A Handbook for
DoD and Small Business

Forging a Partnership Through EDI

DL203LN3

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The purpose of this handbook is to acquaint small business with the concepts of electronic data interchange (EDI) and how EDI will be used in the future by the Department of Defense to conduct business. The handbook introduces the reader to EDI, discusses how and why EDI is used in business, and explains what is needed to start using EDI in a small business.

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Accredited Standards Committee X12

Aerospace Industries Association

American Iron and Steel Institute

American Petroleum Institute

Automotive Industry Action Group

Data Interchange Standards Association

Electronic Data Interchange Association

National Automated Clearing House Association

Uniform Code Council, Incorporated

PREFACE

This handbook is to acquaint small businesses with use of electronic data interchange (EDI) when doing business with the Department of Defense. Of course, most of these same principles apply when using EDI to do business with major defense contractors or with other small businesses.

Both business and DoD readers should find that this handbook provides useful information on the implementation of American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X12 EDI standards within automated data processing systems.

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CHAPTER 1

INTRODUCTION TO ELECTRONIC DATA INTERCHANGE

DEFINITION

Electronic data interchange (EDI) is the computer-to-computer exchange of routine business information using Accredited Standards Committee (ASC) X12 standards. EDI is now in common use in many private companies and promises to become the preferred method for conducting all business in the future. After acquiring the appropriate computer hardware, software, and communications, businesses can eliminate the burden of paper purchase orders, invoices, shipping forms, and other documents that are now used to conduct business. EDI will replace them with their electronic equivalents. The motivation to move to EDI is compelling: the costs for processing one multipart paper document from "cradle to grave" typically can range from $10 to $40 and sometimes more. Conducting business electronically eliminates these paper forms and can slash these costs by a third to a half. Other benefits are identified later.

Certainly, the computer-to-computer interchange of information is not new to American industry nor to DoD. Since the mid-1950s, large, private companies

and DoD activities have been sharing business information electronically. But, because users communicated in unique formats, businesses found it cumbersome and time consuming to expand their electronic communications to new trading partners.

Today, however, nationally and internationally recognized data formats, commonly referred to as standards or transaction sets, have been developed to allow easy interchange of data. Commercial computer programs eliminate the need to create special software to receive or send user-unique data formats. Instead, one software package can generate standard formats to exchange information between all trading partners. And, interestingly, many companies now use these same standards to enable exchange of information between incompatible software and hardware within their organizations.

STANDARDS

Two key groups developed the EDI standards for North America: the Transportation Data Coordinating Committee (TDCC) and the American National Standards Institute (ANSI) ASC X12. The TDCC, formed in the late 1960s, initially created transportation standards for rail, motor, air, and ocean shipping. Its success led other industry groups like grocery, chemical, and warehousing to seek its help. As TDCC created industry-oriented standards, some companies and individuals saw the need for generic standards that cut across industry boundaries.

In 1979, ANSI formed the ASC X12 to develop uniform standards for electronically interchanging business transactions between and among industries. What this means is that the automotive industry, for example, can now share a single standard to exchange electronic purchase orders, invoices, and technical specifications with the chemical, textile, and steel industries.

The TDCC and ASC X12, through the Joint Electronic Data Interchange Committee, created and published a data dictionary that provides for common EDI standard elements, segments, and codes. This dictionary is in essence a common set of definitions and terms for creating standard EDI transactions.

CONFIGURATION OPTIONS

To do business electronically, you need three types of resources: computer hardware, computer software, and communication connections.

Computer Hardware

Three basic sizes of computers are used today: personal computer (PC), minicomputer, and mainframe.

When using a PC to process data, all processing is done by the PC one job at a time using EDI software (see Figure 1-1). Once the PC completes processing, it sends the transactions to its trading partner or trading

partner's network using communications software and dial-up telephone lines. When receiving inbound transactions, the PC obtains transactions from its trading partner or trading partner's network over dial-up telephone lines and processes them. If you select a PC, the start-up costs of the equipment range from $3,000 to $4,000.

FIG. 1-1. STANDALONE MICROCOMPUTER

If you select a minicomputer, the same sequence occurs, only the minicomputer can process multiple jobs. If the minicomputer is used as a front-end processor to a mainframe, the minicomputer will process all input and output transactions (see Figure 1-2). When the front-end minicomputer completes its job, data are passed to the mainframe computer where they are stored for other business applications. Start-up costs for a minicomputer range from $10,000 to $15,000, but it can process higher transaction volumes.

If you already have a mainframe computer all processing will be performed within the mainframe or its communications controllers/processors (see Figure 1-3). The mainframe receives/sends, translates, and processes all transactions. These data reside

in files or data bases for use by other business applications.

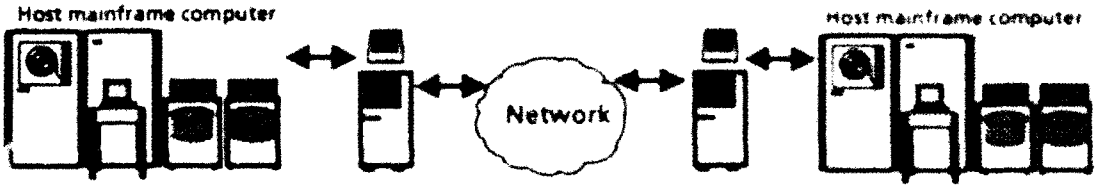


FIG. 1-2. MAINFRAME/MINICOMPUTER FRONT-END PROCESSOR

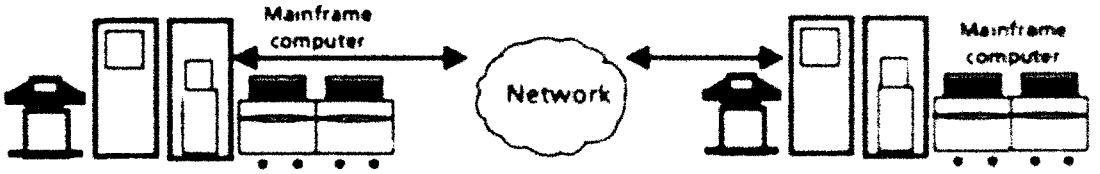


FIG. 1-3. MAINFRAME

Computer Software

Computer EDI software costs range from a few hundred dollars for PCs to thousands of dollars for mainframe computers. Some large businesses may choose to develop their own software. This approach is not recommended for the novice or small business.

EDI software capabilities range from allowing users to process low-volume transactions on a PC to the full range of capabilities designed to run on a mainframe. Some EDI software allows users to design and

maintain electronic forms that replicate paper business forms such as invoices, purchase orders, and requests for quotes (RFQ). It can also send/receive, translate, and store data to be used by other business applications. Other software can limit access and protect corporate data with passwords and encryption.

Communications

The transaction standards and the method of communicating those standards are two primary parts of EDI. A possible addition is special security procedures. There is no single or preferred communication solution. Each company must determine the proper approach based on current and projected transaction volume, level of service, and cost. Two alternatives are possible: point-to-point and value-added network (VAN), also known as third-party network.

- *Point to point.* Direct connection between trading partners can be either by dedicated line or through a dial-up network. This option requires close coordination of data exchanges between trading partners and becomes very complex as the number of trading partners increases.
- *VAN.* The VAN shown in Figure 1-4 provides an electronic mailbox for each trading partner. One partner can send data to another's mailbox for later pickup and also pick up his or her own EDI data without having to connect directly to the other trading partner. This option reduces the coordination problem, and, for this reason, a VAN is useful for large businesses as well as small businesses.

