for a mainframe it may cost \$15,000 or more. The cost of translation software for minicomputers is more variable, between \$10,000 and \$20,000 depending on the hardware.

Note: Most EDI translation software packages incorporate a number of basic security features, including the following:

- *EDI log-on and password control features.* These features generally include user-identification codes and passwords to restrict unauthorized use of the software.
- *Auto log-off feature.* This feature automatically terminates and logs off a user if a predetermined amount of time has transpired without any activity.
- *Trading partner codes and passwords.* These features include unique codes and corresponding passwords maintained by the translation software for each trading partner.
- *EDI transmission control checking.* This feature maintains and ensures the integrity of EDI transmissions.

Other security considerations are discussed in Chapter 5.

Communications Software

In order to exchange EDI data with commercial activities, a basic EDI system must be capable of passing information to and receiving information from an EDI VAN. Communications software helps to facilitate that exchange by (1) automatically dialing and establishing a connection with the VAN and (2) sending and receiving EDI-formatted data to and from the VAN. These two functions are generally packaged together as part of the EDI translation software package, thereby allowing activities to generate an EDI transaction set, dial the VAN, deposit the EDI message in the intended recipient's VAN mailbox, and if desired, receive its EDI messages.

Mapping Software

To generate an ANSI X12 transaction set, a special program called an interface program extracts information from an activity's application system and formats it into an American Standard Code for Information Interchange (ASCII) flat file that is accepted by the EDI translation software. The translation software then cross-references the contents of the flat file with a particular EDI transaction set and passes it (via communications software and a network) to a trading partner. Conversely, EDI data received from a trading partner is reformatted into a flat file by the translation software and passed to the agency's application system through the interface program.

All EDI translation software packages map data to and from a flat file. EDI software vendors typically use one of two approaches in mapping that data. Most simply specify the layout of the flat file, with the understanding that the

organization purchasing the software will develop the interface program that maps the flat file to a specific applications system. Others provide an automatic mapping function that permits the user to define the layout of the flat file. This capability simplifies the development of the interface program by allowing some of the general application editing to occur as part of the transaction set mapping utility. It also reduces the number of items that must be hard coded into the interface program, making it much easier to maintain and modify.

Telecommunications

This category includes telecommunications set-up costs, such as the installation of dedicated telephone lines. It does not include any operating costs, which we address in another section.

Systems Integration

The implementation of EDI generally requires two types of systems integration activities: interface programming and enhancements to applications systems.

Interface programming formats data from the EDI translation software into flat-file records for processing by the applications systems. Without such a program, the activity's systems could not accept EDI data. Interface programming generally requires between 3 and 12 man-months for each applications system although, as described above, some mapping software packages may simplify this task. Drawing upon private-sector experience, an activity should expect that interface programming will consume at least 5 percent of all EDI investment costs.

Even if an activity's applications systems can accept EDI, some systems may need to be modified to process EDI data and take advantage of the full benefits made possible by EDI. Those enhancements are often the largest single category of investment cost during EDI implementation. In fact, some activities may expend up to 50 percent of all EDI investment costs on enhancements to *existing* applications systems, especially if a major system overhaul is required because of EDI.

Program Management

Program management of an EDI project includes promoting and coordinating EDI initiatives among program participants (both DoD and commercial); revising operating procedures and developing new procedures to govern EDI transactions; and establishing and nurturing trading partner relationships and agreements. An activity can use either its personnel to carry out these responsibilities or contractors who specialize in supporting EDI. Program management responsibilities typically command the full-time attention of at least one individual for the first year or two of an EDI project.

Implementation Support

Implementation support for an EDI project encompasses a wide variety of tasks, including the following:

- *Planning and coordination* – finalizing and carrying out an activity's implementation plan (as discussed in Chapter 4)
- *Standards development* – working with ANSI committees to modify EDI standards to meet an activity's data requirements (if required)
- *Implementation guidelines* – mapping specific data elements from an activity's application system to EDI transaction sets
- *Training* – educating activity personnel in EDI concepts
- *Trading partner expansion* – working to increase an activity's trading partner base to achieve its target implementation goal.

Again, contractor support may be used to accomplish these tasks if internal resources are not available.

After estimating its implementation support costs, the activity completes the first column of Worksheet 3-5, EDI Investment Costs. The second column of that worksheet calls for the investment costs of all DoD trading partners required to support the operating concept.

Most DoD trading partners will need to make many of the same types of investments described previously in this section. However, DoD trading partners may not be required to invest either in standards development or implementation guidelines; those tasks are the responsibility of the implementing activity. They may also be able to capitalize upon the activity's work in the areas of interface programming and application system enhancements, particularly if they use the same applications systems. As a consequence, their investments are likely to be substantially less.

Estimating Operating Costs

As discussed in the section "Direct Benefits," an activity's document processing costs should decrease dramatically following implementation of EDI. However, the activity is likely to experience increases in two categories of operating expenses – telecommunications and software maintenance.

Telecommunications Costs

Although every activity could establish direct communications links with its trading partners using modems and commercial telephone lines, a VAN provides a number of services that simplify EDI communications. Those services include document handling and distribution (electronic mailboxing), protocol and speed conversion, network connections, data back-up, and customer support. Without a VAN, an activity would need to negotiate individually with numerous vendors to establish compatible communications protocols, schedule daily information transfers, and arrange back-up procedures if electronic communications fail.

WORKSHEET 3-5 - EDI INVESTMENT COSTS

Activity: _____

Requirement	Investment (\$000)		
	Activity	DoD trading partners	Total
Hardware			
Software			
Telecommunications			
Systems integration			
<ul style="list-style-type: none"> ● Interface programing ● Application systems enhancements 	_____	_____	_____
<ul style="list-style-type: none"> ● Promotion and coordination ● Internal operating procedures ● Trading partner development 	_____	_____	_____
<ul style="list-style-type: none"> ● Planning and coordination ● Standards development ● Implementation guidelines ● Training ● Trading partner expansion 	_____	_____	_____

Note: For more information on the availability of DoD and commercial VANs, contact the EDI Executive Agent.

Worksheet 3-6 provides a methodology for calculating the annual telecommunications costs for each document. It calls for the number of characters on each document and the number of documents sent and received annually by the activity. (The latter figures are available on Worksheet 2-1.) Using an industry average rate of \$0.10 per kilocharacter (1,000 characters), the activity can then use Worksheet 3-6 to calculate the annual cost of EDI telecommunications for each document that it replaces with EDI.

Software Maintenance Costs

Software maintenance costs are driven primarily by the need to update EDI translation software with new standards. Most EDI translation software vendors, however, provide these updates on an annual basis, usually at a cost of 10 to 20 percent of the software purchase price, with no charge for the first year.

Annual Operating Costs

The activity is now in position to calculate its annual EDI operating costs using Worksheet 3-7. In addition to its telecommunications and software maintenance costs, the activity should consider other operating costs that may increase as a result of EDI. Some examples include additional personnel, travel (for EDI purposes), and recurring training. Those costs should be listed under "Other" on the worksheet. The activity's trading partners also may incur increases in telecommunications (since they are responsible for the cost of all EDI transactions that they initiate) and software maintenance. Those costs also are shown on the worksheet.

Determining Net Benefits

The activity can now summarize, on a yearly basis, its costs and savings from implementing EDI. Worksheet 3-8 aids in that summary by using data from Worksheet 3-5 (EDI Investment Costs), Worksheet 3-7 (Annual EDI Operating Costs), and Worksheet 3-4 (Total Life-Cycle Savings). The difference between savings and total costs gives the net cost of EDI for each year of the project.

Rates of Return

At this point, an activity may wish to calculate a rate of return for its EDI projects. (Since we do not call for breaking out investment costs by document or area of application, we are limited to the rate of return on all EDI projects.) Although we do not provide a worksheet for calculating rates of return, we describe three of the more common measures below:

- *Payback period* estimates the number of years required to recover an initial investment. The formula for calculating the payback period is

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Annual savings}} \quad \text{Eq. 3-1}$$

WORKSHEET 3-6 - EDI TELECOMMUNICATIONS COSTS

Document: _____	Activity: _____
------------------------	------------------------

			Number of characters per document
÷	1,000		
=			Number of kilocharacters per document

			Annual document volume
×			Number of kilocharacters per document
×	\$0.10		(Transmission cost per kilocharacter)
=			Annual telecommunications cost

WORKSHEET 3-7 – ANNUAL EDI OPERATING COSTS

Document: _____ Activity: _____

Requirement	Investment (\$000)		
	Activity	DoD trading partners	Total
Telecommunications	_____	_____	_____
Software maintenance	_____	_____	_____
Other			
• _____	_____	_____	_____
• _____	_____	_____	_____
• _____	_____	_____	_____

WORKSHEET 3-8 - SUMMARY OF SAVINGS AND COSTS

Document: _____

Activity: _____

Year	Costs		Total cost	Savings	Net
	Investment	Operating			
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Total					

- **Internal rate of return** determines the discount rate that equates the present value of the expected cash outflows with the present value of the expected inflows. The formula for calculating internal rate of return (IRR) is

$$\sum_{t=0}^n \frac{At}{(1+r)^t} = 0, \quad \text{Eq. 3-2}$$

where At is the net savings (cash flow) from Worksheet 3-8 for year t , n is the last year in which net savings are expected, and r is the interest rate, or IRR.

- **Net present value** is similar to internal rate of return except that it discounts all cash flows to present value using the required rate of return. The formula for calculating net present value (NPV) is

$$NPV = \sum_{t=0}^n \frac{At}{(1+k)^t}, \quad \text{Eq. 3-3}$$

where At is the net savings (cash flow) from Worksheet 3-8 for year t , n is the last year in which net savings are expected, and k is the required rate of return.

Establishing EDI Priorities

Before establishing priorities on its EDI initiatives, an activity needs to determine the time required to replace each document with EDI transactions. Some documents may be ready for immediate implementation, particularly if they expand an existing EDI application. Most, however, cannot be replaced with EDI before 1 to 2 years have elapsed, primarily because of the time required to arrange for program budgeting, procure hardware and software, prepare implementation guidelines, and formulate and implement trading partner strategies. Other documents, such as those supported by application systems that need substantial modification, may require as much as 3 or more years to implement. Worksheet 3-9 provides a convenient form for summarizing the implementation timeframe for each document.

The activity is now in position to summarize its findings on each document using Worksheet 3-10. For each document, it enters the following information:

- Total savings from Worksheet 3-8
- Internal and external trading partner ratings from Worksheets 2-3 and 2-4
- Internal systems rating from Worksheet 2-2
- Business practices rating from Worksheet 2-5
- Applicable EDI transaction set from Worksheet 2-1

- Rate of return (Equations 3-1 to 3-3)
- Implementation timeframe from Worksheet 3-9
- Overall opportunity rating from Worksheet 2-6.

Based on this information, an activity assigns implementation priorities (1, 2, 3, etc.) to each document. It then develops plans for replacing the highest priority documents (i.e., those with the lowest numbers) following the guidance provided in Chapter 4.

WORKSHEET 3-10 – EDI PRIORITIES

Activity: _____

Document title/total net savings	Rating												ANSI trans. set	Implement. timeframe	IRR	Overall rating			Priority
	Trading partner capability						Internal systems			Business practices						E	S	M	
	Internal			External			E	S	M	E	S	M							
	E	S	M	E	S	M													

Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-----------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	-------	-------	-------	--------------------------	--------------------------	--------------------------

Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Document:

Total Net Savings: \$ _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Note: E = Excellent; S = Satisfactory; M = Marginal.

Purpose

At the conclusion of Chapter 3, an activity will have assigned implementation priorities to all documents that warrant replacement by EDI. Building upon those priority assignments, this chapter describes the tasks that are common to all EDI implementation efforts. It also provides a sample schedule for accomplishing these tasks.

Note: The EDI Executive Agent can provide you with support for some of these implementation tasks, including the development of EDI standards and conventions (Subtask 5.2) and training (Subtask 6.6).

Steps to Implementation

Table 4-1 lists eight tasks that an activity typically needs to satisfy as it replaces paper documents with electronic transactions. We discuss each of those tasks below.

Note: Depending on the nature of an activity's project, some of the tasks discussed below may not be required. An activity may also choose to accomplish them in a different order than presented here.

1.0 Establish Project Team

Following the decision to implement EDI, the activity establishes a project team to plan, coordinate, and direct all implementation efforts. The EDI project team should include representatives from all functional areas within the activity that may be affected by EDI.

The activity should give special attention to the selection of someone to lead the project team. Responsible for coordinating all aspects of the planning and implementation processes including relationships with trading partners, software vendors, and network service providers, the project leader should be assigned full time to the EDI project. The project leader should also have the full support of, and direct access to, the activity's top management.

2.0 Develop Business Plan

Among the first assignments of the project team is development of an EDI strategic or business plan for the activity. That plan lays out in broad terms the expected accomplishments, benefits, and associated technical requirements to achieve them. The worksheets from Chapters 2 and 3 should provide the core of the business plan.

TABLE 4-1

EDI IMPLEMENTATION TASKS

1.0	Establish project team
2.0	Develop business plan
3.0	Identify functional requirements
3.1	Complete operating concepts
3.2	Detail data requirements
3.3	Determine applications systems modifications
3.4	Identify and resolve business, legal, and security issues
4.0	Specify operating requirements
4.1	Review and complete hardware specifications
4.2	Identify EDI translation software requirements
4.3	Establish telecommunications strategy
4.4	Identify facility and personnel requirements
5.0	Review EDI standards and conventions
5.1	Map data requirements to ANSI standards
5.2	Develop new or modify existing standards
5.3	Prepare data conventions
6.0	Integrate and test system
6.1	Procure and install hardware and software
6.2	Modify applications systems
6.3	Develop interface programs
6.4	Arrange for telecommunications
6.5	Update operating procedures
6.6	Train operators
6.7	Test, evaluate, and modify system
7.0	Establish trading partner relationships
7.1	Develop trading partner implementation strategy
7.2	Prepare and distribute trading partner information
7.3	Solicit trading partners and execute trading partner agreements
8.0	Implement production system

Note: We recommend that an activity start small (e.g., with one or two EDI transactions) and then expand its EDI base as it gains experience.

