EDI BUSINESS INTEGRATION ISSUES

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Electronic Data Interchange Program (EDIP)

EDI: Business Integration Issues

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Abstract

The rationale for EDI is to replace paper and, consequently, to reduce the clerical transactions required of paper processing.

The challenge of EDI is to introduce electronic systems that achieve this. However, achieving this is not done by simply mimicking the paper processing workflow. Duplicating a manual process with an electronic/EDI process often does not provide any benefits besides speed. Implementing EDI requires rethinking/redesigning business processes and workflows. And, because EDI is an interorganizational application, often the redesign of workflows involves redesigning an organization in the context of other organizations it trades with. That is, it involves redesigning value chains, which can include outsourcing, developing close relationships with a handful of suppliers, entering into consortia with competitors, entering into trading confederations, sharing data and/or contracting data processing services, and other kinds of new arrangements.

As formerly separate value-adding enterprises are integrated through EDI, competitive opportunities and threats arise: manufacturing companies may become service companies, service companies may become information companies, business niches may become obsolete (such as agenting, or some forms of warehousing), and new niches may open (clearinghouses for product/rate data and trade payment processing services).

To strategically plan for organizational shifts effected by EDI—both within companies and within industries—executives need new tools to analyze and assess work. Workflow analysis and activity-based accounting concepts are frameworks that allow executives to grasp and leverage EDI's potentially vast structural impacts.

Because EDI is the integration of a large, distributed network of computer applications, a number of information systems and technologies directly interface with EDI systems. These include data mapping tools, application software, EDI gateways, bar code and automatic identification systems, data capture systems (such as hand-held devices and image systems), and messaging/workgroup environment systems.

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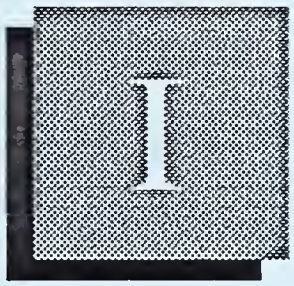
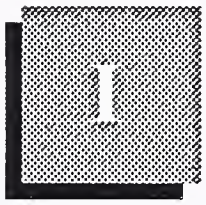


Introduction



Introduction

This report, produced as part of INPUT's Electronic Data Interchange Program, examines the organizational impact of EDI and the possibilities for work reorganization that EDI generates. This report is not a technical or project implementation guidebook for the first-time EDI user. It is a discussion of strategic business issues aimed at the executive level of organizations. Project implementation guidelines can be obtained from most leading vendors of EDI software and services.

A

Scope of Report

EDI is the exchange of intercompany business data—such as purchase orders, freight bills, invoices, etc.—in structured, standard data formats between one company's computer system and another company's computer system.

The impact of EDI on work and on organizational efficiency has been, like most information-communication technologies, difficult to assess. Users and vendors to the EDI market generally agree that EDI reduces clerical labor, labor involved in rectifying data-entry errors, and turn-around time—but in many instances it is not possible to explicitly account for time and energy savings. Indeed, in some cases, the costs of acquiring software, integration services, network services, and other EDI support services rise to hundreds of thousands of dollars, while the benefits of such investments are invisible. EDI is not always the appropriate communication medium through which to conduct commercial transactions. Certain products and certain transaction volumes for those products dictate when and where EDI can be used. In some cases, telephone, interpersonal communication, fax, E-mail, and mail are the most economical methods for enacting commercial exchange.

This report investigates the constituents and limits of EDI. It attempts to identify the necessary business conditions that justify EDI implementation. It attempts to classify the kinds of change that occur in organizations when they adopt EDI. And, finally, it suggests new ways of considering EDI, and new organizations of people and work that it can bring to an enterprise.

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The report examines two dimensions of EDI integration:

- Integrating EDI within a single company. This consists of, but is not limited to, linking computer application programs for purchasing, order entry, inventory control, shipping, and accounting to an EDI software package, and then, via telecommunications software, to a value-added network and/or trading partner.

- Integrating the business activities throughout a value chain via EDI. EDI serves to connect many value-adding businesses into a single entity. It can eliminate certain value chain activities—such as warehousing—and give rise to new value-adding activities—such as third-party payment processing services.

The first integration issues consist more of tactical considerations; the second, strategic. This report presents the organizational and managerial potentials of both, outlines some of the challenges of linking EDI to specific company procedures, and reviews the relevant products and services in the market today that support and work in conjunction with EDI systems.

With this report, INPUT intends to provide the following information for the following kinds of people:

- Executives at EDI-using companies will become acquainted with the strategic implications of EDI. They will see new possibilities for structuring their firms. They will see the areas in which EDI can give their organizations competitive advantage. They will see how EDI can give rise to new products, better cost structures, and improved relations with customers and suppliers.

- Managers at vendor companies will see new possibilities for products and services. From case studies, they will see the successes and pitfalls of EDI implementations from which they can develop and/or enhance their offerings. They will be able to assess user needs in terms of software, services, applications, technologies, and integration services related to EDI.

- For EDI professional service consultants, the report will help further refine how to use EDI to reorganize a company to better take advantage of the company's core competence. It will provide ideas on how to approach using EDI to redesign organizations.

- For students and academics, the report is a bonanza of empirical data (through its numerous case studies) on the effects of EDI. The report includes an initial attempt to re-examine accounting practices that are more appropriate for the management of companies.

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B

Methodology

The research for this report consisted of:

- In-depth, nonstructured interviews with senior personnel in both the information services and end-user departments of a wide cross-section of companies
- Structured survey interviews with senior and technical personnel in information services and end-user departments of 50 companies from a wide cross-section of industries
- In-depth, nonstructured interviews with senior personnel from network and professional service firms in the EDI market, and EDI software vendors
- Ongoing discussion and contact with personnel from the leading vendors to the EDI market—professional service firms, network service providers, and software vendors
- Interviews with industry bodies, such as AIAG, American Trucking Association, TDCC/EDIA, ANSI X12, DISA, etc.
- Analysis of trade and periodical literature pertaining to EDI
- Review of current academic/theoretical research on accounting, information systems technologies, competitive advantage, and business history
- Analysis of product and service literature of EDI vendors

C

Report Structure

This report is structured as follows and addresses the following topics:

Chapter II is an Executive Overview of the entire study. It presents key findings.

Chapter III is a review of the current status of EDI today, how far EDI has come since the sixties, what the current implementation challenges are for users, and what the current product offerings are that address these challenges.

Chapter IV looks at the impact of EDI from a more tactical operational (less dramatic) perspective. It shows what most companies can expect when seriously and fully implementing EDI as a standard way of conducting business.

Chapter V looks at the impact of EDI from a more strategic perspective. It shows the results in companies that have implemented EDI for strategic advantage.

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Chapter VI looks at the technical/systems milieu surrounding EDI. Earlier chapters show where EDI fits from a business standpoint. This chapter surveys the technical systems that literally plug into EDI programs, and their corresponding interface issues.

Chapter VII is a conclusion that lists key recommendations for users and vendors. It points to future questions and issues regarding EDI that need resolving in the area of business integration.

Appendix A is a glossary of EDI terminology.
Appendix B is a listing of current EDI transaction sets (X12) and messages (EDIFACT).
Appendix C is an index of the companies mentioned in this report.

D

Related INPUT Reports

This report is one of many focused on EDI. Other reports include:

- *The Electronic Data Interchange Market 1990-1990: Forecast, Implementation, Trends* (1990)
- *EDI and Financial Services* (1990)
- *The EDI Sourcebook*
- *Advanced EDI Services* (1989)
- *EDI Intertrends—Western Europe* (1989)
- *EDI Standards Reference Guide* (1989)
- *EDI Implementation Case Studies* (Volume I and II) (1988, 1989)
- *U.S. EDI Federal Markets* (1989)
- *EDI and X.400* (1988)
- *EDI Software Products: Issues, Trends and Markets* (1988)

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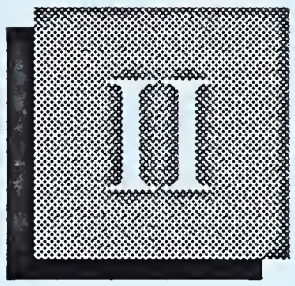

Executive Overview

II

Executive Overview

After 30 years of gradual evolution, EDI is now an institutionalized business practice for communication. Today EDI:

- Has a common definition
- Has two basic world recognized syntaxes, ANSI X12 and EDIFACT, whose compatibility is a nonissue (because a single translation software package can handle both syntaxes)
- Is used widely around the world by tens of thousands of companies
- Is growing in use at approximately 20% per year in its largest market, the United States
- Has a formal, worldwide organization for the development and maintenance of EDI message standards (interlinked national, international, and industry standards bodies)
- Has a robust infrastructure of vendors offering software and services

A Purpose

The cost point of entry into EDI-based trading has fallen so that small and medium-sized companies can participate.

At this mature, consolidated stage, EDI evolution is entering a new phase of development. The issues are now:

- To what degree can EDI be integrated into a company, and thereby integrate companies in a value chain?
- Is it desirable to have all trading partners conducting EDI? If so, how is this possible, and how is it to be financed?
- What are the strategic implications of EDI when the competitive environment (the organizational and industrial structures by and in which a company competes) is altered by EDI? What activities should a company concentrate on and what should be outsourced? Related to this, how much of the electronic network should a company own and operate versus how much should be left to a third party or trading partner?

Exhibit II-1 summarizes today's issues in EDI.

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EXHIBIT II-1

Today's Issues in EDI

- Integration to what degree inside a company?
- Desirable to have all trading partners on EDI? If so, how to finance?
- What are the strategic implications of EDI when the competitive environment is altered by EDI?

B

Findings

Despite the infrastructure and availability of resources to sustain EDI, integration of EDI has been slow. Upwards of 60-85% of companies that have some EDI capability have not fully integrated EDI with internal computer applications, which in many cases requires additional manual input of pertinent data.

The slow pace of adoption, in the face of a robust infrastructure, is due to a lack of understanding of the impact EDI has on an organization singularly and on groups of organizations collectively.

EDI is explicitly aimed at eliminating processing costs associated with business procedures based on paper documentation. However, simply mimicking the paper processing workflow with an electronic procedure often does not provide any benefits besides speed. Implementing EDI requires rethinking/redesigning business processes, workflows, and organizations. Because EDI is an interorganizational application, workflows that occur among organizations must be redesigned as well. In other words, optimal EDI implementation potentially restructures whole industries and value chains.

Reorganizing value chains can include outsourcing, developing close relationships with a handful of suppliers, entering into consortia with competitors, entering into trading confederations, sharing data and/or contracting data processing services, and other kinds of new arrangements.

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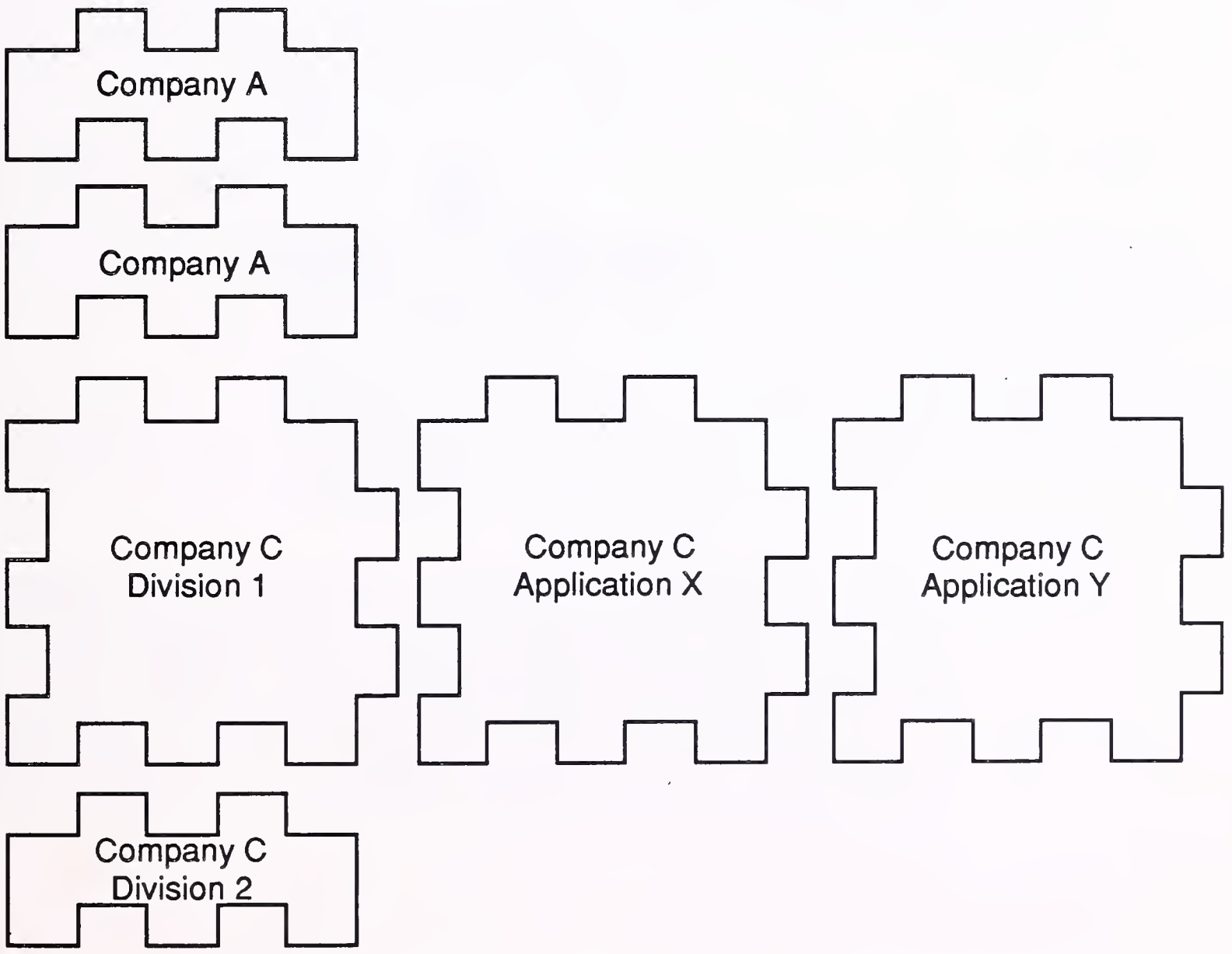
EDI can be viewed as the integration of a series of value-adding operations performed by separate companies, as depicted in Exhibit II-2. Business opportunities that arise given this macro integration and integration across value chains include: manufacturing companies becoming service companies, service companies becoming information companies; certain enterprises becoming obsolete (such as agenting, or some forms of warehousing), and new enterprises becoming possible (clearinghouses for product/rate data and trade payment processing services).

EXHIBIT II-2

EDI Makes Companies, Divisions, and Applications Plug Compatible



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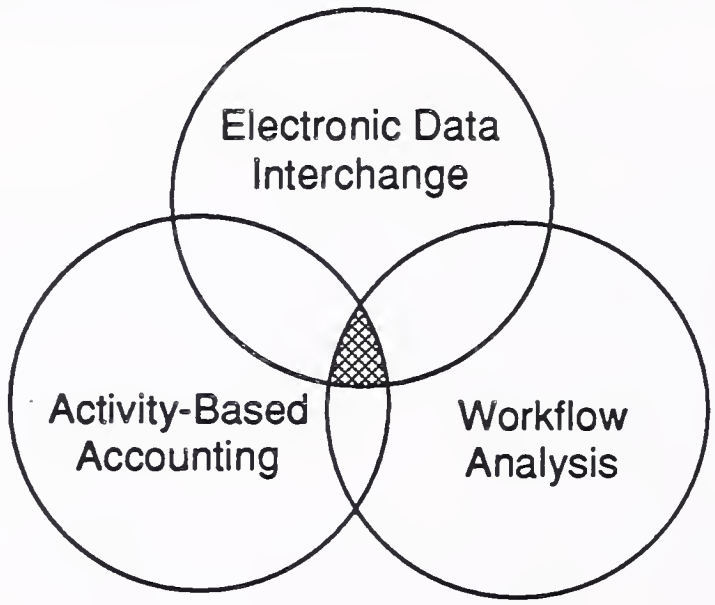
Because proper EDI implementation requires the redesign of a company and, potentially, the value chain it finds itself in, it is of strategic importance. It requires executive-level planning.

Moreover, because of its enormous potential to reshape the flow of goods, funds, work patterns, and communication, EDI requires new management frameworks to analyze and assess work and economic value. Workflow analysis and activity-based accounting are two relatively new frameworks that can aid EDI implementation (see Exhibit II-3).

EXHIBIT II-3

Activity-Based Accounting and Workflow Analysis Support—Superior EDI Implementation



EDI is not appropriate for all forms of commercial exchange. It works for exchanges between value-adding parties where recurrence of the exchange is high, and the terms, conditions, and specifications of the exchange can be made in unambiguous language as classified in Exhibit II-4. Other media for business communication (phone, mail, face-to-face negotiating and signing of documents, facsimile, electronic mail, on-line ordering systems, etc.) will continue to be used along with EDI.

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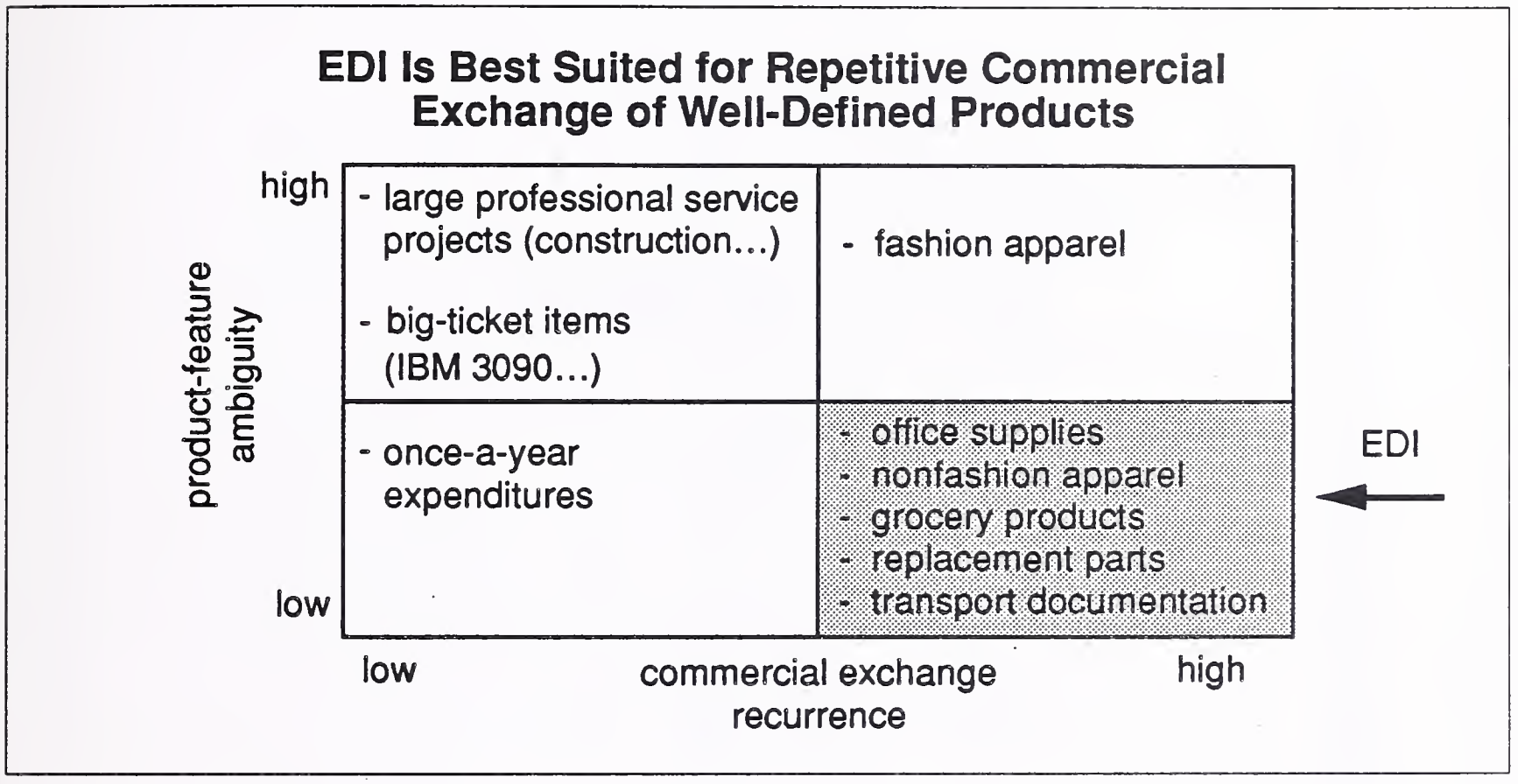
EXHIBIT II-4



To support recurrent, unambiguous commercial exchange, EDI users must establish certain business, legal, and technical conditions as listed in Exhibit II-5. Business conditions consist of commitments to quality, long-term relationships, closer communication, just-in-time deliveries, etc. Legal conditions consist of agreeing on who is responsible for data errors, the timing of transmission, etc. Technical conditions consist of agreeing on the kinds of EDI transaction sets/messages, versions, modifications to the standards, coding schemes, etc.

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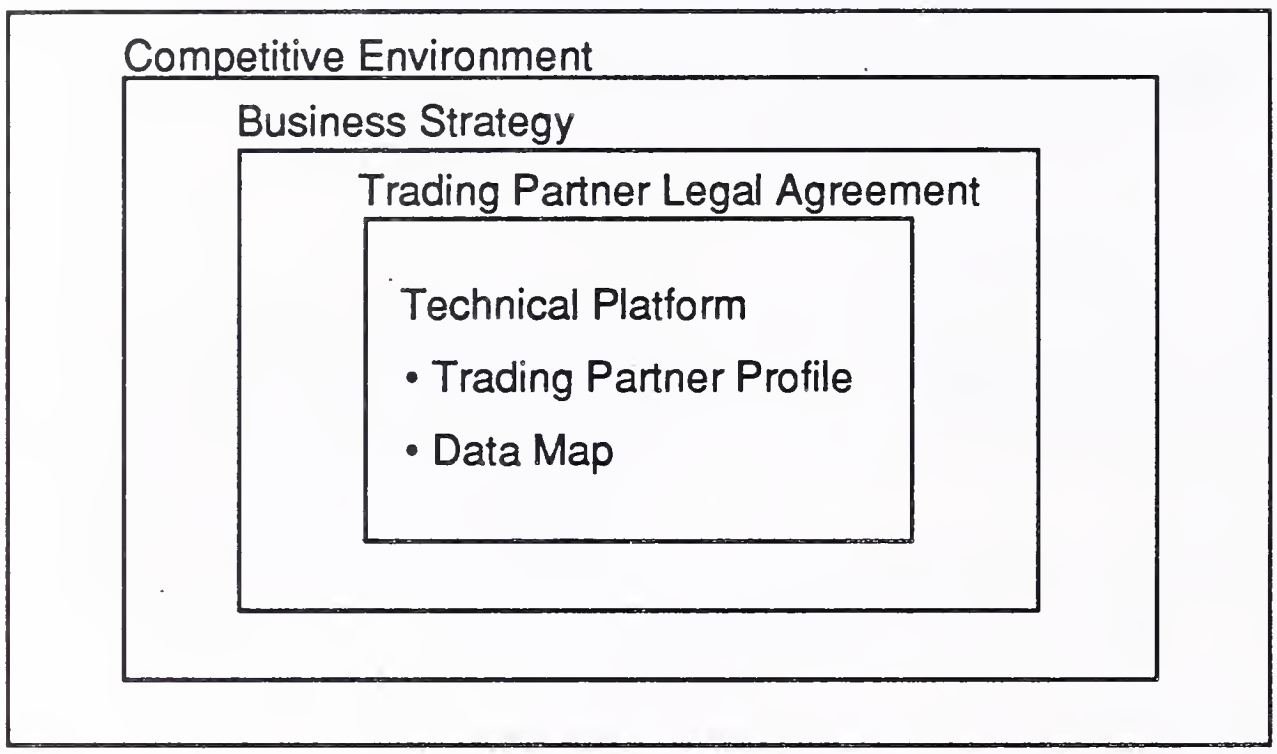
EXHIBIT II-5

The Operational Context of EDI



EDI occurs within already well-defined contexts and agreements.
Defining these contexts and agreements is part of the integration process.

EDI is the formation of a large, distributed network of computer applications that trigger and monitor activities to produce products and services. Consequently, a number of information systems and technologies directly interface with EDI systems. These systems are listed in Exhibit II-6.

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EXHIBIT II-6

EDI Integration Tools and Allied Information Technologies

- EDI software products
  - Translation software
  - Data mapping tools
  - Application software/program interfaces
  - EDI gateways/servers
- Messaging systems and work group environments
  - Compound/active document systems
  - Groupware
  - Electronic mail
  - Facsimile
- Automatic identification
  - Bar codes
  - Radio transponders
  - Smart cards
- Data capture
  - Hand-held devices
  - Image systems
  - Intelligent devices in consumer and industrial products
  - Natural-language processing

C

Conclusions

The restructuring of business with EDI is the building of a single system that electronically routes signals of product demand and supply among relevant value-adding providers. The objective is the automatic, mechanical coordination of these signals in order to trigger people to action at various stations in the value chain. Understanding the full potential of EDI requires new frameworks for costing products, valuing companies/assets, and for analyzing work. Conducting integration across value chains requires the participation of many people with diverse commercial interests. A summary of conclusions regarding EDI business integration issues is shown in Exhibit II-7.

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EXHIBIT II-7

Conclusions

- EDI requires the participation of users and vendors in transcorporate groups.
- EDI is applicable to recurrent, unambiguous interorganizational exchanges.
- EDI generates unforeseeable business opportunities.
- EDI requires the leadership of top management.
- EDI restructures value chains.
- New management/economic frameworks are required to understand the full impact of EDI-related restructuring.
- EDI shifts labor demands from clerical to technical.
- EDI requires a utility-type infrastructure.
- Early EDI adopters finance the infrastructure that late adopters will use without paying for.
- The move toward flexible, nonmass production will not inhibit EDI growth.