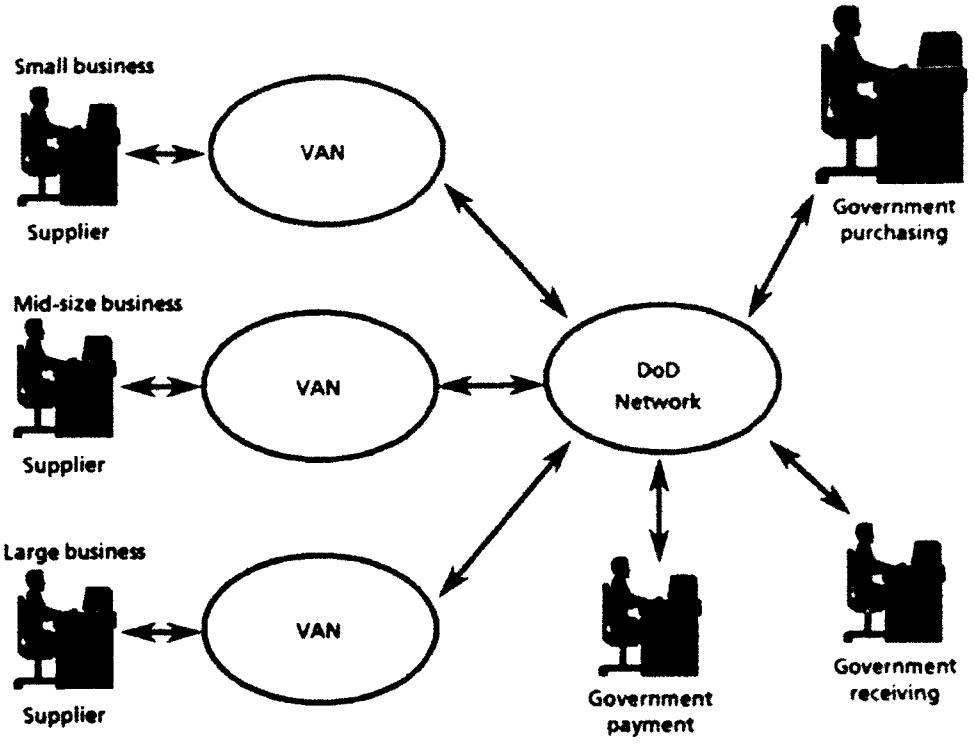


FIG. 1-4. COMMUNICATIONS USING VALUE-ADDED NETWORKS

BUSINESS PROCEDURE INTEGRATION

Streamlining your way of doing business is where EDI shows its real value. First, look at your paper business systems with fresh eyes. The most effective EDI system is not one that simply recreates electronic versions of paper forms. A good system will change the way a company does business to exploit the capabilities of EDI. It is not at all unreasonable to devise a system that almost eliminates such things as paper invoices, multiple copies of correspondence (including electronic copies, of course), contract files, and so on. However, the path from here to there is not the

automation of current paper trails. The key to success lies in intelligent examination of current business procedures. Some procedures will no longer be needed. Redefine procedures so they can be enhanced by using the computer. More importantly, new capabilities will emerge that were not possible in the past world of paper-based transactions.

EDI BENEFITS TO THE SMALL BUSINESS

The benefits of EDI to the small business extend far beyond a decrease in paper handling and storage. They include increased business opportunities, more accurate records, lower data entry costs, lower mailing costs, greater customer satisfaction, reduced order time, and the availability of more accurate information to support decisions.

Increased Business Opportunities

Thousands of RFQs for small purchases that were previously only found on the bulletin boards outside the Government contracting office will be made available to you. Also, having the RFQs in an electronic form will enable you to rapidly review, select, and respond to the RFQs, eliminating days of administrative processing.

More Accurate Records

After a company enters data by keying them directly into its system, the software edits the data to ensure accuracy. For example, software editing will display

an error message if the account number or part number is not valid or if the price is incorrect. When massive amounts of data are exchanged some errors will occur, especially if data are entered manually. Data entry errors can prove to be very costly. An invoice authorized for a $1,000 payment instead of a $100 payment or an order to ship 100 items instead of 10 items can be costly. When errors are discovered, time and money will be wasted tracking down and correcting them. Even if 98 percent of the information entered manually is accurate, the 2 percent that is not can be embarrassing or costly if a customer's name is misspelled or an invoice is undercharged.

By exchanging data directly between computer systems EDI ensures greater information accuracy. A major freight carrier indicated that one EDI client transmitted 600,000 freight bills electronically in a span of 18 months with absolutely no errors. For that client, the elimination of errors alone paid for the cost of developing its EDI system.

Lower Data Entry Costs

Nothing is more inefficient than manually entering data from one computer printout into another computer system. EDI eliminates the need to re-enter such data. With most communications packages today, information can be transmitted directly from one computer to another. EDI installations report that they have accurately transmitted 10,000 invoices

within minutes and processed them immediately without human intervention.

Reduced Inventory

Timely processing of information allows suppliers to know what material to ship and when to ship it instead of having to estimate such factors. One large company reduced its inventory by $167 million in the first 18 months after it implemented EDI. They not only saved the cost of carrying inventory but were also able to reduce the amount of warehouse space they needed.

Inventory reductions through EDI are not limited to users; suppliers, too, have been able to reduce their inventories. Suppliers have learned to trust EDI information and plan receipt of material and production runs based on true need, not guesswork or urgent phone calls.

Decreased Mailing Costs and Paper Handling

Mailing an order in the traditional way is costly and inefficient. When the cost of typing the order, addressing the envelope, and inserting the order into the envelope are added to the cost of postage, a single order can cost $5 or more. When many orders are sent each year, costs accumulate. Sending orders as overnight packages adds another $5 to $10. Many operations justified EDI by the savings in mailing and handling costs alone.

When transmitting information between trading partners (even in a small company) the mounds of paper previously moved from one department to the next can be eliminated. Information stored on the computer is readily accessible by the order entry, accounts receivable, and other departments within the company.

Instead of using people handling pieces of paper, EDI via computer can print directly onto other electronic media and maintain a copy for audit record purposes.

Many businesses use the remittance/payment advice to electronically apply cash to an account. One check may pay thousands of invoices. To post such payment information manually may take hours, whereas with EDI, it can be done with absolute accuracy in minutes.

Greater Customer Satisfaction

With an efficient EDI system, an order can be received, processed, and shipped almost as quickly as it can be transmitted. Companies may use EDI to buy office supplies, furniture, clothing, and other items not used directly in their production processes. They send the order electronically and the goods are shipped immediately. Many freight carriers provide their customers with status reports about their shipments. Locating shipments more quickly and efficiently adds to customer satisfaction.

Reduction in Order Time

When submitting and receiving an order by mail, postal service and handling time can consume a week or more. Allowing for 1-day handling of paper on both ends plus 2 and 3 days in the postal system means that the use of EDI can eliminate almost a full week of order time. With EDI, in many cases companies can order goods and have them shipped the same day.

Better Cash Management

By taking advantage of EDI, companies can ensure the purchase of the right material at the right time. Thus, they are better able to plan cash disbursements. When EDI is used to transmit an invoice or advanced shipping notice for use in an evaluated receipt settlement (ERS) system, the invoice is handled with consistency, and no guesswork is needed to know when it will be paid. This consistency allows for much more efficient cash management.

With the added use of electronic funds transfer (EFT) and EDI, both parties can better plan the use of funds. A paper payment check may arrive anywhere from 2 to 4 days after it has been mailed. (That time is referred to as the float.) With EFT, the money arrives on a preplanned date. With consistent money flow, money use can be planned more efficiently.