3.0 Identify Functional Requirements

In this task, the activity identifies the operational, business, legal, security, data, and technical issues that affect establishment of an electronic operating environment. Since EDI is considered more of a business issue than a technical problem, the activity should be prepared to devote significant resources to this task. The task typically includes four subtasks.

3.1 Complete Operating Concept

Using the EDI operating concept formulated in Chapter 2, the activity develops a formal document that describes, in detail, the data flows, trading partners, work methods, and procedures that it will employ in an electronic environment. This document ensures that the activity has a clear understanding of its new work methods, procedures, and controls.

3.2 Detail Data Requirements

Although the EDI operating concept shows the data flows between trading partners, the activity needs to identify all data elements required to accomplish those data flows. These data requirements eventually will be used to develop or modify EDI standards, conventions for their use, and programs to interface the applications system data base with the EDI translation software package. The EDI project leader should designate an experienced systems analyst to develop those data requirements and publish them in appropriate formats.

3.3 Determine Applications Systems Modifications

The operating concept and data requirements documents completed above may highlight the need to enhance the activity's applications systems to take full advantage of electronically transmitted information. In this subtask, the activity identifies the needed enhancements to those systems and formulates a plan for implementing them. (Since many applications systems must be modified to accept EDI transactions and make full use of the speed and accuracy of those transactions, the activity should not underestimate the importance of this subtask.)

3.4 Identify and Resolve Business, Legal, and Security Issues

In this subtask, the activity investigates and resolves all business issues identified during the EDI opportunities assessment. It also examines the legal and security requirements of EDI and its audit capabilities to ensure that the integrity of those functions is maintained in an electronic environment.

Note: The Executive Agent is developing guidelines to assist in the conduct of EDI security assessments. Additional information on the impact of EDI on DoD regulations and procedures can be found in Drake et al., June 1991, in the Bibliography, and in Chapter 5 of this report.

4.0 Specify Operating Requirements

Following the identification of its functional requirements, the activity is now prepared to address its hardware, software, facility, and manpower requirements. We examine each of these in separate subtasks.

4.1 Review and Complete Hardware Specifications

In this subtask, the activity reexamines its technical architecture and system throughput requirements to determine the hardware required to support the planned EDI applications. If new hardware is required, the activity may need to prepare a document detailing the specifications of that hardware in anticipation of a competitive procurement.

4.2 Identify EDI Translation Software Requirements

Although the primary purpose of EDI translation software is to convert internal fixed-file records to and from EDI standards, most packages include a wide variety of options, such as functional acknowledgment and reconciliation, unattended communications, and standards compliance editing. (Frohman, January 1991, in the Bibliography, provides a complete list of translation software options.) Each activity should base its selection of EDI translation software upon a number of considerations, including final operating concepts, functional requirements, hardware capabilities, as well as the options offered by the vendor.

4.3 Establish Telecommunications Strategy

In this subtask, the activity develops a strategy for communicating with its internal and external trading partners. That strategy builds upon the activity's telecommunications requirements as measured by the number of transactions sent to and received from its trading partners. Worksheet 3-6 provides an initial estimate of those requirements, but the activity may need to update them to accommodate any adjustments to the operating concepts. Most activities will probably use commercial VAN services for sending EDI transactions to their trading partners, although they may also choose to use one of the Military Service VANs or establish direct links with key large-volume trading partners.

4.4 Identify Facility and Personnel Requirements

In this subtask, the activity examines its facilities, including telephone lines, electrical outlets, and office space, to ensure that they are adequate in an electronic operating environment. It also assesses whether its current staff has the needed skills and capabilities. If deficiencies exist, then it should plan for either conducting more training or hiring new personnel.

5.0 Review EDI Standards and Conventions

As noted previously, one of the keys to EDI is the availability of nationally accepted standards. In this task, the activity reviews those standards and proposes needed modifications to ensure that they meet its requirements. Three subtasks comprise this review.

5.1 Map Data Requirements to ANSI Standards

In this subtask, the activity matches the data requirements from each opportunity area (or document) to a specific location in the applicable EDI transaction set. If the activity finds any deficiencies in existing standards, it resolves them in Subtask 5.2. (Appendix A provides an example showing how data are mapped from an application system to an ANSI X12 standard.)

5.2 Develop New or Modify Existing Standards

In this subtask, the activity works with the ASC X12 subcommittees to either develop new EDI standards or modify existing ones.

Note: The Executive Agent can help in working with the EDI standards community. Also, see Appendix A for more information on this topic.

5.3 Prepare Data Conventions

In this subtask, the activity publishes data conventions that detail the rules that it plans to follow when transmitting information through EDI.

Note: The Executive Agent has developed an automated system for producing implementation guidelines in a standard format. The activity should contact the Executive Agent for assistance in obtaining access to that system. Also, Appendix B contains a list of those data conventions that have already been developed for the DoD community.

6.0 Integrate and Test System

This task involves all efforts required to field an EDI capability including procuring hardware, arranging for telecommunications services, developing detailed operating procedures, training operators, and testing and modifying the system. We describe these and other subtasks below.

6.1 Procure and Install Hardware and Software

In this subtask, the activity procures the hardware and EDI software specified in Subtasks 4.1 and 4.2, respectively. Because of the long lead times associated with such procurement, however, the activity may wish to explore the use of existing contracts for those purchases.

6.2 Modify Applications Systems

In this subtask, the activity enhances its applications systems to both accept EDI information and make maximum use of that information. Some functions, such as the use of input screens, data bases, and reports, may need to be modified, while others, such as prepayment auditing, may need to be added. The activity should coordinate these enhancements with any redesigns, either under way or planned, of its applications systems.

6.3 Develop Interface Programs

In this subtask, the activity works with an EDI translation software vendor to define formats for passing data between its applications systems and the EDI

translation software. Following the implementation guidelines prepared in Subtask 5.3, activity programmers should develop the capability to extract selected data elements from the applications systems for transfer to and from the translation software.

6.4 Arrange for Telecommunications

In this subtask, the activity implements the telecommunications strategy developed in Subtask 4.3 and includes accessing commercial or Military Service VANs, establishing mailboxes on those VANs, developing file transfer routines with the EDI host computer, and working with trading partners on communications passwords and codes.

6.5 Update Operating Procedures

Building upon the operating concepts developed in Subtask 3.1, the activity formulates detailed operating procedures for day-to-day EDI operations. Those procedures should address software operation, times of transmission, customer service, back-up routines, and business procedures. To ensure that it meets current operating requirements, the activity should review all internal procedures for the manual processing of documents and compare them to the new procedures.

6.6 Train Operators

In this subtask, the activity formulates a comprehensive EDI training program and oversees its implementation. (The activity may elect to use contract support for EDI training.)

6.7 Test, Evaluate, and Modify System

In this subtask, the activity tests the EDI system using sample data, evaluates the results, and makes appropriate modifications. It then initiates an operational test using actual data sent by a small number of trading partners. This test is conducted in parallel with existing paper flows. Each component of the new system – telecommunications, translation software, host processing, interface programs, and applications systems – is evaluated and modified, as appropriate. The activity should repeat the operational tests until the system passes all preestablished performance criteria.

7.0 Establish Trading Partner Relationships

In this task, the activity formulates a strategy for soliciting and working with trading partners. (See Chapter 5 for more details on trading partner agreements.) The strategy should include development of an information package and procedures for encouraging trading partner participation. The task consists of three subtasks.

7.1 Develop Trading Partner Implementation Strategy

In this subtask, the activity develops a strategy for establishing EDI capabilities with its major trading partners. The strategy should address the pace of

implementation, establishment of milestones, and methods of operation for both internal and external trading partners.

7.2 Prepare and Distribute Trading Partner Information

In this subtask, the activity prepares an information package for all prospective trading partners. That package contains such information as implementation procedures, operating concepts, EDI passwords and codes, points of contact, and EDI trading partner agreements. It also includes the implementation guidelines developed in Subtask 5.3.

7.3 Solicit Trading Partners and Execute Trading Partner Agreements

Using the products of Subtasks 7.1 and 7.2, the activity solicits trading partners to participate in its EDI program and prepares the necessary trading partner agreements. (See Chapter 5 for a more extensive discussion of trading partner agreements.)

8.0 Implement Production System

Once testing is complete and the trading partners are ready to receive and send business information electronically, the activity is ready to use its EDI system in a production environment. The activity should initially focus on increasing the number of trading partners by a fixed number each month (such as 3, 5, or 10). As the trading partner base expands, the activity should explore additional EDI applications and incorporate other trading partners that were not initially targeted.

Implementation Schedule

Figure 4-1 provides a notional schedule for an activity to accomplish each of the above eight tasks. Each activity, of course, would need to tailor the schedule to fit its particular requirements.

Key
 Invoice —————
 Contract
 Status request - - - - -
 Destination acceptance - - - - -
 All —————

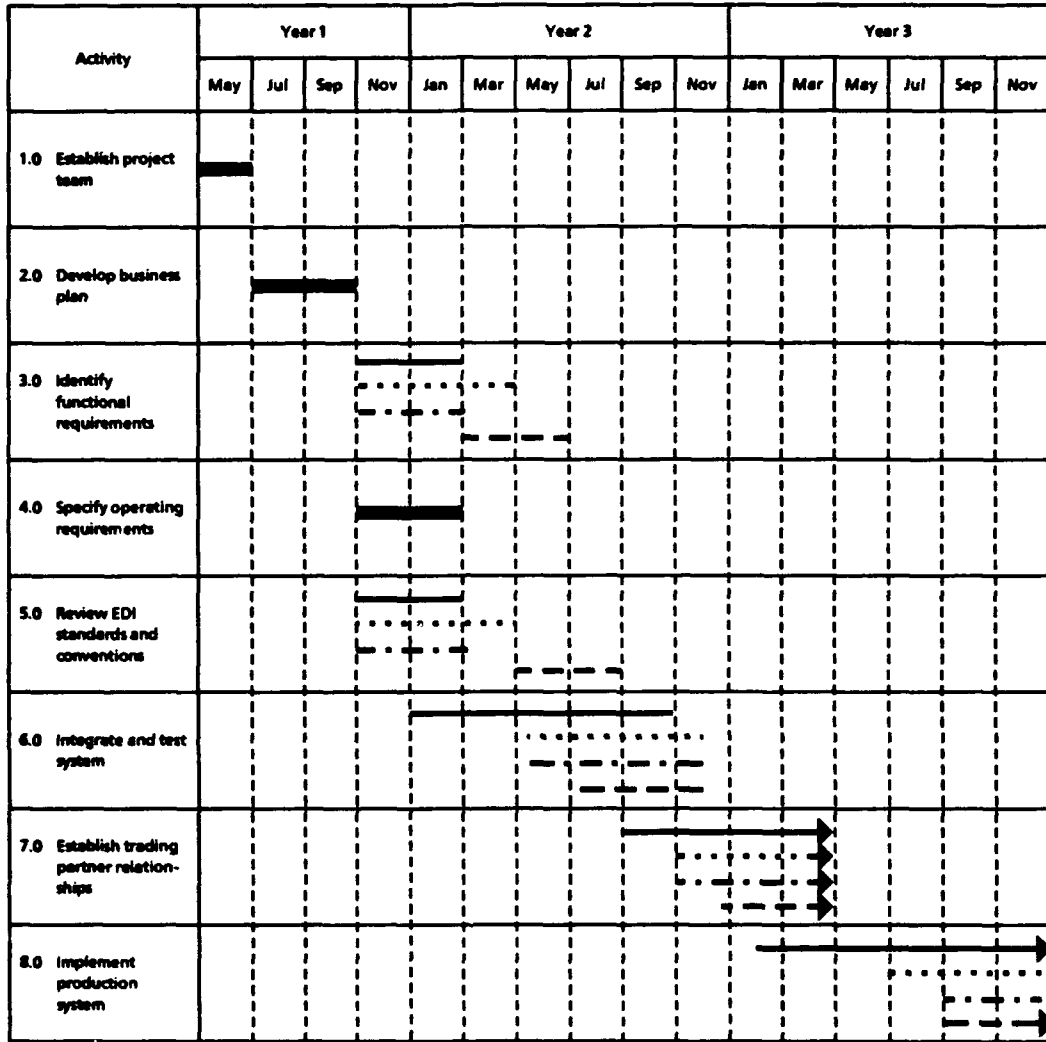


FIG. 4-1. SAMPLE EDI IMPLEMENTATION SCHEDULE

Purpose

Although EDI has many advantages over paper documents, they both share many of the same legal and security problems. As with paper documents, care must be taken to ensure that EDI messages are authentic, properly authorized, and traceable; the messages also need to be protected from loss, modification, or unauthorized disclosure both during transmission and storage.

This chapter addresses these special considerations from an EDI perspective by providing answers to the following questions:

- **Security.** What are the Government's guidelines on the security of electronic messages? What are some of the technologies that an activity can use to satisfy those guidelines? How can the activity protect its EDI transmissions from error?
- **Legal.** What safeguards can an activity put in place to ensure that its trading partners comply with normal business terms and conditions while conducting business through EDI? What is the legal basis for electronic signature?
- **Audit.** How can an activity construct audit trails in an electronic environment? How should an activity maintain and store electronic records?

Security

The Computer Security Act of 1987 requires Federal agencies to identify computer systems that contain sensitive information. It defines "sensitive information" as

... any information, the loss, misuse, or unauthorized access to or modification of which could adversely affect the national interest or the conduct of Federal programs, or the privacy to which individuals are entitled under section 552a of Title 5, United States Code (the Privacy Act), but which has not been specifically authorized under criteria established by an Executive Order or an Act of Congress to be kept secret in the interest of national defense or foreign policy.

Table 5-1 lists six categories of sensitive, but unclassified, data and provides examples of each.

The act further requires that agencies prepare and maintain security plans for sensitive systems and conduct security training for persons involved in the development or operation of sensitive systems.