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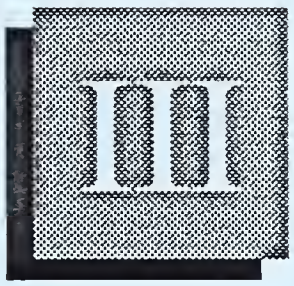
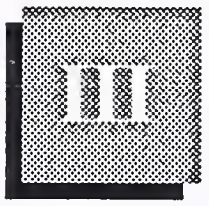


EDI Today



EDI Today

The concept of EDI is as old as digital computers. Systems for the exchange of machine-readable data between companies were first used in the late fifties (by airlines and airplane parts manufacturers). Today, a common name and terminology for this enterprise have become accepted throughout the world, and standards-setting and maintenance institutions have been firmly established to allow EDI users and vendors to develop EDI further. A rich infrastructure of software, hardware, and service offerings have sprung up to allow for easy, off-the-shelf implementation of EDI. What started out as isolated efforts of data exchange has matured into a self-propagating institution. A critical mass has been attained.

Yet EDI has by no means completely matured; much evolution is still to come. Establishing a common name and forum for development is just the beginning—it is the laying of the foundation. Now, having passed this critical incubation period, we are in a new phase of EDI development. In this phase the competitive implications of EDI are identified. This report intends to initiate the conversation on this issue.

A Reasons for Using EDI

The traditional/principal rationale for EDI starts with eliminating paperwork and its accompanying clerical labor costs. The traditional ways of preparing and managing business documents have several problems:

- Paper or verbal information is not directly usable by computers, nor is information transferred by facsimile.
- Telephone ordering and order-taking is labor intensive and error prone.
- Reliance on the mail slows turnaround time. Couriers are very expensive.

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Many companies hold safety stocks of raw-material and finished-product inventories. This expedites product flow and improves customer service, but it requires capital, incurs the cost of capital, and thus erodes profit margins. Competitive pressures today have companies looking for ways to cut inventory holding costs and work toward just-in-time environments.

EDI has been proven to save firms money. Interviewed users who have analyzed their paper and electronic costs report that EDI transactions cost one-tenth what the equivalent paper document costs.

- A single, fully burdened paper purchase order would cost $50, whereas a single, fully burdened EDI purchase order would cost on the order of two to five dollars.

Exhibit III-1 lists the traditional benefits of EDI.

Although reducing the costs associated with paper document processing is the overt objective of EDI, the benefits of EDI extend beyond this. Indeed, mimicking the paper process with an electronic one often provides the company with marginal benefits. Duplicating the same processing with electronics will miss taking advantage of efficiencies that are inherent in electronic information-communication systems. Taking advantage of these efficiencies requires re-examining work flows within the company, and between the company and its trading partners. It requires looking at the assets and core competencies of the company. It requires considering the strategic objectives of the company and incorporating them into systems. Integrating EDI most effectively requires rethinking the organization. This report looks at this issue.

Looking for other benefits of EDI other than the reduction of clerical work requires, additionally, the development of new systems evaluation and management criteria. EDI benefits can be measured by many criteria—new services, speed, low inventories, reduced processing costs, generation of new kinds of strategic information, better integration of departments, etc.). Corporate strategy and focus, again, is critical in determining the criteria for evaluating the costs and benefits of EDI. Exhibit III-2 is a more systematic approach to evaluating the benefits of EDI.

EDI enables management to change corporate strategy, however. EDI originally promises expedited processing of rote paper documents — a cost-reducing tactic. Yet, once implemented, the corporation may find itself on a new footing with new possibilities in terms of product offerings and enhancements, new organizations of its people, new relationships with trading partners, and new markets — in short, new strategic possibilities.

EDI enables companies to transform themselves. This can be seen in the way EDI has evolved in business over the last three decades.

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EXHIBIT III-1

Benefits of EDI

- Data Keying—EDI reduces or eliminates redundant data entry.
- Errors—EDI eliminates keying errors, eliminates human interpretation/classification errors, and eliminates filing errors and lost documents.
- Filing—EDI replaces paper document filing with electronic files. It eliminates the need for human filing and file retrieval, and reduces total space for computer files.
- Paper Forms—EDI reduces paper forms, especially multipart carbons going to many departments.
- Postage—EDI replaces mailed documents with data transmissions.
- Invoicing—EDI eliminates the need to invoice, since payment can be automatically triggered upon receipt of goods (evaluated receipt settlement).
- Payment—EDI replaces checks with electronic payment.
- Accounts Receivable—EDI automates the cash application function, improves control, and eliminates the billing/invoicing function via evaluated receipt settlement.
- Accounts Payable—EDI automates the entire payment process, including payment and remittance creation; it eliminates invoice validation via evaluated receipt settlement.
- Inventory—EDI reduces order lead time and order confirmation delay; it facilitates just-in-time inventory and the maintenance of lower levels of costly inventory. It reduces out-of-stock situations and allows better control overall.
- Customer Service—EDI allows for more responsiveness to customers and direct sales connections, and encourages lasting relationships with customers.

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EXHIBIT III-2

EDI's Benefits Can Be Measured According to Different Standards of Value

	Assets	Time	Coordination
Relevant Metrics	• ROI • Productivity • Capacity utilization • Assets include: - inventories - cash - people - physical plant	Reduction of cycle time periods: • Receiving trading partner acknowledgment of message received • Receiving/delivering product • Inventory turns	• Error counts • Product quality • Service levels • Customer satisfaction • Trading partner relationships • Product design effectiveness • Inventory levels
Drawbacks of Approach	Hard to distinguish EDI contribution	Doesn't reflect all the benefits	Hard to measure quantitatively
Benefits of Approach	Accepted by management; easiest way to identify advantages	Captures the thrust of EDI	Captures the thrust of EDI

B

History of EDI

The automatic passing of information related to commercial transactions has evolved over the past 30 years. Prototypical systems of today's EDI have originated in different sources: airline parts systems, the transportation industry, pharmaceuticals distribution, the oil industry, grocery, etc. Exhibit III-3 depicts the substantive events in the history of EDI.

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EXHIBIT III-3

Milestones in EDI History

Year	Event
1958	Specification 200. First EDI system. Airlines order replacement parts from manufacturers.
Early 60s	United Nations Working Party established for the simplification and standardization of trade documents.
1968	Transportation Data Coordinating Committee (TDCC) formed. Edward Guilbert president.
Late 60s	Large retailers (Sears, J.C. Penney) establish proprietary (nonstandard) EDI with suppliers. Automakers (Chrysler, GM, Ford) establish proprietary EDI with suppliers.
Early 70s	Transportation industry (particularly railroads) adopts EDI. Automated Clearinghouse established. Pharmaceutical makers and hospitals establish Ordernet EDI. Petrodex established. Oil industry accountants establish EDI for the sending of accounting data among oil companies.
1975	TDCC releases first public EDI standards for rail, motor, ship, and air carriers.
1979	American National Standards Institute (ANSI) X12 Accredited Standards Committee (ASC) chartered.
1980	A.D. Little report on the grocery industry shows that $650 million per year can be saved as a result of EDI.
Early 80s	Grocery EDI launched using Uniform Communication Standard (UCS) data format standards. EDI begins in the United Kingdom with the Tradacoms standard. Odette standard developed and implemented by European automobile industry.

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EXHIBIT III-3 (cont.)

Milestones in EDI History (continued)

Year	Event
1984	TDCC and X12 form Joint EDI Committee.
1985	United Nations Working Party commences work on EDI For Administration, Commerce and Trade (EDIFACT) Automobile industry adopts X12 EDI.
1987	EDIFACT releases its first Universal Standard Message, the invoice. International Standards Organization (ISO) approves EDIFACT syntax as a world standard.
1988	Harmonized Code promulgated to international trading community (standard way to classify products, easing administrative procedures when goods cross borders). Most industrialized countries adopt immediately. U.S. adopts year later.
Late 80s	Australia, New Zealand, Singapore, and Hong Kong pioneer EDI in the Pacific Rim.
1989	UN EDIFACT organization formally ties into national standards organizations including X12.
1990	X12 organization assumes control of TDCC standards. TDCC continues metamorphosizing into the EDI Association (EDIA), a national EDI trade organization.

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EXHIBIT III-4

EDI INPUT - OUTPUT MATRIX

INDUSTRIES AS BUYERS →

INDUSTRIES AS SELLERS ↓

Cells contain: • Significant EDI projects • Dominant uses of EDI
• The degree of EDI standards development (low, medium, high)

INDUSTRIES AS SELLERS	Discrete Manufacturing	Process Manufacturing	Distribution	Trans-portation	Utilities	Commun-ications	Banking	Insurance	Government	Agriculture	Construction	Education	Health care	Services
Discrete Manufacturing				• Spec 2000 • Transnet	• Electrical equipment				• CALS • Vendor Express • GSA		(Infancy) • Fittings, valves, parts, electrical supplies	• Book buying (Pubnet)	• Medical/ surgical supplies	
Process Manufacturing	See Expanded Matrix			• Spec 2000 (fuels)	• Fuels				• USMC commissaries • GSA	• Fertilizers			• Pharmaceutical supplies	
Distribution (Retail/Wholesale)										(Infancy) • Invoice prcssng • No purchase order potential	• Contractors buy materials and tools			
Transportation	(High)	(High)	(High)	• Intermodal handoffs • RR handoffs • CLMs	(Infancy)	• Film distribution			• USMC transport program					• Travel agents buy airline services
Utilities			Franchise site power billing	RR crossing billing		• Billboard power billing								
Communications	Phone billing	(all industries) →				• Film dist. data between theaters & distributors								
Banking (Financial EDI Services)	• GM pays suppliers • Lock box • Cash mgmnt. • EFT pymnt svc	(all industries) →	• Factoring svcs • Gas stations pay oil co.s • Retailers pay apparel maker	• Freight bill processing										
Insurance								• NEIC • IVANS						
Government	• EFT for corp. taxes	(all industries) →		• Customs • EPA										
Agriculture			• Farm co-ops • Dairies											
Construction		• Petrochemical, food processing, paper, pharma-ceutical co.s buy construction services and facilities			• Utilities co.s buy new construction & renovation for facilities				• US military buys lrg. scale construction services		• Contractor-designer-subcontractor EDI			• Commercial real estate developer buy office bldg. construction
Education									• Student loan information • Veterans Administration			• Transcripts • College catalogs • Standardized test data		
Health care								• Health care providers submit health claims						
Services				• Freight forwarding • Customs brokering										Travel, tourism

EDI90

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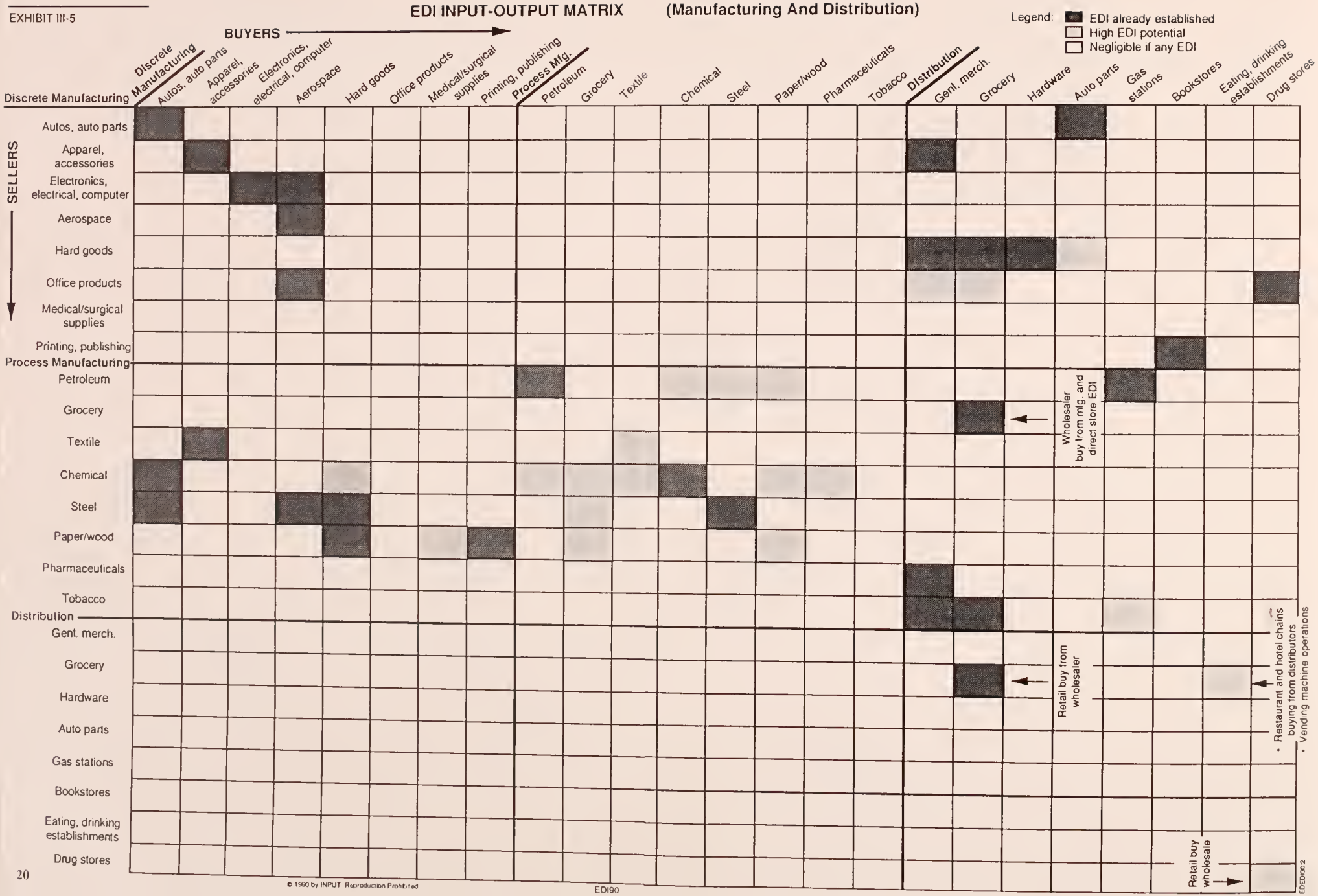
EXHIBIT III-5

EDI INPUT-OUTPUT MATRIX (Manufacturing And Distribution)



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C

EDI Today

EDI has proliferated to all major sectors of the U.S. economy, and in many countries today, instances of EDI use can be found. Governments are finding EDI invaluable in reducing the paperwork involved in procurement, customs, taxation, military operations, and others.

Exhibits III-4 and III-5 are EDI input-output matrices showing applications of EDI throughout the U.S. economy. Exhibit III-4 lists EDI applications within and among 14 basic vertical markets. Exhibit III-5 lists applications in specific industries within the manufacturing and distribution sectors. (Read down columns to read EDI performed with a particular vertical market's suppliers. Read across rows to read EDI performed with a vertical market's customers.)

EDI is indisputably a viable technology for business. It has become institutionalized. It is well established in business and becoming more so. Today, EDI:

- Has a common definition
- Has two basic world-recognized syntaxes (ANSI X12 and EDIFACT), which are essentially compatible
- Is used widely around the world by tens of thousands of companies
- Is growing in use at approximately 20% per year
- Has a formal worldwide organization for the development and maintenance of EDI message standards (a single organization of interlinked national and industry standards bodies)
- Has a rich infrastructure of software and services, with inexpensive standardized products bringing the entry-level EDI costs within reach of just about any company

Exhibit III-6 examines how far EDI has come since its origins thirty years ago.

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EXHIBIT III-6

EDI Yesterday versus Today

Early EDI	Today
Few, scattered implementations	Pervasive in economy, in function, and in trading partner type. • Every major industry uses it (not just transport, manufacturing, and distribution but education, government, advertising, etc.) • A company can conduct EDI with a wide variety of trading partners.
Proprietary data formats	Two basic standards families whose organizations are tightly integrated
All applications custom developed	A rich infrastructure of competitively priced products and services.
No organization to support development	Many national and international organizations to support users and standards development.
EDI was unknown, hard to describe, and considered to be an idiosyncratic application	A common vocabulary and user/vendor community for EDI
Growth confined to hub & spoke clusters	20% growth per year economywide
Applied to specific corporate couplings	Multiple trading partner types are common using a single translator platform.

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EDI has attained a critical mass of acceptance and use. Every major economic sector uses it. Companies can expect to conduct EDI with not just a narrow array of suppliers, but with the full spectrum of its trading partners: inventory suppliers, banks, government agencies, service providers such as advertisers, etc.

The widespread use and publicity of EDI has produced an environment in which a company can expect either to have a trading partner request that it use EDI, to see a competitor using EDI, or both. EDI, like the telephone or facsimile machine, is becoming mandatory business equipment in some industries.

The standards of EDI are coalescing into a more or less single generic family (even X12 and EDIFACT), with a variety of dialects for specific industry groups.

A single, international confederation of standards organizations and user groups is coalescing as well. The ANSI X12 organization, for example, is the conduit for North American EDI users to input and vote on UN EDIFACT standards. The people designing X12 and UN EDIFACT standards are the same.

The worldwide community of EDI users speaks a common lexicon of EDI terms: mapping, translation, data format, and hub company. The distinctions of EDI can be discussed.

The infrastructure of standardized products and services greatly adds efficiency to the EDI market. Users have a wide choice of EDI software and network services. Entry price points for EDI range from as low as $800 to hundreds of thousands of dollars, depending on the volume of trade and the degree of integration a company wants to pursue. Off-the-shelf EDI implementations are possible, and interchangeable software is available. Systems integration—options where a company's entire supplier base is brought up on EDI—are provided by vendors today.

EDI is here today and it is not going away. It is firmly established. It has matured. It has attained a critical mass similar to the telephone—there are EDI users in almost every industry.

At this mature, consolidated stage, EDI evolution is entering a new phase of development. The issues are now:

- To what degree can EDI be integrated into a company, and thereby, integrate companies in a value chain?
- Is it desirable to have all trading partners conducting EDI and, if so, how is this possible and how is it to be financed?

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- What are the strategic implications of EDI when the competitive environment (the organizational and industrial structures by and in which a company competes) is altered by EDI? What activities should a company concentrate on and what should be outsourced? Related to this, how much of the electronic network should a company own and operate versus how much should be left to a third party or trading partner?

Exhibit III-7 summarizes today's issues in EDI.

EXHIBIT III-7

Today's Issues in EDI

- Integration to what degree inside a company?
- Desirable to have all trading partners on EDI? If so, how to finance?
- What are the strategic implications of EDI when the competitive environment is altered by EDI?

The issues today are how to integrate EDI into the internal systems of companies. INPUT estimates that as high as 60-85% of all companies that use EDI have not integrated the EDI translation software with applications. These companies are rekeying data to and from the translator and applications. The EDI computer that receives and sends transmissions is no more functional than a facsimile machine.

EDI integration is not a straightforward matter, however. Technically it can be complicated, but it is the business organization implications of integration that are vexing businesses as they approach EDI. The process of integrating EDI changes organizations. And, changed organizations require new features and capabilities from EDI systems. Thus, dialectically, EDI evolves, and in the process of evolution, both organizations and EDI change.

The history of EDI shows that EDI and the business environment evolve dialectically/iteratively. Effective EDI implementation and systems design is an ongoing process. EDI implementation requires experimentation and a management perspective that proactively looks for new opportunities.

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Furthermore, history has shown that companies may start as EDI users and end up as EDI users and vendors. Management should be prepared to operate in the entire infrastructure of EDI: as user, as vendor, as participant in standards discussions, and as an entrant to a new service or product market. Playing with EDI leads to many opportunities, many of which are unforeseeable.

In the next chapter, we will examine how EDI changes the organization. Following this, we examine how these changes induce changes in the design of EDI.

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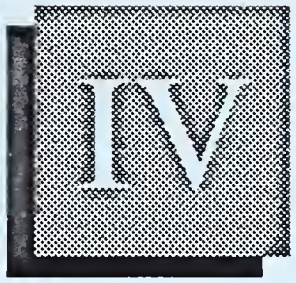
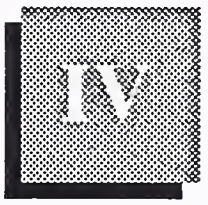


The Organizational Impact of EDI



The Organizational Impact of EDI

The rationale for EDI is to replace paper and, consequently, to reduce the clerical transactions required of paper processing.

The challenge of EDI is to introduce electronic systems that replace paper. However, achieving this is not done by simply mimicking the paper processing workflow. Duplicating a manual process with an electronic/EDI process often does not provide any benefits besides speed. Implementing EDI requires rethinking/redesigning business processes and workflows. And, because EDI is an interorganizational application, often the redesign of workflows involves redesigning the organization in the context of other organizations that it trades with. In other words, EDI involves redesigning value chains, not simply redesigning procedures within a single company. Redesigning value chains can include outsourcing, developing close relationships with a handful of suppliers, entering into consortia with competitors, entering into trading confederations, sharing data and/or contracting data processing services, and other kinds of new arrangements.

To achieve this redesign process requires executives, managers, consultants, and systems integrators to examine current strategies, business environments, and business practices. Only at such a high level will strategic opportunities become apparent.

EDI impacts how a company accomplishes operational activities—a tactical impact. EDI impacts the form of the company and the offering it makes to the market—a strategic impact. The tactical versus strategic impacts are similar to the way computers have impacted publishing. Tactically, computers give preproduction (word processing and page layout activities) a huge productivity gain. Strategically, computers have provided entirely new delivery modes for published materials—namely, on-line data bases and CD ROM.

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A

The Tactical Impact of EDI

We will look at the tactical and strategic impacts that EDI has on organizations, its contribution to competitive advantage, and how integration and business strategy are related.

Potentially, EDI impacts every functional area of a company: research, procurement, receiving, manufacturing, sales/order entry, shipping, and accounting. This section explores these operational impacts. Exhibit IV-1 lists the impacts discussed.

EXHIBIT IV-1

Selected Tactical Impacts of EDI

- Workflow and Job Description Changes
- Accounting Changes
- Control of Company Resources

1. EDI Changes Workflows and Job Descriptions

One of the most immediately observable impacts of EDI is on workflows and jobs. EDI reduces clerical labor, which is EDI's explicit objective. Positions in the firm that are entirely clerical (such as accounts payable clerks, order-entry clerks, expediters, etc.) can be eliminated. The component of managerial and professional labor that is clerical can be eliminated or minimized.

For example, Frito-Lay delivery truck drivers spent upwards of an entire day per week accounting for inventories and reporting back to distribution points regarding their deliveries. Having made the inventory process electronic (including using EDI exchanges of data at the supermarket), this chore has been reduced to less than two hours per week.

Sales representatives and procurement officers—the two sides of a commercial transaction between typical large companies—are freed of the bureaucratic chores of paper work and can concentrate on relationship building. Buyers at Digital Equipment's Augusta plant (its best EDI facility) act as liaisons between suppliers and DEC design and manufacturing engineers. One buyer discovered that if DEC modified the speci-

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fication on one component, the supplier of the component could promise much more punctual and quality deliveries (because the modification would make the component easier to build). The buyer relayed this message on to the product and manufacturing engineers who, eventually, redesigned the product and how it was manufactured to accommodate the new specification. The overall flow of product from supplier to customer was improved as a result of the buyer having more time (due to EDI) to discuss new possibilities with the supplier and DEC engineers.

The logistics function at many companies is facing significant change in all aspects of the business. The demands from the logistics departments will continue to intensify because of pressures from increased competition, international supply and distribution networks, corporate restructuring, and high levels of service expectations. This is impacting the role of the logistics/traffic manager at companies.

2. EDI Changes Accounting

a. Merging of Ship Notice and Invoice

The disappearance of invoices is one of the publicized accounting impacts of EDI. A company that sends supplies to a customer sends one message: an advanced ship notice (ANSI 856) to the buyer. The buyer places the message in its system so that when goods arrive at the warehouse dock, clerks check the shipment contents to the ship notice and to the original purchase order (to see if what was ordered was actually sent). With this on-the-spot inspection completed without problem, the receiving company is then ready to pay for the goods. An invoice, sent by the supplying company at a later date, is not needed. This procedure is called evaluated receipts settlement. It does not require EDI, but is made much easier with EDI.

- Ford Motor Company and SuperValu Foods, an Eden Prairie, MN-based food wholesaler/retailer, has eliminated the invoice with much success.

- Not surprisingly, the merging of ship notice and invoice reduces the clerical processing requirement and associated labor costs.

b. EDI Necessitates New Productivity Measurements

- *Receivable indicators are potentially worsened by financial EDI.* Credit managers may find that their receivable indicators of health get worse instead of better when their companies have customers pay electronically. Companies that have chosen to pay suppliers electronically are adding three extra days to payment terms to compensate for the float lost by paying electronically instead of by check. These extra days cause two common measurements of treasury department perfor-

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mance to deteriorate. Average Days Slow (ADS) measures the dollar-weighted time from when an invoice matures until it is paid. Average Days Delinquent (ADD) measures the receivable investment at the end of a period and portrays, in terms of days' sales, how much is delinquent. For both ADS and ADD, the critical date is when the check arrives at a company's receivables department or lockbox (and therefore is considered paid). Extending the allowable date for payment will cause these two indicators to lower the credit department's performance rating.

- *Accounting department productivity is apparently worsened.* At the Polaroid accounts payable department, managers are concerned about converting from paper to electronic invoices. The department's performance has been measured according to "hit rate," matches of supplier invoices to warehouse receipts. Usually the department operates at approximately 70%, with the unmatched invoices due to late shipments, breakdowns in warehouse receiving, or shipments that do not correspond one-to-one with an invoice. EDI invoices come to Polaroid much faster than paper ones, often faster than goods are shipped. Thus, more invoices will accumulate that cannot be matched with shipments. The hit rate will fall.

Resolving these apparent negative impacts requires modifying performance measurement indicators and possibly accounting procedures.

c. Switching from Credit to Debit Mechanisms

A company that pays another electronically through the Automated Clearinghouse usually will opt for a credit mechanism. The company tells its bank to send funds to the supplier's bank. However, because a credit instruction must be filed days prior to the actual settlement date, the bank that sends the funds is exposed to risk. To cover the risk, it asks the paying company for collateral. R. J. Reynolds Tobacco (Winston-Salem, NC) has gotten around this obstacle by allowing its suppliers to initiate a debit instruction to its bank, rather than RJR initiating a credit instruction. This way, the banks can avoid the payment loop until the day of settlement, which eliminates the need to post collateral against future payments.