More Accurate Information Available to Make Decisions

The availability of accurate information supplied by EDI permits an organization to identify problem areas more quickly. It highlights areas with the greatest potential for efficiency improvement or cost reduction. Better information about shipping charges, inventories, sales orders, shipment dates, invoice amounts, or cash flow is key to more efficient operation. Continuous knowledge of the location of inbound freight, for example, enables more accurate scheduling of the receiving dock and in many cases better scheduling on the production floor.

CHAPTER 2

USING EDI TO SELL PRODUCTS

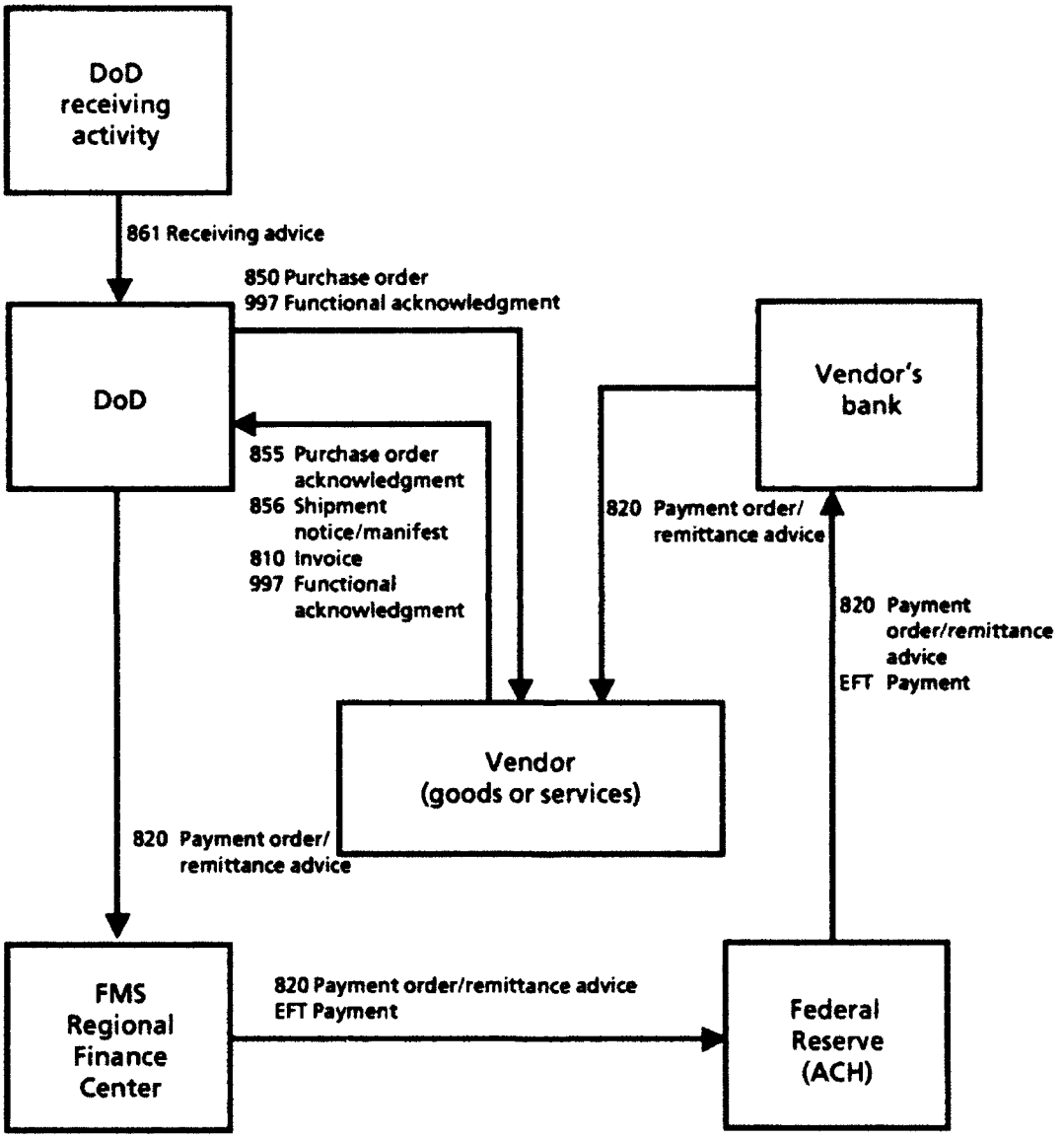
USING EDI FOR PROCUREMENTS

The DoD uses two basic categories of electronic purchases: purchase orders issued against existing contracts (indefinite delivery contracts) and individual competitive purchases.

Indefinite Delivery Contracts

Multi-item, indefinite delivery contracts usually create a multiyear business relationship with a commercial vendor, which is an ideal environment for EDI. Figure 2-1 shows the logical data flow when using EDI to order supplies and services under a multi-item indefinite delivery contract. The numbers in the illustration are EDI transaction numbers. DoD issues a purchase order (transaction 850) to buy material from an existing contract. The vendor returns a purchase order acknowledgment (transaction 855) to confirm the order. When the material is shipped, the vendor sends a shipment notice/manifest (transaction 856) to the buyer followed by an invoice (transaction 810). Upon notice of receipt (transaction 861), DoD initiates an EFT payment and payment order/remittance advice (transaction 820). The DoD and the vendor exchange functional

acknowledgments (transaction 997) for each transmission to confirm that the format of the transmissions was ANSI X12 correct.



Notes: ACH = Automated Clearing House; EFT = electronic funds transfer; FMS = Financial Management Service.

FIG. 2-1. INDEFINITE DELIVERY CONTRACT

Individual Competitive Purchases

Common items whose specifications are well known to both DoD and vendors can be purchased using EDI, although this is a more complex process. Figure 2-2 depicts the logical data flow where there is no contract.