TABLE 5-1
SENSITIVE/UNCLASSIFIED DATA

Type	Definition	Example
Vital records	Records essential to maintaining continuity of Government activities during a national emergency	<ul style="list-style-type: none"> ● Emergency operation records ● Rights and interest records
Privacy Act information	Records maintained on an individual that include a name, identifying number, symbol, or other particulars assigned to an individual	<ul style="list-style-type: none"> ● Payment and retirement records ● Medical and psychological records ● Educational achievement records ● Financial records
Official use only	Unclassified information that may be exempt from public release under the Freedom of Information Act	<ul style="list-style-type: none"> ● Internal correspondence ● Working papers
National security related (but unclassified)	Unclassified information that alone or in the aggregate, reveals information regarding a high-volume U.S. program or initiative	<ul style="list-style-type: none"> ● Unclassified intelligence information ● Controlled scientific and technical information ● Foreign exchange information
Security management	Unclassified information developed and stored to administer and ensure compliance with security programs	<ul style="list-style-type: none"> ● Limited access information ● Security/internal audit information ● Legal information
Commercial information	Unclassified information that, if released, could provide unfair advantage to competitors	<ul style="list-style-type: none"> ● Contract or proprietary information

Sources: Adapted from a table provided in the U.S. Department of Energy Risk Assessment Methodology; Volume I: DOE Risk Assessment Guideline Instructions, Resource Table, and Completed Sample; Volume II: DOE Risk Assessment Worksheets, National Institute of Standards and Technology (NIST), U.S. Department of Commerce, NISTIR 4325, Edward Robeck, NIST Coordinator, May 1990.

EDI Security Requirements

A June 1991 Computer Systems Laboratory (CSL) Bulletin on computer systems technology published by the National Institute of Standards and Technology (see Bibliography) provides explicit guidance on EDI security. It directs that each activity implementing EDI should attempt to satisfy five broad security requirements:

- **Message integrity.** The transmitting trading partner must ensure that all critical information transmitted is unchanged when received by another trading partner.
- **Confidentiality.** All trading partners must restrict access to EDI messages that contain personal, trade-secret, or sensitive data. (Table 5-1 gives examples of such data.)

- **Originator authentication.** The receiving trading partner must have assurance that the EDI message was transmitted by the named originator (i.e., the trading partner that sent the message).
- **Nonrepudiation.** The trading partner establishing the EDI system must develop procedures to ensure that a binding proposal (such as a bid) submitted by any of its trading partners cannot be denied.
- **Availability.** All trading partners must develop back-up procedures for protecting important data in case of systems failure.

Identifying Sensitive/Unclassified Documents

Worksheet 5-1 can be used by an activity to identify sensitive documents or sensitive data items within a particular document. This worksheet should only be used for documents whose contents are not classified. Follow the directions given below to complete the worksheet:

- **Step 1.** At the top of the page, write the document's number, title, and the function of that document. Note that in some instances the same document is used for more than one function. In such cases, a copy of Worksheet 5-1 should be completed for each distinct function of the document.
- **Step 2.** In the first and second columns of the matrix, list the data elements and their corresponding block numbers as they appear on the document.
- **Step 3.** Place an X in as many columns under the title "Types of sensitive/unclassified data" that accurately describe the sensitivity level of the contents of each data element on the document. Refer to Table 5-1 for definitions and examples of each of the different types of sensitive/unclassified data. If there are no sensitive data elements within the document, place an X in the column entitled "Not sensitive."
- **Step 4.** In the block at the bottom of the matrix, identify the methods that are used to provide security protection to the document in the current processing environment. For example, if a document must be signed by the person authorizing the action initiated by the document, then indicate that a written signature is required. Other examples of protection that are commonly used in the paper environment include sending a document through the U.S. mail in a sealed envelope and requiring a written or verbal notification of receipt from the recipient of a document.

Technical Options

This subsection examines some of the technological options that an activity may use to protect EDI transmissions. It draws extensively from the previously cited CSL Bulletin. (Techniques for controlling access to computer networks, such as password protection, identification tokens, and verification by means of personal attributes, are discussed in Federal Information Processing

WORKSHEET 6-1 - IDENTIFICATION OF SENSITIVITY LEVELS FOR DATA USED IN EDI SYSTEMS

Document: _____ Function: _____

Data elements	Block no.	Types of sensitive/unclassified data							
		Vital records	Privacy Act information	Official use only information	National security related information (not classified)	Security management information	Commercial information	Other (describe type)	Not sensitive
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
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28.									
29.									
30.									
31.									
32.									
33.									
34.									
35.									
36.									
37.									
38.									
39.									
40.									

Note: List types of protection required for this document in the current processing environment.

Standards Publication 83, September 1980, in the Bibliography.) We briefly examine three approaches for protecting EDI messages.

Authentication

To ensure that EDI messages are authentic, an activity can use one of the following techniques:

- Require that every trading partner send an acknowledgment for each EDI message it receives.

Note: Most EDI translation software packages include this feature as an option.

- Require that VAN message status reports, which provide information on the transaction type, data, and time of receipt, be sent to both the sender and recipient of EDI messages, provided they use the same VAN.

Note: Future EDI standards may accommodate the transmission of message status reports between VANs.

- Require use of reference numbers or passwords, known only to the sending and receiving trading partners, within the EDI message.

Integrity

An activity can assure the integrity of its EDI messages by using one of the following techniques:

- The receiving trading partner could recalculate real and hash totals when numerical data (such as part numbers, quantities, unit prices, and total prices) are transmitted.
- The receiving trading partner could send critical parts of messages back to the originating activity for verification.
- The involved trading partners could include a unique code in every message to prevent confusion between similar but distinct messages.

Encryption Techniques

An activity may also use one of two encryption techniques to protect sensitive or classified EDI information: Message Authentication Code (MAC) and Public Key Encryption (PKE).

With MAC technology, both the sending and receiving trading partners have secret encryption/decryption keys. The electronic transmission and the sender's key are entered into a sophisticated algorithm called the Data Encryption Standard (DES), which is located between the EDI translation software and the telecommunications software. The DES creates a special authentication code that is unique to a particular message and key combination. The code is appended to the message and transmitted with the key to the receiver. The receiving trading partner breaks off the authentication code (the transmitted MAC) and runs the message and key back through the DES,

which generates a second code. This code is then compared to the transmitted code. If they are identical, then the message has not been altered. The only way that the message could be tampered with is to recreate the key by generating the correct combination on the first attempt. (Such an occurrence is nearly impossible as the National Security Agency, who designed the system in a joint effort with National Institute of Standards and Technology and IBM, estimates that 54 octillion possible key combinations exist.)

With PKE, each trading partner has a pair of cryptographic keys – a public key and a private key. Both trading partners know the public key, but the private key is known only to its owner. To assure confidentiality, the trading partner sending the message encrypts it with the receiving trading partner's public key. The receiving trading partner then uses its private key to decrypt the message. For maintenance of message integrity and authentication, the sending trading partner uses its private key to encrypt the message while the recipient decrypts the message with the originator's public key. (See June 1991 CSL Bulletin reference in the Bibliography for further information on encryption techniques.)

Note: Any activity that wishes to pursue the use of either MAC or PKE should contact the Executive Agent for additional information.

Legal

Although the Federal Government has published regulations governing its use of EDI [see Title 41 of the Code of Federal Regulations (CFR), April 1989, in the Bibliography], a number of issues remain, with trading partner agreements and electronic signatures the most prominent. We discuss these two issues in more detail below.

Trading Partner Agreements

A trading partner agreement is a written instrument of understanding negotiated between EDI trading partners. Its primary purpose is to decrease the cost of telecommunications by eliminating the need to transmit lengthy and repetitive administrative material with each EDI message.

In the private sector, trading partner agreements accomplish two purposes: they state the contractual relationships and references (terms of conducting business) between trading partners, and they specify the EDI technical protocols (such as transaction sets and mailbox addresses) that will be used in conducting business through EDI.

Unlike their commercial counterparts, Government-prepared trading partner agreements are not contractual documents. Instead, they focus on clarifying various technical and telecommunications issues associated with exchanging business information electronically. The typical Government trading partner agreement includes the following items:

- The applicable EDI implementation guidelines
- The telecommunications mailbox addresses and routings for each trading partner

- The schedules for transmitting messages and which trading partner pays for telecommunications costs
- The procedures for resolving transaction and system errors
- The back-up procedures in the event of system failure
- The electronic recordkeeping responsibilities of each trading partner
- The password generation and security methods that each trading partner will use.

If the EDI message encompasses some type of procurement action, the specific clauses of the Federal Acquisition Regulation need not be transmitted with each transaction. Instead, they could be referenced by the use of codes in the EDI transaction set.

The activity developing an EDI system needs to establish a separate agreement with each trading partner. Although the first few trading partner agreements usually require a significant amount of time to develop and finalize, subsequent agreements are much easier.

Note: The Executive Agent has sample EDI trading partner agreements.

Electronic Signatures

Contracts are typically considered valid only when signed by individuals. In 1947, however, the Statutes of Fraud broadened the definition of written signatures to include "printing and typewriting and reproductions of visual symbols by photographing, multigraphing, mimeographing, manifolding, or otherwise." In 1977, those statutes were further revised to define writing to include "fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device." This latter definition is particularly important for EDI transactions because it is technologically independent.

More recently, the General Accounting Office has recognized facsimile signatures and machine-made signatures to be legally binding. Further, an amendment to 41 CFR Part 101-41 now authorizes the use of electronic signatures in the transportation industry provided they are properly authenticated. That regulation, in part, now reads:

Electronic data interchange (EDI) means the electronic exchange of transportation information in lieu of a paper document. Also "signature," in this case of EDI transmission, means a discrete authenticating code intended to bind the parties to the terms and conditions of a contract.

Additional information on the use of electronic signatures can be found in a 13 December 1991 Decision issued by the Comptroller General (see the Bibliography).

Audit

The use of EDI to carry out business transactions frequently requires that all trading partners have the capability to create comprehensive audit trails and

to maintain records of electronic transactions. We briefly expand on each of these requirements below.

Audit Trails

Auditors traditionally look for "paper trails" to ensure that documents have existed and that all calculations associated with the use of those documents can be reproduced. Although EDI cannot provide a trail of paper, it can meet DoD data storage requirements since many EDI vendors offer a variety of alternatives for archiving electronic records. An activity should consider the following auditing issues when developing an EDI system:

- Are the transactions reproducible and accurate?
- Is the audit trail clear with proper authorization records?
- Can the electronic documents (such as invoice, purchase order, and receiving documents) be reconciled?
- Can the EDI system guarantee that only authorized individuals pay invoices or place orders for material or services?

Auditors are gaining more experience working with electronic records, and all major accounting firms now recognize EDI. One sure way to satisfy audit requirements is to get the auditors involved in laying out the plans for the EDI system.

Maintenance of Electronic Records

Many Government agencies are required to retain their business records for as long as 20 years. Those requirements vary widely, however, depending on the nature of the business being conducted. An activity needs to consider its data storage requirements early in the EDI planning process. EDI translation software vendors can be very useful in reviewing an activity's data storage requirements and suggesting ways to satisfy them.

Appendix A

EDI Message Standards

This appendix describes the role of message standards in electronic data interchange (EDI). It identifies the various components of the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X12 message standard, the most widely used standard. It also demonstrates how a commercial invoice is translated into an ASC X12 transaction set and how a typical transaction set is structured.

The following material is taken from the Data Interchange Standards Association, Inc. (DISA), publication entitled "An Introduction to Electronic Data Interchange," published on 1 May 1990. (See the Bibliography for a more complete reference.)

INTRODUCTION

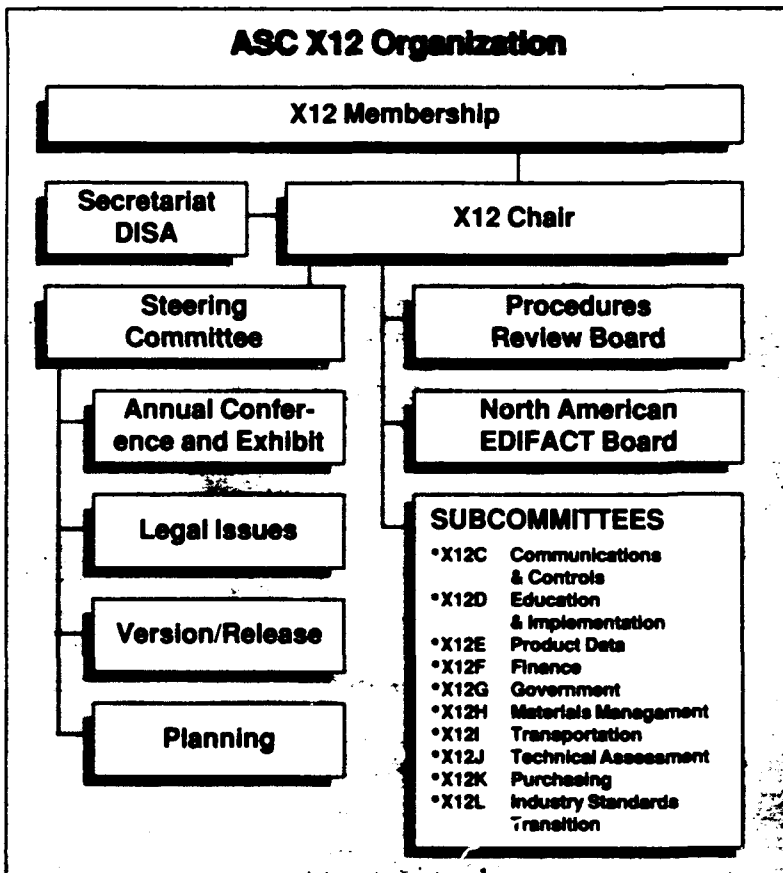
AMERICAN NATIONAL STANDARDS INSTITUTE

The American National Standards Institute (ANSI) was founded in 1918 as the coordinator for national standards in the United States. The U.S. voluntary standards system consists of a large number of standards developers that write and maintain one or more national standards. Among them are professional societies, trade associations, and other organizations. Thousands of individuals and companies, labor, consumer, and industrial organizations, and government agencies voluntarily contribute their knowledge, talent, and effort to standards development.