Although having suppliers debit the company's account smacks at traditional corporate practice of using credits, according to representatives at R.J. Reynolds, it has eliminated RJR's bad debt reserve. RJR representatives urge treasury officials to change their views on ACH debits. RJR has allowed its EDI trading partners to debit its bank accounts for some time.

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GE Information Services offers a payment service, Customer Originated Electronic Payment (COEP), that uses the debiting mechanism without exempting the paying company's control over its disbursements. Upon receiving an invoice (electronic or paper), the paying company sends a payment instruction to the supplier's bank (not its own bank, as is typically done for electronic payments). The supplier's bank then sends an ACH debit instruction to the paying company's bank, and the transaction is settled. In this way, the supplier pays the bank charge to enact the funds transfer.

Users of financial EDI payment services are claiming that debiting is a better payment mechanism than crediting.

d. Price Lists Are Synchronized between Buyer and Seller

Getting food items on supermarket shelves requires food vendors and retailers to engage in an onerous process of accounting reconciliations. The vendor provides the retailer with a list of products and their prices. The retailer authorizes portions of the list to be sold to the store over a given period of time. When delivery drivers come by to replenish the shelves, the retailer must ensure they haven't padded the bill with nonauthorized goods. The retailer must also check to verify that what the driver said was delivered is actually delivered.

After an accounting cycle has elapsed, the vendor sends the retailer a statement itemizing all the deliveries made within that cycle. The retailer in turn sends a payment advice along with the check listing the deliveries it is paying for. Often, the respective time periods of the statement and advice do not match. Also, the retailer may refer to a different price list from the one referred to by the vendor. The result: vendors and retailers waste time checking each other.

With EDI, prices are generated once (by the vendor) and propagated electronically through the vendor's and retailer's accounting systems. Disputes between salespeople and buyers are minimized. Also, the new direct-store delivery EDI formats (used only in the grocery industry) create an electronic record of how many times the retailer has had to adjust a delivery-receipt record to correct for unauthorized items or counting discrepancies. Thus bill padding by delivery drivers can be spotted quickly.

e. Accounting Reconciliations Accomplished in Appropriate Time Period

EDI has become practically a mandatory technology supporting accounting in the tightly integrated oil industry. Oil companies swap gasoline supplies. They use each other's pipelines. They join together to explore and drill. Keeping track of who owes whom was practically impossible using paper.

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Oil industry accountants, working together under an umbrella organization, the Council of Petroleum Accountant Societies (COPAS), developed Petrodex in the mid-seventies. Petrodex provides detailed information on the transactions that take place when oil companies share fuel products at each other's terminals. Gas stations of the major oil companies as well as the independents have mutual supply contracts. These typically allow one company to draw gasoline from another company's storage terminal. In return, the borrowing company allows the other to draw comparable amounts from its terminals in other parts of the country. Such sharing saves in transport costs.

Payment is usually in reciprocal drawing rights—not cash. Although the mutual supply contracts brought greater efficiency to product distribution, they created havoc for the accounting departments of the companies involved. Getting records for all the transactions of an accounting cycle in time to make a monthly statement usually was impossible. Carry overs—amendments to the following month's statement—were the norm.

The Petrodex system eliminated this confusion. Now, three days is usually the most it takes for the record of the transaction to reach other relevant parties. Since Petrodex was established, COPAS has established other EDI systems to allow oil companies to track the sharing of petroleum products among companies.

f. EDI Impacts Auditing

One consideration pertinent to EDI is the lack of paper documentation and paper audit trail. The cost reductions that result from paper substitution can be negated if the environment is not controlled and security is not maintained properly. Internal controls, both application and general, need to be re-assessed, and often modified, to encompass risks that accompany EDI use.

Since EDI changes the way transactions are put into an application system, the control procedures must be modified accordingly; in particular, the application controls that address the completeness, accuracy, and authorization of input. EDI use also introduces additional control issues in many general control areas, most importantly in the areas of implementation, maintenance, computer operations, and data and program security. Finally, the paper source documents often examined by auditors may no longer exist in the EDI environment. As a result, there are additional audit considerations raised that may require the modification of audit procedures.

A complete overview of EDI's impact on auditing procedures can be obtained from the EDI Association (Washington, D.C.).

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3. EDI Improves Control of Company Assets

The New England-based Ottaway newspaper chain, a Dow Jones subsidiary with 22 newspapers, uses EDI solely to receive ship manifests from newsprint manufacturers. The manifests serve two primary functions for Ottaway: they enable the company to accurately monitor production costs, and they allow the company to collect inventory data. The manifests contain information on each roll of newsprint—indicating, among other things, the mill that manufactured the roll and the tract of trees that was logged. Ottaway tracks the use of the roll through newspaper print runs. A breakage in paper is a costly downtime occurrence. By being able to monitor each roll closely, Ottaway managers can determine if the problems from production stem from the roll of paper or their own equipment.

Ottaway buys newsprint from five major newsprint makers for its 22 newspapers. Newsprint of different prices is used in the production of a single newspaper. Ottaway uses the data off of the manifests to determine how much an issue costs in terms of the different newsprint it required.

Also, with each newsprint roll numbered with a barcode, Ottaway can keep careful track of its inventories. Inventory control is important because the company contracts to buy a set amount of newsprint for the whole year. Throughout the year, it is shifting its contracted newsprint entitlements among its 22 newspapers. Weekly, the corporate office polls its warehouses to see what supplies are on hand and looks at the circulation/page length requirements to see what is needed.

EDI has allowed Nabisco to build a "consolidated order program" for its brokers and customers. With the automated processing of orders that EDI facilitates, Nabisco computers calculate out how to configure customer orders efficiently so that delivery trucks are fully loaded. Pricing discounts are given to brokers. A single broker and a single grocery distribution center are involved. A better loading of the truck is achieved so that trucks don't run partially full.

B

The Strategic Impact of EDI

Beyond impacting the operations of companies, EDI opens possibilities for companies to reduce costs and/or create new products and services; in other words, EDI opens strategic possibilities. Exhibit IV-2 lists some of these possibilities.

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EXHIBIT IV-2

Selected Strategic Impacts of EDI

EDI Enables Companies to Offer New Products and Services	• Service Companies Become Information Companies • EDI Expands Retailers' Product Lines • Firms Spin Off Software and Services
EDI Shifts Corporate Boundaries; Redelimits Functional Groups	• Purchasing/Sales • Accounts Receivable/Payable • Manufacturing • Corporate Decentralization • Corporate Centralization • Mergers and Acquisitions • Networking the Organization
EDI Restructures Value Chains	• Retail-Apparel-Textiles • Oil Industry • Transportation • Distribution

1. EDI Enables Companies to Offer New Products and Services

Information technology is giving rise to a lengthening list of companies that have entered new markets and have invented new offerings. Telephone company AT&T enters the credit card business, news company Reuters starts selling financial services, regional telephone companies position themselves to enter the cable television and electronic publishing businesses; and Citicorp joins the consumer target marketing business. EDI, too, is allowing companies to sell products other than their main products.

a. Service Companies Become Information Companies

The transportation industry is one of the pioneering industries in EDI. The changeover from paper documents to electronic communication systems has radically altered the functions of many transport companies. The information they offer clients is increasingly a major product offering, in contrast to just physical transport of freight.

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Due to just-in-time and quick-response logistics management, increasing global competition and sourcing, and shorter time frames to get product to market, shippers (customers of transport companies) are demanding information services from transportation companies. Typical queries to carriers are:

- Where is the freight now and when is it expected to arrive at the warehouse?
- For imports, at what stage are the goods in Customs ?
- How much of an import quota remains on a regulated product category?
- Which importations included a specific part type?
- Where are those particular goods that were imported temporarily and will shortly be leaving the country?

Much of this information can be distilled from the documents that shipping companies, freight forwarders, customs brokers, and others in the transport industry are already shuffling in their offices. With the documents increasingly placed in computer files, the electronic distribution of this information becomes a major service to customers and a major source of revenue or differentiation for the provider.

In the transportation services industry (freight forwarders, customs brokers, shipping agents, etc.), some companies have practically become electronic switching stations with perhaps a handful of customer representatives to answer phones.

Merit Steamship Agency Inc. (Los Angeles, CA) is the shipping agent for Japan Line Ltd. (Tokyo) and several smaller shipping companies. Using a single midsized IBM computer, Merit has positioned itself as a major receiver and sender of electronic information to the myriad business entities with which it deals.

- Repeat customers, using computer terminals, call up Merit's computer, log on to the booking system, and conduct business. The computer asks the necessary information and clients respond through computer screen menus with fill-in-the-blank questions.
- Customers who need shipping updates can access the computer repeatedly throughout the shipment of cargo.

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- For import shipments into the U.S., Merit's computer picks up manifest information at the ship's embarkation port, reformats it, then sends it to U.S. Customs through the Automated Manifest System for prearrival Customs checks and releases. This same manifest information is automatically fed into Merit's accounts-receivable system, where the information is converted into invoices.

- Merit's computer connects electronically with other information systems: it receives container location messages from railroad companies; it pulls off shipping tariffs daily from commercial and government tariff data bases; and it checks a data base that lists the insurance coverage of trucking companies.

Penson and Co. (New York, NY), a customs broker, offers its main customers (largely apparel manufacturers and retailers) on-line information on the status of freight that is moving through U.S. Customs' clearance process. Penson's computer calls the computer in Customs every 30 minutes and pulls off status information on all its accounts. Penson customers, using their own computers, dial Penson's computer and, in turn, pull the information relating to their accounts.

For each customer, Penson has placed this data in formats that the customers have specified. Landed-cost-per-style reports inform the customer of all duties; freight charges; forwarding charges; fees for insurance, trucking, brokerage and inspections; and other related costs per shipment for a given delivery location. Exception reports tell the customer of all the shipments that are undergoing some special treatment, perhaps an extended inspection.

The customer can pull this data out of Penson's data base and download it into a spreadsheet program. Once in a spreadsheet, customers can perform "what-if" analysis.

In the apparel business, such analysis is critical. Because costs vary for a single style of clothing from shipment to shipment, retailers must pay close attention to costs if they want to make a profit. For example, retailers want to know, "Which merchandise item causes the most transport problems?" "Which truckers are the fastest?" "Of the freight forwarders in a given country, which provides the most consistent service?" "Which carriers have best met the standards of the company?"

Burlington Northern Railroad Co. has incorporated EDI into its electronic Agricultural Commodity Information Retrieval System (ACRES). ACRES allows shippers to access grain industry data, transportation tariff and rate data, agricultural news, as well as make reservations for rail cars using EDI certificates of transportation. The system is a marketing tool, and Burlington provides customers with free PC-based software

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that allows the customer to dial into the ACRES system. While the EDI pertains to its core business, Burlington is leveraging the electronic platform by offering additional services through it. Thus, a basic EDI capability—which, by itself, is a productivity enhancer to both Burlington and its customers—is transformed into a major differentiator for Burlington.

Point-of-sale data (the data captured, typically, by scanning cash registers in retail outlets) is a critical source of market demand data that is receiving greater attention these days from original manufacturers. Retailers (sometimes in conjunction with third parties) are gathering this data, formatting it, and transmitting/selling it back to manufacturers. Grocery retailers are the most advanced in this new effort. Systems for sales data capture are further explained in Chapter VI, Section C, Subsection 1 (Bar Codes).

b. EDI Expands Retailers' Product Lines

EDI, as a part of their quick response inventory strategies, enables retailers to bring a wider assortment of products to their customers. EDI and quick response ensure that retailers can replenish low-stock levels quickly—in a few days, rather than weeks. Thus, they are relieved from keeping large buffer supplies of products. With less supply of certain merchandise on hand, retailers can fill the vacated floor/shelf space with new merchandise. Thus, the retailer can sell a greater variety of products.

Instead of stocking large quantities of a few items, the retailer is enabled to stock small quantities of many different types of items. The goal of the retailer is not to keep less inventory (the goal of manufacturers), but to keep less inventory per item of merchandise.

The store's floor space is a fixed asset. The retailer must think of ways of maximizing the productivity of this asset. EDI is a part of this.

c. Firms Spin Off Software and Services

By virtue of being EDI users, many companies develop expertise that can be commercialized. Sears is probably the most prominent example of an EDI user turning around and offering its accumulated expertise in EDI to the market. It is now offering EDI network services to any company, not just its own suppliers. It plans to offer systems integration and consulting to EDI companies as well. General Electric, long a user of EDI, regularly commercializes EDI services and software that it had developed for internal purposes. A number of EDI software vendors today are spin-offs of EDI-using companies or software companies that developed custom software for EDI-using companies. ACS Network Systems/Premenos and Mpact EDI Systems are examples.

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Castelazo & Associates (Los Angeles, CA), a customs broker, has commercialized the EDI and data management software it developed in-house and sells it to other customs brokers in modules. According to company spokespersons, commercializing the software has allowed the company to offset development costs.

Continental Graphics (Los Angeles, CA), the largest printing company in the greater Los Angeles area, is the principal printer for aerospace industry documentation. Using state-of-the-art electronic graphics and printing tools, Continental maintains much of the documentation in digital form in in-house electronic data bases. When the Air Transport Association wanted to build a product data base to enhance its Specification 2000 parts-ordering EDI system for airlines, it turned to Continental. Continental reconfigured its electronic files of aerospace documentation and produced a commercial data base that airline companies use to review parts specifications.

2. EDI Shifts Corporate Boundaries, Redelimits Functional Groups

Since EDI reduces the number of intermediate transactions between one value-adding activity and another, function outsourcing and reorganizing of multidivisional companies is made more viable with EDI than without EDI. Vertical integration of value chains was suited to the pre-electronic age. Now, with electronic data interchange, companies can more effectively organize functional areas of a company—consolidating some, distributing others, and outsourcing still others. Vertical integration is no longer the only strategy for minimizing transaction costs.

Exhibit IV-3 lists the main communication flows between functional areas of two companies engaged in trade, and the EDI transactions that support this communication.

a. Purchasing/Sales: Supplier-Generated Purchase Orders

Close relationships among suppliers and their customers is an growing trend. Concomitant with this closeness is the sharing of proprietary data so that supplier and customer can better coordinate activities. The retail industry is one of the most active in this area.

Levi Strauss and Playtex have pioneered the concept of using retailer point-of-sale data to generate purchase orders. The retailer sends POS data to the apparel manufacturer. Based on inventory models custom-designed for each retailer and retail outlet, the manufacturer calculates the needed quantities to replace what has been purchased.

Both Levi and Playtex have developed proprietary methods for conveying this data from the retail outlet to their modelling computers. The Voluntary Interindustry Communication Standard (VICS) committee, the retail industry's EDI standards group, has designed standardized transaction sets for this very purpose.

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EXHIBIT IV-3

EDI Connects Functional Applications of Two Companies

Buying Company's Functional Area	EDI Transaction	Selling Company's Functional Area
Research and development planning	Request for quote Response to REQ UPC sales catalog Trading partner profile Product activity Inventory advice	Marketing
Purchasing	Purchase order PO acknowledgment	Order entry
Manufacturing	Material release Advance shipping notice	Manufacturing
Transportation	Bill of lading Shipment status inquiring	Traffic/shipping transportation
Finance/accounts payable	Invoice Payment/remittance advice	Finance/accounts receivable

Automatic generation of purchase orders by suppliers is good for commodity products that are purchased recurrently. It is not applicable to trend or fashion products.

Automatic generation of purchase orders is expected to be implemented in many industries besides retail and apparel. The grocery industry is experimenting with it. Most process and discrete manufacturing industries are ripe for it.

b. Accounts Receivable/Payable

For any two companies involved in trade, the selling company's accounts-receivable people communicate (usually by paper invoices, possibly by heated telephone conversations) with the buying company's accounts-payable people. GE Information Services has developed a network service that assumes many of the chores that these two formerly distinct groups performed. The service is called Customer Originated Electronic Payments (COEP).

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COEP acts as a payment membrane between two companies and their respective banks. COEP funnels incoming payment data into the seller company's accounts-receivable application in whatever file formats are required. It also sends payment instruction data to the banks, which will ultimately transfer the funds among themselves. COEP "sits out there" on GEIS' network. Buyers, sellers, and banks pick up and drop off data from it.

In addition to feeding data directly into the selling company's accounts-receivable application, COEP delivers payment reports via E-mail or fax to specific areas of the company. For example, account and sales representatives can be notified that a customer has paid or not paid for products/services rendered.

General Electric itself and the U.S. Air Force are two prominent users of the COEP service.

The recognition of freight's broad role in the corporate supply chain has created renewed interest within corporate logistics functions in methods that can improve freight payment efficiency. With huge sums represented by many corporate freight bills, astute logicians are looking for every edge possible to reduce their exposure as a cost center and increase their contributions to operational efficiency, service quality, and profit margins. Today a large number of third-party vendors offer freight payment and cash management services. Using EDI and EFT mechanisms, these third parties offload the onerous clerical task of tallying freight bills and enacting funds transfers. Exhibit IV-4 lists various providers of freight payment services.

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EXHIBIT IV-4

Third-Party Freight Payment Vendors

Bank of Boston	(Boston, MA)
Barry & Lloyd	(Norwood, MA)
Berman, Blake Associates Inc.	(Garden City, NY)
Cass Logistics Inc.	(St. Louis, MO)
Chase-Trans INFO	(San Francisco, CA)
Continental Traffic Service Inc.	(Memphis, TN)
Equitable Bank	(Baltimore, MD)
FTS Freight Traffic Services	(Somerville, NJ)
Numerax McGraw-Hill Inc.	(Maywood, NJ)
Tranzact Systems	(Lansing, IL)

c. Manufacturing

EDI enhances the competitiveness of a manufacturer on many levels (faster turnaround, less overhead, etc.) but in the area of restructuring corporate boundaries, it gives the manufacturer the ability to outsource production processes that were formerly kept in house.

Manufacturers are increasingly subcontracting the manufacture of components and subassemblies

- To reduce overhead and capital expenses
- To have more flexibility to respond quickly to changing market conditions
- To take advantage of low materials and labor costs
- To concentrate the company's resources on core competencies

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EDI plays a role in distributing the workload of a given production job over a number of smaller contractors. The automotive, aerospace, and apparel industries are pioneering these kinds of exchanges.

Engineering drawings, images, photographs, medical CAT scans, digitized x-rays, voice annotation, and binary files of application programs (such as spreadsheets, data base files, etc.) can technically move as part of a commercial transaction.

A common example of this movement is the exchange of graphical information among contractors and subcontractors. Design specifications may be represented in 2-D or 3-D line or solid drawings; engineering specifications of physical properties; or other textual, numeric, or graphic expressions that define physical and mechanical properties of the manufactured object.

An exchange of graphical information may occur under a variety of circumstances. The information may accompany a request for bid and a bid acknowledgment; it may reside in an on-line parts catalog; or it may be exchanged during a concurrent design cycle where a consortium of companies is working to design and produce a single item.

Similar to subcontracting and outsourcing, many types of manufacturing enterprises require many firms to band together to build a product. Construction, mining, aerospace, ship building, and oil production are examples. In these industries, one company will assume the lead role as contractor/operator for the group, with the other companies as partners. Minimizing risk and pooling expertise are the main benefits. The lead contractor is responsible for the day-to-day operations and administration of the project, dealing with suppliers, and paying all the bills. The lead contractor, in turn, is entitled to reimbursement of these expenses. EDI is being used now to requisition payment from partners in these kinds of group projects. The oil industry has developed the Joint Interest Billing Exchange (JIBE) EDI document for the (common) situation where one company is the operator of the well and needs to expense-bill its oil company partners. The oil industry expects that its JIBE format can be applied to other industries.

d. Corporate Decentralization

Because it receives 8,000 air courier invoices per month, Pizza Hut, before EDI, used to pay its courier invoices without validating them. Consequently, the company inadvertently paid the courier expenses incurred by the franchise restaurants. The franchises are supposed to pay their own courier bills. Often, due to lack of procedural clarity on the part of franchise and courier clerks, courier invoices would be sent to the Pizza Hut corporate office.

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Now, with EDI processing, invoice validation is automated and incorrect billings are easily detected and flagged. Pizza Hut returns to the courier all invoices that are billable to franchises. The courier is responsible for sending the invoices to the correct payor.

Although the Pizza Hut example may more appropriately be considered a tactical impact of EDI, it illustrates the power of EDI to assist a corporation in achieving a fundamental organizational structure. In the case of Pizza Hut, the structure is the franchise model.

EDI's capability to decentralize an organization is not confined to the private sector. U.S. Customs uses EDI to distribute the workload involved in the clearing of imported cargo. In a process called triangular processing, the paper work surrounding a shipment is conducted at coastal ports (where the cargo first enters the country), but inspection and final clearance is done at interior points closer to the final destination.

e. Corporate Centralization

EDI has allowed many multifacility companies to centralize some portion of operations. Hewlett-Packard and Mervyn's department stores have had considerable success in centralizing their purchasing operations. Internally, plants and store outlets communicate procurement needs to a central office. The office consolidates the requests into large purchases that are subject to discounts. Deliveries are made directly to the facility/outlet in need. EDI purchasing allows the company to consolidate the purchases yet ask suppliers to make deliveries to individual addresses.

Some manufacturers conduct EDI among divisions. Auto parts manufacturer Federal Mogul has 19 plants around the world. The plants use EDI to buy and sell parts among themselves. The EDI translation software (Translate, from Sterling Software Ordernet) is an integral part of the intracompany transfer pricing mechanism and accounting-control mechanism for operations. The translator is the focus for divisional integration of a corporation. It is also a pivotal device for a company's accounting system, as it relays information regarding material and value transfers among the value-adding activities of the corporation. EDI is used to allocate costs among the value-adding activities of a firm.

Whether Federal Mogul will do EDI overseas depends on its plant location strategy. To reach international customers, it is asking itself whether it should ship or build the product abroad. The question is one of corporate identity: where does Federal Mogul want to draw the line around its business? Keep it local and have foreign resellers? Or become (more) international (FM already has plants in Mexico, Spain, and Brazil)? FM's EDI strategy depends on the answers to these questions.

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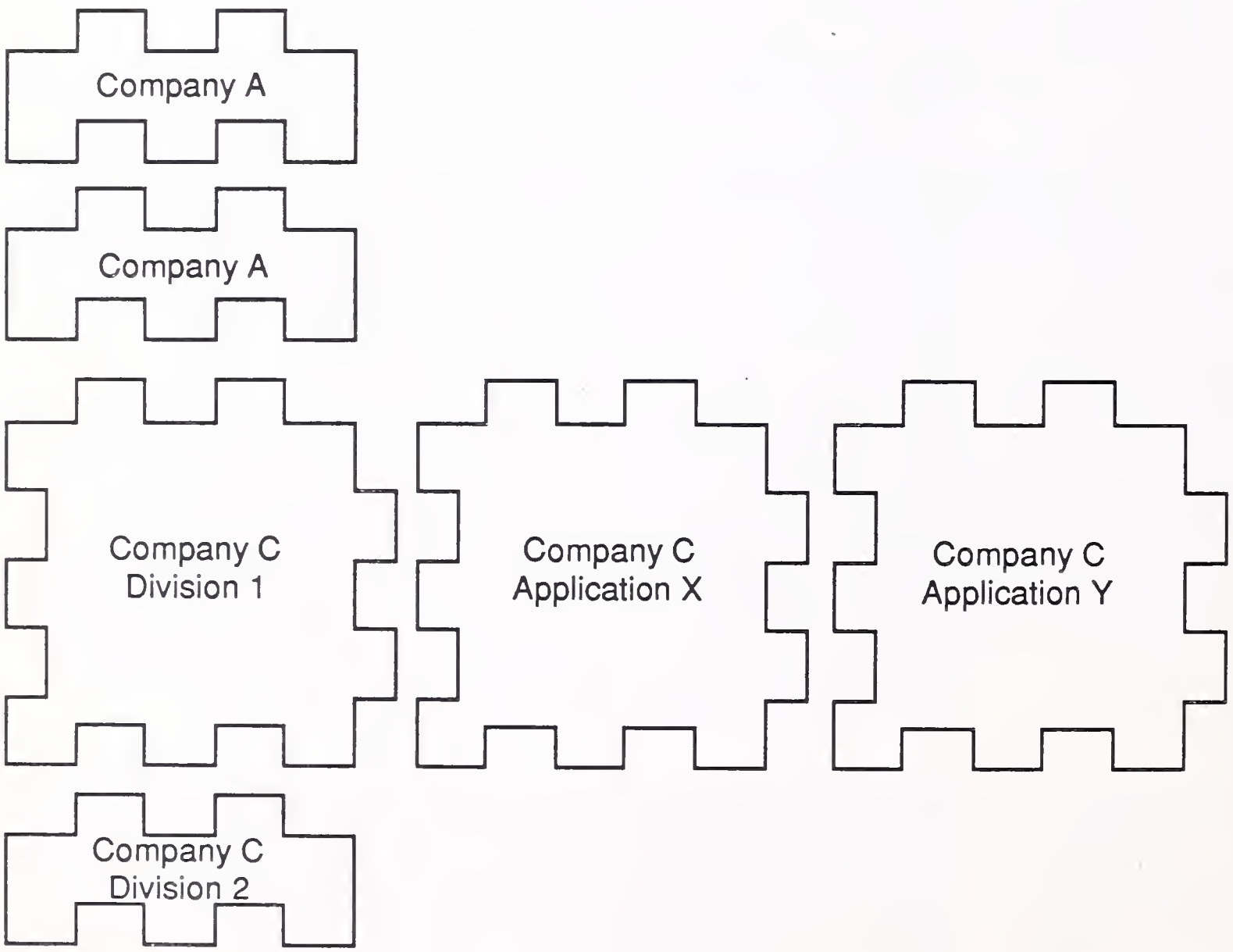
f. Mergers and Acquisitions and EDI

Because EDI is a universal, standard interface among company processing operations, it would seem to facilitate the disassembling and reassembling of companies through mergers and acquisitions. Like tinker toys, various companies and company operations could be taken apart and put back together again in new arrangements because EDI makes all the parts "plug compatible" (see Exhibit IV-5). Efficiency is, theoretically, the objective of both corporate restructuring and EDI, so the two should go hand in hand.