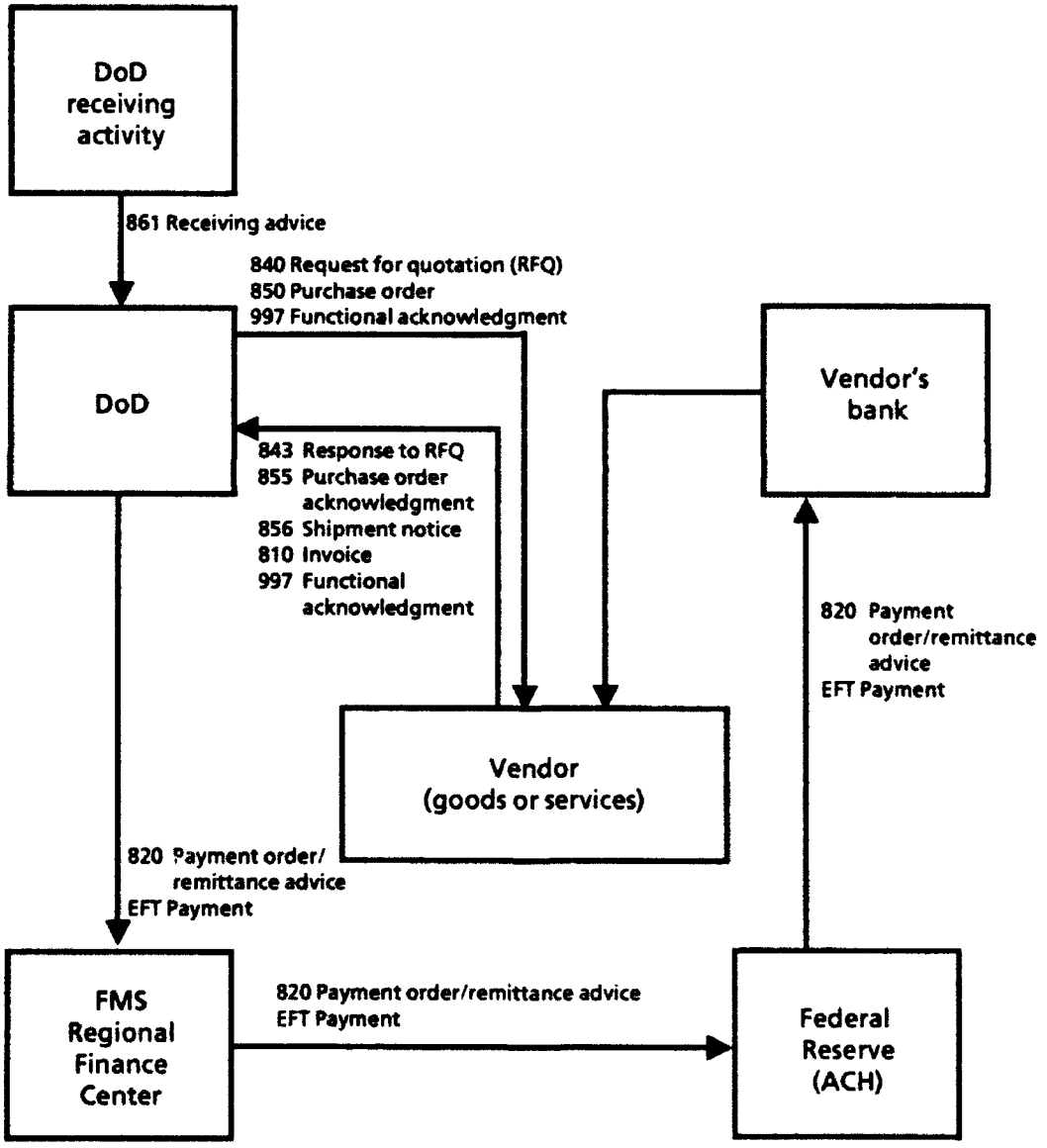


FIG. 2-2. INDIVIDUAL PURCHASES

DoD sends an RFQ (transaction 840) to one or more vendors. The vendors respond with a quote (transaction 843). DoD then sends a purchase order (transaction 850) to the vendor of choice. The vendor sends acknowledgment to confirm acceptance (transaction 855). After shipment, the vendor sends a shipment notice (transaction 856) to DoD followed by an invoice (transaction 810). Upon notice of receipt (transaction 861), DoD initiates an EFT payment and payment order/remittance advice (transaction 820). DoD and the vendor exchange functional acknowledgments (transaction 997) for each transmission to verify that the format of the transmissions was ANSI X12 correct.

SMALL-DOLLAR PROCUREMENTS

One of the more costly aspects of DoD procurement is competitive small-dollar procurement. It has been estimated that the process of making a single purchase of an item priced under $25,000 can cost anywhere from $50 to $250 or more in direct and indirect costs. Using electronic commerce (EC)/EDI techniques can reduce costs, while still meeting the following basic procurement requirements:

- New RFQs are announced promptly.
- Even competition is promoted, in accordance with Federal Acquisition Regulation (FAR) 13-106.
- A lower cost than current paper-based and telephone-based systems is achievable.

- The integrity and confidentiality of submitted quotes is ensured.
- Award information is provided to appropriate respondents.
- Electronic mail (E-mail) is integrated between suppliers and DoD.

The DoD EDI integration plan uses E-mail as the carrier of information ensuring confidentiality of respondents. The series of events would follow a sequence similar to the following:

- DoD contracting and procurement offices provide ANSI X12 RFQs to a DoD host computer.
- DoD host computer disseminates information to participating commercial VANs.
- VANs, on receipt of the information, make the information available to private-industry suppliers/subscribers for standard fees. (Using a VAN as a vehicle for communicating with business trading partners is the configuration that has been most preferred by small companies.)
- Commercial subscribers respond to an RFQ and submit quotes using ANSI X12 standards.
- VANs receive quotes and responses from private-industry subscribers and forward them directly to the DoD host computer.
- DoD host computer time-stamps messages and archives them for audit. The system simultaneously forwards the original bid messages to the contracting officers.

- DoD awards the contract after an appropriate evaluation period. It sends the contract information via the same channels to the awardee. DoD also provides the award information to participating VANs for posting on their electronic bulletin boards to make it accessible to its subscribers.

- EDI transactions which were a part of this entire process now join with the rest of the purchasing process, culminating in the payment of an invoice (which was also received electronically) using EFT.

This system has a number of features which should be emphasized, including the following:

- One-time registration for vendors across DoD's sites for most purchases using a simple electronic process.

- Appropriate secure mail procedures, password protected or encrypted, will be used by both the individual supplier and the DoD contracting officer.

- Small businesses can choose to use the VAN which provides the best price/performance combination for them. This encourages competition among VANs.

- DoD personnel will archive quote data to provide an audit trail.

- E-mail and query-by-mail techniques eliminate the requirement for having thousands of simultaneous logins on a DoD or commercial VAN computer.

- Quote information is stored on a DoD computer, which can make powerful statistical analyses of data.
- RFQ information is stored in the DoD host computer, and lists of quotes can be pinpointed for local minority or depressed area initiatives.

USING EDI AND ELECTRONIC FUNDS TRANSFER

The contractor must use the Standard Form 3881 Payment Information Form to request that the DoD agency pay using direct deposit. After approval and testing, payment data are transmitted to the Federal Reserve Bank (FRB) to initiate direct deposit payments to the contractor's bank account. The electronic payment conforming to National Automated Clearing House Association rules includes addenda records as well as the disbursement amount. The addenda records use ANSI X12 standards to define the structure of the remittance information.

By combining the payment with the EDI payment information, the contractor can credit the payment upon notice of the deposit and save reconciliation time. Reports are generated to provide an appropriate audit trail and to establish a complete history of disbursements.

CHAPTER 3

PLANNING EDI FOR SMALL BUSINESS

DEFINITION

To avoid misunderstanding about the meaning of the term "small business," we use the Small Business Administration (SBA) definition. A small business is one that is independently owned and operated and not dominant in its field. The following size and volume standards are used to determine eligibility for some SBA programs; they illustrate that small business does not always mean small.

- Manufacturing – fewer than 500 employees
- Wholesale – fewer than 100 employees
- Retail – less than $3.5 million in sales per year
- Service – less than $3.5 million in sales per year
- Construction – less than $17 million in sales per year.

GETTING STARTED IN EDI

The first step is to review the standards and internal systems of a small business. Can ANSI standards be met? Each ANSI standard is introduced with the following words: "This standard was developed with the intent that users need not reprogram their

internal data processing systems." The ANSI standard is structured to allow computer programs to translate internal formats to the ANSI X12 standard, and conversely. Software to translate data to and from the ANSI standard format may be developed by the small business or purchased commercially. Most small businesses elect to purchase commercially available translation software.

If you are processing information on paper today, you can convert to EDI. You will discover that some efficiencies can be realized if the internal data flow is changed, but you do not have to change it to conduct business electronically. You may also consider some or all of the steps outlined below.

Education

Both Government and commercial EDI seminars can expose you to what others are doing and help you sell the idea of EDI to your company. EDI educational seminars are sponsored by many sources: the Federal Government's "Productivity Enhancement Program," the Automotive Industry Action Group, the National Industrial Transportation League, the American Trucking Association, the Electronic Data Interchange Association (EDIA), ASC X12 Data Interchange Standards Association (DISA), and some VANs.

Establish a Project Team

The team approach to EDI has proven to be highly successful. Some EDI projects may involve only selected departments, but others will cross several departments. All company departments need to be represented on the EDI team. Select a project leader to help coordinate meetings and EDI projects. Share the information about these meetings by distributing the minutes to as many people as possible. They will help others in your company learn what you are doing.