ANSI is the U.S. member of nontreaty international standards organizations such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). As such, ANSI coordinates the activities involved in U.S. participation in these groups.

Many standards developers and participants support the American National Standards Institute (ANSI) as the central body responsible for the identification of a single consistent set of voluntary standards called American National Standards. ANSI provides an open forum for all concerned interests to identify standards needs, plan to meet those needs, and agree on standards. ANSI itself does not develop standards.

ANSI approval of standards indicates that the principles of openness and due process have been followed in the approval procedures and that a consensus of those directly and materially affected by the standards has been achieved. The *Procedures for the Development and Coordination of American National Standards*, published by ANSI, must be adhered to by standards committees accredited by ANSI for the development of American National Standards.



ACCREDITED STANDARDS COMMITTEE X12

In 1979 ANSI chartered a new committee, which is now known as Accredited Standards Committee (ASC) X12, Electronic Data Interchange, to develop uniform standards for electronic interchange of business transactions. The X12 Committee develops standards to facilitate electronic interchange relating to such business transactions as order placement and processing, shipping and receiving, invoicing, payment, and cash application data associated with the provision of products and services.

The operations of ASC X12 are governed by the *Organization & Procedures* manual, which provides a system of orderly administration, incorporating the procedures required by ANSI. The work of ASC X12 is conducted primarily by a series of subcommittees and task groups whose major function is the development of new and the maintenance of existing electronic data interchange (EDI)

standards. Their recommendations are presented to the full ASC X12 Committee for ratification.

MEMBERSHIP IN ASC X12

Membership has grown dramatically (from fewer than 70 to more than 300 in a two-year period). Membership is open to virtually all organizations and individuals with a material

interest in the standards. Benefits include an opportunity to vote on every issue before the X12 Committee, price discounts on standards publications and meeting and conference registration, and frequent information updates on committee activities and standards. Contact DISA, the Secretariat of the X12 Committee, for information.

ASC X12 MEETING SCHEDULE

ASC X12 convenes for a five-day meeting three times yearly, usually in February, June, and October. These meetings are held in different sections of the country in major hotel facilities to accommodate attendance by members and participants numbering well over 650. X12 subcommittees and task groups may meet at other times and places to work on assigned activities.

PARTICIPATION IN STANDARDS SETTING

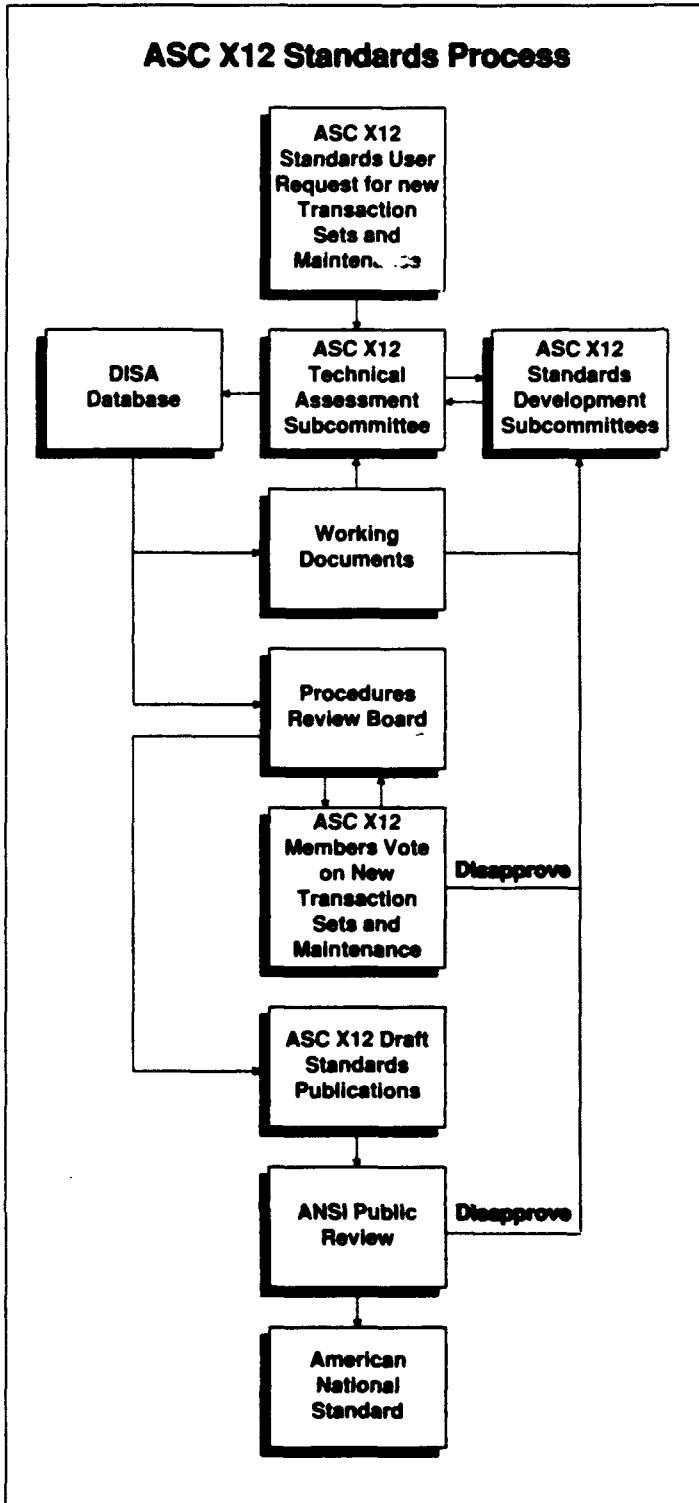
The family of ASC X12 Standards is continually expanding as a result of development activities supported by the members of the X12 Committee and standards users. Businesses and industries new to ASC X12 are welcome to present their requirements for additional EDI standards, or maintenance to existing standards, to the X12 Committee. Procedures are in place for processing these requests; address inquiries to DISA, the Secretariat.

ASC X12 BALLOTS

After each X12 Committee meeting, a series of ballots incorporating subcommittee-approved documents is sent to X12 members for their approval. New draft standards approved by the members of ASC X12 are published individually as Draft Standards for Trial Use, and immediately placed in maintenance status.

SECRETARIAT, DATA INTERCHANGE STANDARDS ASSOCIATION (DISA)

The X12 Committee is supported by a not-for-profit organization, Data Interchange Standards Association (DISA), which serves as



its Secretariat. The principle activities of DISA include communicating with ANSI and the public on behalf of the committee, managing the standards database, publishing, planning and managing ASC X12 meetings and the annual EDI Conference & Exhibit, conducting ballots, and handling membership and administrative matters.

DISA also serves as the Secretariat of the North American EDIFACT Board, whose primary function is participation in the development and maintenance of international EDI standards. UN/EDIFACT (United Nations/Electronic Data Interchange for Administration, Commerce, and Transport) standard messages are developed under the auspices of the United Nations.

DISA sponsors an annual EDI Conference & Exhibit for the general public, featuring EDI information seminars and exhibits by vendors of numerous EDI products and services. Inquiries should be directed to DISA's Conference and Meetings Department.

ASC X12 PUBLICATION SCHEDULE

Once each year DISA publishes the entire set of X12 Standards in one volume, called a release. This includes revisions of previously published Draft Standards for Trial Use, as well as new draft standards approved by ASC X12 during that year. DISA also publishes separately other ASC X12-approved documents, such as ASC X12 Guidelines. Contact the DISA Publications Department for information on how to order these documents.

At approximately three-year intervals the latest release is reviewed by the ASC X12 subcommittees for selection of appropriate draft standards for submission to ANSI to begin the national public review process for their elevation to American National Standards. Those proposed standards surviving public review are published as American National Standards and assigned a new version number.

PUBLICATIONS AND COPYRIGHT

ANSI published and owns the copyright for all Version 2 (1986-87) ASC X12 American National Standards. DISA, as the publisher, holds the copyright on each new Release and will publish future Versions. Requests for permission to reproduce any part of a copyrighted document must be submitted in writing to DISA.

PUBLICATIONS AND VERSION/RELEASE CONTROL

In 1983 the American National Standards Institute approved the publication of a series of standards developed by ASC X12 for electronic data interchange. These are referred to as Version 1 (1983) standards. Version 1 was superseded by the Version 2 family of standards published in 1986-87. Version 2 includes revised Version 1 standards, and a number of additional standards approved as American National Standards in 1986—including the Ship Notice/Manifest Transaction Set (856) and X12.5-Interchange Control Structures published in 1987.

Since 1987, DISA has published a series of "releases." These documents (called Release 1, Release 2, etc.) represent ASC X12-approved revisions of those previously published American National Standards and new draft standards approved by ASC X12 during the previous year. As such, releases are not American National Standards, since their contents have not been subjected to the rigors of the public review process required by ANSI for such consideration. In the form provided in releases, all of the standards are considered to be Draft Standards for Trial Use, Comment and Criticism. These standards are implementable, and users number in the thousands.

ASC X12's purpose in publishing these releases is to put current ASC X12-approved draft standards into the hands of users on a more frequent schedule, since the public review process resulting in American National Standards is lengthy. This technique is intended to speed implementation, reflect industry needs in the standards more quickly, and allow industry to gain experience with new draft standards before solidifying them as American

National Standards. Draft Standards for Trial Use undergo the ANSI-required public review process approximately every three years.

A version/release represents a snapshot in time of the status of the development and maintenance efforts of ASC X12 as of a specified date. Releases are published generally once each year in a single volume and are governed by version control numbers, reflected in the codes for Data Element 480 shown in parentheses below:

Version 2, Release 0	ANSI 1986	(002000)
Version 2, Release 1	X12 1987	(002001)
Version 2, Release 2	X12 1988	(002002)
Version 2, Release 3	X12 04/89	(002003)
Version 2, Release 4	X12 12/89	(002040)

This code represents the standards' status at the time of the snapshot and is used to communicate implementation status to EDI trading partners, who must support the same version/release in order to effect interchange. It should not be assumed by implementers that different releases are upward or downward compatible. Transaction sets, segments, and data elements must all be used at the same version/release level.

For Release 4 the code structure was changed to permit the designation of subreleases. Draft Standards for Trial Use approved for publication in February or in June will be published as separate documents to permit implementation by interested users prior to the annual release publication in December. Thus, the fifth character of the code designates the release, and the sixth character the subrelease, e.g.,

Version 2, Release 4, Subrelease 1 X12 2/90 (002041)

As required by ANSI, the standards included in Release 4 (December 1989) were submitted for public review and comment in spring 1990. Those documents surviving public review and approved by ANSI will be published as American National Standards, Version 3, Release 0 (estimated 1991). Releases will continue to be published annually as well.

Contact DISA for a price sheet and order form for the X12 Standards.

INDUSTRY CONVENTIONS/GUIDELINES

Many industries have developed and published "subsets" of the ASC X12 draft standards as industry-recommended implementation guidelines. Industry conventions are designed to facilitate the implementation of selected standards between members of the industry and their trading partners. Most industries that publish guidelines periodically update them to reflect the enhancements and changes that appear in each new version/release of the standards. A list of industries with known EDI programs or publications is available from the Secretariat.

ASC X12 STATUS REPORT

A detailed report on current X12 Committee activities is available from the Secretariat on request. It gives the publication status of each draft standard, its purpose and scope, ballot status, approved project proposals, ASC X12 subcommittee activities, and other relevant information.

INTRODUCTION

Electronic Data Interchange (EDI) is the exchange of routine business transactions in a computer-processable format, covering such traditional applications as inquiries, planning, purchasing, acknowledgements, pricing, order status, scheduling, test results, shipping and receiving, invoices, payments, and financial reporting. Additional standards cover interchange of data relating to security, administrative data, trading partner information, specifications, contracts, production data, and distribution and sales activities. As other industries and businesses join ASC X12's development activities, additional types of transactions are included in the body of standards.

HISTORY OF EDI

Organizations traditionally have conducted business on paper, often using preprinted business forms to exchange information with trading partners. With the explosive growth of these paper-based exchanges and the amount of data associated with the manufacture and sale of new products and services, many organizations have been forced to seek a more expedient technique for communicating and processing business data.

The widespread use of computers for commercial business applications and the introduction of techniques for computer telecommunications enabled the solution. Early electronic interchanges utilized proprietary formats agreed between two trading partners for this purpose. However, the disadvantages of programming the widely varying formats required by different trading partners mitigated some of the benefits of this method of interchange.

In the 1960s some industry groups began a cooperative effort to develop industry EDI standards for purchasing, transportation, and financial applications. Many of these standards supported only intra-industry trading; but others, such as bills of lading and freight invoices, were applicable across industries. Eventually the idea of national standards for use across industries received substantial support from a number of different industries.

In the late 1970s, using the pioneering work of the Transportation Data Coordinating Committee and the National Association of Credit Management's Credit Research Foundation, ASC X12 began the development of its first standards for electronic data interchange. In 1983 ANSI published the first five American National Standards. In 1989, Release 4 contained 32 standards. By 1990, the X12 Committee had approved development projects for nearly 100 additional domestic and international standards, including most of the transportation and retail industries's EDI standards.