EXHIBIT IV-5

EDI Makes Companies, Divisions, and Applications Plug Compatible



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Del Monte Foods (Coral Gables, FL) is both a prominent EDI user (receiving 25% of all purchase orders via EDI) and the subject of multiple acquisitions and restructurings over the past 10 years.

In 1979, Del Monte was bought by R.J. Reynolds Industries Inc. After a couple of minor acquisitions, Reynolds bought Nabisco Brands Inc. in 1985. The holding company's name changed to RJR Nabisco Inc., and it settled in Atlanta. At this time, Nabisco and Del Monte swapped many functional and manufacturing divisions. The next few years saw a number of divestments. The food-related items were retained, however. Del Monte and Nabisco continued to reapportion items between themselves. In 1989, Nabisco was bought by the Wall Street group, Kohlberg Kravis Roberts & Co.

Some of the restructurings were made possible because of EDI. When all operations were handled manually, it was difficult changing procedures and getting the paperwork right. With EDI, as companies merged, data processing functions were consolidated. Many divisions began using one central computer rather than each having their own. When a merger or divestment took place, to some extent, Del Monte's customers merely changed the telephone number to which their computers sent purchase orders. In other cases, no changes were needed at all since the same third-party mailbox was maintained throughout the restructuring period.

But the restructurings caused challenges to existing EDI systems. When Del Monte inherited A-1 Steak Sauce and Grey Poupon Dijon Mustard from a parent company acquisition, merging them into Del Monte's EDI program was problematic. Different brokers handled the products. A single invoice from a buyer could possibly specify three to four brokers, each with its own discounts and rates. Del Monte had to redesign its EDI and application systems accordingly.

Mergers and acquisitions can negatively impact EDI development in a company because they can distract upper management. The EDI program suffers by not getting the appropriate attention and resources.

g. Networking the Organization

Large corporations are finding that their electronic networks that link divisions are increasingly a strategic resource. The networks also act to link to trading partners—customers, suppliers, and subcontractors—in production confederations. Again, the idea is to establish a more coordinated, tighter organization of value-producing activities than existed with nonelectronic linkages.

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Westinghouse Electric has 25-30 plants around the United States, all of which conduct EDI to some degree. All plants communicate with a centralized EDI translator (the Sterling Translate package) via Remote Job Entry (RJE) transmissions over an internal corporate network. The network also supports E-mail within the company and outside, as Westinghouse conducts E-mail communication with a handful of its trading partners. In addition to its network infrastructure, Westinghouse also maintains an on-line ordering system with 450 of its distributors.

Tektronix had twenty-two divisions. Earlier in the eighties, each one developed its own translator. Total cost is estimated to have been $800,000. While still divisionalized, the company decided in 1988 to consolidate its translation capability. Now it has two translators: one that operates in an IBM environment, one in a DEC environment. Divisions send and receive flat files over internal networks to these translation servers. The servers connect the internal corporate network to the outside VAN.

Because Tektronix divisionalized its accounts payable functions, EDI/EFT corporate payments became infeasible. This may change.

Tektronix uses electronic mail to place purchase orders for indirect inventories, office supplies, computer printer supplies, etc. Suppliers within a sixty-mile radius are connected to the Tektronix corporate E-mail network. Buyers use E-mail to place orders.

Nabisco has an on-line broker-support system that runs on its IBM 3090 mainframe. The system allows brokers to query the status of orders, available inventories, prices, etc. Nabisco is considering building E-mail functionality into the system so that brokers and Nabisco sales personnel can communicate via this medium.

As Nabisco moves to bring up its food services trading partners (with 2,500 ship-to-customer locations, its EDI program is fully matured in the grocery distribution business), it is considering building its own data communications switch facility. This would enable food services customers (restaurant distributors, restaurants, and hotels) to dial directly into Nabisco computers to drop off orders and pick up invoices.

In addition to its EDI use with suppliers of overhead supplies, Pizza Hut uses parent company PepsiCo's internal network to allow its outlets to place internal food replenishment orders.

3. EDI Restructures Value Chains

Corporations in the industrialized world are continuing to experience an unprecedented wave of restructuring. The changes and uncertainties involved here push companies to concentrate on their core business rather than expand either horizontally (broadening product lines) or

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vertically (integrating the supply chain under a single corporate roof). Also, new debt levels cause companies to look for opportunities to cut fixed costs, reduce the asset base, and reduce head count. Thus, many operations and services that used to be performed in house are contracted out.

As we have seen so far, EDI causes companies to restructure activities that add value to goods and services. This restructuring always involves changing the organization of the company. In many cases, it involves changing the organization of the value chain in which a company exists. With the globalization of the economy—where customers, suppliers, and finance providers exist anywhere—competition has reached a new level. Alliances among manufacturers and suppliers is seen as mandatory. Production "confederations" and industrial consortia/groups, with a bank as a center (following the Japanese Kereitsu model), are being pursued by large companies. The clustering of companies into strategic alliances requires communication links, many of which are between computer systems. Here is where EDI plays a role. EDI is helping companies integrate themselves into strategic groupings/partnerships. EDI is not only a tool for facilitating trade between any two companies, it is a tool for making a certain collection of companies—each contributing value-added services within a supply chain—into a strategic unit that is more able to compete in the world economy than if each company acted alone.

a. Retail-Apparel-Textile Value Chain

Integrating textile mills with apparel manufacturers and, in turn, apparel manufacturers with retailers—particularly large department stores and mass merchandisers—is seen as a strategic necessity by executives in this sector. Quick response strategy intends to coordinate the actions of the various parties in this value chain.

Reducing the number of suppliers has been one characteristic of the quick response strategy. The relationships with remaining suppliers becomes more focused on quality and customer satisfaction than on profit.

Besides reducing the number of suppliers, quick response strategists are applying EDI to further integrate their production flows with those of their trading partners. While traditional EDI documents (purchase orders, invoices, and ship notices) are in use today, advanced EDI users in this value chain are exchanging two fundamental types of information:

- Point-of-sale information, captured in the retail store by cash registers that scan bar-coded merchandise
- Inventory data, sent by suppliers (textile mills and apparel manufacturers) to their customers.

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Retailers (such as Dillard's, Bullocks, Mervyn's) send the point-of-sale (POS) data not only to apparel manufacturers (such as Levi Strauss, Hagar, and Maidenform), but to the textile and accessory manufacturers that supply the apparel manufacturers. With POS data, all players in the value chain can better plan production. Some manufacturers are taking action to eliminate the need for customers to send purchase orders. The POS data alone will trigger shipments from the manufacturers. Levi and Playtex are moving in this direction.

Flowing in the opposite direction of POS data is the inventory data, which comes down from upstream suppliers. This data again helps midstream manufacturers to plan production, and helps retailers gauge potential stock outs.

Special X12 standards are being developed for the transmission of POS and inventory data. Developed by the retail industry's EDI committee, Voluntary Interindustry Communication Standard, the new standards are called "quick response" standards.

Sales and inventory data are some of the most sensitive data that can be revealed by a company and are traditionally kept under lock and key. The need to compete more effectively now than in the past—with competitors from all over the world—has compelled retailers and manufacturers into these new data-sharing relationships. These relationships establish a new organization of the retail-apparel-textile value chain. Before, there were a multitude of parties vying for each other's business by price cutting. The result was acrimonious relationships among customers and suppliers. Today, there is an attempt to coordinate as a single unit. The value chain is being reorganized.

b. Oil Industry

In the oil industry, companies frequently join together in consortiums. Consortiums dampen each firm's exposure to risk. And, since oil products are in continual movement once pumped from the ground, joint efforts help keep the flow moving smoothly. Consequently, the industry is a tightly integrated network of corporations. Pipelines literally tie companies together. Drilling operations and properties are jointly owned. Where one company ends and the other begins is not always readily apparent. Parallel with the oil flow is a network of information. Passing among different companies' computers over telephone lines, the information details the myriad intercompany transactions.

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c. Transportation Industry

According to some transportation analysts (Yosef Sheffi, MIT), many corporations are cutting their logistics and transportation staffs because of short-term pressures on purchasing and marketing executives. Nevertheless:

- Logistics is increasingly recognized as a vital part of marketing and operations management.
- The logistics function is becoming more complex and demanding.
- The opportunities to improve both service and bottom lines through better logistics engineering are increasing exponentially.

Furthermore, while shippers are outsourcing transport functions, the transport industry is consolidating into a handful of megacarriers that offer one-stop shopping for all shippers' needs. One-stop shopping includes the provision of services that had traditionally been handled by an array of intermediaries. These services include several types of brokerage, forwarding, freight consolidation, warehousing, and information processing services (including freight bill auditing and payment, tracking, EDI, transaction processing, and MIS reporting) and fleet operations (vehicle leasing and management, container control, intermodal trailer operations, etc.).

EDI is playing a central role in this transportation industry realignment. As one of the originators of EDI, transportation is using electronic data interchange to move freight-related documentation among carriers (in an intermodal situation) and among carriers, shippers, government agencies, and miscellaneous transport service providers.

Already in place for shippers are completely computerized systems for analysis of planning, bidding, awards, routing, equipment orders, tracing, and audit-and-payment compliance. These systems are tied into order-entry and inventory management systems.

Carriers have started to offer a large array of service beyond the box on wheels, including: shipping-status, rate, billing, and logistics information in various forms; warehousing; consolidation; sequencing of parts for assembly; custom brokerage; bonded warehousing; international EDI; and other related services—all outgrowths of traditional offerings. Megacarriers are offering one-stop shopping.

Examples of these megacarriers are shown in Exhibit IV-6.

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EXHIBIT IV-6

Megacarrier Organizations

CSX

CSX Rail
Sea-Land
CMX (trucking)
TDSI (warehousing)
Countrywide (trucking)
California Temperature Controlled
CTI (JIT)
ACBL (barge)
CSX Technology (information)
LMG

American President Companies

APL (ocean)
APT (trucking)
APAD (automotive)
APDS (JIT)
API (international stack trains, terminal operations)
APC (central marketing & logistics planning)

Consolidated Freightways

CF
Conway Companies
CF Air
CF TL Services (transloading, customs, intermodal)

Union Pacific

UP Rail
Overnite (LTL)
UPFS (rail broker)
UP Technologies (information)
UP Logistics
Skyways (trucking, JIT, international)

Ryder

Ryder Truck Rental (leasing, fleet management)
Ryder Freight Systems (TL)
Ryder Bulk Transport
Ryder Temperature Controlled
US Parking & Shipping (warehousing)
Auto Carrier Companies
Ryder Distribution Resources (logistics management)
Ryder International Customs

Source: *Journal of Business Logistics*, Vol. 11, No. 2, 1990

EDI, along with other information/communication technology, is acting to restructure transportation. Not only are vendors of transportation services realigning and consolidating, but customers are outsourcing more of their transportation needs (particularly companies with sales in the $50 million to $5 billion range).

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d. Distribution

i. Elimination of Intermediaries

Distribution channels (wholesalers, jobbers, agents and representatives, warehouse operators, etc.) exist to facilitate the routing and consolidation of manufactured goods from multiple sources to multiple destinations. Information/communication systems, including EDI, are making some of these distribution niches obsolete.

For example, a warehouse collects merchandise in a central place so that it can be dispatched easily in smaller quantities to other places. In this sense, EDI serves a "clerical processing" function. EDI is eliminating the need for some warehouse services.

Mervyn's (Hayward, CA) and Hills Department Stores Inc. (Canton, MA) are both discount retail merchandisers with hundreds of stores apiece. Both purchase from suppliers from a single, central office. EDI is allowing these retailers to send single huge purchase orders itemizing the merchandise needs of all stores. Suppliers deliver directly to the stores. Suppliers must break out the purchase order into portions for each store delivery. Prior to EDI, Mervyn's required deliveries to intermediary distribution centers. Hills put a huge processing burden on suppliers—suppliers had to sort through multipage purchase orders. With EDI, Mervyn's has eliminated the distribution centers and Hills has eliminated the human processing of its huge POs.

A business niche exists to facilitate the communication between magazine publishers and their library (corporate, university, and public) subscriber-customers. Subscription agencies (such as Faxon and Ebsco) handle the detail-packed one-to-many relationships that libraries have with publishers, and, in turn, publishers have with libraries. Librarians spend a lot of time ordering, cancelling, and inquiring about missing issues of magazine subscriptions. Likewise, publishers spend a lot of time responding to these customer queries. The amount of work is large because libraries often manage several thousands of subscriptions. The liaison function between publisher and library-subscriber is what subscription agencies handle.

A library standards group, with representatives from subscription agencies, libraries, and publishers, is developing EDI transaction sets that would allow librarians to order from, pay, and query publishers concerning magazines. Making a standard interface between magazine buyers and publishers, to streamline/merge the procurement functions of libraries and the sales/support functions of publishers, possibly threatens the need for a subscription agency.

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If library buyers can communicate with any publisher through a single workstation, why use an agency? Potentially, the same amount of work for ordering and filing claims for missing issues is required of libraries as before EDI: only now, all these message types can, in a keystroke, be sent to multiple publishers. In filing a claim for a missing issue of a magazine, for example, a librarian will have to fill out the publisher's address details, its purchase order number, the title of the periodical, etc.—whether the librarian is sending the claim to the agency or directly to the publisher (or to a third-party network provider/clearinghouse).

The subscription agency provides a service to libraries by consolidating a library's many subscription orders and claims. The agency is the library's single point of contact for subscriptions from multiple publishers. Libraries can save processing hassles by dealing with just one source. The agency provides added value in that it takes care of a variety of sorting, consolidating, and routing procedures related to ordering, billing, and claims monitoring that otherwise cause headaches to librarians who are responsible for hundreds, sometimes thousands, of subscriptions.

But all these sorting, consolidating, and routing procedures potentially can be automated. Using standardized, structured electronic messages—EDI—software and networks can perform these procedures instead of clearinghouse clerks. The initial data entry that a librarian performs (for a subscription order, an invoice payment or a claims submission)—data entry that the librarian would have to perform with or without EDI—is all that is really needed to set in motion the kind of services that agencies provide. The librarian fills out subscription orders and claims complaints, pushes a button, and the translator looks up addresses and routes communications. With EDI, the library's single point of contact with its many publishers becomes the library's EDI software platform. There is no need for a clearinghouse. The clearinghouse is part of the system: its function has become a series of software routines.

A representative from a subscription agency notes that EDI is only the tip of the iceberg in terms of technologies that could revolutionize its business. The whole area of electronic publishing, where magazines are delivered directly from publisher—or possibly, author—to reader, is the truly radical frontier that information technologies represent. The agency's response to these possibilities has been to define its business purpose in the widest possible sense: to play a role in the information exchange between users and creators of knowledge. With this strategy, whatever new possibilities technology presents, the agency will still have a service to provide.

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ii. Distributor Consortia

Manufacturers that sell predominantly through distributors are often removed from their final customers and fail to feel the pulse of their market. Likewise, distributors often work together in splitting up territory to sell to. Together, manufacturers and distributors often enter into complicated pricing structures that result in tedious accounting reconciliations.

Sterling Software (Ordernet) offers an EDI-driven data base service that enables manufacturers and distributors to keep track of product movements and discount allocations. Called MarketQuest, it tallies EDI traffic that flows through Ordernet's store-and-forward EDI switch. The flow of EDI purchase orders and sales tracking documents is counted across many competing companies. The composite data shows market share, market trends, product acceptability, and product sales by region and by class of customer. The degree of access to the data by manufacturers and distributors is governed by mutual agreement among all participating parties. Such information is valuable market intelligence that is typically available only through traditional market research.

The data base service is currently used by distributor consortia in the electrical supply, pharmaceutical, and animal health industries.

4. EDI and Competitive Advantage

When adopted proactively—ahead of one's competition—EDI confers a competitive advantage. According to Michael Porter, Harvard business professor, competitive advantage can be gained by differentiating a company's offering to the market, by reducing the cost to deliver an offering, or both. In the above examples, this report examined how EDI differentiated products—such as transportation companies offering on-line shipment status information, or megacarriers that offer one-stop transportation shopping. Although the companies in these examples also derived a cost savings advantage from EDI, differentiation was explicitly discussed. In this section we examine gaining a competitive advantage based on cost saving. The example used is distribution, where profit margins are traditionally low.

The Car Guys, a nationwide auto parts wholesaler, was running into difficulty expanding its business. Its procedures for invoicing clients and paying suppliers were getting bogged down in paperwork. Payments were received late and the cost of processing checks was increasing.

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The company has begun implementing EDI and is forecasting the following cost-reducing measures. To change the company's 100 PCs to DEC's All-In-One Phase II will cost $102,980 for a MicroVAX 3300, peripherals, memory, communications, and plug-in cards for the PCs. The software—which includes DEC office automation software and EDI translator—will cost another $60,000, bringing the total after-tax cost to $171,129.

Yet, for this expense, the payoff is likely to be large. By using EDI, the Car Guys are expecting to cut the cost of printing and mailing 200 checks per month from $10 per check to $2, resulting in an annual savings of $38,400.

The cost of sending 350 invoices per month will drop from $2 to 2 cents per invoice, resulting in an annual savings of $8,400.

Finally, the company's 25 clerical workers will experience a gain in productivity. The staff spends approximately 15% of its time inputting data and converting formats to meet the formats of the company's general ledger and other systems. At an annual salary of $25,000 for each clerical worker, that 15% savings comes to $93,750 per year. The total first-year savings accrued by the company by moving to an integrated office automation system comes to $140,550. Over five years, the total income after taxes and depreciation will be $543,193. After discounting this cumulative cash flow by 11% over the five-year period, the Car Guys calculates that the move to adopt office automation and EDI will be worth $34,101, at an internal rate of return on its original systems investment of 14.3%.

C

Systemic Knowledge, EDI, and Integration

Gaining the fullest tactical and strategic benefits of EDI is an issue of integration. It is an issue of integrating within a single company because EDI, fully implemented, interfaces with every functional department in a company. It is also an issue of integrating value chains because EDI interfaces two or more companies. Gaining the most out of EDI constitutes a massive integration effort within and among companies.

EDI is the embedding of business procedures into electronic systems. There is a movement toward developing whole value chains that are interconnected electronically and are essentially a single unity—despite being separate corporations. This has strategic implications in that companies are forming more integrated value chains, similar to the Keiretsu model of Japanese industrial organization. There is emerging a single, interconnected electronic system that links companies in a value chain, and moves data from one value-adding process to another, as depicted in Exhibit IV-7.

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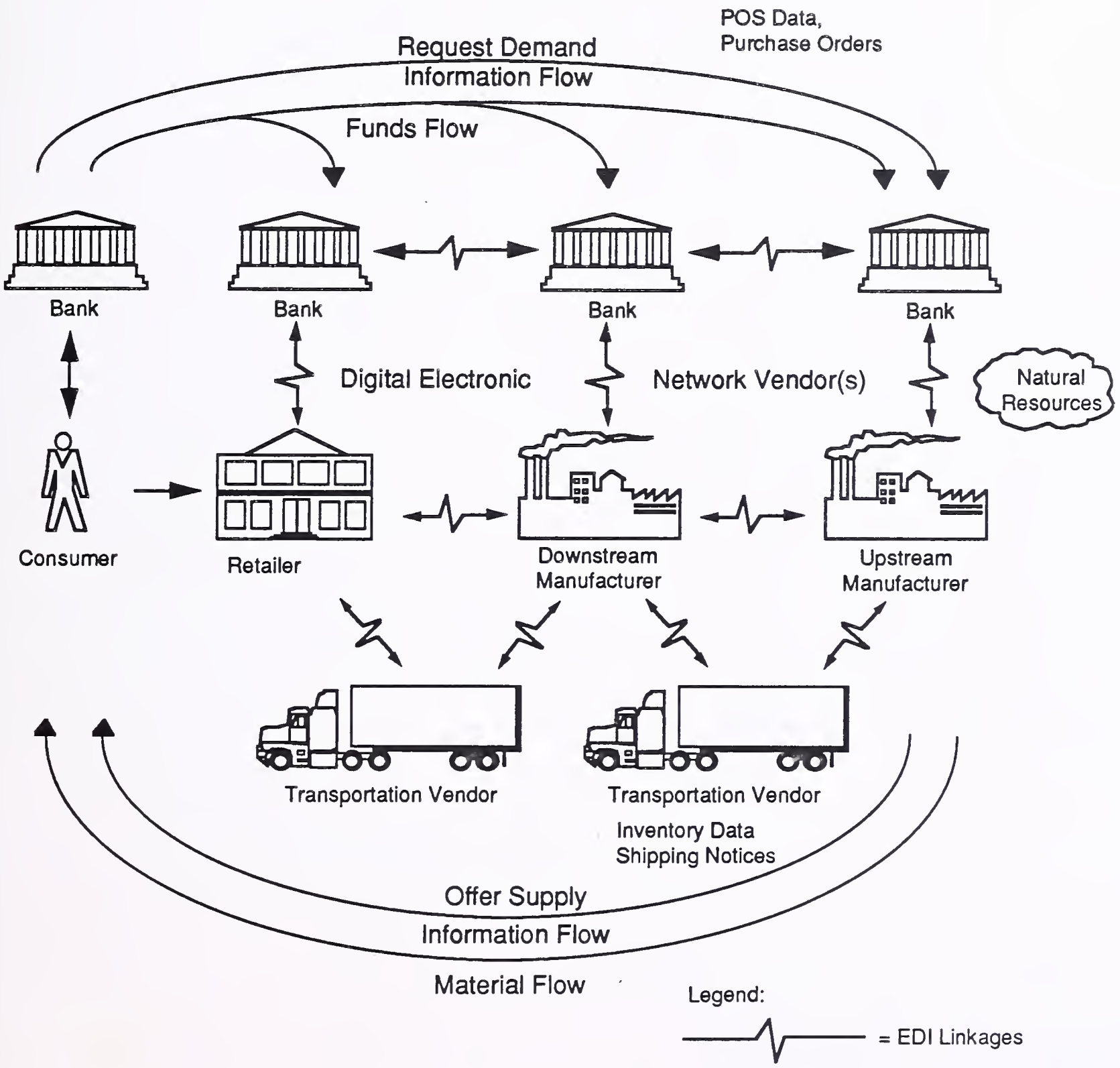
EXHIBIT IV-7

EDI Makes Communication Linkages in the Value Chain Electronic



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EDI has the power of integration: EDI is the ultimate integration technology. As was just seen in the above examples, EDI and associated electronic communication systems restructure business fundamentally and qualitatively. With the ongoing implementation of EDI in the economy, a system is developing whereby material moves one direction, and funds move the operation direction. Accounting for the flows each way is done entirely electronically. To get a handle on this restructuring, the integration process requires examining the relationship among standards, accounting practices, and business strategy.

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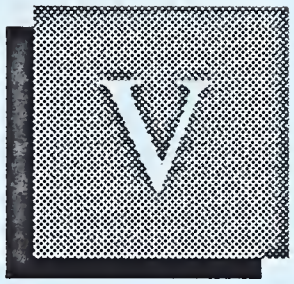
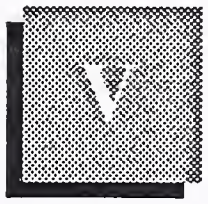


Tying EDI to Business Operations and Strategy: Standards and Accounting



Tying EDI to Business Operations and Strategy: Standards and Accounting

The movement to implement electronic data interchange is a movement to interconnect all value-adding activities of a value chain. For example, retailers are connected electronically to apparel makers, who are connected to textile mills, who are connected to fiber makers and chemical companies, and everyone is connected to transportation providers, banks, and the government. EDI, by providing standard interfaces among disparate systems, allows the creation of a single monolithic system for an entire value chain, and eventually, for an entire economy (similar to how the telephone system connects all players of the economy). With EDI implemented throughout a value chain, data enters once into the system at various points in the system: it need not be re-entered; the system's flow routes it to the processes that require it. The data bases and systems of individual companies are filled by data largely generated elsewhere in the value chain, in other companys' systems.

As seen in the preceding chapter, the electronic exchange of information among applications (EDI) changes the tactical and strategic possibilities of companies. Indeed, EDI changes the capacity of value chains, and EDI changes the value that a group of people who constitute a value chain can provide. Effective implementation of EDI must take these changes into account.

EDI changes products offered, it changes timing and synchronization of activities, and it changes the activities themselves. EDI qualitatively changes business activity. Consequently, to implement EDI requires companies, individually and collectively, to reconstruct the intermixing of activities and the data flows that coordinate these activities. Reconstruction begins with assessing possibilities and formulating strategy. It ends with defining the accounting methods and the data formats (EDI standards) used to coordinate action among companies.

In this chapter, we examine the issue of accounting and standards, the part of EDI integration that maps business strategy to action.

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A

Assessing When and Where EDI Is Appropriate

Businesses are essentially networks of conversations, as depicted in Exhibit V-1. The conversations take place within the boundaries of the company among staff. In addition, conversations occur across company boundaries among staff and trading partners and the general business environment (newspapers, professional organizations, other business acquaintances, etc.).

A fundamental conversation that occurs between two companies is the conversation for the exchange of goods and services. The conversation typically starts with a request by the buyer (a purchase order or a request for quote) and ends up with a declaration (implicit or explicit) that the buyer is satisfied when it sends payment. Most EDI messages today facilitate some aspect of the exchange of goods and services between companies. Other messages exist for the location of things (car location messages), the movement of freight (manifests and customs entries), and profiles of people (college transcripts and loan applications). All these exchanges, however, are subconversations to an overall exchange conversation.

(Note: Conversation is used in a broad sense here. For example, a person reading the newspaper is considered to be having a conversation with the journalist or with the general social discussion of the subject.)