Discuss the various aspects of EDI at your project team meetings. What types of EDI transactions do you want to do? What standards could you use? Would a third-party network help? What resources do you need? What standards are already being used in your company or industry?

Use these meetings to help educate your organization on EDI. Bring in outside experts, such as the Federal agency or company with which you plan to become an EDI trading partner. Gather the facts and communicate the results.

Involve your financial people as early as possible. Once they are tuned in to EDI, they may become your strongest supporters.

Analyze the Company System

Carefully consider the resources that you will need. Analysis should provide answers to the following questions:

- What documents will be sent? What ANSI ASC X12 standard will be used?
- Should the company develop its own communications network or select a third-party network?
- Should the company purchase software or write its own?
- When will resources be available?

All EDI systems incur some communications costs. These costs are assumed by different parties that vary from industry to industry and company to company. When compared with the overall savings produced by EDI, these costs often are insignificant. In some industries, the supplier typically pays for the phone charges or third-party network charges for sending and receiving EDI. In other industries, the sender of a message may pay the costs or the sender and receiver may split them evenly. Review the practice your trading partner follows and establish an organizational position for your company.

Develop a Plan

A strategy should evolve from these discussions. Each department should submit a summary of projects to which EDI can be applied: systems, accounting,

auditing, legal, and transportation. These projects should be included in the company budget. If a project would not provide a payback, re-evaluate it. EDI must be applied for good business reasons, not just for the sake of applying EDI.

If the appropriate information can be printed on a piece of paper, it can also be translated for EDI. But when starting out, do not try to make too many changes at once.

If a piece of information does not translate easily, do not immediately revise your system. Perhaps a note (NTE) segment of an EDI transaction will get you by until sufficient business reasons require that the internal programs be updated. Refer to your industry or trading partner's guidelines for assistance. If the existing codes do not match your circumstances, submit a change request to the ASC X12 Data Interchange Standards Association.

Reach consensus on the long-term goals and establish individual tasks that move toward those goals. Assign responsibilities to individuals to complete these tasks. To keep the team motivated, it needs success. Publish results. The more the entire organization knows about the successes, the more others will give their support.

Choose a Trading Partner

The trading partner chosen for a pilot test in most cases will be a Defense agency. If not, select a

company that already has EDI experience. A supplier or customer may have already expressed interest in doing business using EDI.

The pilot test will reveal the processes, procedures, and operations that need to be worked out. The more your trading partners know about your company plans the happier they will be about using EDI with your company. Give your trading partners at least 60 to 90 days' notice of your pilot test. They will need to make some evaluations to help you start your EDI project.

The trading partners that send you the largest number of RFQs are the ones that will gain the most from your EDI system. Choose such a company for your test. The one that sells you the largest number of individual items is the one that will gain the most from an electronic material release or schedule.

CHAPTER 4

IMPLEMENTATION OF EDI IN A SMALL BUSINESS

After following the planning prescription of Chapter 3, you should be ready to implement EDI. If you are installing EDI and currently use an automated data processing system, you will essentially apply the ANSI X12 standard to your current system. If you are starting with a paper-based system, you may want to install additional automation capability in conjunction with your EDI system.

Implementing EDI is not an insignificant task. It is intended to change the way you do business. Top management must be involved in the approval phases of the project to ensure the availability of adequate funding and personnel. Requirements for projects will vary from one organization to another, but the company should adhere to the following general rules for a successful project:

- Treat EDI as a business issue because EDI is a solution to a business problem.
- Do not deviate from the ANSI X12 standards. Deviations will require that the system be customized, which will increase costs in the long

run. Deviations will cause problems for you and your trading partners when the ANSI X12 standards change.

- Make the transition to a full production system only after your system has proved itself in testing.

EDI STAFF

Traditional internal automation projects differ from EDI projects in that planning, development, and implementation tasks must be performed in concert with the trading partners.

Implementing an EDI project will involve several people in a variety of roles. At a minimum, the EDI project should have the following staff:

- Senior manager
- Functional coordinator
- EDI coordinator
- Contract administrator.

For a small business, some of these positions will be combined. (For larger systems, more personnel may be required.)

During project development, it will be necessary to provide ad hoc support to the project team. The following support is needed:

- Functional managers to develop the business plan
- Technical and functional managers to coordinate standards and procedures with your trading partner
- Analysts with detailed knowledge of the interfacing systems, communications, computer operations, and operating system software.

For a small business, this support can be combined into a small group.

IMPLEMENTATION CHECKLIST

- Identify key management the personnel from each functional area affected by adoption of EDI. Each area should be included in analysis, development, testing, and implementation.
- Provide resource estimates and identify potential savings.
- Prepare a milestone schedule and estimated completion times.
- Contact your DoD trading partner for help in implementing the ANSI X12 standard. Establish EDI contacts among industry associations and network providers.
- Obtain copies of the ANSI X12 publications, training materials, and implementation guidelines. You will need access to data dictionaries and documents that define functional codes. Contact

DoD or industry procurement personnel for this documentation.

- Learn the types of resources available and the communication system used by your trading partner. Your system must be compatible.
- Compare your business data against your trading partner's ANSI X12 conventions. This will help you determine whether your internal system contains the required data elements. You should identify optional data elements and discuss them with your trading partner.

SYSTEM INTEGRATION PLAN

Using the information you have collected, prepare a detailed system integration plan that may include the following items:

- General narrative
- Functional description
- Data requirements and data flows
- Communications network
- System specifications
- Program specifications
- User procedures
- Computer operations procedures.

Develop this plan early since it will influence such other decisions as maintaining connections, coordinating the polling schedules, providing audit reports,

and sharing costs. If you work closely with your trading partner, your plan will be similar to his.

COMMUNICATIONS PLAN

If your first trading partner is DoD, you must find out if a Government communications network is available for you to use. If none are available, you should investigate third-party, VAN resources. If you plan to conduct EDI with both DoD and commercial firms, the VAN is your best choice.

No matter which communications alternative you choose, some hardware or software installation will be required. Installation on a PC is the least complicated. Larger computers are more complicated. Communications software vendors normally provide some installation services. Make them aware of your needs by providing all the planning information you have collected.

Protocols

A protocol is a kind of etiquette, much like the conventions people follow when making introductions, extending greetings, in conversation, and parting. Computers must do the same if they are to exchange information with one another. They must agree to speak the same language, at the same speed. They should know how to say hello and goodbye to each other. They have to agree that only one of them can speak at a time. The rules are of little importance, as

long as the two parties can agree upon and follow them. Such a set of rules is called a protocol.

There are many communications protocols. Their rules are designed to ensure that computer files (e.g., EDI messages) can be transferred from one computer to another correctly and completely, despite the many pitfalls that lie in the way. Some typical file transfer protocols are XMODEM, KERMIT, and YMODEM. Successful file transfer requires compatible software running on the two machines (or compatibility with your VAN).

Since you are just starting EDI, you will want to adhere to the protocol that your trading partner or VAN is using. If you plan to directly communicate with multiple trading partners, you may have to use several different protocols. This is one area where using a VAN is helpful. The VAN can make the problem of multiple protocols transparent to you.

Translation Software

Translation software is a set of programs designed to automatically translate proprietary data formats into ASC X12 standard format for sending. The software reverses the process when data are received. The ASC X12 standard normalizes the results of processing. It does not affect how a program is designed nor how it operates.

Configuration of the EDI translation software depends on how your system is designed. For all but in-house-developed software, translation software must interface with your internal software and communication systems.

Translation software must be configured to run in your system environment (unless you are using a network-based translation). Tables must be updated and modified to support your applications.