AN INTRODUCTION TO ELECTRONIC DATA INTERCHANGE

Interchange Control Header, ISA Segment, see X12.5.	ISA*00*000000000*01*PASSWORDME*01*123456789*****987654321*****890714*2210*U*00204*000000008*0*P*:NL	Outside Envelope																									
Functional Group Header, GS Segment, see X12.22.	GS*IN*012345678*087654321*900509*2210*000001*X*002040NL	Inside Envelope																									
Transaction Set Header, ST Segment, see X12.22.	ST*810*0001NL	Invoice																									
	BIG*900713*1001*900625*P989320NL	DATE 7/13/90 ORDER DATE 6/25/90 INVOICE # 1001 CUSTOMER ORDER # P989320																									
	N1*BT*ACME DISTRIBUTING COMPANYNL N3*P.O. BOX 33327NL N4*ANYTOWN*NJ*44509NL	CHARGE TO Acme Distributing Company P.O. Box 33327 Anytown, NJ 44509																									
	N1*ST*THE CORNER STORENL N3*601 FIRST STREETNL N4*CROSSROADS*MI*48106NL	SHIP TO The Corner Store 601 First Street Crossroads, MI 48106																									
	N1*SE*SMITH CORPORATIONNL N3*900 EASY STREETNL N4*BIG CITY*NJ*15455NL	REMIT TO (Selling Party) Smith Corporation 900 Easy Street Big City, NJ 15455																									
	PER*AD*C.D.JONES*TE*6185558230NL	CORRESPONDENCE TO Accounting Dept. C.D. Jones (618) 555-8230																									
	ITD*01*3*2*10NL	TERMS OF SALE 2% 10 days from invoice date																									
		<table border="1"> <thead> <tr> <th>QUANTITY</th> <th>UNIT</th> <th>UNIT PRICE</th> <th>DESCRIPTION</th> <th>UNIT PRICE</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>Cse</td> <td>6900</td> <td>Cellulose Sponges</td> <td>12.75</td> </tr> <tr> <td>12</td> <td>Ea</td> <td>P450</td> <td>Plastic Pails</td> <td>.475</td> </tr> <tr> <td>4</td> <td>Ea</td> <td>1640Y</td> <td>Yellow Dish Drainer</td> <td>.94</td> </tr> <tr> <td>1</td> <td>Dz</td> <td>1507</td> <td>6" Plastic Flower Pots</td> <td>3.40</td> </tr> </tbody> </table>	QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	UNIT PRICE	3	Cse	6900	Cellulose Sponges	12.75	12	Ea	P450	Plastic Pails	.475	4	Ea	1640Y	Yellow Dish Drainer	.94	1	Dz	1507	6" Plastic Flower Pots	3.40
QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	UNIT PRICE																							
3	Cse	6900	Cellulose Sponges	12.75																							
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1	Dz	1507	6" Plastic Flower Pots	3.40																							
	IT1**3*CA*12.75**VC*6900NL																										
	IT1**12*EA*.475**VC*P450NL																										
	IT1**4*EA*.94**VC*1640YNL																										
	IT1**1*DZ*3.4**VC*1507NL																										
	TDS*5111NL	Invoice Total																									
	CAD*M***CONSOLIDATED TRUCKNL	Via Consolidated Truck																									
Hash Totals	CTT*4*20NL	(4 Line Items, Hash Total 20)																									
Transaction Set Trailer	SE*21*000001NL																										
Function Group Trailer	GE*1*000001NL																										
Interchange Control Trailer	IEA*1*000000008NL																										

b = Space Character * = Data Element Separator NL = Segment Terminator

Smith Corporation 900 Easy Street Big City, NJ 15155 (618) 555-6765		INVOICE No. 1001			
CHARGE TO Acme Distributing Co. P.O. Box 33327 Anytown, NJ 44509		INVOICE DATE 7/13/90 SALES PERSON NTO SHIP TO The Corner Store 601 First Street Crossroads, MI 48106			
YOUR ORDER NO.	CUST. REF. NO.	ORDER DATE	TERMS		
P989320	66043	6/25/90	2 1/2 10 Days		
QUAN.	UNIT	NO.	DESCRIPTION	UNIT PRICE	TOTAL PRICE
3	Cse	6900	Cellulose Sponges	12.75	38.25
12	Ea	P450	Plastic Pails	.475	5.70
4	Ea	1640Y	Yellow Dish Drainer	.94	3.76
1	Dz	1507	6" Plastic Flower Pots	3.40	3.40
Please direct correspondence to:					
C.P. Jones					
(618) 555-8230					
PLEASE PAY THIS AMOUNT					\$51.11
DATE SHIPPED	7/13/89	SHIPPED VIA	Consolidated Truck		
ORIGINAL					

Figure 1

Left: A description of the ASC X12 format for a typical invoice.

Right: The same data on a traditional paper invoice.

Note: In this example, not all data on the paper invoice has been mapped.

EDI BENEFITS

It is estimated that 10,000 organizations use EDI standards and enjoy many of the following benefits of EDI:

- * Reduction of paperwork and associated savings:
 - One-time data entry
 - Reduced errors, improved error detection
 - On-line data storage
 - Faster management reporting
 - Automatic reconciliation
 - Reduced clerical workload and phone chatter
 - Higher productivity without increasing staff

- * More timely communications:
 - Rapid exchange of business data
 - Elimination of mail charges, courier services
 - Reduced inventory safety stocks
 - Improved production cycle

- * Uniform communications with all trading partners:
 - Customers
 - Suppliers
 - Carriers
 - Banks and financial institutions

- * Better market position relative to non-EDI competitors

A GUIDE TO THE ASC X12 STANDARDS

In developing the ASC X12 series of American National Standards, the X12 subcommittees seek to minimize the necessity for users to reprogram their internal data processing systems to effect interchange. For this reason, the standards are structured so that computer programs can translate data from internal to external formats and vice versa. In this way, either through internally or externally developed software and public-access communications vendors, all sizes of firms and institutions using intelligent computational devices may benefit from the use of the standard. Through the use of the standard, all institutions can enjoy the efficiencies of a common interchange language, rather than experience the difficulties of a proliferation of methods and procedures, which could occur if each institution were to impose its own format on every other institution with which it does business.

EDI FOUNDATION STANDARDS

The ASC X12 series of standards on electronic data interchange is based on interdependency. The "foundation standards" define the syntax of X12 EDI, as well as the data elements, data segments, and control structures. The following standards are required to interpret, understand, and use the ASC X12 series of transaction set standards, which in turn define the format and data contents of business transactions:

- * X12.3 Data Element Dictionary
- * X12.5 Interchange Control Structures
- * X12.6 Application Control Structures
- * X12.22 Segment Directory

X12.6 Application Control Structures

This is the syntax ("architecture") document which governs the other EDI standards. It contains the formal definitions of all terms related to electronic data interchange.

X12.6 was published in 1986 as an American National Standard. Releases 1-3 do not contain X12.6. Subsequent releases do contain a revised X12.6, issued as a Draft Standard for Trial Use (DSTU).

X12.6 is not governed by version/release. Version 2 standards and Releases 1-4 of the standards can be processed using either the American National Standard X12.6-1986 or the DSTU X12.6-1989 editions of the Application Control Structures.

X12.5 Interchange Control Structures

X12.5 contains specifications for the control structures ("envelope") for the electronic interchange of one or more transaction sets. This standard provides the interchange envelope of a header segment (ISA) and trailer segment (IEA) for the electronic interchange through a data transmission, and it provides a structure to acknowledge the receipt and processing of this envelope.

This document is available as ANSI X12.5-1987 Interchange Control Structures. Release 1-1987 does not include X12.5; however, Release 2-1988 and successive releases do contain X12.5, revised and issued as a Draft Standard for Trial Use.

This standard is self contained and governed by version control independent of the transaction set standards (Data Element I11). X12.5 and transaction sets of any version/release can be implemented independently of each other.

X12.22 Segment Directory and X12.3 Data Element Dictionary

These define the segments and data elements, respectively, that are used to construct the transaction sets.

STANDARDS COMPONENTS

Functional Group

A functional group is a group of similar transaction sets (e.g., three purchase orders). A functional group, when transmitted, is bounded by a functional group header segment and a functional group trailer segment. Each transaction set is assigned a functional identifier code, which is the first data element of the header segment. Only those transaction sets with the same code are considered members of one functional group.

Transaction Set

The information included in a transaction set is that contained in a conventional printed document. A transaction set is the data that is exchanged in order to convey meaning between parties engaged in EDI.

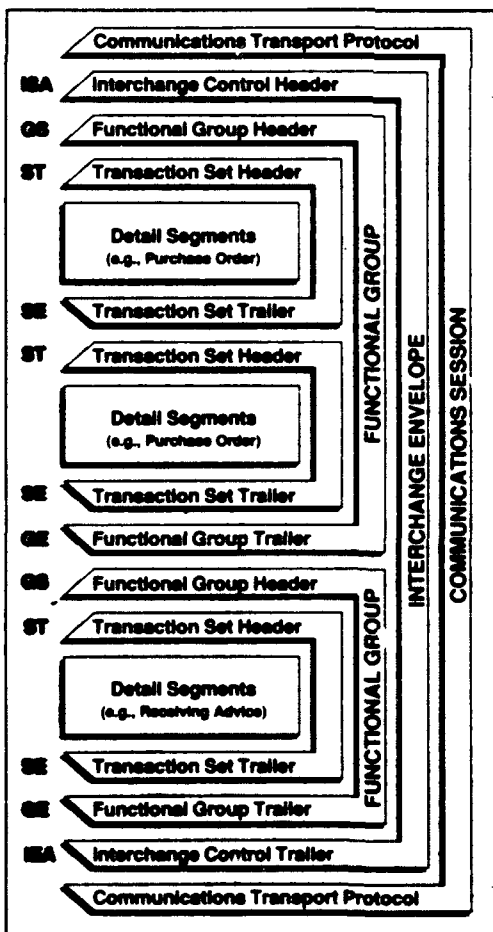


Figure 2

An extract from an ASC X12 release describing the structure of an EDI transmission.

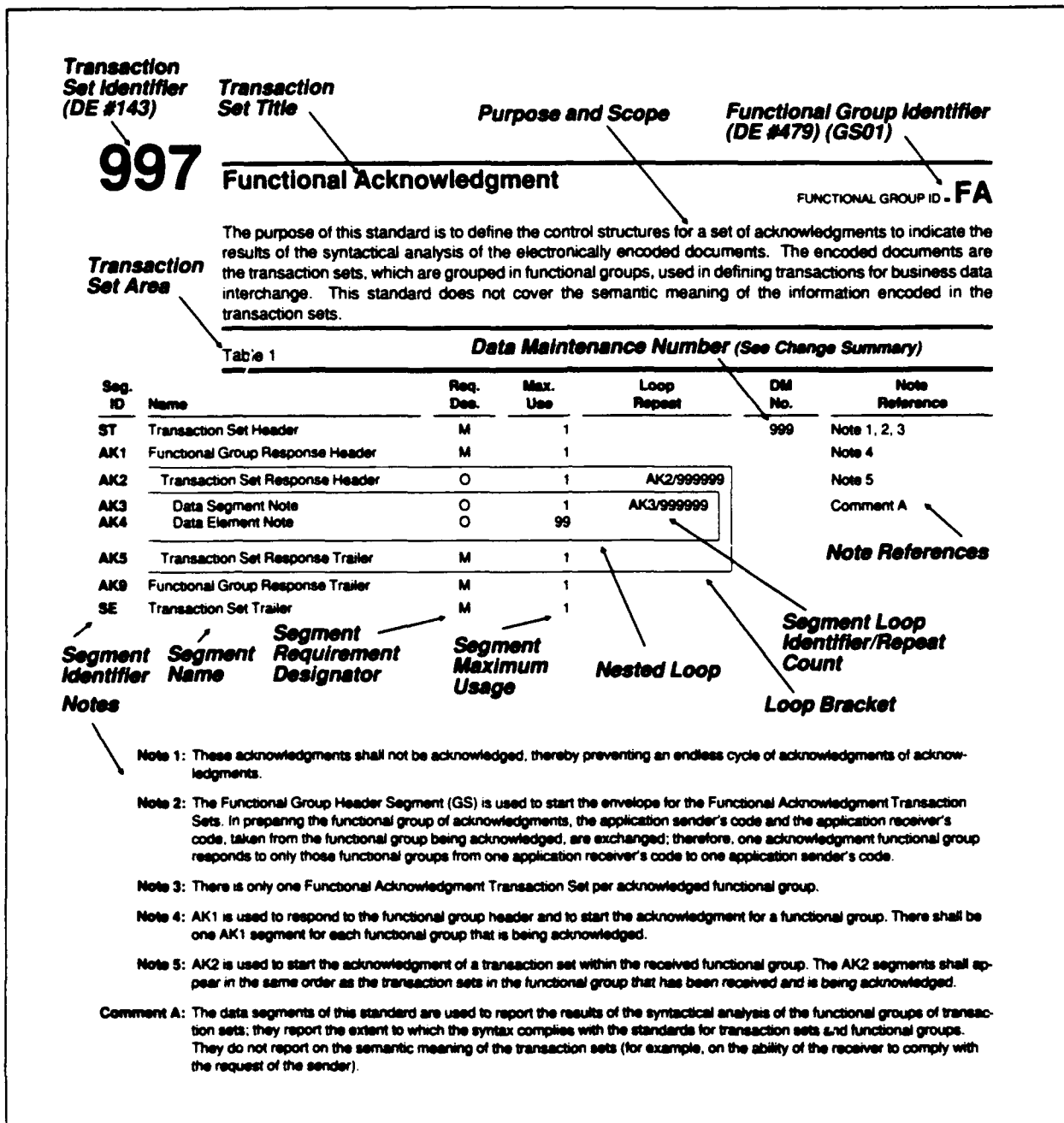


Figure 3

An extract from an ASC X12 release describing the format of the transaction set listings.

consisting of a specific group of segments that represent a business document (e.g., purchase order, invoice). See Figure 1 on pp. 8-9 as an example.

The function of each transaction set is defined in a purpose and scope statement. Each transaction set is composed of one or more tables, which list the segments in a predefined position. Tables display a transaction set header segment as the first segment, one or more data segments in a specified order, and a transaction set trailer segment.