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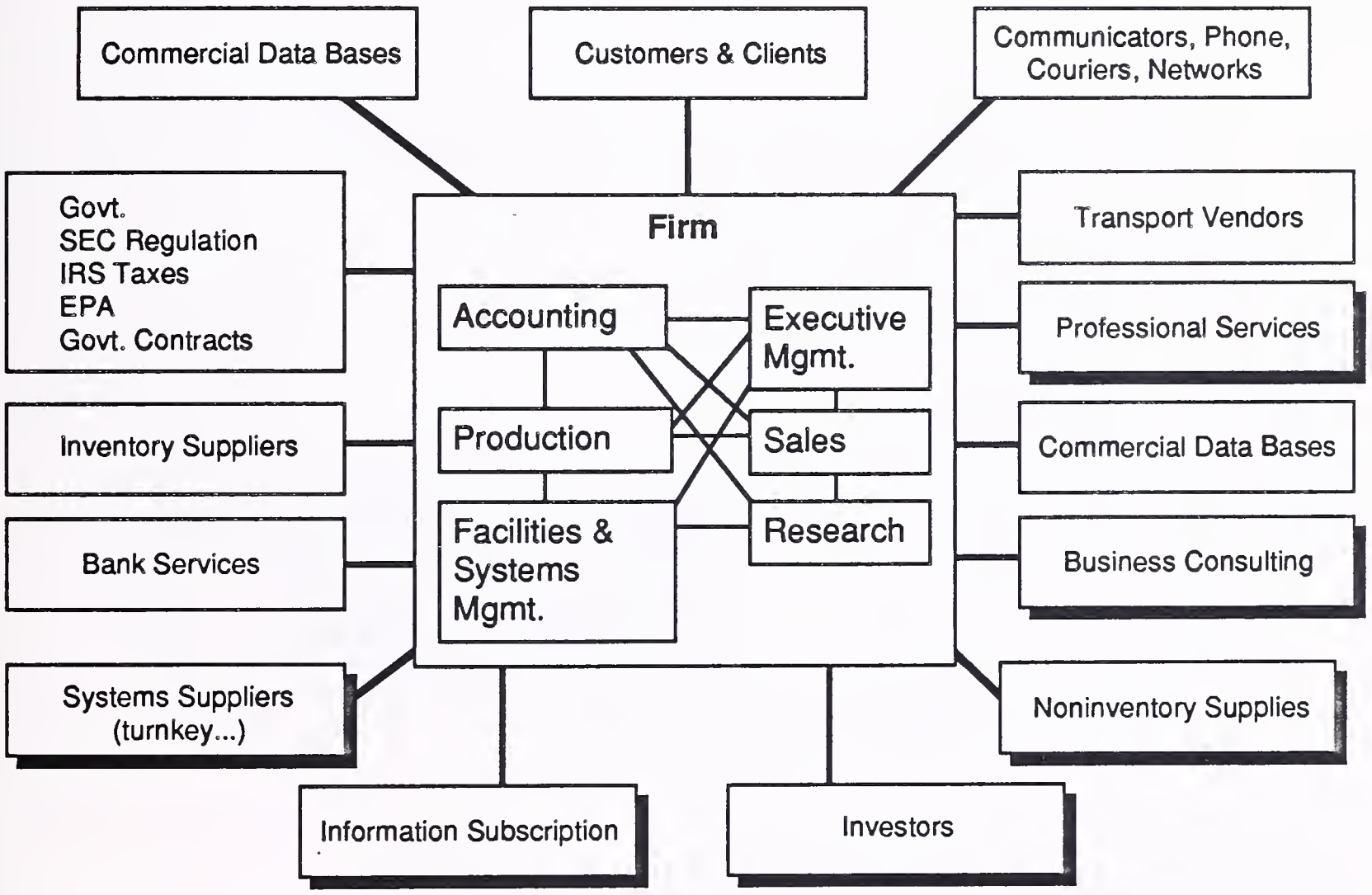
EXHIBIT V-1

A Business Is a Network of Transactions among Staff, and between Staff and Trading Partners

Various Technologies augment/facilitate these transactions by streamlining their inherent processing overhead



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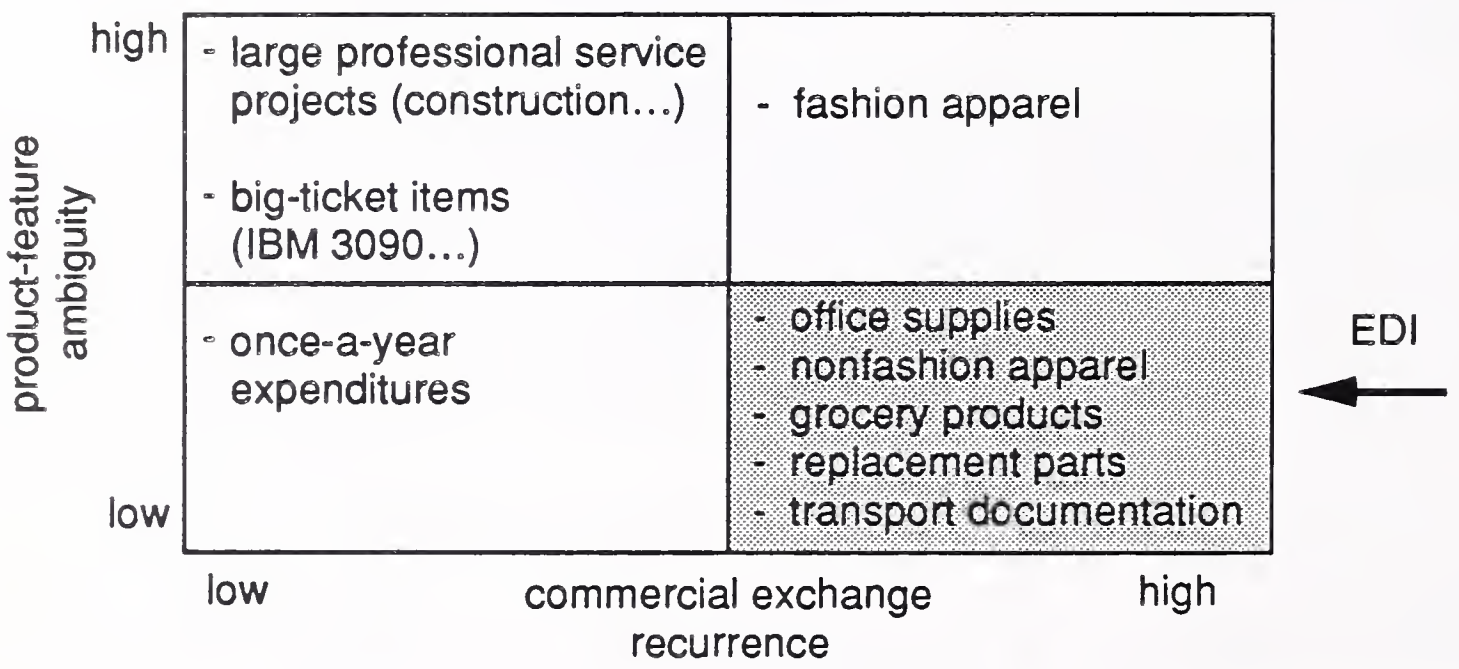
EDI is an attempt to automate some of the conversations that take place in the course of business. EDI is a structured conversation within a value chain. EDI focuses on those conversations among companies (and government agencies) that are highly repetitive and where the terms of the conversation are absolutely unambiguous. With these conditions met, the conversation can become machine processable. Exhibit V-2 classifies transactions according to their adaptability to EDI.

EXHIBIT V-2

EDI Is Best Suited for Repetitive Commercial Exchange of Well-Defined Products



EDI is useful where there is high volume of data exchange (large and/or recurrent files) and where the details of the exchange conversation are unambiguous. EDI is not used (yet) for consumer purchases.

Because EDI is a structured conversation that can be automated (having recurrence and nonambiguity), EDI will not be an all-pervasive, comprehensive media through which to conduct business. Many other commercial exchanges don't meet the EDI qualifications and will be conducted by other means: telephone, mail, face-to-face, and fax. These other transactions are not worth the trouble to make electronic. Buying big-ticket items, such as a multimillion dollar Cray supercomputer, will not be done by EDI.

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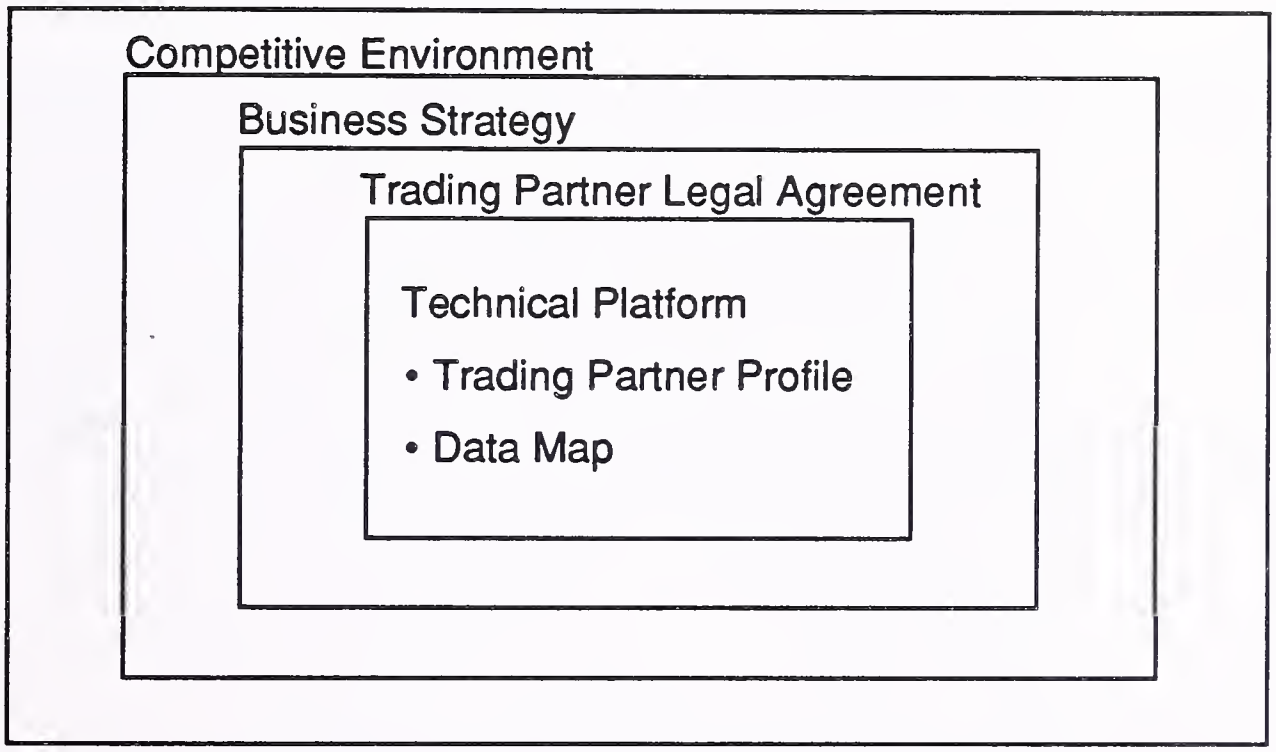
In addition to being recurrent and unambiguous, EDI-enabled commercial conversations assume other preconditions. They take place within a specific technical, legal, organizational, and competitive context, as depicted in Exhibit V-3.

EXHIBIT V-3

The Operational Context of EDI



EDI occurs within already well-defined contexts and agreements.
Defining these contexts and agreements is part of the integration process.

Trading partner agreements specify the transaction sets/messages used, versions, scheduling of transmissions, who is responsible for lost or garbled data, etc. It also may spell out payment terms including whether the supplier can initiate an EFT debit from the buyer's bank.

B

The Importance of Standards: The Language of EDI

EDI integration is a matter of design: workflow design, organizational design, and interorganizational design (value chain design). The business design issues eventually become embedded in the design of EDI standards. Participants in EDI should be prepared to act in all areas.

EDI is distinguished from other information technologies in that users and/or user organizations, not vendors, design the standards of EDI. (Of course, vendors participate in standards design, but the organizations are primarily meant for users.) When designing business practices that

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transcend a single company, it is mandatory to have the involvement of people from as many areas as possible. EDI standards design is equivalent to a meta-organizational systems analysis. It requires input from many sources.

EDI standards define and delimit the action of two businesses engaged in trade. Purchase orders pinpoint what items are ordered (including a company's product number), and to what destination they should be sent (possibly using a Dunn's number). Car location messages indicate where the railroad car is. Data formats reflect/represent items of exchange, the parties involved, and special instructions.

The effectiveness of EDI rests on users' declaring the existence of specific data fields that will allow them to indicate the "what, where, who, when, and how" of a commercial transaction. This declaration process occurs between two trading partners when they first set up an EDI relationship—in standards committees, in industry-specific EDI committees, or by large hub companies that dictate the data format for EDI.

Understanding how data formats are designed and what can be done with them is critical to implementing EDI. Data formats—transaction sets in the X12 nomenclature, and universal messages in the EDIFACT nomenclature—determine how well two organizations can coordinate their activities. EDI integration includes the design of data formats. This is especially true at this stage in EDI history when message architectures are still not stable. Although, as mentioned in Chapter III, the standards design bodies have been institutionalized, the final comprehensive message architecture for EDI is far from being attained. Much experimentation and redesign of business practices is necessary before the optimal data formats are established.

Exhibit V-4 summarizes the importance of EDI standards.

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EXHIBIT V-4

Key Points about EDI Standards

- Users directly participate in standards design (unlike other areas in information technologies where vendors exclusively set standards).
- Business practices dictate standards; standards, in turn, define business possibilities.
- Standards design requires the input of many people from throughout the business community/value chain.
- Design involvement is mandatory to EDI integration.
- EDI standards incorporate other industrial standards and measurements.

C

Problems and Issues with Today's EDI Standards

According to INPUT's 1990 survey of EDI users, only 40% of companies that use standard EDI data formats (X12, UCS, TDCC, or other EDI standards) strictly adhere to the standard. Twenty percent reported filling in data fields with noncompliant data (such as free text, private codes, etc.), simply not using data elements, or adding new data elements to the format. Exhibit V-5 depicts the results from INPUT's survey on EDI standards compliance.

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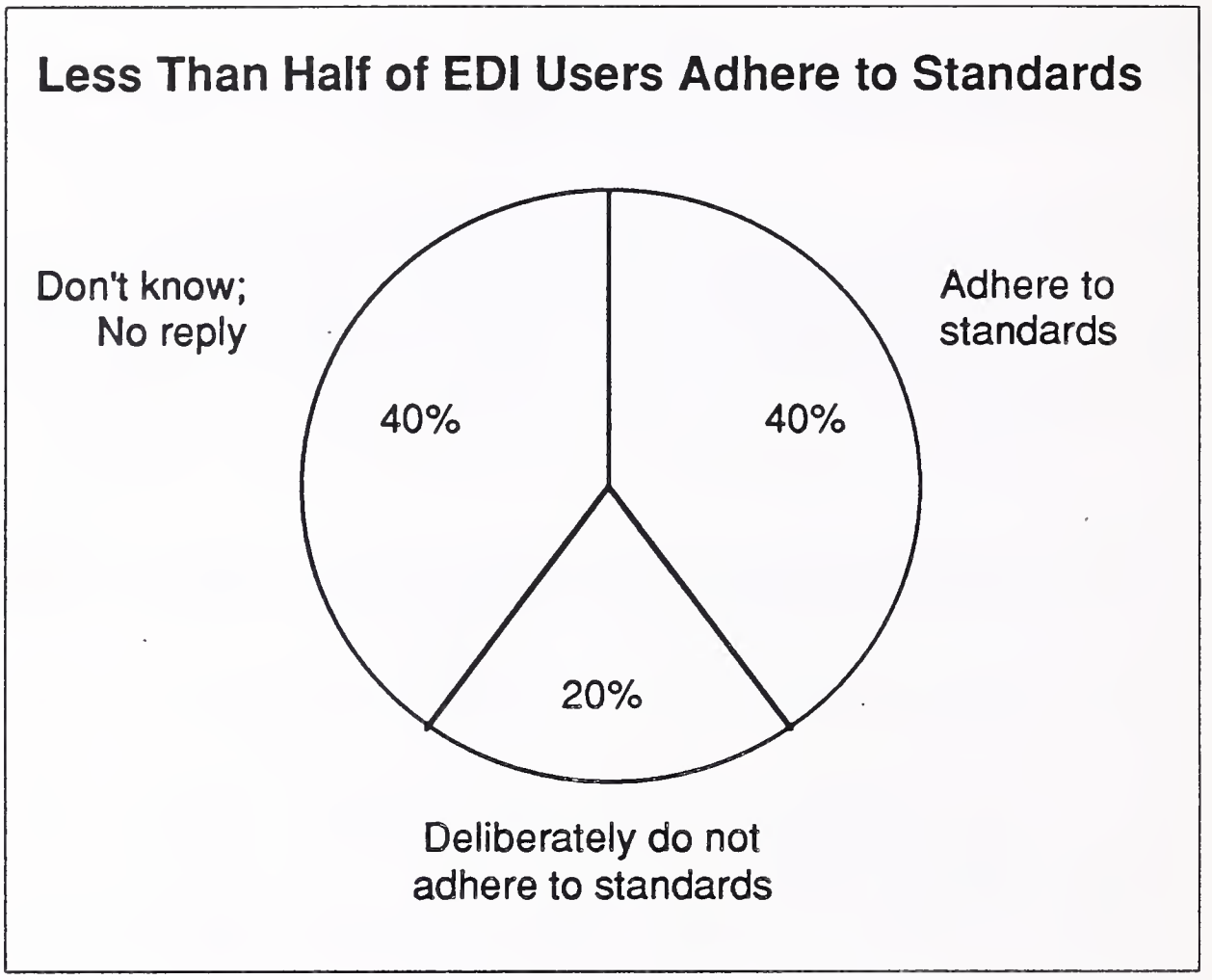
EXHIBIT V-5



The noncompliance with standards by users is a result of the standards not adequately accommodating the existing practices of companies. The following examples demonstrate the kind of problems users are facing in standardizing their data interchanges.

1. Standards Not Accommodating Business Practices

- A data field on invoices (X12 810) would permit companies to assign an invoice to a particular cost center, retail outlet, and/or division of a company that is responsible for the invoice. Pizza Hut charges its costs back to its individual restaurants (half of which are independently owned franchises). Its suppliers—especially for overhead expenses such as courier services, utilities, and trash services—have agreed to place cost center reference numbers on each invoice so that Pizza Hut corporate accounts payable can charge a given restaurant its respective cost. Some of these vendors are placing a cost center reference number as the last 10 characters of the address segment of the invoice. Pizza Hut's computer can read this. But a separate data field would be desirable because not all vendors consistently place the number in the last ten digits or always use reference numbers (sometimes they write free text).

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- For technology companies, particularly electronic system vendors, purchasing has an intimate tie into product enhancements and upgrades. As a company upgrades its product, the components that go into the product must be upgraded. Buyers of custom components—such as ASIC chips—must often communicate to their suppliers/subcontractors not only design changes, but also when design changes go into effect and, therefore, when the supplier should ship the components that meet the new design specifications. At Tektronix, buyers have modified the X12 850 purchasing order to include a date field for a product revision. This date tells the supplier when it should start shipping the ordered product according to a new product specification. Tektronix sends POs often months ahead of when delivery is expected. For example, it will send a PO to Motorola for a certain kind of ASIC. The PO has a revision date within it. The date tells Motorola that all shipments for the given ASIC after the given date must conform to the new design specification.

- John Deere requires suppliers to place the part numbers that John Deere uses to reference the supplier's parts on the invoice that the supplier sends. This is accomplished by using a comment data element.

The diversity of business practices is vast. Standard data formats will always be modified by users. Trade industry groups and specific trading partner couples will always need to customize the formats to fit specific business conditions.

2. Standards Incapable of Characterizing Products

Another aspect of the problems of standardization is the inability for standardized electronic documents to fully represent a product or service.

- Ship line tariffs are legal documents that include the fees and rules that ship lines use to charge for their services. Tariffs are a combination of rules and mathematical formulas. Tariffs are calculated based on hundreds of factors contingent on what is being shipped and where it is going. Currency adjustments, surcharges for high-risk ports, and other details are part of the tariff structure. Incorporating these rules and formulas in automated systems is proving difficult. Artificial intelligence techniques are being used. This difficulty underscores the fact that even in a market as seemingly straightforward as transportation—where the product is to move X from point A to point B)—there is a high degree of product differentiation.

- In the apparel industry, building standardized messages for ordering fashion items is difficult. Basic items (blue jeans, for example) stay the same year after year. But other fashion items change from one season to the next. Developing UPC (bar) codes for fashion items is nearly impossible. These codes, however, are the foundation for moving

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merchandise items from manufacturer to retailer to consumer. The codes are scanned at point-of-sale cash registers, which generate purchase orders with attached codes, which are sent to apparel vendors that monitor production and shipping by using the codes. Without a code for fashion items, the process cannot be automated.

3. Evolving Standards Lead to Data Errors

- Another problem is the transmission of erroneous data from one trading partner to another because one partner upgraded its data format without telling the other. The U.S. Customs Automated Broker Interface (which handles 80% of all broker import releases) changes its data requirements periodically. Brokers who fail to keep up with the changes by modifying their software and data entry procedures end up having their release entries rejected. Customs is considering penalizing brokers who fail to update their systems.

4. Hierarchical Design Hard to Process

X12 ship notices adhere to a hierarchical design that is the source of great discontent among EDI users. Different shippers interpret the levels differently. Also, each level is not identified explicitly. The sublevel to a truckload is assumed to be a pallet, the sublevel to pallets is assumed to be boxes. This ambiguity is causing problems.

An automotive parts supplier claims that a "Big Three" car manufacturer interprets the hierarchies on the advance ship notice (X12 856) differently from the interpretations of the other two "Big Three" manufacturers. The manufacturer considers carton and pallet segments to be on the same level, whereas the other two see cartons to be subordinate to pallets.

Also, the same manufacturer wants additional information put on the ship notice—such as weight of each carton—in addition to attaching a specific kind of trailer on the interchange. The result is extra work for the parts supplier without any payback except keeping its customer satisfied.

Furthermore, as real-time transmissions of EDI messages are under consideration and have been implemented in a few instances, the hierarchical design won't work. In real time, each segment is passed from one computer to another one at a time. Each segment is verified on the spot by the receiving CPU—the entire transaction set or interchange (group of transaction sets) is not sent in a single batch. When each segment is sent individually, every segment must be identified explicitly.

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5. Quick Response Transaction Sets

The retail-apparel-textile industries, under the direction of the Voluntary Interindustry Communication Standards (VICS) committee, have developed "quick response" transaction sets.

These sets are to be used in lieu of earlier X12 transaction sets, namely the 867 (sales data) and the 846 (inventory data). One of the quick response transaction sets allows companies to send sales and inventory data to their trading partners. The other allows them to send forecast and modelling information. The transaction sets are designed to work in the advanced implementations of EDI where suppliers, not customers, determine replenishment quantities of product items. This radical departure from conventional buying practices is most popular in distribution industries (retail, mass merchandise, grocery, and possibly auto parts stores).

A sales trend analysis transaction set is another transaction developed by VICS. It allows a supplier to let a retailer know how well it is selling a particular product compared to the aggregated sales of all other retailers in the same geographic area. The retailer uses this data to measure its outlet's performance. Procter & Gamble Co., Gillette, and Levi Strauss are pioneering this kind of EDI with key retailers.

6. People Data Formats

EDI exchange of university transcripts, mortgage applications, and insurance enrollment forms are under development. For the first time in the history of EDI, transaction sets are being designed to convey information about people, not things. Data formats would characterize such personal attributes as educational accomplishments, financial status, medical history, family member profiles, etc. Such information is—like fashion and transportation tariff information—hard to represent in machine-readable code. Personal names, for example, have many variations. Women change their names (sometimes) when they are married. Currently, X12 has no standard way (no data segment) for representing personal names.

7. Real-Time EDI Formats

There is an increasing call for real-time EDI where messages are exchanged directly between one trading partner's computer and another without sitting in a third-party mailbox. Ship notices between suppliers and manufacturers and cargo space reservation systems are two specific areas where real-time systems have been implemented. The design for real-time data formats would be radically different than the existing EDI architecture, which is store-and-forward or batch transmissions. Specifically, real-time transaction sets would be sent segment by segment and transactions set by set: there would not be a mailbag/interchange of

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many transaction sets all at once. Passing segments one at a time from one processor to another would require additional data elements on the segments to identify segments and inter-relate them to the overall EDI message. The meanings of many segments in the X12 architecture as they stand today are implied by their sequence/context within a transaction set.

8. Disuse of Data Elements and Transaction Sets

In addition to a lack of appropriate data elements, many transaction sets today contain redundant/unnecessary data elements. In part, the design of quick response transaction sets (as mentioned above) addresses this issue. Food wholesaler SuperValu Foods (Eden Prairie, MN) uses, on average, only 20% of the data elements on UPC EDI transaction sets. An X12 850 purchase order has approximately 120 possible field types in it, many of which are unused by most EDI users. In addition to unused data elements, a number of TDCC transaction sets are being discontinued because of disuse.

9. Standards Bodies Not Fast Enough

Users and vendors alike have expressed concern that the EDI standards organizations are not keeping up with the demand for new and/or revised data formats. This leads to companies going off on their own and developing nonstandard formats—a self-defeating action in the long run.

10. Conclusion

These trends in standards development point out some of today's shortcomings in standards design, the challenges ahead, the fact that making EDI work means embodying business practices in machine-readable code, and that EDI still has a way to go before such optimal design is attained.

The examples also demonstrate that not all forms of intercompany communication will be conducted through EDI. Many kinds of transactions do not occur often enough to warrant the establishment of an EDI infrastructure and relationship. These transactions may not have the requisite clarity of terms as well. The telephone, face-to-face communication, facsimile, etc. will all exist along side EDI.

Finally, the examples also demonstrate that to integrate EDI in business requires knowledge of and participation in the design of EDI messages/standards.

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D

EDI Message Composition

To be understandable by disparate computer systems, the EDI language is standardized. This means a given message is made up of alpha-numeric symbols that reference a common dictionary of meanings agreed upon by the community of EDI users and by specific trading partner couplets. Each company installs software that references, through computer-coded look-up tables, these common meanings. When the alpha-numeric symbols flow from one company's system to another's, all parties receive the same meaning.

The symbols of EDI are quite elaborate, as they must accommodate a vast range of commercial and noncommercial transactions. This vast body of meanings is concentrated into a machine readable language by defining small basic semantic units and then putting the units together in various combinations. The relationship is comparable to letters, words, and sentences.