Choosing EDI Software

Selecting the correct EDI software to meet your particular company needs makes a big difference in the ease and timeliness of your EDI implementation. Good EDI software vendors are a source of implementation expertise because they have gone through this process with other companies. They can help you with all of the choices facing you as you implement EDI, from choosing a VAN to choosing the hardware components required to do the job. While there are many good software packages to choose from, EDI software falls into three main categories:

- *Standalone PC.* This type of software provides data entry screens for your documents as well as printing commands. The software performs translation to X12 standards and handles communication interfaces to the VANs and trading partners.

  This type of software is straightforward to implement and can get you started in EDI quickly. Its drawback is the lack of integration with your

existing application software (e.g., your purchase ordering system or accounts receivable system). You will have to re-enter information that already exists on your computer.

Standalone PC software can also cost less than other types. Beware, however, of per-document pricing structures rather than a more all-inclusive approach – you may end up paying more in the end as your EDI usage expands.

To summarize – standalone PC advantages include quick implementation and potential low cost. A disadvantage is the lack of integration, forcing re-entry of data.

- *Integrated PC/UNIX.* Integrated software has the same translation and communication interfaces as standalone PC software and also includes the ability to integrate with your existing application software, eliminating the need for re-entry of data. This type of software usually runs in both the PC and UNIX operating system environments.

  Integration is accomplished in two very different ways. The first is through "flat file input," and the second is through "mapping."

  Flat file input integration means that the EDI software will accept information from your application software, provided that you can first transfer it to a file that meets the format criteria of the EDI software. This may or may not be possible for your particular application software. It may take a little programming expertise on your part. Future changes by your trading partners may also be difficult to implement quickly.

  Mapping integration allows you to specify a link between the document you need to send your trading partner and the data layout of your application software. Once the link is set up, the

data exchange is automatic. Future changes by your trading partners can be implemented easily, and existing "maps" can be copied and altered to support new EDI documents.

Mapping integration is the more desirable of the two methods. When choosing mapping software, pay close attention to the user interface and ease-of-use features for creating the maps themselves.

To summarize – integrated software eliminates the task of re-entering data but at a higher initial cost than standalone PC software. Mapping-style integration is the most desirable.

- *EDI server/gateway.* If you want to support business applications on one or more mainframe computers or implement advanced EDI you need to use EDI server/gateway software. This software has all of the features of integrated EDI software plus data transfer, routing, and timing mechanisms; mailboxing capabilities; and restart/ recovery options.

  Traditionally, EDI server/gateway software was run on the mainframe. With the advent of powerful minicomputers, companies can choose a minicomputer-based server. A single server can interface to multiple mainframe host machines.

  EDI server/gateway software requires a longer implementation timeframe as well as more in-house computer expertise and is more expensive than either standalone PC software or integrated software.

When choosing any software that will affect your business operations, be sure to do the following when evaluating the software vendors:

- Get references from the software vendor. Ask for the names of companies similar to yours who used the vendor's software to implement EDI.
- Call two or three of the references and listen to their experiences from purchase through ongoing software support.
- Take a copy of the software to your company for a test or trial evaluation if possible.
- Attend the training that the vendor offers so you can take full advantage of its capabilities, after you choose your software.

Good software from a reputable vendor, backed up with competent support, can make your EDI implementation a profitable decision.

Table 4-1 identifies functions and features that we recommend for inclusion in an EDI system.

TABLE 4-1

EDI SYSTEM SOFTWARE REQUIREMENTS

Function/feature	Operating environment		
	Stand-alone PC	Front-end EDI server/ gateway	Minicomputer/ mainframe
Communications features			
Communications software	M	M	M
Transaction set consolidation routines	M	M	M
Multiple communications interface	O	O	O
Network identification table	M	M	M
Unattended operations capability	M	M	M
System utilities			
Automatic recovery/restart capability	M	M	M
Installation routines	M	M	O
System interface routines			
Application system interface	M	M	M
Data input screens	M	O	O
Input editing	M	O	O
User-defined print output	M	O	O
User-definable system interface	O	O	O
User-defined data input screens	O	O	O
Customized operations routines			
Code conversion capability	O	O	O
Data element delimiter table	M	M	M
Functional acknowledgment capability	M	M	M
Multiple header support	M	M	M
Segment terminator table	M	M	M

Notes: M = mandatory; O = optional.

[a] Only pertinent to those sites that will use point-to-point communications for one or more trading partners.

[b] Operating system utilities separate from the translation software package may fulfill this requirement.

[c] Either training or the help screens and tutorial package are mandatory.

[d] When the requirements for such a feature have been fully defined, we expect this feature to be mandatory for all operating environments.

TABLE 4-1

EDI SYSTEM SOFTWARE REQUIREMENTS (Continued)

Function/feature	Operating environment		
	Stand-alone PC	Front-end EDI server/ gateway	Minicomputer/ mainframe
Customized operations routines (cont.)			
Trading partner profile	O	M	M
Transaction set sequential numbering	M	M	M
Version support table	M	M	M
Editing features			
Character conversion capability[a]	O	O	O
Inbound standards compliance editing	M	M	M
Internal codes duplication routine	M	O	O
Outbound standards compliance editing	M	M	M
Transaction set correction capability	M	O	O
System maintenance routines			
Automated purging	M	M	M[b]
Expandability	M	M	M
Maintenance support	M	M	M
Table-driven software structure	M	M	M
Transaction set archiving[b]	M	M	M
Version support	M	M	M
Report functions			
Error reports	M	M	M
Functional acknowledgment reconciliation	M	M	M

Notes: M = mandatory; O = optional.

[a] Only pertinent to those sites that will use point-to-point communications for one or more trading partners.

[b] Operating system utilities separate from the translation software package may fulfill this requirement.

[c] Either training or the help screens and tutorial package are mandatory.

[d] When the requirements for such a feature have been fully defined, we expect this feature to be mandatory for all operating environments.

TABLE 4-1

EDI SYSTEM SOFTWARE REQUIREMENTS (Continued)

Function/feature	Operating environment		
	Stand-alone PC	Front-end EDI server/ gateway	Minicomputer/ mainframe
Report functions (cont.)			
Inbound transaction set reporting	M	M	M
Outbound transaction set reporting	M	M	M
Transmitted characters	O	O	O
User-defined management reports	O	O	O
Support features			
Help screens[c]	O	O	O
Technical documentation	M	M	M
Training[c]	M	M	M
Tutorial package[c]	O	O	O
User documentation	M	M	M
User support (hot lines)	M	M	M
Miscellaneous features			
Compatibility with encryption and authentication package[d]	O	O	O
Multiple users	O	O	O
Selective accessibility	M	M	O
System entry security	M	M	O

Notes: M = mandatory; O = optional.

[a] Only pertinent to those sites that will use point-to-point communications for one or more trading partners.

[b] Operating system utilities separate from the translation software package may fulfill this requirement.

[c] Either training or the help screens and tutorial package are mandatory.

[d] When the requirements for such a feature have been fully defined, we expect this feature to be mandatory for all operating environments.

INTEGRATED TESTING

Conduct an integrated test of all components to verify that the system can perform the following tasks:

- Obtain data from your internal system
- Translate those data to ASC X12 format
- Assemble and transmit the ASC X12 formatted data to your trading partner
- Receive transmissions from your trading partner
- Translate the ANSI X12 formatted data to your internal system format
- Generate and send an acknowledgment.

Conduct extensive system testing before actual production. Use the old paper system in parallel to validate your new design. Schedule these tests over a predetermined time period. Prepare a trading partner agreement (TPA) document to be signed by all participants in the project before production begins. Make sure everyone signs the agreement.