Many transaction sets are divided into three "areas" (tables) which generally relate to the format of a printed document. Table 1 is the heading area, in which information common to the entire transaction is placed. Table 2 is the detail area, which is usually one large loop; and Table 3 is the summary area. When the same segment appears in more than one table, the following semantic rule applies: a segment appearing in Table 1 applies to the entire transaction set, and this may be overridden for the duration of a specific

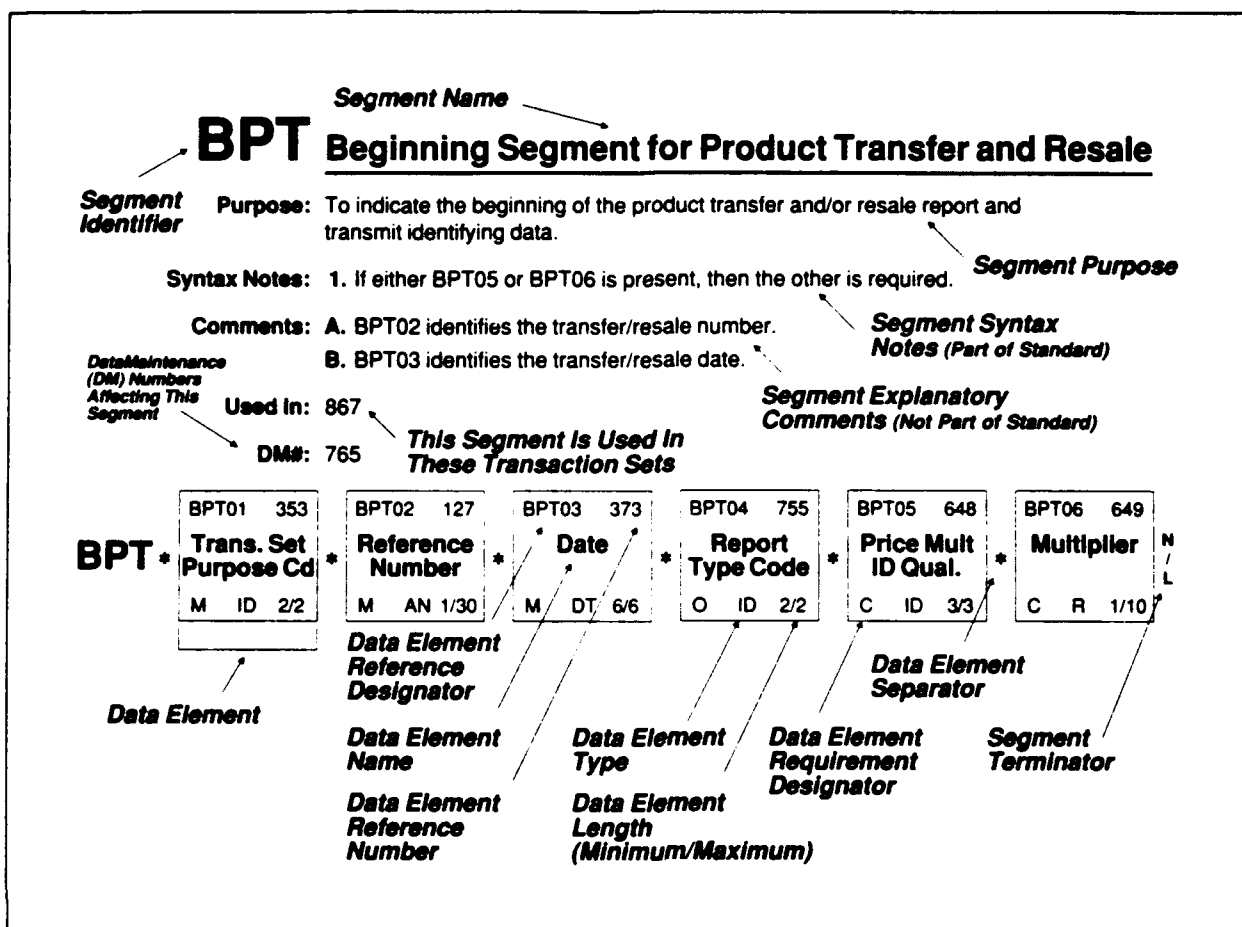


Figure 4

An extract from an ASC X12 release describing the format of the segment directory.

occurrence of a loop in Table 2 when the same segment with a changed value is present in that occurrence of the loop.

Other specifications are listed in the tables. The requirement designator defines a segment's need to appear in the data stream of a transmission: mandatory (required to appear), optional (at the option of the sending party), floating (only for the NTE segment which may appear anywhere in the transaction set between the transaction set header and trailer). Maximum use is the number of times the segment is permitted to be used in that position in the transaction set.

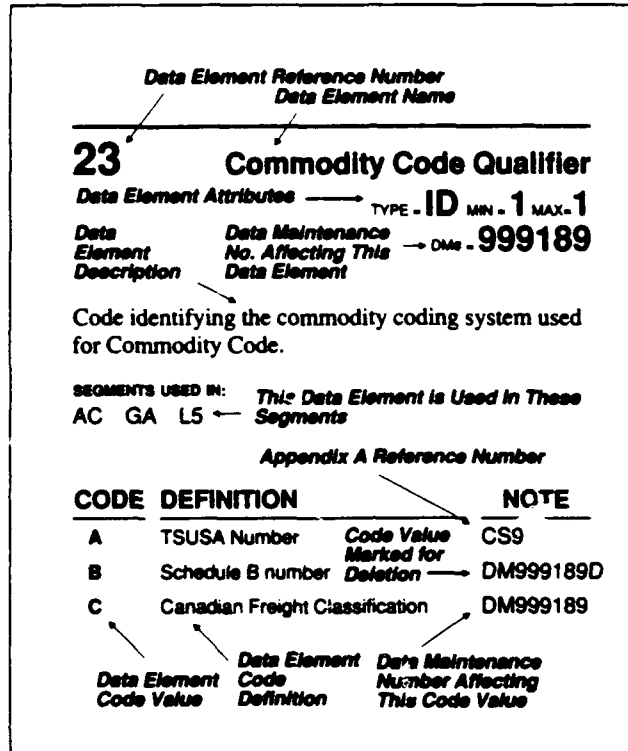
Segments may be repeated as loops, which are designated by a bracket; within each bracket a loop identifier and the maximum occurrence are given. Loops themselves are optional or mandatory. There is a specified sequence of segments in the loop, and the first segment in the loop may appear only once in each iteration. A segment may be mandatory within a loop, and loops may be nested within other loops. For nested loops, the same segment in an inner loop will override the data in an outer loop.

Notes and comments may be provided with the tables, to provide additional information to users.

Segment

A segment is an intermediate unit of information in a transaction set. A segment consists of logically related data elements in a defined sequence: a predetermined segment identifier (which is not a data element), one or more data elements, each preceded by a data element separator, and a segment terminator. Segments are defined in the Segment Directory, which gives the segment identifier, name, purpose, and the data elements it contains in their specified order.

Contiguous optional data elements that appear at the end of a segment that are not used are omitted; transmission of the segment terminator signifies this omission. The omission of data elements other than at the end of a segment is specified by successive data element separators.



Data Element

The data element is the smallest named unit of information in the standard. Data elements are defined in the Data Element Dictionary. Each data element is identified by a reference number. For each data element, the dictionary specifies the name, description, type, and minimum/maximum length. For ID-type data elements, the dictionary lists all code values and their definitions, or indicates in an appendix where the valid code list can be obtained.

Figure 5
An extract from an ASC X12 release describing the format of the data element dictionary

Appendix B

Transaction Sets

This appendix lists all transaction sets included in the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) document *X12 Electronic Data Interchange Standards, Draft Version 3 Release 2*. In addition to the approved standards, we have also listed those standards under development since both are of interest to the Department of Defense (DoD).

The first column in the table below contains the ASC X12 Transaction Set Identification Number. The second column contains the title of the transaction set. In the third column, we indicate any Defense Management Report Decision (DMRD) 941 forms that may apply to a specific transaction set. In some cases (such as Standard Form 1113, *Public Voucher*), a single DMRD 941 form may apply to more than one transaction set. (DMRD 941 documents are described in more detail in Appendix D.) In the fourth column, we list other DoD documents, reports, and transactions that apply to the transaction sets. Modernization of Defense Logistics Systems (MODELS) transactions are highlighted by an underline in this column. More information on the content and structure of the ASC X12 transaction sets can be obtained by contacting:

ASC X12 Secretariat
 Data Interchange Standards Association, Inc.
 1800 Diagonal Road, Suite 355
 Alexandria, VA 22314-2852
 Phone: (703) 548-7005

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
104	Air Shipment Information		
110	Air Freight Details and Invoice	SF 1113	
114	Air Ship Status Message		
170	Revenue Receipts Statement		
180 ^a	Revenue Receipts Statement		<u>Materiel Returns</u>
196 ^b	Contractor Manufacturing Progress Reporting		DD Form 1921
204	Motor Carrier Shipment Information		
210	Motor Carrier Freight Details and Invoice	SF 1113	
213	Motor Carrier Shipment Status Inquiry		
214	Motor Carrier Shipment Status Message		
217	Motor Carrier Loading and Route Guide		
218	Motor Carrier Tariff Information		
300	Reservation (Booking Request) (Ocean)		
301	Confirmation (Ocean)		

^a Not yet approved.

^b In development.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
303	Booking Cancellation (Ocean)		
304	Shipping Instructions (Ocean)		
309	U.S. Customs Manifest (Ocean)		
310	Freight Details and Invoice (Ocean)		
312	Arrival Notice (Ocean)		
313	Shipment Status Inquiry (Ocean)		
315	Status Details (Ocean)		
322	Terminal Operations Activity (Ocean)		
323	Vessel Schedule and Itinerary (Ocean)		
324	Vessel Stow Plan (Ocean)		
350	U.S. Customs Release Information (Ocean)		
353	U.S. Customs Master In-Bond Arrival (Ocean)		
354	U.S. Customs Automated Manifest Archive Status (Ocean)		
361	Carrier Interchange Agreement (Ocean)		
404	Rail Carrier Shipment Information		
410	Rail Carrier Freight Details and Invoice	SF 1113	
414	Rail Carhire Settlements		
417	Rail Carrier Waybill Interchange		
418	Rail Advance Interchange Consist		
426	Rail Revenue Waybill		
429	Railroad Retirement Activity		
431	Railroad Station Master File		
466	Rate Request		
468	Rate Docket Journal Log		
485	Ratemaking Action		
490	Rate Group Definition		
492	Miscellaneous Rates		
494	Scale Rate Table		
511 ^c	Requisition		<u>DD Form 1348, DA2765, Requisitions</u>
517 ^a	Material Obligation Validation (MOV)		<u>MOV</u>
527 ^c	Material Receipt		<u>Material Due-in/Receipt</u>
561 ^a	Contract Abstract		<u>Contract Abstract and Acknowledgment</u>
536 ^a	Logistics Reassignment		<u>Logistic Reassignment</u>
567 ^c	Contract Completion Status		<u>Contract Completion Status</u>
568 ^a	Contract Payment Management Report		<u>Contract Payment Notice</u>
602 ^a	Transportation Services Tender	MT 364R	
806 ^c	Project Schedule Reporting		CSCSC Reporting

Note: Material transactions will replace Military Standard Requisition and Issue Procedures/Military Standard Transaction Reporting and Accounting Procedures (MILSTRIP/MILSTRAP) transactions and their Military Standard Petroleum System (MILSPETS) corollaries. DA=Department of the Army; CSCSC=Cost Schedule Control System Criteria.

^a Not yet approved.

^b In development.

^c Approved for Version 3-Release 3 Dec. 1992.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
810	Invoice	SF 1443, SF 1113, DD Form 1898	<u>DoD Invoices,</u> Commercial Invoices, Public Vouchers, Request for Progress Payments
811	Consolidated Service Invoice/Statement		
812	Credit/Debit Adjustment		
815	Cryptographic Service Message		<u>Invoice Adjustments</u>
819	Operating Expense Statement		
820	Payment Order/Remittance Advice	SF 1443, SF 1113	Remittance Advice in EFT
821	Financial Information Reporting		
822	Customer Account Analysis		
823	Lockbox		
824	Application Advice	All	All
826	Tax Information Reporting		
827	Financial Return Notice		
828	Debit Authorization		
829	Payment Cancellation Request		
830	Planning Schedule with Release Capability		<u>War Materiel</u> <u>Requirements</u>
832	Price/Sales Catalog		Price/Sales Catalog
835	Health Care Claim Payment/Advice		
836	Contract Award		Notice of Award
838	Trading Partner Profile	SF 129	Trading Partner Agreement, Registration/ Acknowledgment
839	Project Cost Reporting		CSCSC Reporting
840	Request for Quotation	SF 18	RFB, RFP, IFB, etc.
841	Specifications/Technical Information		CALS Data Envelope, Technical parts of Bid Sets
842	Nonconformance Report	SF 361, SF 364, SF 368	
843	Response to Request for Quotation		Quotes, Bids and Proposals
844	Product Transfer Account Adjustment		
845	Price Authorization Acknowledgment/Status		Price and Availability
846	Inventory Inquiry/Advice		<u>Small Arms Reporting</u>
848	Material Safety Data Sheet		<u>MSDS and HAZMAT</u> <u>Reporting</u>
849	Response to Product Transfer Account Adjustment		
850	Purchase Order	DD Form 1155	Contracts

Note: RFB = Request for bid; RFP = request for proposal; IFB = invitation for bid; MSDS = Material Safety Data Sheet; HAZMAT = hazardous materials.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
851	Lease Schedule		
852	Product Activity Data		
855	Purchase Order Acknowledgment		To Create bilateral agreement
856	Ship Notice/Manifest	DD Form 250, DD Form 1898	<u>In-transit Visibility, Shipment Status</u>
857	Shipment and Billing Notice		<u>Shipment Performance Notice, Manifests, and Destination Acceptance Alert (Combined Ship Notice/Invoice)</u>
858	Shipment Information	SF 1103, SF 1203, 619/619-1	<u>TCMD</u>
859	Freight Invoice	SF 1113	
860	Purchase Order Change Request – Buyer Initiated	SF 30	Contract Modifications and Charges to Contract and Solicitations
861	Receiving Advice/Acceptance Certificate		<u>Receiving Report</u>
862	Shipping Schedule		
863	Report of Test Results		Adjunct to PQDRs
864	Text Message		
865	Purchase Order Change Acknowledgement/ Request – Seller Initiated		In lieu of paper-based correspondence, change order/acknowledge
866	Production Sequence		
867	Product Transfer and Resale Report		<u>Issue Backorder & Demand</u>
868	Electronic Form Structure		X12 data maintenance
869	Order Status Inquiry		
870	Order Status Report		<u>Requisition Status, Revised Deliver Forecast and PCO Response</u>
872	Residential Mortgage Insurance Application		
878	Product Authorization/Deauthorization		
879	Price Change		Adjunct to 832
888	Item Maintenance		<u>Storage Item Correction</u>
889	Promotion Announcement		
894	Delivery/Return Base Record		Inventory Records
895	Delivery/Return Acknowledgement and/or Adjustment		Inventory Records
896	Product Dimension Maintenance		

Note: TCMD = Transportation Control and Movement Document; PQDRs = Product Quality Deficiency Reports; PCO = Purchasing Contracting Officer.