Exhibit V-6 is an example of how an EDI message is built up, first from data elements, and then from data segments to produce a single message, called a transaction set in X12 nomenclature and a standard message in EDIFACT nomenclature.

Today, in the X12 family of EDI standards—the most comprehensive and widely used—over 900 unique data elements combine and recombine to make close to 400 data segments that, in turn, are combined and recombined into approximately 100 transaction sets.

The basis for the language of EDI is the data element dictionary. The dictionary defines each data element for name, description, specifications for data type, values for minimum and maximum number of characters, an assigned reference number, a listing of segments in which that data element is used, and, if appropriate, a list of code values and definitions of each value. The X12, UCS, WINS, and TDCC EDI standards all subscribe to the same data element dictionary. EDIFACT, Tradacoms, ODETTE, and other EDI standards each have their own data element dictionaries.

Data elements typically convey quantities, measurement classifications, identification codes, dates, and times. The vast majority of elements are codes and classifications. The 900-plus data elements refer to codes and classifications that have already been developed by trade groups. More than 80 trade groups and other sources of industrial codes (such as Dun & Bradstreet, Brussels Nomenclature, Standard Transportation Commodity Code, Lloyd's Register of Shipping, MILSTAMP, etc.) have their codes referenced by these elements.

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EXHIBIT V-6

EDI Message Composition

Data elements are the alphabet
Segments are words
Transaction sets are sentences

Transaction Sets
(sentences)

"Please, send me
300 containers full
of Bart Simpson T-shirts"

Data Segments
(words)

300 Containers
Bart Simpson
T-shirts

Data Elements
(alphabetic characters)

T-shirt
Container
Numeric value
Type of request
Product description free text

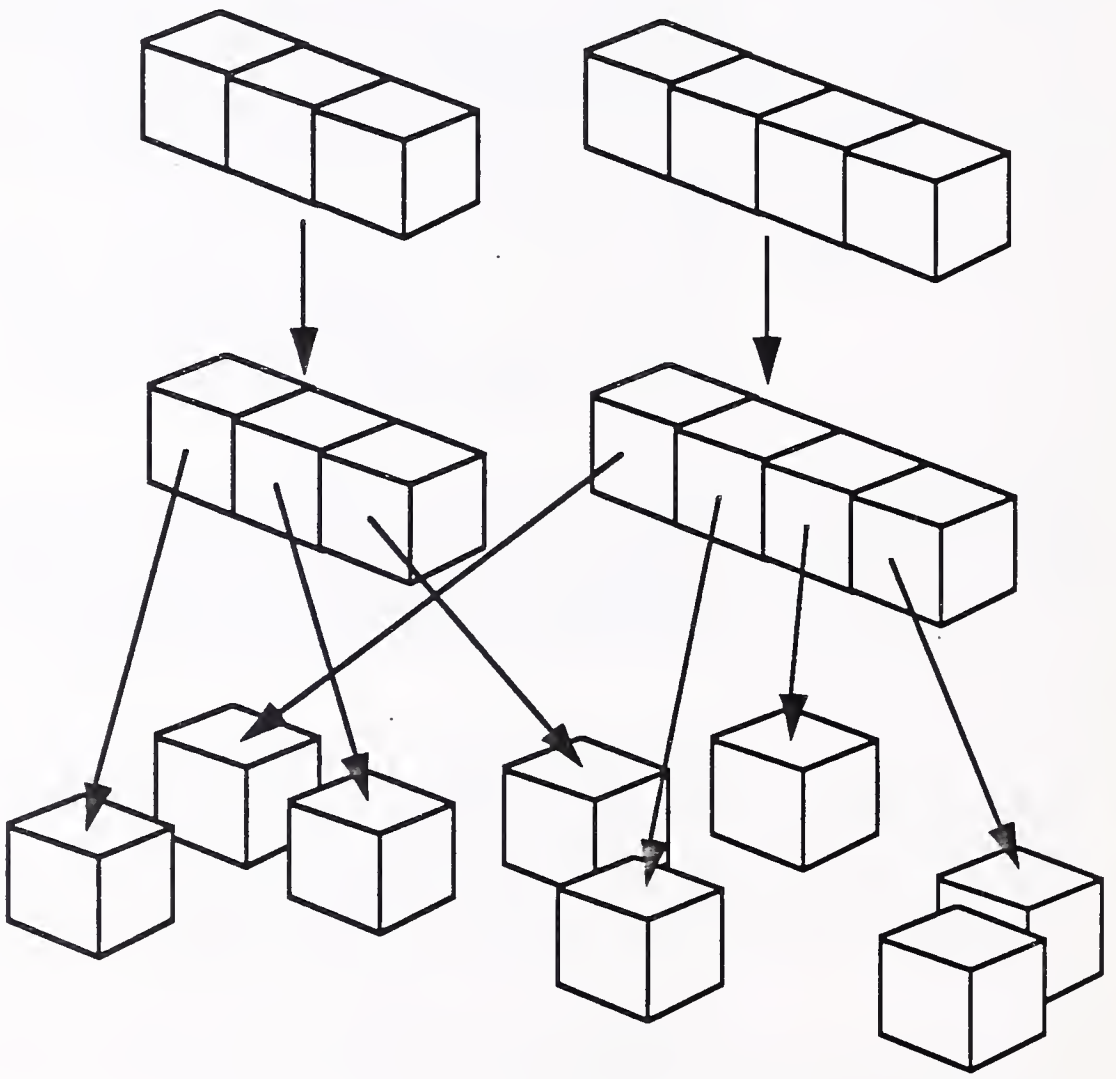

Exhibit V-7 lists a sample of possible measurements for the Unit of Measurement Code. This element identifies the basic unit of measurement of any kind of physical quantity sent between trading partners. As shown in the diagram, the element is an identification (ID) element, with a minimum and maximum of two characters in length. The element is used in 70 different data segments, and the codes (specified by two alphabetic characters) are partially listed.

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EXHIBIT V-7

An Example of an EDI Data Element

Code	Unit of Measurement
02	statute mile
26	actual tons
CI	cubic inches
CL	cylinder
CP	crate
HR	hours
IN	inch
EP	eleven pack

A two-character code specifies units of measurement

One of the segments into which the Unit of Measurement Code data element is incorporated is the measurements data segment. This segment is used to specify the physical measurements, including dimensions, tolerances, weights, and counts of items. The measurements segment is composed of nine other data elements, each separated by an asterisk (*). One of the other elements, the measurement value element, specifies the quantity of the given measurement (e.g., six tons). Exhibit V-8 illustrates the measurement segments.

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EXHIBIT V-8

An Example of an EDI Segment

MEA

*	MEA01 737 Meas. Ref. ID Code O ID 2/2	*	MEA02 738 Measurement Qualifier O ID 1/3	*	MEA03 739 Measurement Value C R 1/10	*	MEA04 355 Unit of Meas. Code C ID 2/2	*	MEA05 740 Range Minimum C R 1/10	*	MEA06 741 Range Maximum C R 2/2
*	MEA07 935 Meas. Sign. Code O ID 2/2	*	MEA08 936 Meas. Attr. Code C ID 2/2	*	MEA09 752 Surf/Layer Pos. Code O ID 2/2						

N / L

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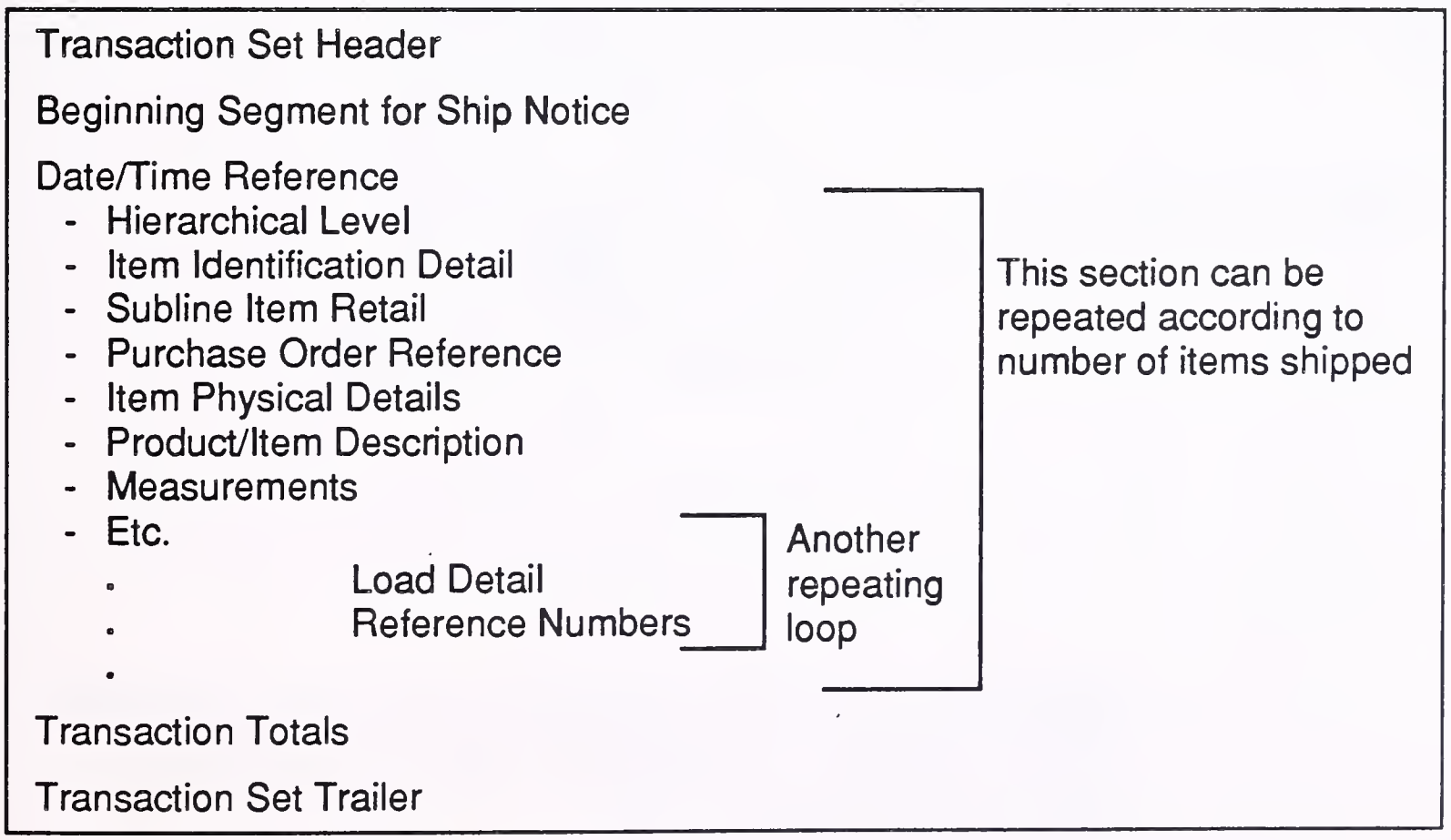
The measurements segment is used in 19 transaction sets. One of these transaction sets, the ship notice/manifest, is partially shown in Exhibit V-9. A ship notice/manifest lists the contents of a shipment of goods as well as additional information relating to the shipment—such as order information, product description, physical characteristics, type of packaging, marking, carrier information, and configuration of goods within the transportation equipment. The sender of this transaction is the organization responsible for detailing and communicating the contents of a shipment, or shipments, to one or more receivers of the transaction set. The receiver of this transaction set can be any organization having an interest in the contents of a shipment or information about the contents of a shipment.

Appendix B lists all EDI transaction sets and their functional purpose. (X12 and EDIFACT)

EXHIBIT V-9

An ANSI X12 Transaction Set



Segments that composed a ship notice

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E

Two New Paradigms for Strategically Positioning EDI

In other reports, INPUT has recommended guidelines and rules of thumb for implementing an EDI program in a company (see Chapter I, Related INPUT Reports). In this report, rather than review these guidelines, INPUT offers two new frameworks that, during the eighties, have been applied to the design of organizations. The two frameworks have not only been successful, but are growing in acceptance and are being further refined in organizations such as Frito-Lay, Du Pont, Marriott Corp., Hughes Aircraft Company, and others.

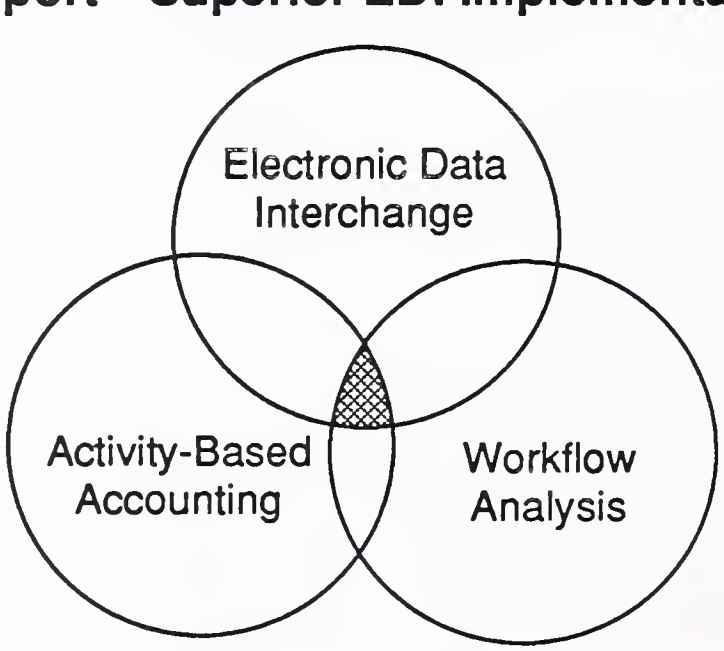
The frameworks are:

- Workflow analysis
- Activity-based accounting

The two together create a context in which the design and application of EDI to business can be strategically understood, as shown in Exhibit V-10.

EXHIBIT V-10

Activity-Based Accounting and Workflow Analysis Support—Superior EDI Implementation



These frameworks deal with communication for action and accounting. Their principles have been developed separately. They have yet to be specifically applied to an EDI context. In this section, INPUT will attempt to merge the two with EDI.

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1. Workflow Analysis

Action Technologies Inc. (Alameda, CA), a maker of office productivity/ groupware software (see Chapter VI, groupware), has developed a framework for analyzing work and systems. ATI's workflow analysis is an advancement over traditional systems analysis because its unit of analysis is the whole cycle that satisfies a customer request. Traditional systems analysis—using no business assumptions about why work is undertaken in the first place—often simply replicates existing, ineffective procedures.

EDI coordinates the workflow between two distinct organizations. A workflow is a unit of work that happens repeatedly within and among organizations. It is the fundamental unit for getting things done. A workflow has a beginning, a middle, and an end. And, most importantly, workflows complete functions that are related to, or result in, satisfaction for customers. In effect, every workflow has a customer. That customer may be a customer or client of the organization or another work group or individual in the organization—an internal client.

In a typical sales workflow, for example, a product or service is offered to a customer, the offer is accepted, and then it is delivered to the satisfaction of the customer. This workflow could include a number of other important steps such as a formal sales offer, a purchase order, a shipping notice, and the signing of a bill of lading to signify the customer's satisfaction.

The communication between people, between people and machines, and between machines and machines, that occurs to coordinate workflows adheres to an inherent structureis shown in Exhibit V-11 .

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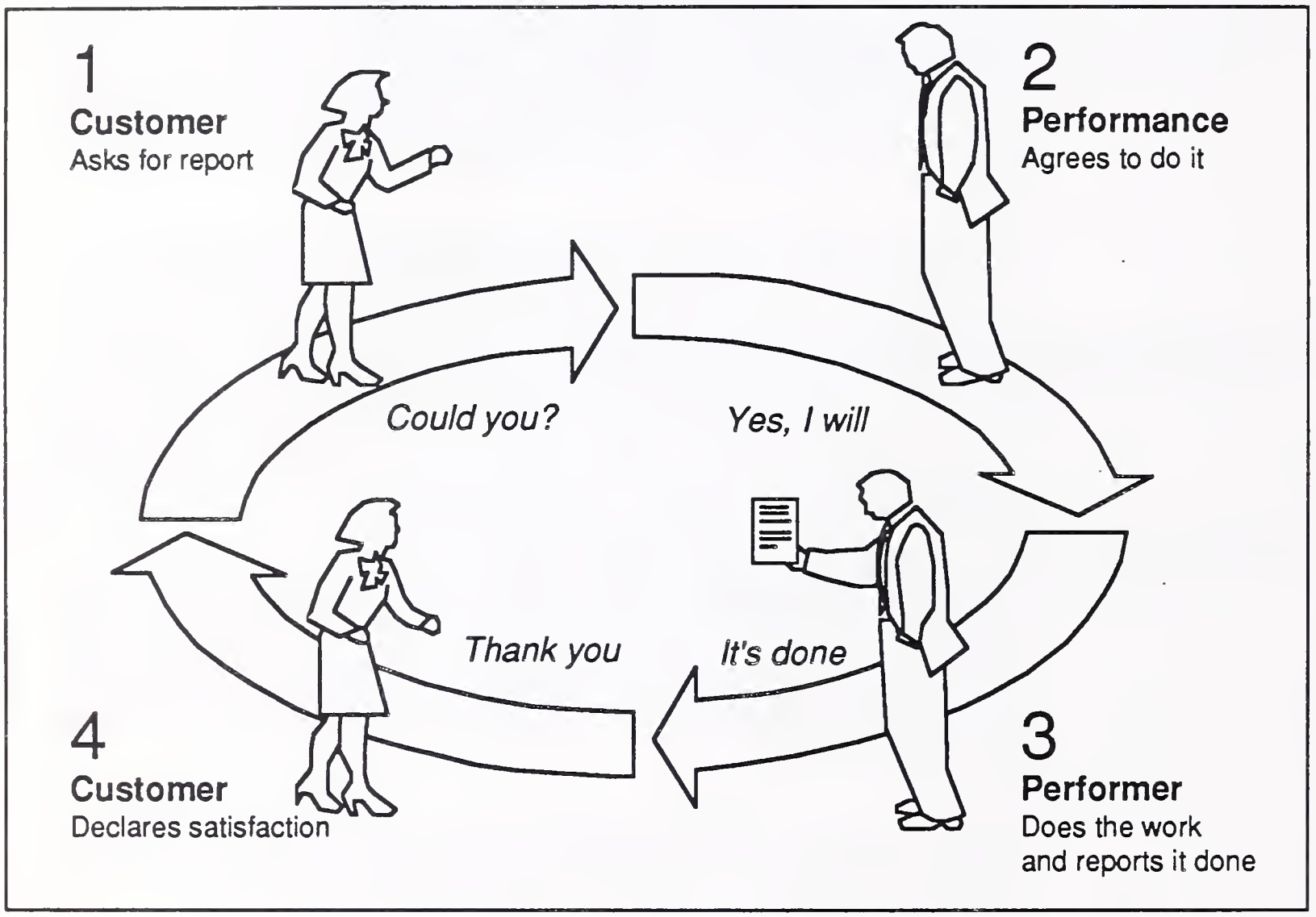
EXHIBIT V-11

Basic Action Workflow



A workflow is initiated by one of two events: a customer makes a request to a supplier or a supplier makes an offer to a customer. Depicted in Exhibit V-11 is a customer making a request. Whether a request or offer opens the workflow, all subsequent moves by both parties are confined to the same structural boundaries.

That is, given a request, a supplier has a finite number of possible replies: it can accept the request (and promise to fulfill it), it can decline it, or it can make a counter offer. Given that the supplier has promised to fulfill the request, the supplier now faces again a finite set of moves: it can fulfill the request and report this to the customer (for example by sending a shipping notice) or it can delegate the customer's request to someone in the company for that person to fulfill (the latter option is depicted in Exhibit V-12).

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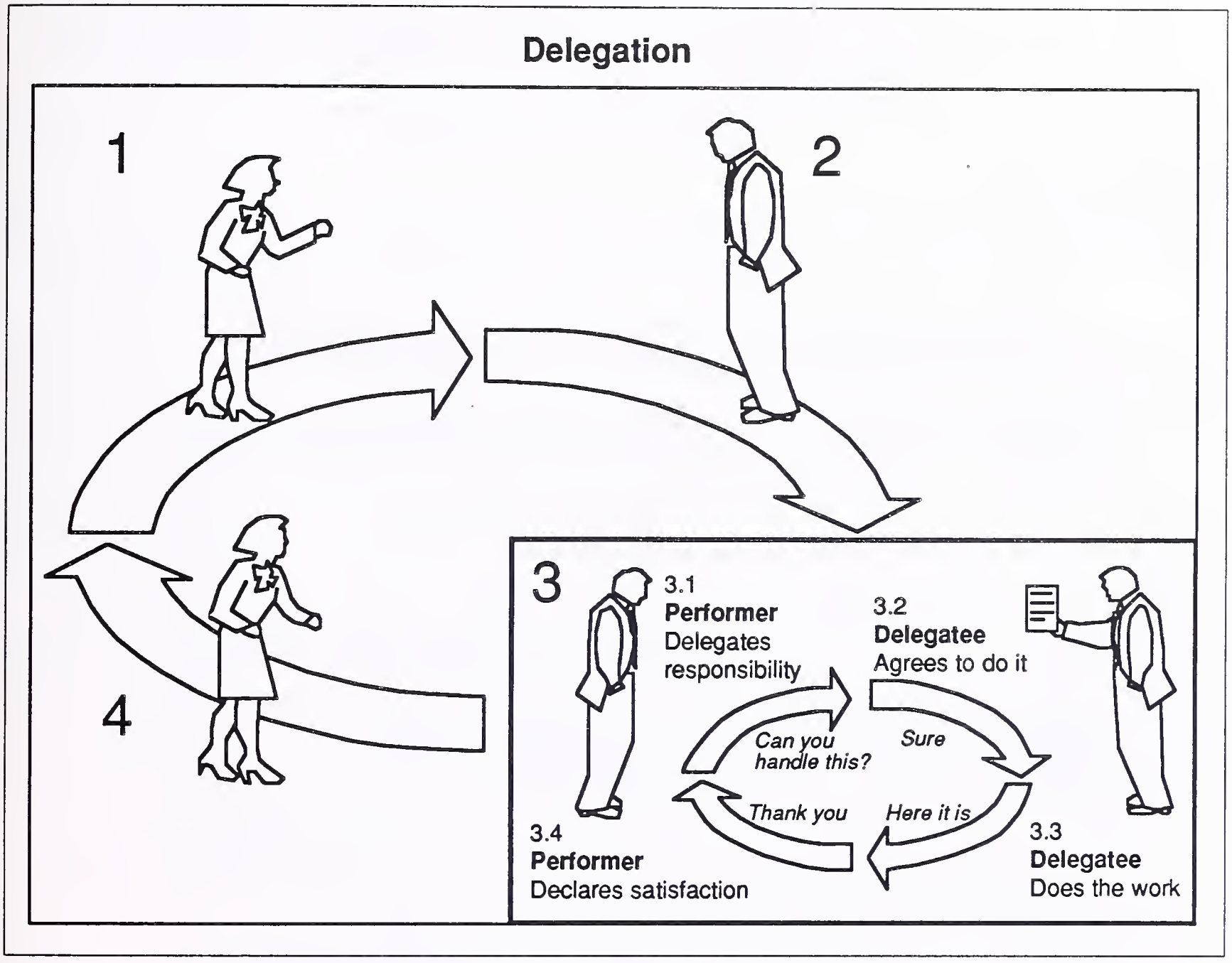
EXHIBIT V-12



Finally, to complete the closed loop that all workflows are, the customer signals to the supplier whether it is satisfied with the fulfillment of the request. Satisfaction may be explicitly signalled by immediate payment or implicitly signalled, say by the initiation of another request.

EDI coordinates the workflow between two distinct organizations. The design and use of EDI between organizations (including the design of transaction sets/messages) can be simplified by applying workflow analysis.

EDI is a language by which people specify in unambiguous terms specific requests, offers, promises, and declarations to their trading partners (e.g., please send a quote, this is our quote, please send this item, we are sending you the item, please pay us this amount, here is the amount we

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owe you for what you sent us, etc.). EDI is a machine-processable language that coordinates workflows. The transaction sets/messages of EDI correspond to the basic communication moves inherent to workflows (see Exhibit V-13). Because workflow communication moves are finite in number, so too can the number of basic EDI transaction sets/messages be finite in number.

EXHIBIT V-13

EDI Transaction Sets Can Be Designed According to Workflow Moves, Which Are Finite in Number

Workflow Move	Corresponding X12 Transaction Sets
Request	Purchase Order Request for Quotation Invoice Payment Order
Offer	Response to Request for Quotation Inventory Advice
Agree to Request/Offer } Promise	P.O. Acknowledgment Contract Award
Decline Request/Offer	No Response from Trading Partner
Counter Offer	P.O. Change
Cancel	Payment Cancellation Request
Report Completion	Operating Expense Statement Payment Status Report
Inform	Product Activity Data Report of Test Results Trading Partner Profile

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Using the workflow analysis framework, designers of EDI systems can

- Build intercompany EDI systems that more completely execute commercial exchanges and, thereby, lead to customer satisfaction
- Keep transaction set/messages from proliferating into hundreds and hundreds of idiosyncratic types
- More easily identify and model data requirements for EDI transaction sets/messages. This makes possible a more controlled, easy-to-manage worldwide standards development effort.
- Integrate an EDI capability with a company's internal applications (because workflow analysis allows systems designers to characterize all the workflows inside a company that are incumbent to the workflows in which the company participates with suppliers and customers)

2. Activity-Based Accounting and EDI

EDI and accounting are intimately related in a variety of ways.

- The justification of EDI requires an accounting of costs and benefits before and after EDI is implemented.
- Implementing EDI impacts the company's accounting system sooner or later. Fully integrated EDI directly interfaces and provides critical data to general ledger, accounts payable, and accounts receivable systems. EDI drives accounting systems.
- In some instances, EDI facilitates companies to modularize and outsource functions, such as billing, subassembly manufacture, and various processing functions specific to industries (advertising bill payment, library subscription management, etc). Assembling and disassembling value-adding functions is done on cost considerations. The designing of organizational structure, therefore, requires a careful weighing of costs and benefits.