Initial production should be limited to one trading partner. Start with one or two transaction sets. You should determine in advance a specific time period for the initial operational capability (IOC). Use that time to validate assumptions about costs, savings, and transaction processing times. Make all adjustments before going operational.

TRADING PARTNER AGREEMENTS

Sometimes referred to as "preauthorization agreements" in DoD, TPAs may require help from legal counsel. Check to determine if DoD has a general TPA that establishes the terms and conditions for EC. If this is acceptable to you, then a specific TPA will not be required. Whether it is a stand-alone agreement or simply a provision in a master agreement, a TPA must be executed before you begin trading using EDI transaction sets.

The TPA is the key document that sets forth the rights and obligations of the trading parties. The TPA provisions are tailored by DoD to meet the standard practice of the industry – transportation, medical supplies, grocery, etc. The following elements are essential components of any DoD TPA. (These elements, of course, can be used in a commercial TPA as well.)

- *Recital.* A statement that the parties desire to enter a mutually binding agreement to begin exchanging EDI transaction sets. The recital should state that the parties intend to be legally bound in the same manner as though they were exchanging hard-copy paper documents.
- *Standards.* The TPA should specify all standards and their issuing organizations; it should reference data dictionaries, segment dictionaries, etc.; and it should state how to handle updates of newly adopted standards. (DoD has adopted the ANSI X12 standards developed by the ASC X12.)

- *Documents.* The TPA should specify which transaction sets are authorized to be exchanged between the parties. The TPA is a good place to incorporate by reference the industry guidelines that will be followed. Most DoD procurement, financial, and shipping documents can be transmitted using the standard EDI transactions, segments, and data elements.

- *Duration.* The TPA should specify the effective date and period the TPA is to be in effect. Execution requirements and any necessary approvals should also be stipulated.

- *Communications mode for EDI.* DoD may require that the Federal Government file transfer system, or FTS-2000, be used. If approval is obtained to use an independent communications provider, the TPA should specify the name of the provider, the method of payment for services, and the notification or procedure required to change the provider.

- *Acknowledgments/acceptances.* The TPA should include the legal requirements for any special acknowledgments or acceptances as a condition for the transaction to be legal. If you require remittance advice, for example, specify it here.

- *Disputes.* Small businesses may follow state law in disputes, but DoD contracts will contain the standard disputes clause specified in FAR 52-233.

- *References.* You may incorporate any special publications, specifications, and guidelines by reference. You should specify the order of priority in case of internal conflicts in references.

- *Security.* You should agree upon and specify security procedures to be followed by each party to protect business data from improper access and/or disclosure.

- *Signatures.* To provide for the confidentiality of the signatures of both authorizing parties, the TPA should establish a method, such as a discrete authentication code, that can be affixed in code or in symbol to each transaction set.

- *Mailbox contents.* The TPA should specify at what time each day the parties are required to review and collect the contents of their mailboxes. Ordering or shipping requirements may also be specified.

- *Force majeure.* The TPA should include a typical act of God clause excepting such things as explosion, fire, or flood from imposing a liability on either party.

- *Garbled/erroneous transmissions.* The TPA should allocate the risks of garbled or erroneous transmissions as negotiated. It should specify who shall be liable, if anyone, for bad transmissions. If a third-party provider is responsible, the extent of the liability must be set out clearly.

- *Termination.* If the agreement may be terminated by either party, the TPA should state this fact. It should specify the termination notification period. It should also set the parameters and termination procedures to be followed if one of the parties falls below an acceptable standard of performance.

- *Damages.* The TPA should describe how the parties should handle special or consequential damages, as well as actual or liquidated damages.

- *Whole agreement.* The TPA should contain the typical clause covering mergers.

- *Special terms and conditions.* You may add any other special provisions that may be wise and necessary to establish an efficient trading operation.

The Electronic Messaging Services Task Force, a Subcommittee on Electronic Commercial Practices, Uniform Commercial Code Committee, Section of Business Law, American Bar Association, has prepared a draft model agreement to assist the practitioner in preparing a TPA.

THIRD-PARTY SERVICE AGREEMENTS

The small business can choose from a host of commercial value-added network services (also called third-party services).

Third-party providers can be of great service in getting any EDI program off to a good, solid start. They can provide a variety of services, especially to small, unsophisticated trading partners not conversant with the technology. They can assist in selecting hardware and software and in providing training.

Usually third-party service providers have their own printed contract forms which will be helpful to the small business.

Like any legal agreement, the third-party agreement should not be drafted and executed without the assistance of competent legal advice. The merger or whole agreement clause is a necessity as well as the *force majeure* clause, which exonerates the provider from liability connected with acts of God, such as fire, theft, and other causes outside the control of the service provider. In addition, the small business

should negotiate acceptable terms in these areas because of the following concerns:

- There should be a complete description of the services to be provided to the respective trading partners.
- There should be language specifying that the third-party provider has no independent property interest in the data and further, foreclosing any claim that the provider has added value to the data giving some legal right to a mechanic's lien or a possessory lien.
- There must be an understanding that the provider will store records or perform some archival service should be covered along with the cost for this service. If you desire backup copies, this agreement should provide for them. It should also specify the length of time backup copies must be kept.
- The confidentiality, integrity, and security measures to be provided should be listed in the third-party agreement.
- The third-party provider's responsibility for accurate, reliable service should be outlined. You should define the third party's liability and its scope; responsibility for compensatory damages in case of data loss, delay, mistakes, or misdirection; liquidated damages; etc.
- The agreement termination date should be outlined. The agreement should say whether the date can be changed periodically and whether the parties are free to change service providers after the date has been agreed upon. This is the time and place to specify these issues. Agree upon a standard of services below which the parties may terminate

the agreement without risk of breach and associated damages.

- Very definite language should be included detailing exactly how the network charges, if any, will be shared between the suppliers and the customers. DoD may be able to negotiate a no-cost, service-provided agreement with a network.

- Include a warranty that the provider's system, when used in consonance with procedures specified, will perform as stated. This should not mean the provider has absolute liability but that the provider should deliver services as promised barring extraordinary circumstances. Inclusion of a provision that this warranty is in lieu of any warranties implied by law is a reasonable requirement.

- Outline the network requirements to support ANSI or EDI for administration, commerce, and transport (EDIFACT) standards. Specify the small business expectations. What audit trails are to be provided?

- You should specify all record keeping requirements. For example, when can the provider discard the data? The provider may ask for a short statute of limitations beyond which its liability is forgiven. DoD cannot agree to such a provision because it must use the statutory period provided by Federal law.

BACK-UP PROCEDURES

Businesses, large and small, should establish back-up recovery procedures so they can retransmit unsuccessful EDI messages. The following safeguards should prove useful.

- Back-up procedures should be available for use if the computer system or communications fail.
- Establish a maximum number of attempts at retransmission after a transmission error to minimize communications costs.
- Establish a minimum back-up of 24 to 48 hours of data. You will need access to this much data for real-time transactions, such as the advance ship notice and shipping schedule.
- Batch transactions, such as those used for the purchase order and invoice, require a 1- to 2-week back-up.
- Some types of data must be archived on a more permanent basis. Ideally, this should be accomplished at a different location. The permanent archives and supporting system should allow a specific EDI message to be recovered.

The back-up and recovery system must be thoroughly documented. It should allow anyone with the proper authority to retransmit data.

The functional acknowledgment (transaction 997) can be used to provide a level of automation for backup and recovery. If the EDI system is designed to receive a functional acknowledgment for every transaction

group it sends, that group should be available for retransmission until the sender receives a functional acknowledgment. Once the sender receives that functional acknowledgment, the system can archive the original EDI message.