ASC X12 Transaction Set ID	ASC X12 Standard Title	DMRD 941 Form	Other Uses
940	Warehouse Shipping Order		<u>Material Release Order</u>
943	Warehouse Stock Transfer Shipment Advice		
944	Warehouse Stock Transfer Receipt Advice		
945	Warehouse Shipping Advice		<u>Material Release Advice</u>
947	Warehouse Inventory Adjustment Advice		<u>Inventory Adjustment</u>
980	Functional Group Totals		
990	Response to a Load Tender		
996	File Transfer		
997	Functional Acknowledgment	All	All

Appendix C

Submitting Projects to the Executive Agent

This appendix describes the procedures an activity should use to request funding for electronic data interchange (EDI) projects from the Executive Agent for EDI and Data Protection.

Recently, the Department of Defense (DoD) incorporated EDI into the Corporate Information Management (CIM) program managed by the Office of Defense Information. To assist in allocating scarce resources among competing automation projects, the Office of Defense Information now requires activities to submit a Functional Economic Analysis (FEA) detailing that activity's baseline operating expenses, EDI investment costs, and expected benefits over a 6-year period.

An abbreviated FEA form has been developed specifically for FY92 automation projects. That form and supporting documentation are provided as annexes to this appendix.

The worksheets contained in this *EDI Planing and Implementation Guide* should assist an activity in completing Parts b (Investment) and c (Benefits) on the abbreviated FEA form contained in Annex 2. In addition, the activity is required to supply an estimate of its baseline operating costs over the life cycle of the proposed project (see Part A). After completing the FEA form, the activity should attach the completed worksheets from this Guide and submit the package to the Executive Agent.

Introduction

This preparation guide is designed to assist Functional Managers in arriving at and documenting a CIM functional improvement baseline. Worksheets are provided in attachment A2 [in this report Annex 2] which, when completed, contain a structure for presenting basic financial information with supporting schedules for decision and transition information. Automation of the forms is encouraged, where possible, to assist in reducing the time required to perform the economic analysis and documenting the results. Use of the IDEF modeling language is encouraged but not required, especially in early iterations of the plan. Also, there is no direct mapping between the attached worksheets and the IDA model. However, the worksheets can be used as a first cut estimate to identify data required for more detailed analysis and modeling.

Analytic Elements

The following steps are normally performed to complete a CIMBASE analysis. These must be completed before attempting to document the decision using Annex 2 formats.

1. Define the boundary of the functional area. Briefly describe how the future business system will operate and the goals of the CIM-driven functional objective (vision). Define what services are part of the business mission and relationships with other business areas.
2. Define the planning horizon for the near-term, mid-term, and any residual year periods.
3. List candidates to be considered in developing the CIM functional baseline.
4. Estimate the following data by year for the planning horizon defined in step 2.
 - a. Costs data
 - Current baseline cost of operations (resources used, not necessarily budgeted). Projections for outyears should reflect changing workload, expected to decline due to DoD downsizing, but not implementation of an alternative.

- Investment cost required to make each alternative the CIM functional baseline. Major cost subcategories may include development, transition, conversion, implementation, etc., with residual costs entered under "other."
- b. Benefits data (i.e., actual budgetable dollar savings) attainable by implementing this alternative as the CIM functional baseline. Measurable benefits are preferred, and at least one should be included. Areas of benefit include, but are not limited to, such broad categories as:
 - Development/modification dollars not spent on maintaining other systems
 - Consolidation savings
 - Obvious (skim the cream) process improvements
 - Identified Benefits (in savings \$) – (Note: should be specified in a convenient format.)

The cost and benefit data can be gross estimates within a reasonable range of the true value based upon that value's size. For example, a \$10 million dollar estimate is "accurate" enough if the estimated actual cost is – say \$10.326 million – and that cost is much larger than all other costs or benefits.

5. Select the best alternate CIM functional baseline from the *economic perspective*, if any. The decision process should include a review of the above information to identify the cost/benefit drivers and the impact of estimating errors on the decision (sensitivity). Some considerations may be (a) cost and savings estimates, (b) horizon time – (near-term and residual), (c) financial, technical, and functional risks, and (d) discount rate.
6. Outline the transition plan mapping the current system support environment to the CIMBASE platform.

The Decision

The CIM functional baseline decision choice should be made following a review of the information captured above. Special emphasis should be placed on ensuring that benefits claimed can be measured. The functional area manager should consider the following additional factors in reaching a decision:

- Consistency of alternative with CIM functional and technical objectives
- Extensibility to the CIM functionality
- Market share, product segment functional considerations.

Qualitative considerations and their impact on the final CIM functional baseline choice should be documented.

Documentation

The CIM functional baseline should be chosen and the following information entered in the worksheet format:

- **Summary** – Use to capture cost and savings summaries (in total and incrementally by year). Marginal savings (benefits) by year are sufficient for initial functional economic analysis. Measurable financial targets which can be tracked to verify the progress toward achieving the CIM migration financial objectives.
- **Schedule A** – Supplies general, common decision support information. Use background to transcribe functional objective, planning horizons, CIM work group efforts, current MIS and environment data, identify alternatives, and describe the selected alternative and selection criteria. Also, benefit measurement methodology, benefits reporting, and milestones are entered in this schedule.
- **Schedule B** – Use to document the transition strategy.

The completed worksheets should be reviewed for financial validity with all affected parties prior to formal submission to the functional manager for approval.

**WORKSHEET 2-1 -- INITIAL FUNCTIONAL ECONOMIC ANALYSIS
SUMMARY**

1. Identification: _____
2. Originator (Organization): _____
3. Financial validation (Organization): _____
4. Selected alternative financial summary (\$M)

Category	FY_	FY_	FY_	FY_	FY_	FY_	Residual
a. Baseline:	---	---	---	---	---	---	---
b. Investment (e.g., Development, Transition, Conversion, Implement, as appropriate):							
1. _____	---	---	---	---	---	---	---
2. _____	---	---	---	---	---	---	---
3. _____	---	---	---	---	---	---	---
4. _____	---	---	---	---	---	---	---
5. _____	---	---	---	---	---	---	---
Other	---	---	---	---	---	---	---
Total	---	---	---	---	---	---	---
c. Benefits:							
1. _____	---	---	---	---	---	---	---
2. _____	---	---	---	---	---	---	---
3. _____	---	---	---	---	---	---	---
4. _____	---	---	---	---	---	---	---
5. _____	---	---	---	---	---	---	---
Other	---	---	---	---	---	---	---
Total	---	---	---	---	---	---	---

Attached Schedules

Location/Format

___ A – General Decision Support Information

___ B – Transition Information

Review Checklist

Financial Validation: ___

Mission Baseline: ___

Benefits: Alternatives ___ Measurement ___ Report ___ Achievable ___

Investment/Benefit Ratio Adequate ___

**WORKSHEET 2.3 – SCHEDULE A – GENERAL DECISION SUPPORT
INFORMATION**

1. Background:
2. Description:
 - a. Baseline
 - b. Alternatives identified
 - c. Alternative preferred/rationale
3. Benefits identified:
 - a. Benefit opportunities
 - b. Benefit measurement/reporting responsibilities/procedure
4. Milestones:

**WORKSHEET 2-4 – INITIAL FUNCTIONAL ECONOMIC ANALYSIS
PREPARATION INSTRUCTIONS**

Summary section.

(2 pages expected)

This initial section of any functional economic analysis includes identification, validation, and financial information. A general decision support narrative section (Schedule A) is always required. Other schedules may be specified to support particular decisions. Extensive use of automated media and communication networks is encouraged for preparation, distribution, and updating.

1. **Identification:** Identifies CIM Functional area/Decision identifier. (Local specification.)
2. **Originators Organization/Title:** Identifies point of contact for more information, preferably a manager.
3. **Financial Validation (Organization/Title):** Identifies financial office, usually comptroller. Financial validation may include but is not limited to
 - a. Confirm financial information is correctly annotated.
 - b. Costs and benefits consistent with current costs or budget information.
 - c. Costs and benefits do not overlap other analyses.
4. **Selected Alternative Summary:** This section contains information to support the selected alternative. Data represents financial information by fiscal year in millions for the first 6 years with residual column cumulating annual figures through the expected life cycle consistent with the IDA model. Reportable categories are described in the following paragraphs and related to IDA model elements.
 - a. **Baseline:** Total resources required to support the functional area, both IT and mission.

(IDA Model Relationship: Baseline Sub-total Displays for Baseline Operations & Baseline Management and Support Costs and also Summary Chart for functional Area, Costs and benefits.)
 - b. **Investment:** Investment costs, mission and IT, (by FY and Residual) for development, transition, conversion, implementation and other major categories. Normally the total is the requested amount to support the decision. Major categories often identified under investment are development, transition, conversion, and implementation to encourage completeness. Only major categories should be identified which are needed to support the description.

Total: Column totals for investment.

(IDA Model Relationship: "INVEST" Data Sheets for Alternative Operations Investment (Phase A2) Costs & Alternative Management and Support Investment (Phase B2) Costs)

Appendix D Frequently Used Documents

This appendix describes 16 documents routinely used by Department of Defense (DoD) activities to conduct business. These 16 documents were used as a basis for Defense Management Report Decision (DMRD) 941, *Implementation of Electronic Data Interchange in the DoD*. We group these documents into four major functional categories: procurement/contract administration, transportation, supply and maintenance, and fuels. (The documents described in this appendix constitute just a few of the documents that DoD uses to conduct business.)

Procurement/Contract Administration

- *Department of Defense (DD) Form 250 – Material Inspection and Receiving Report.* This form is a multipurpose document. It is primarily used for inspection, acceptance, and receiving of materials from a vendor, but it may also be used as an invoice if a vendor chooses. It is typically distributed to the consignee, contract administration office, purchasing office, and payment office. It may also be sent to numerous other organizations under certain circumstances.
- *DD Form 1155 – Order for Supplies and Services.* This form is one of the most pervasive in DoD. It is used as either a purchase order for small purchases (less than \$25,000) or delivery orders for indefinite delivery type contracts. Some procurement activities have developed local forms that mimic the purchase order function of the DD Form 1155 to accommodate their special requirements.
- *Standard Form (SF) 18 – “Request for Quotations.”* Although the SF 18 is principally a paper document, DoD activities execute as much as 50 percent of their requests for quotation by telephone. The SF 18 is used by prospective DoD vendors, who complete the unit price and certification sections and then return the form to the procuring activity.
- *SF 30 – Amendment of Solicitation/Contract Modification (Non-Local).* This form is used to modify contracts, orders, or solicitations. Vendors receive the form and use it to adjust their internal proposal preparation and contract/order management systems. Replacement of this document with electronic transmissions would give DoD activities better visibility over contract details and improve the ability to track contract line items, unit prices, delivery schedules, engineering changes, and amended shipping instructions.
- *SF 129 – Solicitation Mailing List Application.* The SF 129 permits prospective vendors to be added to a buying activity's mailing list. It is

completed by the vendor and mailed to a buying office, which enters the information into an automated mailing list.

- **SF 1443 – Contractor’s Request for Progress Payments.** This form is used by DoD contractors to request progress payments, which are usually made by DoD on a regular basis.

Transportation

- **SF 1103 – Freight Government Bill of Lading (GBL); Commercial Bill of Lading (CBL); SF 1113 – Public Voucher.** These documents are used to procure freight transportation and related services from commercial carriers. The GBL, used to procure nonlocal service, is a seven-part document distributed to the carrier, shipper, consignee, Military Traffic Management Command (MTMC), and a DoD finance center.
- **SF 1169 – Government Travel Request; SF 1113 – Public Voucher.** These documents are used to procure travel services. The SF 1169 is distributed to a finance center by the passenger carrier along with an SF 1113 for payment.
- **SF 1203 – Personal Property GBL; 619/619-1 – Statement of Accessorial Services Performed; SF 1113 – Public Voucher.** These documents are used to procure personal property transportation and related services from commercial carriers. The SF 1203 is a seven-part document distributed to the carrier, shipping office, receiving office, MTMC, and a finance center. The 619 and 619-1 are used to confirm the performance of additional personal property services and are submitted along with the SF 1113 for payment to a finance center.
- **Voucher Stub and Check.** These documents are used to pay carriers for transportation-related services. A finance center mails the check, along with the stub from the public voucher (SF 1113), to the carrier. The voucher stub serves as the carrier’s remittance advice.
- **MT 364R – Standard Tender.** This MT (military tender) form specifies the freight rates under which carriers propose to move DoD cargo. It provides information for transportation pricing, carrier selection, auditing, and payment. Carriers submit nine copies to MTMC, which, in turn, distributes copies to its Eastern and Western Commands, the General Services Administration, and the Navy Material Transportation Office.

Supply and Maintenance

- **SAV 926 – Monthly Report of Repairables.** The SAV (Standard Aviation) 926, an Army document, is generated monthly by commercial maintenance activities to notify inventory control points of the quantity and status of unserviceable assets sent to them for repair.
- **SF 361 – Transportation Discrepancy Report.** Administered by MTMC, the SF 361 is used to report conditions such as damage to material while

intransit or delivery to the wrong recipient. It is usually sent to the appropriate MTMC area command and to the ultimate consignee if it is issued by an intermediate receiver. A copy is also sent to the commercial carrier if one is involved.