As seen in Chapter IV, EDI impacts the effectiveness of organizations singularly and collectively. It allows the more effective integration of functions (such as order entry, manufacturing, shipping, accounts receivable, accounts payable, etc.) within a single company. It allows a more effective integration of functions within a value chain—manufacturers in a value chain better synchronize production to minimize inventories and waste. EDI changes the value-adding capacity of a company and groups of companies. The application of EDI to productive processes requires the manager to examine the whole company and the whole value chain in which it operates. Application requires the assessment of capacities and the business opportunities that arise by enhancing capacities.

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In order to evaluate value-adding capacity, the manager must rely on a cost-accounting methodology. Traditional financial-statement accounting practices are not sufficient for this purpose, however. These do not reflect true costs of value-adding activities. For example:

- Product costs are not accurately reflected in the management reports. Overhead costs are distributed to products by simplistic and arbitrary measures, usually direct-labor based, that do not represent the demands made by each product on the firm's resources.

- Inventories are valued at cost of acquisition and/or cost-attaching methods rather than current market value, thus possibly distorting the true opportunity costs those inventories represent.

- Costs outside the company (associated with sales, distribution, and service) are not taken into account by managers. These costs determine the competitiveness of products. Ignorance of them makes the firm vulnerable to competitors entering the market.

- Multidivisional, multiproduct companies typically do not know the true costs of each of their products. All too often, profitable products cross-subsidize unprofitable ones. Without accurate cost accounting, companies are in danger of concentrating resources on unprofitable products and discontinuing profitable products.

Accounting experts are recommending, among other things, that companies use the automated data collection features inherent in information systems to capture key statistical quantities that can help them measure performance and cost. The idea is to measure activities in a process beginning to be known as activity-based costing (ABC). EDI is one information technology that is poised quite well for this purpose.

EDI inherently supports the principles of ABC.

- EDI supports the automatic sorting and counting of repetitious transactions. The number of invoices from government customers can be counted and compared to those from the private sector.

- EDI data—because it is in electronic, machine-readable form—can easily be combined, collated, and aggregated into accounting measurements deemed appropriate by managers.

- EDI, to begin with, eliminates intermediary transactions (such as printing a purchase order, stuffing it in an envelope, mailing it, delivering it, etc.), reduces overhead costs, and pinpoints specific cost-producing activities more clearly.

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- EDI helps logistics managers itemize the complexities of distribution costs across products and vendors.

- Financial EDI and EFT help corporate treasury managers more clearly see where funds originate and where they are disbursed.

- EDI supports data collection beyond the company's boundaries, thereby enabling trading confederations to know and optimize overheads for procuring materials, manufacturing, distributing, and servicing finished goods in a value chain.

Activity-based accounting (ABC) is a new cost-accounting method that some forward-thinking companies are adopting (Hewlett-Packard, Hughes Aircraft Company, and Monarch Mirror Door Inc.). ABC was developed in part by Robert Kaplan of Harvard and Charles Goldenberg of Peat Marwick. The principle of ABC is that

- Products do not incur costs.
- Activities incur costs.

To get accurate cost estimates requires measuring activities for which electronic systems provide a great opportunity. With many production processes under direct control of computers, information can be recorded in real time for analysis of operating performance. In highly automated environments, virtually every transaction can be captured for subsequent analysis.

EDI plays a natural role in developing activity-based costing systems because, like other information technologies, it can generate data that is ready to be fed into cost analysis systems.

a. Transaction Costs

The primary cost drivers in any organization are not physical volumes of production (measured by direct labor and material costs), but transactions —transactions involving exchange of materials or exchange of information. Examples include number of machine set ups, number of orders, number of inspections, number of calls to cinch a sale, number of shipping orders, number of scrapped products off the assembly line, number of material movements, etc. EDI plays an important role here because (1) it directly reduces transaction costs by eliminating human data-entry procedures associated with intercompany transactions and (2) an EDI message is, in itself, an electronic record of a transaction that lends itself to aggregation and collation with other electronic data for management accounting purposes.

According to Jeffrey Miller and Thomas Vollmann, Harvard Business School professors, there are four types of transactions:

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- Logistical transactions: to order, execute, and confirm materials movement. Personnel busy with logistical transactions include indirect shop floor workers as well as people engaged in receiving, expediting, shipping, data entry, EDP, and accounting.

- Balancing transactions: to match the supply of material, labor, and machines with demand. Purchasing, materials planning, production control, forecasting, and scheduling personnel perform balancing transactions.

- Quality transactions: to validate that production is in conformance with specifications. People in quality control, indirect engineering, and procurement perform quality transactions.

- Change transactions: to update manufacturing information. Manufacturing, industrial, and quality engineers involved with ECOs, schedules, routings, standards, specifications, and bills of materials perform change transactions.

Exhibit V-14 lists the types of transaction and the kinds of EDI messages and/or applications that today address these transactions.

EXHIBIT V-14

X12 Transaction Sets That Address the Four Fundamental Kinds of Transactions

Transaction Type	Transaction Sets
Logistical	Purchase Order Ship Notice Acknowledgments Warehouse Transaction Sets Transportation Transaction Sets
Balancing	Purchase Order Ship Notice Product Activity Inventory Advice
Quality	Quality/Product Data Material Safety Data Sheet Ship Notice
Change	Engineering/Design Changes Production Schedules/Release Design Specification Bill of Material

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b. Performance Measurement

Improved measurement and control of costs and processes is only one part of developing management information systems that contribute to more effective, competitively sound action by managers. Defining what performance indicators to measure is necessary. This definition process will determine how EDI is to be applied to the functioning of an enterprise.

The relevant performance indicators will be determined by the enterprise's strategy. Exhibit V-15 is a partial list of strategic objectives, relevant performance indicators for these objectives, and specific EDI applications that support these indicators.

EDI is a data collection device that serves not only a single company's need for management information, but an entire value chain. With EDI, the true cost of a product in a value chain, and therefore its overall competitiveness, can be determined. Cost of production is only one aspect of costs; the other aspects include the costs of sales, distribution, and servicing. Costs of selling will vary according to the class of buyer—industrial, commercial, institutional, or governmental. The costs of distribution channels vary whether product flows through distributors, retail, wholesale, brokers, direct mail, OEM, or export determines total product cost. EDI is an instrument that permits the collection of cost data (through transaction data bases, for example) across distribution chains. EDI can be used to help optimize whole value chains.

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EXHIBIT V-15

EDI Supports Effective Performance Measurement Management Systems

Strategic Objective	Relevant Indicators	EDI Application
Quality	• Scrap • Rework • Part-per-million defect rates • Unscheduled machine downtime • Customer complaint • Warranty expenses • Service calls	• Nonconformance report (X12 842) • Material safety data sheet (X12 848) • Report of test results (X12 863) • Product activity data (X12 852) • Loss or damage claim (X12 920, 924) • Inventory advice (X12 846)
Lowest Cost Producer	• Productivity measures • Distribution costs	• Product activity data (X12 852) • Price sales catalog (X12 832) • Transaction data bases
Just-in-time Production and Delivery	• Average set-up times • Throughput times • Average number of days production in inventory	• Mainstream EDI messages: P.O. (X12 850) Ship notice (X12 856) Invoice (X12 810) Quick response transaction sets
Design and Process Flexibility	• Total number of parts per product • Percentage common versus percentage unique parts in products • Number of subassembly or bill of materials levels	• CAD/CAM and binary data with product specification (X12 841) • Report of test results (X12 863)
Continuing Flow of Innovative Products	• Total launch time for new products • Key characteristics of new products (accuracy, speed, reliability) • Customer satisfaction	• Product activity data (indicating customer satisfaction) (X12 852)
Enhancing Employee Value	• Absenteeism • Turnover • Recruiting success • Morale • Skills	• All EDI data formats

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F. Conclusion

Workflow analysis and activity-based accounting are new frameworks in which managers can design and measure the performance of organizations. As they are both concerned about specifying activities and the successful fulfillment of objectives, they are well-suited to the EDI design and implementation process. EDI is the mechanization of recurrent, unambiguous commercial exchanges. Workflow analysis and activity-based accounting are the tools by which such exchanges can be designed and incorporated into a management information system.

Workflow analysis and activity-based accounting can be looked upon as the beginning and end points for the implementation of an EDI system. Workflow analysis specifies the agents (in terms of people and computer applications at customer and supplier sites) and the activities of each. Activity-based accounting monitors those activities, possibly being driven by EDI data itself.

Because the impact on company and industrial organization is potentially so large, designing and implementing EDI requires the use of new frameworks for analyzing and assessing work. Workflow analysis and activity-based accounting are two new frameworks that fill this need.

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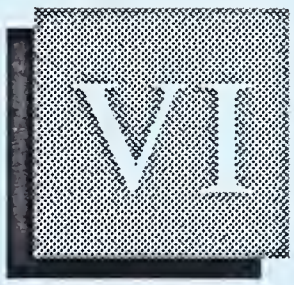
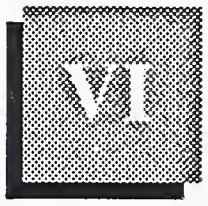


EDI Integration Tools and Allied Information Technologies



EDI Integration Tools and Allied Information Technologies

To be effective, EDI must be integrated into the electronic systems of the organization. This chapter examines EDI software products and the systems that interface with these products and/or make the company's EDI products more effective.

This chapter examines technologies inherent and adjacent to EDI. Exhibit VI-1 lists the software tools and systems examined.

EXHIBIT VI-1

EDI Integration Tools and Allied Information Technologies

- EDI Software Products
  - Translation Software
  - Data Mapping Tools
  - Application Software/Program Interfaces
  - EDI Gateways/Servers
- Messaging Systems and Work Group Environments
  - Compound/Active Document Systems
  - Groupware
  - Electronic Mail
  - Facsimile
- Automatic Identification
  - Bar Codes
  - Radio Transponders
  - Smart Cards
- Data Capture
  - Hand-held Devices
  - Image Systems
  - Intelligent Devices in Consumer and Industrial Products
  - Natural-Language Processing

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A

EDI Software Products

1. Translation Software

Early EDI was conducted in data formats that either one strong trading partner dictated to its suppliers (such as Sears, Chrysler, and J.C. Penney) or were set by a tight-knit industry trade group (such as the Uniform Code Council setting grocery industry UCS standards). Thus, a given EDI trading community was kept compatible. There was little need for translating one format to another. The translation that was needed would be performed by the value-added network.

Today, the situation is changed. Standard formats—ANSI X12 (including TDCC, WINS, and UCS) and EDIFACT—are being adopted by all industries because interindustry EDI trades are occurring on a many-to-many basis, and standards are of paramount importance. The typical EDI user, anticipating trading with a variety of company types, receives the most advantage from building an EDI capability to a single set of data format standards. Much commercial software is now available to perform translation on the user's own computer platform and therefore obviate the need to have third-party network providers to do it.

Thus, to conduct EDI today requires the purchase (or construction) of EDI translation software. Translation software converts files in standard formats to files in formats that are processable by a company's internal computer applications, and vice versa. Translation software is undergoing an evolution. The first commercial packages were complicated COBOL-based packages built exclusively for mainframes and requiring extensive programming to integrate. Today there are UNIX-based packages that run on PCs with easy-to-use menus allowing users to map internal application files to standard EDI files. The evolution of EDI translation software will continue as the unforeseeable business possibilities of EDI continue to be played out. Exhibit VI-2 is a list of the leading vendors of EDI translation software. For a more thorough analysis of these vendors' products, refer to INPUT's *EDI Sourcebook*.

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EXHIBIT VI-2

Leading Vendors of EDI Transaction Software

Micro	Midrange	Mainframe
Supply Tech	ACS Network Systems	Sterling Software
GEIS	Sterling Software	GEIS
Harbinger	IBM	IBM
EDI Inc.	Louis Wright	EDI Solutions
American Business Computer	Other	TSI International
Foretell		DEC
Sterling Software		Other
DNS		
APL Group		
RMS		
Piedmont		
EDS Canada		
Other		

UNIX operating systems: American Business Computer, Perwill, Birmingham Computer Group, EDI Solutions

2. Data Mapping Tools

Data mapping is the critical activity of EDI integration where the user maps data elements of files used in host applications with files that come out and go into the EDI translation software. Data mapping is linking a flat file of an application to a standard EDI format. The relationship is not always one-to-one. EDI formats do not necessarily correspond to any particular application format. Nor will the name of a standard EDI data element be the same as the name of the field in the application's data base. Agreement with the trading partner on what the specific elements represent must first be attained.

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The map contains tables that relate standard EDI segments and data elements to the records in the application's data base. These tables tell the computer where a particular EDI segment/element goes in relation to the application's data base. For an incoming X12 purchase order, for example, the map sees the "850" in the ST segment and knows that this is a purchase order. The system calls up the purchase order map. When it sees the begin (BEG) segment, it loads the purchase order sales header. When the system sees the PO1 segment, it loads the line-item record because that is the type of data the PO1 segment contains, etc.

Mapping often involves the following procedures:

- Separate EDI files from non-EDI files. For example, an application may generate purchase orders for trading partners that are not EDI users. The mapper, using tables, must segregate POs for EDI use and those headed for paper.

- Maintain trading partner profiles. Almost every trading partner will use a standard EDI message type differently. Each trading partner will require the use of some data elements and not others. A profile is a table assigned to each trading partner. A profile indicates which data elements of which transaction sets/messages it uses.

- Reformat data. This includes changing the position of certain data elements. For example, the application may hold the customer name in the fifth field of a purchase order record, but the translator requires it in the third field. It includes changing the length of alphanumeric fields, truncating or expanding fields to fit the standard. It requires converting numeric data, adding zeroes, placing decimal points, etc. It requires reformatting dates.

- Convert data values. An important function of mapping is the conversion of data values. For example, one company's product coding scheme may differ from its trading partner's (one may use standard UPC codes, while its trading partner adheres to its own internal coding scheme). Again, mapping tables perform the conversion between the two schemes.

- Accommodate fixed- and variable-length records. Data maps must be able to place data elements that repeat themselves in a variable-length record. Line items in a purchase order are a typical example of repeating fields that vary the purchase order record length.

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3. Application Software/Program Interfaces

More and more application software vendors are building EDI hooks into their products. The products—such as accounts payable or manufacturing resource planning software—receive and generate EDI transactions directly in the application. EDI management functions—such as unattended operation, custom reporting, automatic functional acknowledgment transmission, archiving/logging of messages, and holding files for rejected data—are built in. In many cases, application software is built only with interfaces to specific translation software packages.

Exhibit VI-3 is a partial list of applications, vendors, and targeted translation software.

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EXHIBIT VI-3

Application Software with EDI Hooks

Application Vendor	Application	Targeted EDI Translation Software Package
SAP America Inc. (Lester, PA) Subsidiary of SAP International (Biel, Switzerland)	The R/2 System • Production Planning & Control • Materials Management • Plant Maintenance • Sales Order Entry, Shipping, Invoicing • Financial Accounting • Fixed Assets Accounting • Human Resources Management & Payroll • Cost, Order, & Product Accounting • Project Management	SAP - EDI
American Software (Atlanta, GA)	Order Entry	Translator Sterling Software
Dun & Bradstreet Software Services	MRPII Software	Gentran Sterling Software
ASK Computer Systems (Mountain View, CA)	Manufacturing Software	DEC/EDI (Digital Equipment Corp.)
CINCOM Systems Inc.	CONTROL (Manufacturing Software)	DEC/EDI (Digital Equipment Corp.)
Distribution Architects Inc.	ENLOG (Logistics)	DEC/EDI (Digital Equipment Corp.)
Dun & Bradstreet Software	P.O.: Millenium (Purchasing)	DEC/EDI (Digital Equipment Corp.)
GSI Transcomm	TOLAS (Distribution & Financial Mgmt)	DEC/EDI (Digital Equipment Corp.)
Ross Systems	Purchasing and Sales	DEC/EDI (Digital Equipment Corp.)
IBM	MAPICJ, COPICS	Data Interchange (IBM)

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4. EDI Gateway/Servers

A recent development in the evolution of EDI is the appearance of the EDI gateway/server. The design is to place EDI translation software on a network so that more than one application can access it from remote CPUs. The gateway would also include telecommunications software that connects the company's internal network with the outside world—either by direct connections to trading partners or connections to a third-party value-added network.

An EDI gateway/server eliminates duplicating translation software functionality when a company has many departments or applications that use EDI (purchasing, order entry, shipping, accounting, etc.), or when a multidivisional company has many divisions using EDI. A single EDI translation software package serves all needs. Furthermore, the maintenance of the software is centralized, which is efficient, particularly in upgrading standards versions and maintaining trading-partner profiles.

Vendors of gateway/server EDI software offer such software as a part of a larger messaging server platform. This platform is aimed at large companies with a variety of different computing environments that need to exchange information. The platform acts as a bridge between different applications, environments, and the outside world. The platforms handle EDI transmissions, intra- and intercorporate E-mail, RJE, CICS, and other network data communications.

Exhibit VI-4 lists vendors of gateway/servers that support EDI transmissions.

EXHIBIT VI-4

EDI Gateway/Servers

Vendor	Product Name	Hardware
Mpact EDI Systems	Message Way	Tandem
Sterling Software	Gentran	IBM
SoftSwitch	X.400	PC-M/F
Digital Equipment Corp.	DEC/EDI	DEC

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B

Messaging Systems and Environments

Since the mid-eighties, network solution products—called environments—have emerged to tie together applications, workers, and work groups within companies, as seen in Exhibit VI-5. One of the purposes of this all encompassing environment architecture is to give a common user interface to disparate applications accessible through a network.

EXHIBIT VI-5

Office Environment Software

Environment	Vendor
NewWave	Hewlett-Packard
Office Vision	IBM
All-in-One	Digital Equipment Corp.
Rhapsody	AT&T
FreeForm	WANG

EDI plays a twofold role in regard to environments. EDI can be seen as one more application to be made available to the network environment. EDI translation software and application software send messages to one another through the office environment. Alternatively, EDI can be part of the technology that enables the construction of a homogeneous network environment. Disparate applications communicate with each other using EDI and other OSI standards. This section examines the relationship between various networking systems and EDI.

1. Compound/Active Document Systems

Although compound/active documents are currently aimed at the corporate publishing market because they facilitate communication among various groups of people who share a common objective, these documents are akin to EDI. Furthermore, the object orientation of compound documents (having explicit data structures—for example, for documents, graphic elements, page number elements, etc.) is similar in utility to the structuring of EDI documents.

Active documents are documents programmed to act in response to a wide variety of inputs and events. They are aware of their contents, the contents of other files, and of environmental variables. They can evaluate data and act upon data, using their own software functionality or

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interacting with and executing external applications. For example, a weekly executive report could automatically assemble itself from dozens of electronic sources inside and outside the company. The report collects notes from salespeople, retrieves financial data from news wires, and even edits irrelevant data.

The following are examples of active documents that help speed the process of accessing, presenting, and distributing information:

- An illustrated parts catalog that builds an order form based on which items you click your mouse on, and then electronically submits your order
- A contract that lists on-screen everyone who has viewed it or modified it
- A document created from a data base that updates that data base if one makes changes in the imported document
- An expense form with live math that automatically inserts its total into a separate annual tally; the entries in the annual tally are automatically linked back to their original expense reports
- A document that, when completed, electronically mail itself and automatically takes itself through the review process

EDI is identical to active documents in that it is the automatic creation of documents triggered by certain events (the absence of inventory, the attainment of a sales threshold for a certain merchandise item, an outgoing shipment, a received shipment, etc.). It is the transmission of data, triggered by events, that results in the updating of data bases located in many locations of many organizations. For example, as cargo is moved internationally, the transactions that it undergoes—shipper handoff to carrier, to intermodal carrier, to customs, to warehouse operator, etc.—triggers numerous data dispatches/documents to and from several data bases. From this standpoint, EDI is the creation of an interorganizational active document system. Active document software and EDI software share form (object-oriented, machine-processable data structures) and function (to share information across groups of people; to have events update distributed data bases).

Just as EDI is based on standards (so that data/messages can be sent to/over disparate systems), compound document architecture has been standardized to facilitate interoperability in heterogeneous computing environments. Two standards, specifying the digital representation of documents, have been promulgated: the Office Document Architecture (ODA) and the Standard Graphic Markup Language (SGML). Since compound documents are already structured, it would not be difficult to

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write interface programs that extract data from a compound document and deliver it to EDI translation software for conversion into a standard EDI document. For example, from an internal requisition document that is in a compound-document format, merchandise line item, quantity, vendor name, and address, etc., could easily be recognized and translated into a standard EDI purchase order.

Vendors of active/compound document systems include: Interleaf Inc. (Cambridge, MA), Frame Technology (San Jose, CA), Xerox Corp. (Rochester, NY), and Aldus Corp. (Seattle, WA).

2. Groupware

Groupware is messaging software with data base capabilities—often using structured messages—that runs on a local-area network. Groupware may be an effective catalyst for successful integration of EDI into a company's applications (as well as integration of other non-EDI related applications within a company). Groupware software is imposing structure on electronic mail. Messages are categorized according to a specific application's needs and/or have categories built into them so that users fill in fields with specific text and numerics. Building EDI readiness into the E-mail/groupware network of a company makes sense because it is conversations among employees that give rise to requisitions, billings, ship notices, and other message types.

Groupware/structured E-mail products either work on a data base model or use store-and-forwarding of messages (or both), all of which fit EDI architecture. Groupware, like EDI, is a good vehicle for enabling different applications to work together (cooperative processing) and may prove to be effective in integrating applications with EDI translation software.

a. Lotus Development Corporation: Notes

Lotus Notes is a text document data base manager. It is a software package that allows users to store text documents according to categories that the user defines. Documents can be retrieved according to the categories/key words. Notes is more than just a searching capability built into a word processor. When a user places a given document under a certain category, Notes places a data field in that document with the given category name. In fact, the document is segmented into user-defined data fields so that certain portions of the document are key words.

Notes is an ideal vehicle for creating forms. Price Waterhouse (PW) is making a bill preparation application based on Notes. The application will allow a PW consultant to call up an invoice on his/her terminal, fill it out, then pass it to his/her manager for approval. The manager can then

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send it on to accounting, where it cycles through additional desks. All the stages that the bill has to go through internally are built into the application. The form has signature/approval data fields built into it. At each stage, the appropriate manager signs or adds further information to the document. Any person involved in the process can call up the Notes data base to check on the status of a particular document. The application will initially be used just internally in PW, but PW is considering the commercial potential and possibilities to interface with EDI software.

Notes may be an ideal match for interfacing with EDI. Notes has application program interfaces. Programs written in C or COBOL, for example, can talk with Notes (exchange data). Thus, a company could have a forms system built on Notes that generates requisitions or purchase orders. The purchase order document (once all levels of approval and/or engineering/manufacturing has signed off) can be dumped into the EDI translator. The translator puts the data into standardized data formats, dials up the network (or trading partner), and off goes the PO to the trading partner's order-entry application.

In addition to interfacing with EDI translation software packages, Notes can also interface with a company's mainframe data base. Notes can go in and extract information from the data base and feed it back to the end user in a form that is useful to the user. Again, the beauty of Notes is that it allows the end-user to customize how he or she wants information to appear.

Notes is not merely an E-mail system. In fact, it is really a distributed text data base that, additionally, allows users to pass messages back and forth. It provides structured document storage in a distributed fashion. Notes supports compound documents so that scanned images and graphs and charts can be part of the stored documents.

Price Waterhouse sees Notes as solving many of the challenges inherent to the professional service business. Professional service businesses often involve the storing and retrieving of a great amount of textual information: client proposals, in-house opinion letters, résumés, client correspondence, tax and related law codes, and information out of Congress. The nature of PW's business requires people with the expertise to encode in text form. A user-programmable, structured data base for text documents is exactly what is needed.

b. Action Technologies Inc.: The Coordinator

Another popular groupware product is The Coordinator by Action Technologies Inc. of Alameda, CA. Rather than providing data base support for structured text documents, The Coordinator creates an E-mail/messaging environment where all point-to-point communications are classified according to conversational function. A message from one

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person to another is either a request, an offer, a decline, a delegation—one of a finite set of 12 possible conversational "moves." Classifying messages like this is useful because it allows users to monitor the status of a workflow (for example, the processing of a customer order or a material requisition), track commitments, and monitor project requirements such as staff, hours, and other resources. Also, in the course of the group communication that accomplishes the workflow, each user is prompted as to what he/she should do next in the flow. Each user can quickly call up the status of all of her/his conversations to get an idea of how many pending tasks he/she is involved in and must help to complete.

Action Technologies, and its sister systems integration company Business Design Associates, is designing applications using this taxonomy of conversational moves. Person-to-person or person-to-machine interactions can be modeled around request, offer, counteroffer, etc. Marriott Corp. and Frito-Lay are two major corporations that use The Coordinator.

The Coordinator is based on a message-switching software unit from ATI called MHS. Novell uses it in its NetWare LAN system. MHS can also be bought directly from ATI. MHS is being incorporated into an EDI turnkey system for mortgage-backed securities being developed by Price Waterhouse.

3. Electronic Mail

Applications using text recognition, groupware, or compound documents can link EDI and E-mail. For example, the contents of an E-mail document could be identified, extracted, and placed in an EDI message—and vice versa.

Different from this kind of E-mail/EDI relationship, however, are the similarities that both media share. Electronic mail and EDI are both messaging technologies. Technically, since they are discrete packets of bits, they are transported over digital networks using similar means (protocols that link store-and-forward devices). The push today is to standardize the means by which EDI documents, E-mail documents, and other digital documents (files from applications, fax transmissions, and digital voice and video recordings) move over networks. Standardization consists of designing a generic "envelope" into which all the various document types can be inserted. The envelope contains addresses (of receiver and sender), urgency, whether copies need to be made, security functions, and other delivery specifications. With such a standard envelope, hardware and software equipment vendors build systems that understand the standard's specifications. Thus, using the standard envelope, a person can send a message to another person even though the message will travel over many intermediary networks. For example, the sender creates the message on a company E-mail network, which in turn

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passes it off to a public E-mail system, which passes it to the receiver's company's E-mail system. More than one public E-mail network may be necessary for international transmissions or even national transmissions where the country has multiple regional networks (such as the Bell Operating Companies of the U.S.). With a standard envelope, a message can be dropped into a hodgepodge of interconnected networks and be smoothly routed to its destination.