The system should be designed to provide a degree of flexibility. The use of functional acknowledgments can vary based on business requirements. It may be appropriate to send/receive functional acknowledgments to some and not other trading partners, for a specific transaction or combination of the two, or for some other variation unique to your EDI requirements.

DoD will require functional acknowledgments.

Recovery Procedure Considerations

You should establish recovery procedures to provide controlled management of unusual telecommunications problems such as the following:

- A trading partner's computer or VAN will not respond when your computer calls to pick up or deliver EDI messages.
- A bad connection causes continuous or excessive numbers of retransmissions.

Disaster Recovery Considerations

Disaster recovery becomes correspondingly critical as the number of EDI transactions increases. Consider the consequences if you were suddenly unable to send messages for an unacceptably long period.

You should not assume that you can fall back on a paper-based system. Your trading partners may not be able to switch from EDI back to paper. You may not have access to the resources needed for paper transactions.

Develop a plan to deal with extreme problems, such as a total loss of your data center, computer system, or telecommunications. If you use a microcomputer, backup may be as simple as using an alternate PC and software. The larger your system, the more complex your solution will have to be.

SECURITY

The elimination of paper document processing through the introduction of ANSI X12 EDI standards requires an evaluation of your existing internal control processes and procedures. Without a signed document and paper audit trail, you still must determine whether a transaction is accurate, valid, and approved.

The small business should make certain that security precautions taken to protect EDI data and transmission are at least as good as those currently

used for the paper exchange. The small business at a minimum should adhere to the standards developed by its trading partner.

This problem is not new. All software and telecommunications systems have addressed this problem for years. The same elements of control apply to EDI as they do to other automated systems. Controls must ensure:

- *Confidentiality* – only authorized persons have access to data.
- *Integrity* – data accuracy.
- *Authenticity* – proof of valid transaction and ownership.

POINTS OF CONTACT

If you would like additional information about the SBA's training schedules, call the Division of Minority Small Business Outreach at (202) 205-6421. If you have questions about participating in a DoD EDI program, call the DoD Executive Agent for Electronic Commerce/Electronic Data Interchange at (703) 617-7107.

GLOSSARY

ACH
Automated Clearing House

ANSI
American National Standards Institute

ANSI standard
A document published by ANSI that has been approved through the consensus process of public announcement and review. Each of these standards must have been developed by an ANSI committee and must be revisited by that committee within 5 years for update.

Application acknowledgment
A transaction set whose purpose is to return a response to a transaction set that has been received and processed in an application program. The purchase order acknowledgment (transaction 855) is an example of an application acknowledgment. It is used to respond to the purchase order (transaction 850) presenting such things as whether the receiver can fulfill the order and if it can be done on time.

Application advice (824)
A transaction set that documents errors in the content of any transaction set beyond the normal syntax checks

ASC
Accredited Standards Committee

ASC X12
The Accredited Standards Committee X12 comprises Government and industry members who create EDI draft standards for submission to ANSI for subsequent approval and dissemination.

Authentication
A mechanism which allows the receiver of an electronic transmission to verify the sender and the integrity of the content of the transmission through the use of an electronic key or algorithm which is shared by the trading partners. This is sometimes referred to as an electronic signature.

Compliance checking
A checking process that is used to ensure that a transmission complies with ANSI X12 syntax rules

Conditional (C)
A data element requirement designator which indicates that the presence of a specified data element is dependent on the value or presence of other data elements in the segment. The condition must be stated and must be computer processable.

Control segment
A control segment has the same structure as a data segment but is used for transferring control information for grouping data segments.

Control validation
Provides confirmation that information within the control segments is correct

Data element
The basic units of information in the EDI standards containing a set of values that represents a singular

fact. They may be single-character codes, literal descriptions, or numeric values.

Data element length
This is the range, minimum to maximum, of the number of character positions available to represent the value of a data element. A data element may be of variable length ranging from minimum to maximum, or it may be of fixed length in which the minimum is equal to the maximum.

Data element reference number
The reference number assigned to each data element as a unique identifier

Data element requirement designator
A code defining the need for a data element value to appear in the segment if the segment is transmitted. The codes are mandatory (M), optional (O), or conditional (C).

Data element separator
A unique character preceding each data element that is used to delimit data elements within a segment

Data element type
A data element may be one of six types: numeric, decimal, identifier, string, date, or time.

Data Interchange Standards Association
The Secretariat and administrative arm of ASC X12

Delimiters
These consist of two levels of separators and a terminator. The delimiters are an integral part of the transferred data stream. Delimiters are specified in the interchange header and may not be used in a data

element value elsewhere in the interchange. From highest to lowest level, the separators and terminator are segment terminator, data element separator, and subelement separator (only used in EDIFACT).

Direct transmission
The exchange of data from the computer of the sending party directly to the computer of the receiving party. A third-party value-added service is not used in a direct transmission code.

EC
electronic commerce

EDI
electronic data interchange

EDIA
Electronic Data Interchange Association. A nonprofit, public interest organization designed to develop, foster, and maintain a program of action to achieve coordination of data and information systems by the standardization of descriptions and codes for intercompany computer-to-computer EDI for business transactions.

EDIFACT
This is an international standard for EDI for administration, commerce, and transport.

EDI translation
The conversion of application data to and from the X12 standard format

EDI translator
The computer software used to perform the conversion of application data to and from the X12 standard

EFT
electronic funds transfer

E-mail
electronic mail

Electronic mailbox
The place where an EDI transmission is stored for pickup or delivery within a third-party-service provider's system. Trading partners can also maintain mailboxes within their own domains.

Encryption
A process of transforming clear text (data in its original form) into ciphertext (encryption output of a cryptographic algorithm) for security or privacy (security transaction set 815)

ERS
evaluated receipt settlement

FAR
Federal Acquisition Regulation

FMS
Financial Management Service

FRB
Federal Reserve Bank

Functional acknowledgment
A transaction set (997) transmitted by the receiver of an EDI transmission to the sender, indicating receipt and syntactical acceptability of data transmitted according to the ASC X12 standards. The functional acknowledgment allows the receiving party to report back to the sending party problems encountered by the syntax analyzer as the data are interpreted. It is not

intended to serve as an acknowledgment of data content.

Functional group
A group of one or more transaction sets bounded by a functional group header segment and a functional group trailer segment

Industry conventions
This defines how the ASC X12 standards are used by the specific industry.

Industry guidelines
This defines the EDI environment for using conventions within an industry. It provides assistance on how to implement X12 standards.

IOC
initial operational capability

Mandatory (M)
A designator that indicates a specified data element is required

Mapping
The process of identifying the relationship of the standard data elements to application software data elements

Message
The entire data stream including the outer envelope

NTE
note segment – EDI message

Optional (O)
A data element/segment requirement designator that indicates the use of the element is at the option of the sending party

PC
personal computer

Proprietary format
A data format specific to a company, industry, or other limited group. Proprietary formats do not comply with ASC X12 standards.

RFQs
requests for quotes

SBA
Small Business Administration

Security
A process of system screening that denies access to unauthorized users and protects data from unauthorized uses

SF
Standard Form

Syntax
The grammar or rules which define the structure of the EDI standards

TDCC
Transportation Data Coordinating Committee

TPA
trading partner agreement

Trading partner
The sending and/or receiving party involved in the exchange of EDI transmissions

Transaction set
The transaction set unambiguously defines, in the standard syntax, information of business or strategic significance. It consists of a transaction set header segment, one or more data segments in a specified order, and a transaction set trailer segment.

Transaction set ID
A code that uniquely identifies the transaction set. This identifier is the first data element of the transaction set header segment.

Translation
The act of accepting documents in other than standard format and translating them to the standard

VAN
value-added network. These are usually third-party service organizations.