- **SF 364 – Report of Discrepancy (Supply).** The SF 364, administered by Defense Logistics Standard Systems Division, reports shipment conditions such as incorrect quantity, improper labeling, or poor conditions. It is sent to the DoD item manager or an item manager from an affiliated civil agency, such as the General Services Administration.
- **SF 368 – Product Quality Deficiency Report.** Administered by the Defense Logistics Agency, the SF 368 reports material defects stemming from the original manufacturer. It may require the products being shipped to undergo product analysis or testing by laboratories. Like the SF 364, it is sent to the DoD item manager or an item manager from a civil agency.

Fuels

- **DD Form 1898 – Aviation Fuels Sales Slip.** The DD Form 1898, an aviation fuels sales slip or "delivery ticket," documents that the aviation fuel documented on an into-plane invoice was actually delivered to a Government activity. DD Form 1898 into-plane receipts are signed by the pilot, who retains a copy. The fuel company sends another copy of the delivery ticket with its into-plane invoice to the Defense Fuels Supply Center for payment. If the hardcopy DD Form 1898 has valid nameplate information and is signed by a Government representative, then the Defense Fuels Supply Center certifies the invoice for payment.

Books

International Guide to EDI Products and Services, Marietta, Ga.: EDI EXECUTIVE Publications, 1991.

The EDI Project Planner, Mike Witter and Jack Shaw, Marietta, Ga.: EDI EXECUTIVE Publications, 1990.

EDI – The Competitive Edge, Phyllis Sokol, 1989.

Electronic Data Interchange – From Understanding to Implementation, Kathleen Conlon Hinge, New York: American Management Association, 1988.

An Introduction to Electronic Data Interchange, Gaithersburg, Md.: American National Standards Institute, July 1987.

EDI: Making Business More Efficient, Ben Milbrandt, Dallas: EDI, spread the word!, 1987.

Logistics Management Institute Publications

U.S. Navy Strategic Plan for Electronic Data Interchange, H. Featherstone and M. McEwen, LMI Report NA103, November 1991.

Feasibility of a Single Discrepancy Reporting System, D. Egan, H. Featherstone, R. Frome, and J. Ott, LMI Report DL902R2, September 1991.

Modernization of Defense Logistics Standard Systems (MODELS): Establishing the Functional Baseline, 3 Vols., D. Egan, et al., LMI Report DL902R1, September 1991.

Electronic Commerce and Competitive Procurement, D. Drake and J. Ciucci, LMI Report PL006R1, June 1991.

An Electronic Commerce Program for the Defense Finance and Accounting Service – Columbus Center, T. Hardcastle and W. Ledder, LMI Report DL001-02R1, May 1991.

Technical Support Task Report for the Modernization of Defense Logistics Standard Systems, 3 Vols., W. James, et al., LMI Report DL702R1, May 1991.

DoD Implementation Guidelines for Electronic Data Interchange (EDI): Volumes I and II, M. Henderson, LMI Report DL001-01TR1, April 1991.

- Paperless Material Inspection and Receiving Report: A Strategy to Streamline Acquisition and Reduce Paperwork*, S. Luster, LMI Report AF005R1, March 1991.
- A Guide to EDI Translation Software, 1991 Edition*, H. Frohman, LMI Report PL005R1, January 1991.
- Defense Logistics Management System – A Commitment to Customer Support*, LMI Brochure DL902, January 1991.
- Electronic Commerce: A Strategic Plan for DoD and Work Plan Annex*, T. Heard and M. Henderson, LMI Report DL001-01, December 1990.
- A Business Case for Electronic Commerce*, T. Hardcastle and T. Heard, LMI Report DL001-06R1, September 1990.
- How to Submit EDI Tenders to the DoD for Transportation of Freight in the Continental United States*, T. Heard and M. Creedon, LMI Report MT901TR2, September 1990.
- Modernization of Defense Logistics Standard Systems (MODELS) Site Conversion Guide*, M. McEwen, LMI Report DL902TR1, June 1990.
- EDI Telecommunications Strategy for Defense Transportation*, H. Frohman, B. Kaplan, and W. Ledder, LMI Report PL005TR1, April 1990.
- Electronic Data Interchange in Procurement*, D. Drake, J. Ciucci, and B. Milbrandt, LMI Report PL904R1, April 1990.
- Evaluation of Existing EDI Implementation Guidelines*, M. Henderson, LMI Report PL911TR1, March 1990.
- Impact of FTS 2000 and GOSIP on the Telecommunications Alternatives for EDI*, J. Lycas, LMI Report PL911TR2, March 1990.
- Electronic Data Interchange Trading Partner Agreement for Defense Transportation*, B. Milbrandt and J. Ciucci, LMI Report MT901TR1, January 1990.
- Electronic Data Interchange: Toward a Paperless Community*, T. Heard, et al., LMI Brochure AL711, January 1989.
- Greater Buyer Effectiveness Through Automation*, D. Drake, LMI Report PL804R1, January 1989.
- An Operating Concept for Electronic Funds Transfer*, T. Heard, M. Bridges, and T. Hardcastle, LMI Report AL719TR1, August 1988.
- An Electronic Future for Defense Transportation Management*, T. Heard and M. Bridges, LMI Report AL711R1, January 1988.
- Electronic Data Interchange in Defense Transportation*, T. Heard and W. Ledder, LMI Report ML538R1, October 1987.
- Concept and Plan for Modernizing the Defense Logistics Standard Systems*, P. Young, LMI Report DL502R3, April 1987.

Defense Logistics Standards and Systems Functional Requirements, P. Young, LMI Report DL502R1, March 1987.

A Report on Current Logistics Concepts, P. Young, K. Kiebler, and J. Habermann, LMI Report DL502R2, December 1985.

Electronic Exchange of Transportation Shipment Information, T. Heard and W. Ledder, LMI Report ML517, November 1985.

Other Publications

Decision: "National Institute of Standards and Technology – Use of Electronic Data Interchange Technology to Create Valid Obligations," Issued by the Comptroller General of the United States (File B-245714), 13 December 1991.

CSL Bulletin: "Advising Users on Computer Systems Technology," Washington, D.C.: U.S. Department of Commerce, National Institute of Standards and Technology, June 1991.

EDI Yellow Pages: *Business Partner Directory*, Edition VII, September 1991 – August 1992, Dallas: EDI, spread the word!, 1991.

Electronic Data Interchange (EDI): *Using Electronic Commerce to Enhance Defense Logistics*, Judith Payne and Robert H. Anderson, Santa Monica, Calif.: The RAND Corporation, 1991.

"An Introduction to Electronic Data Interchange," (ASC X12S/90-115), Alexandria, Va.: Data Interchange Standards Association, Inc., 1 May 1990.

Title 41 of the Code of Federal Regulations, Part 101-41.007, 20 April 1989.

"Electronic Data Interchange: A Tutorial," W. G. Cafiero and B. E. Dearing, *EDI Forum*, Oak Park, Ill.: EDI Publications, Inc., Vol. 2, pp. 10 – 14, 1989.

"The ADL Grocery Report Revisited," Richard C. Norris, *EDI Forum, Founding Issue*, Oak Park, Ill.: EDI Publications, Inc., 1989.

"The Impacts of Electronic Data Interchange on Inventory Levels," Ned C. Hill and James V. Hansen, *EDI Forum: The Journal of Electronic Data Interchange*, Oak Park, Ill.: EDI Publications, Inc., 1989.

Data Encryption Standard, Federal Information Processing Standards (FIPS) Pub. 46-1, Gaithersburg, Md.: U.S. Department of Commerce, National Bureau of Standards, January 1988.

"Detroit Tries to Level a Mountain of Paperwork," Russell Mitchell and Peter Heywood, *Business Week*, 25 August 1985.

Guideline on User Authentication Techniques for Computer Network Access Control, FIPS Pub. 83, Washington, D.C.: U.S. Department of Commerce, National Bureau of Standards, 29 September 1980.

Electronic Data Interchange for the Grocery Industry Feasibility Report, Washington, D.C.: Arthur D. Little, Inc., April 1980.

Glossary

ASC	The Accredited Standards Committee, chartered by ANSI to develop uniform standards for electronic interchange of business transactions.
ANSI	The American National Standards Institute, a private, nonprofit coordinator and clearinghouse on national and international standards.
ASC X12 standard	A standard for cross-industry electronic interchange of business transactions.
authentication	A security measure involving the Data Encryption Standard that verifies that the EDI transmission and message were not tampered with or altered.
business case	The economic analysis or cost-benefit portion of an EDI business plan.
business plan	A document that identifies the EDI opportunities at an activity, presents an economic analysis of those opportunities, and lays out an implementation plan and schedule for specific EDI transactions.
communications envelope	An enveloping function of EDI management software that identifies communications protocols, line speeds, etc., for an interchange envelope.
communications software	A software program that controls computer hardware and modems and arranges for the transmission or reception of electronic data.
conventions document	That portion of an EDI implementation guideline that maps application data requirements into a specific ASC transaction set.
data element	The smallest, meaningful piece of information in a business transaction. A data element may condense lengthy descriptive information into a short code. Equivalent to a "field" in a paper document, a series of data elements are used to build a data segment. A data element dictionary that defines the data element and, where appropriate, the code is part of ASC X12 standards.
Data Encryption Standard (DES)	An algorithm that creates a special authentication code unique to a particular message and key combination and is appended to EDI messages.

data segment	Equivalent to a "record" in a paper document and composed of a series of data elements. Each data element is defined and placed in the data segment in a specific sequence. A data segment directory, which defines the proper data element sequence, is part of ASC X12 standards.
direct cost savings	Those EDI cost savings that result from the elimination of manual handling and processing of documents (e.g., document sorting, reconciling, archiving, mailing).
DISA	Data Interchange Standards Association, secretariat for ASC X12 to ANSI.
EDI critical mass	An EDI application in which participating trading partners account for 70 to 80 percent or more of an activity's business volume.
EDI translation software	Formats flat files of data to and from ASC X12 transaction sets.
EDIFACT	The international EDI message standard (EDI for Administration, Commerce, and Trade) based largely on ASC X12 standards.
Electronic Commerce	The integration of electronic mail, electronic funds transfer, EDI, and similar techniques into a comprehensive, electronic-based system for conducting business transactions throughout the Department of Defense.
electronic data interchange (EDI)	The computer-to-computer exchange of data from common business documents using standard data formats.
electronic funds transfer (EFT)	The exchange of payment and remittance information electronically.
electronic signature	A code or symbol that is the electronic equivalent of a written signature.
encryption	A security measure similar to the authentication method except that the actual message is scrambled. Encryption is required for highly sensitive or classified data.
enveloping	A function of EDI management software that groups all documents of the same type (transaction set) and destination into an electronic envelope.
Executive Agent	Designated by the Assistant Secretary of Defense (Production and Logistics), the Defense Logistics Agency is DoD's Executive Agent for EDI and Data Protection and is charged with the responsibility to implement EDI throughout the Department of Defense.

flat file	A computer file used for transferring information from one computer program to another. It uses fixed-length (flat) formats rather than the variable length ASC X12 or EDIFACT standard formats.
functional acknowledgment	A function of EDI management software that sends a message from the receiver to the sender indicating that the document was received and interpreted.
functional group	A grouping of related transaction sets belonging to the same class. A functional group "PO," for example, can include purchase orders, purchase order acknowledgment, etc.
generation	A function of EDI management software that translates business data from an activity's internal format into an ASC X12 standard format for transmission.
implementation guideline	A document that provides general guidance on how to implement EDI at a particular activity including data conventions, business and legal issues, system architecture, and network access.
indirect cost savings	Those EDI cost savings resulting from changes in business practice made possible by EDI (e.g., inventory reduction, streamlined business operations).
industry-specific standard	An intra-industry message standard developed cooperatively by companies in a common industry.
interface program	A software program that defines the format for passing flat files between an applications system and EDI translation software.
mailbox	Part of an EDI value-added network service that holds a customer's message/transaction sets until retrieved.
mapping	A process of diagramming what EDI data are to be exchanged, how the data are to be used, and what internal applications systems require the data.
Message Authentication Code (MAC)	A specific data encryption technique, using the Data Encryption Standard and based on the use of specific encryption and decryption keys.
message standards	Rules by which business data, traditionally found in paper documents, are translated into a computer-readable format for electronic transmission to a trading partner's computer for processing (see ASC X12 standard).
modem	A hardware device that converts digital (computer) data into audio (analog) tones for transmission over a telephone network. The process is reversed when receiving data.
operating concept	A diagram (with supporting text) detailing, at a high level, EDI information flows and a system architecture.

proprietary standard	A message standard specifically developed by a single company with the economic power to dictate its use by the company's trading partners.
protocol	A set of rules governing information flow in an electronic communications system.
Public Key Encryption (PKE)	A specific data encryption technique, based on the use of public and private encryption keys.
Release	A title given to annual updates of ASC X12 standards by the Data Interchange Standards Association.
standards	(See: message standards and ASC X12 standards.)
trading partner	A customer, supplier, or service provider (such as banks, transportation carriers, and manufacturers) that conducts business with a DoD activity. Trading partners are usually divided into two categories: external (commercial) and internal (DoD activities) vendors.
trading partner agreement	A written instrument of understanding negotiated between EDI trading partners that specifies contractual matters and protocols of governing EDI transactions.
transaction set	The EDI equivalent of a paper business document and primarily composed of data elements and data segments.
transmission control standards	A defined format for the address information required for trading partners to exchange business data contained in transaction sets, commonly referred to as the EDI envelope.
value-added network (VAN)	A service provider that transmits, receives, and stores EDI messages for EDI trading partners, as well as a wide variety of other EDI related functions.
version	A title given to the updates, every 3 years, to the ASC X12 standard as officially approved by ANSI.

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