The standard to create such an all-purpose envelope is called X.400. It is designed by the Consultative Committee on International Telephony and Telegraphy (CCITT), an arm of the International Telecommunications Union, which is a treaty organization under the United Nations.

Already, a number of products are available from software and hardware vendors that wrap messages in this standard envelope and create interconnections among networks. These vendors include SoftSwitch, Retix, Tandem, Mpact EDI Systems, Stratus, EDI Solutions, and Sterling Software (Ordernet). Large Fortune 500 companies are implementing these network gateways so that their internal mail systems are connected to systems outside of the company. EDI messages are intended to go through these gateways. Texas Instruments, using the outside network of MCI, sends EDI and E-mail messages using the X.400 envelope to trading partners outside of the company.

Work is underway to accommodate X12 EDI messages (which contain much of the addressing information of the X.400 standard) within the X.400 standard. A special protocol, P-EDI, has been devised. This allows an X.400 envelope to reference data already found in the X12 address segments.

4. Facsimile

Facsimile is often seen by devout EDI users and vendors as anathema to EDI. Use of facsimile often sidetracks companies from developing truly integrated EDI systems. Nevertheless, facsimile is a well-entrenched way of business communication. Facsimile machines are ubiquitous throughout the world. Forward-looking EDI service vendors are making EDI networks accessible via this huge existing fax infrastructure.

a. EDI-to-Facsimile Conversion

A number of EDI network providers offer this conversion service. It is typically used by large EDI hub companies that want to communicate electronically with all suppliers. For suppliers that do not have EDI software, the hub company can send EDI documents to the third-party network provider, where they are converted to facsimile format and forwarded to the supplier. For EDI messages returning to the hub company, some third-party providers offer a fax-to-EDI manual input service. Facsimiles are received from the supplier company and clerks key the data into an EDI message format and send it.

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b. Facsimile-to-EDI Conversion

Facsimile-to-EDI conversion is completely different and much more technically difficult than EDI-to-facsimile conversion. Automatic fax-to-EDI conversion requires character recognition software that converts the bit-mapped images of a facsimile document to ASCII characters that are readable by computers. Furthermore, the software must be able to distinguish appropriate EDI data fields and document types from the recognized clusters of characters.

TRW Financial Systems (Berkeley, CA) has developed a prototype fax-to-EDI system for the Shared Project on EDI (SPEDI), the joint venture between the Hong Kong government and the Tradelink value-added network. Facsimile users transmit facsimiles of paper export licenses, certificates of origin, cargo manifests, etc., and the system creates X12 or EDIFACT-formatted EDI messages. TRW has pioneered other commercial image processing systems including those for MasterCard International, American Express, bank check processing centers, and credit card processing centers.

C Automatic Identification

Automatic identification includes bar code scanning, optical character recognition, radio frequency identification, magnetic stripe capture, voice data entry, machine vision, and smart cards.

1. Bar Codes

Bar codes identify items, locations, individuals, and work steps. They represent a machine-processable language (symbology) for reporting transactions, process activities, or status via a data collection network to a host computer. Bar code identification of a thing, person, etc. is done in three possible ways: numeric, classification, or alphanumeric. Exhibit VI-6 lists the various kinds of bar code languages (symbologies) used throughout the world. The Federation of Automated Coding Technologies (FACT) is working to standardize bar codes throughout the world.

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EXHIBIT VI-6

Bar Code Languages around the World

Application	USA and Canada	Pacific Rim	Europe	Middle East
Manufacturing	C39	C39	C39	C39
Retail/POS	UPC	UPC	EAN	UPC
Retail/Dist.	I2 of I5	C39	EAN	C39
Libraries	Codabar	C39	Codabar	C39
Health Care	UPC	UPC	EAN	UPC
Blood Centers	Codabar	Codabar	Codabar	C39
Transportation	C39	C39	C39	C39

This chart illustrates the use of a primary bar code language (symbologies) in various geographical areas by application.

a. Bar Codes in Transportation

Bar coding and EDI are a natural fit and are being used in conjunction with each other throughout many industries. A prominent application is in transportation. A supplier will tag product items and shipping containers with bar codes. Once a shipment has been assembled, the supplier scans the bar codes to create a bill of lading. The bill of lading information is then transmitted to the customer in a EDI ship notice format (X12 856 transaction set) that notifies the customer of the material actually shipped and the date and time of shipment. When the shipment is received, the shipping containers are scanned again, and that data is compared to the EDI ship notice. Exceptions can be noted immediately and accounts payable can issue payment accordingly.

The carrier of the shipment uses bar codes to provide location/status reports to the shipper/consignee. The carrier uses the bar codes that the supplier had placed on the shipment or attaches its own. With these codes in place, the carrier can track the shipment as it moves through various consolidation points and relay the information to the shipper/consignee.

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b. Bar Codes as an Information Integration Tool

Pillowtex Corporation (Dallas, TX), the largest American manufacturer of bed pillows, mattress pads, and down comforters, uses bar codes to track material through every stage of the manufacturing process—from receiving raw materials, picking them from inventory, and then on to shipping the finished product to the customer. The cycle begins when Pillowtex receives an order from a retailer. Over 50% come in via EDI. When manufacturing workers remove raw materials from inventory, the materials (which have either been bar coded by Pillowtex' suppliers or Pillowtex warehouse clerks) are scanned to update the inventory file. The file is tied into Pillowtex' procurement-purchasing system. Manufacturing assembles the merchandise for the order. Each piece of finished product has a bar code sewn into it. By scanning these product codes and placing them in bar-coded shipping containers that are also scanned, shipping clerks can quickly verify if the shipment matches the customer order. A ship notice, based on the scannings, is created and dispatched via EDI. Retailers receive the merchandise and, using the bar codes that Pillowtex installed, update their own warehousing and inventory systems. When the merchandise is finally purchased by the consumer, the point-of-sale cash register scans the bar code and creates an invoice for the customer and updates the store's inventory file.

c. Key Data: Inventory and Sales Activity

EDI and bar codes work together in many areas. Bar-coded specifications and product lists can help fill in data fields of EDI transaction sets. But the most direct overlap of EDI and bar code technology is in the conveyance of sales and inventory data from one trading partner to another. In the retail-apparel-textile trading community, the Voluntary Interindustry Communication Standard committee has developed EDI transaction sets specifically designed to move sales and inventory data. These sets are needed in quick response environments.

Sales data, captured by point-of-sale cash registers in a retailer's outlet, is transmitted back to the relevant apparel manufacturer, which uses it to gauge product demand. The same manufacturer receives inventory data from its suppliers telling it how much raw material is on hand and can be ordered. Both sets of data are critical to the manufacturer's ability to supply market demand.

Point-of-sale (POS) data garnered at retail outlets is fueling a revolution in target marketing and frequent-buyer plans. Consumers make purchases using a card (e.g., credit card, smart card, or special ID card) that identifies their purchased basket of goods and provides a complete listing of the goods.

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Manufacturers buy this data to examine consumer purchasing habits and to send direct mail to the consumers. Manufacturers may even offer price discounts to consumers who continue to purchase their products. The discounts are enacted electronically. The next time the consumer presents his/her card at the point of sale to purchase the targeted good, the price is automatically marked down. Ensuring loyal consumers in this way, manufacturers are copying airlines by offering frequent *buyer* plans.

Grocery stores and food manufacturers are in the forefront of this technology. Citicorp, Dun & Bradstreet, Procter & Gamble Co., IBM, and National Cash Register are leading vendors. Citicorp is building a National Household Purchase Data Base covering 40 million households—half the homes in the U.S.—with information to be gathered from 12,000 retail stores.

2. Radio Transponders

Where bar codes are vulnerable to becoming dirty and unscannable, some companies are using radio transponders. Transponders are passive devices (they require no electrical power) that, when exposed to a radio wave, emit identification information similar in content to a bar code. Like bar code systems, transponders are being incorporated into EDI environments.

American President Companies, the Oakland, CA-based transportation giant, tags its shipping containers with transponders. Truck drivers hauling the containers in or out of dock yards stop beside a pole containing a receiver that reads the information. The transponder contains information on the container's identification number, gross weight, length, width, and height. Additionally, pickup trucks roam dock yards and keep tabs on yard inventory. All data is transmitted via radio to a workstation in the terminal administration building. The information gathered at the various APC yards around the world are then transmitted to the APC data center in San Mateo, CA. There, the data is used to keep track of APC's worldwide distribution of cargo and equipment. This same data drives APC's on-line customer cargo location service.

An inventory system that once took 24 hours per week to capture 80% of the information can now collect data instantaneously, with 100% accuracy. APC's system, called the Automatic Equipment Identification system, costs $1.8 million and involves principal contracts with Digital Equipment Corporation and Amtech Corp. (an electronic tagging firm based in Dallas, TX). APC is working toward standardizing a coding scheme for containers throughout the world.

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3. Smart Cards

Smart cards (credit-card-sized cards that have electronic memory of cardholder statistics) have not yet been used in an EDI context (they have yet to be used significantly in the U.S.). But as they facilitate commercial transactions for consumers, they are allied to with EDI. Data structures used in smart cards for detailing consumer background could make use of X12 or EDIFACT standards. Smart-card information that coincides with EDI information includes medical history (used in medical insurance claim EDI documents), financial status (in the EDI mortgage application transaction set), product codes, etc.

D

Data Capture

EDI is inherently a data-capture technology. With EDI, a company captures data from its trading partner rather than keying it by hand. The following are data capture technologies that support EDI.

1. Hand-Held Devices

Hand-held devices address a huge need by inventory clerks, shipping clerks, couriers, and delivery drivers who are ambulatory yet need an electronic interface to a data system.

Direct-store EDI in the grocery industry is increasingly using hand-held devices. Delivery drivers (for example, those of Frito-Lay) tote along a hand-held computer on which they itemize the items that they just stocked on the store's shelves. The computer, using UCS/EDI formats, downloads this information (an invoice) to the grocery store's computer.

2. Image Systems

EDI is not able to single-handedly eliminate paper from the exchanges between organizations. The varieties of documents plus the expediencies of using paper are wider in scope than the EDI application is suited for.

Imaging—scanning text and graphic documents to make bit-mapped electronic files—can handle many paper-based procedures that EDI misses.

Typically, an EDI user has paper and EDI processing systems running in parallel. Facsimile, mail, telephone, and other media-based transactions ultimately must be entered into the same systems that EDI messages interface with. Teknekron Transportation Systems (Berkeley, CA), a subsidiary of systems integrator Teknekron Corporation, offers an imaging system for the transportation industry. It uses scanning to help data entry clerks input data; it also allows EDI data to be fed into the system.

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Hard copy documents are scanned into the system. Data entry clerks sit in front of a split-screen monitor. On the top of the screen is the scanned image. On the bottom are empty data fields of the company's application(s). Clerks enter by hand the information on the screen. Although still requiring hand keying of data, the imaging improves clerical productivity by 30-50%, according to Teknekron.

TechLaw Systems (Chantilly, VA) makes a text imaging system that has an optical character recognition (OCR) capability built into it. In a two-pass process, paper documents are scanned into the system, creating a bit-mapped image file. OCR processing reads the bit map and produces a string of ASCII characters. Once in an ASCII format, the document (formerly on paper) can be coded, indexed, have full-text searches performed on it, etc. The Port of Los Angeles uses TechLaw's Intellex image processing system to store and distribute documents among the Port's offices and trading partners.

Northwest Airlines spent an estimated $50 million on an imaging system that captured and indexed ticket stubs of airline passengers. The stubs were matched to the flight reservation data base to calculate passenger revenues. (Often, passengers don't use their entire ticket, change flights, swap the ticket to fly with another airline, etc.)

Another important-image-processing technology relevant to EDI is in the area of facsimile-to-EDI conversions. This is explained in this chapter under "Facsimile" (Chapter VI, Section B, Article 4).

Combined EDI and image-processing systems will increasingly play a role in the electronic trading environments that develop in the 1990s. Bridges between the two technologies are critical.

Exhibit VI-7 is a partial list of vendors of imaging systems.

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EXHIBIT VI-7

Image Systems Vendors

TRW Financial Systems Inc.	Berkeley, CA
Litton Integrated Automation	Alameda, CA
Eastman Kodak	Rochester, NY
Image Business Systems	New York, NY
Sigma Imaging Systems	Anaheim, CA
Calera Recognition Systems	Santa Clara, CA
Recognition Equipment Inc.	Irving, TX
FileNet Corp.	Costa Mesa, CA

3. Intelligent Devices in Consumer and Industrial Products

The intelligent devices (namely, microprocessors) that are embedded in and control industrial and consumer machinery are, potentially, a great source of performance data that could be of use to manufacturers, service personnel, and equipment users. Formatting the data that these devices generate and/or monitor in standard EDI formats is the best solution for allowing such a variety of parties to access it. This has been proposed by the Automobile Industry Action Group (AIAG).

Otis Elevator Co. (Farmington, CT) is now equipping new elevators with microprocessors and telecommunication equipment to have "remote elevator monitoring" (REM). The microprocessor on board the elevator, which controls all the operations of the elevator, will also run the unit through a self-check periodically. If it encounters an irregularity, it calls out on a telephone line using an on-board modem. In the Otis service center in Farmington, an alert flashes on an operator's computer screen. It tells the identity and location of the elevator. The operator calls the local field office and informs people there. The on-board microprocessor records the events that led up to the system failure. Like the "black box" flight recorder on airplanes, the microprocessor helps the mechanics reconstruct what happened that made the elevator malfunction. Otis is upgrading the system by having the elevator contact the field office directly and to send the diagnostic information over the line, rather than have it accessible only at the elevator site.

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The Automobile Industry Action Group, the trade organization formed in the 1980s to coordinate EDI and other leading-edge technologies in the auto industry, has recommended using intelligent devices that are embedded in machinery to collect data.

In an average car there are $300 worth of computer devices that control braking and traction, shift transmissions, adjust suspensions, or boost fuel economy. Airplanes are almost entirely electronic systems that are then housed in aerodynamic skins to allow them to fly. Refrigerators, microwave ovens, and all kinds of consumer durable and electronic products contain many intelligent devices that control function.

With the addition of data storage capabilities, these products could log data on product usage. Later, this data could be transmitted back to manufacturers for analysis. Such analysis could help improve future product design. For example, if an automaker is designing a new model of an existing car, it is important for it to know that owners of the existing model use the vehicle primarily in stop-and-go city driving, use their air conditioning all the time, and that they typically use their brake systems very aggressively.

Placing this usage data in standard EDI data formats should be a consideration. Parties other than the manufacturer that would be interested in this data include service companies, component/subassembly manufacturers, marketers of complementary products, government regulatory agencies, U.S. Customs, etc.

4. Natural Language Processing

With explicit semantic structures built into its messages before transmission, EDI is the opposite of natural language processing, where freely spoken or written text is, after transmission, processed into explicit, identifiable meanings. EDI places the burden of explicit articulation of the message at the front end of message creation, whereas natural language processing places the burden at the back end. EDI is a coding scheme that is closed at any given time, composed of a finite set of language components. Natural language processing is open ended, and accommodates any possible text. The two technologies have a lot in common in that they both attempt to make messages actionable by machines.

a. Machine Translation

EDI and natural language processing have an immediate joint application in the area of language translation. Particularly in applications of international EDI, the translation of the contents of an EDI message is useful. As the percentage of commerce that is conducted internationally increases, a purchase order in English, for example, is increasingly likely to

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be translated into a purchase order in Spanish or Thai. Machine translation of EDI documents is significantly easier than translation of free text. EDI message text is structured (so that software knows, for example, that a certain data element contains a product description code), and the vocabulary is limited (product description codes are finite in number and published in a standards specification). Translation is merely a matter of constructing look-up tables. The Tradelink EDI project in Hong Kong is developing EDI services and software that translate EDI messages to and from Chinese and English.

b. Voice Processing

Voice-processing technology is being applied in inventory and yard management applications. With a microphone plugged into a wearable voice-recognition computer, clerks can conduct inventory with both hands free. The systems have a limited vocabulary (a couple hundred words) that include part names and numbers. The clerk takes inventory by counting items and speaking into the system. The system automatically updates a data base. Such voice recognition can be incorporated into EDI systems in the same manner that hand-held data capture devices are.

c. Handwriting Recognition

Like hand-held data capture devices, handwriting recognition systems are facilitating data collection by personnel responsible for warehouse, inventory, and yard management functions. The manager/clerk is equipped with an electronic writing tablet with electronic stylus. The person fills in a form/template by writing as he/she normally would write with a pen or pencil. The electronic tablet converts the script into ASCII (computer processable) characters and updates the associated data base. Handwriting systems could tie directly into inventory or cargo-tracking data bases that use EDI.

d. Text Processing

Text-processing systems are software systems that read a string of digitally encoded text and perform sorting-routing functions. The procedure is good for extracting items from a text string and downloading certain words and symbols into a structured record file. Banks have implemented funds transfer telex processing. Telex money wires are read by machines and converted into electronic files.

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E. Conclusion

EDI is a communications application that, to be best utilized, must be integrated with the information/communication systems of an organization. This requires interfacing EDI technology with a plethora of other information technologies. This chapter dealt one-on-one with those information technologies that are most closely connected with the communication requirements allied to EDI.

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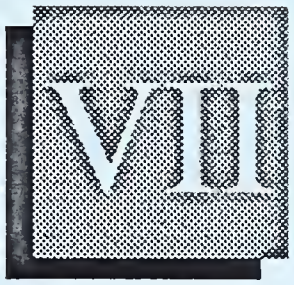
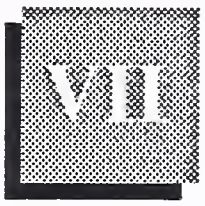


Conclusions, Recommendations, and the Future



Conclusions, Recommendations, and the Future

Implementing EDI has an impact that goes beyond the single organization. The implications for industrial reorganization due to EDI are so far-reaching that to date very few are understood and, consequently, implementation efforts are slow and sometimes misguided. This report is one effort to provide the analytical framework that will help organizations individually and collectively build value chains largely activated by electronic data interchange.

A

Conclusions

Exhibit VII-1 summarizes this report's conclusions.

- EDI integration involves user and vendor participation in transcorporate groups (standards bodies, user groups, industry trade groups, and clusters of trading partners).

- EDI is applicable to intercompany and interdivisional transactions that occur frequently and whose terms are unambiguous and subject to precise codification. Other communication media (phones, faxes, E-mail, post, etc.) will continue to be viable modes for transmitting business transaction data and will exist alongside and in conjunction with EDI systems.

- EDI generates unforeseeable business opportunities (such as selling of point-of-sale data). The competitive environment will continue to evolve in wave after wave of creative destruction and construction.

- EDI helps firms accomplish existing workflows more efficiently than in previous paper-based mechanisms—a tactical aid. EDI also helps firms reorganize workflows and company structures—a strategic aid. EDI impacts organizations tactically and strategically. Its integration into the activities of the organization must take this into account. Therefore, EDI integration requires the leadership of top management.

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EXHIBIT VII-1

Conclusions

- EDI requires the participation of users and vendors in transcorporate groups.
- EDI is applicable to recurrent, unambiguous, interorganizational exchanges.
- EDI generates unforeseeable business opportunities.
- EDI requires the leadership of top management.
- EDI restructures value chains.
- New management/economic frameworks are required to understand the full impact of EDI-related restructuring.
- EDI shifts labor demands away from clerical, toward technical.
- EDI requires a utility-type infrastructure.
- Early EDI adopters finance the infrastructure that late adopters will use without paying for.
- The move toward flexible, non-mass production will not inhibit EDI growth.

- EDI has the potential to restructure value chains, and often eliminates intermediaries between customers and suppliers. EDI lays the groundwork for adding new information and offering other services to customers. The redefinition of value chains includes changing the relative economic values of activities and assets in the value chain. For the same reason that opportunities for enhanced and new product offerings and services are generated, so are competitive threats by other companies entering a company's traditional market.
- Because the impact on company as well as industrial organization is potentially so large, designing and implementing EDI requires the use of new frameworks for analyzing and assessing work. Workflow analysis and activity-based accounting represent two good directions in this vein.

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- Implementing and maintaining an EDI capability shifts labor demands away from many low-skilled clerical workers to a few high-skilled systems programming workers and managers. Also, EDI requires the sending of high-skilled workers to standards organizations, educational seminars, trading partner conferences, trade shows, and trade-group functions.

- Building EDI is building a utility-like infrastructure: the more EDI-capable companies there are, the more effective each company becomes. Similar to the telephone, one EDI system by itself is worthless: its value increases with each new EDI user that comes onto the network.

- Because EDI is a utility infrastructure, the financing of EDI is problematic. Early adopters of EDI finance the establishment of an EDI infrastructure that late adopters will use without paying for. Typically, companies do not equitably share the costs of EDI in proportion to the benefits that they gain. Some companies have paid more for the value that they have gained; others have paid less. INPUT expects this situation to continue up to 1995. Thereafter, EDI will be much more common and familiar, and the initial financing era will have ended. Some companies, such as Sears, finance their trading partners; others, such as Mervyn's, have their trading partners pick up the expense. It is impossible to clearly quantify the benefits of EDI as a function of EDI's costs.

- EDI is a critical component in a massive integration of the economy by electronic communication technology. It is the codification and embodiment of those recurrent, unambiguous transactions within value chains into mechanical hardware/software systems. The transactions that EDI is designed for typically occur among companies, but they certainly can occur within a single company (among divisions, for example). EDI can (and there are plenty of examples) be implemented simply within companies.

- The move toward flexible, non-mass production (where individual orders are custom-specified by consumers) will not inhibit the growth of EDI, but will be facilitated by it.

B

Recommendations

1. Users

EDI integration is not building something out of nothing (from scratch) it is an extension—the next logical progression—of the evolution of business practices, forms, nomenclature, and taxonomies. It is the embodiment of the business heritage into electronic systems. As such, EDI integration requires the following:

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- A technical expertise in building and programming electronic systems
- A collaborative effort of many different people—trading partners, other EDI users who are not trading partners, and the work of others in the past that further EDI development is built upon
- Company managers and technicians to go outside of the company to work with others
- Managers to view their company in terms larger than their own company—a view that sees the company in its value chain and how it can embody commercial distinctions developed in the past to better its competitive position
- Systems integration in the broadest sense
- A comprehensive understanding of business nomenclature and how it can be used for commercial exchange

a. All EDI Users

INPUT offers the following specific recommendations:

- Look for ways to cut out intermediaries when dealing with customers and suppliers
- Use workflow analysis to design EDI capabilities. Apply the analysis to workflows both internal to the company and between the company and its trading partners.
- Have all functional departments of the company discuss EDI together. Reexamine the organization and look for departments and functions that can be eliminated by the improved communication that EDI offers.
- Look for ways that competitors who use EDI can threaten the company's market.
- Explore with departments within the company, as well as with trading partners, new kinds of business opportunities that could be gained with EDI. Additional information services to customers may include JIT deliveries, information data base services, or clearinghouse operations (such as Petrodex or Transnet—see INPUT's report *The Electronic Data Interchange Market, 1990-1995*).
- Provide a means for gathering more meaningful and accurate cost and performance measurements on the operations of the firm. Develop better cost-accounting systems that make use of electronic systems, including EDI. Make EDI capability a direct component of the company's accounting system.

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- Allocate time to work with customers and suppliers in specifying, designing, testing, operating, and maintaining EDI and related communication systems. Developing open and solid communication lines with trading partners is critical to making EDI work. Work together to build a more integrated value chain.

- Choose applications and trading partners for EDI with the highest payback initially. For example, implement EDI purchase orders with the highest dollar volume trading partners, ship notices with the highest volume of units sent, and invoices with those responsible for the highest document volume.

- Assign EDI responsibility to specific personnel.

- Get involved in standards design groups and user groups. Send EDI managers and technical people to attend standards meetings, industry trade groups, and local user group meetings, and to talk extensively with trading partners. Because EDI is a trans-organizational application, collaboration with diverse interest groups makes for a robust EDI infrastructure.

b. Public Sector Users

EDI contains the possibility of greatly reducing the bureaucratic, procedural, rote processing tasks associated with government and public administration.

In addition to the conventional use of EDI for procurement and transportation, government will use EDI in a variety of innovative ways, including the following:

- EDI will provide government and advisory bodies with statistics for the monitoring and regulation of the economy. For example, Eurostat, the Statistical Office of the European Communities based in Geneva, is turning to EDI to help it gather statistical data to see if countries and companies comply with European Common Market rules after the unification in 1992. With the elimination of internal borders, control of products imported from outside the common market may be difficult. The harmonization of value-added taxes can be accomplished through EDI.

- A plethora of trade statistics can be garnered from EDI transaction data. Such statistics can give policy makers much more precision in analysis and prescription for action. Economic indicators that can be dervied from EDI transactions include those on money supply, price levels, and import-export balances.

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- The promulgation/dissemination of government regulations may occur via EDI. Likewise, in the reverse direction, corporate tax filing and regulatory compliance reporting from the private sector to the government via EDI or EDI-like systems will continue to increase. EDI represents a potential for a vast reduction in bureaucratic procedure in government.

2. Vendor Recommendations (General)

- Show how EDI can open up new business opportunities to users.
- Support interoperability and provide open systems architectures.
- Target supply chains to sell products and services to.
- Keep in mind that whole value chains are being integrated.
- Develop products that integrate with adjacent technologies: application software, LAN servers, bar code software, imaging, etc.
- Offer consulting and systems integration services.

a. Recommendations for Network Service Providers

INPUT believes that third-party networks are the logical parties that can provide EDI-connected companies with various services that optimize the value chains in which these companies operate. Top among these services are:

- Transaction data bases that generate market statistics derived from EDI transaction traffic
- Trading partner profile data bases coupled with business brokering services. The trading partner profile data base helps link EDI-capable companies by providing network address data, listings of acceptable EDI transaction/message types, versions, network pick-up and delivery schedules, product code mappings, commercial code standards, etc.
- Systems integration services that include matching companies together in efficient value chains. Similar to the above, but with emphasis on technical systems integration of computer applications among companies
- UPC catalogs and similar product catalogs that can be accessed by a community of interested commercial parties to disseminate product-related data

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- Tariff/rate data bases, for the similar purpose of UPC catalogs, but for those service industries such as transportation, advertising/media, subscription agencies, and temporary-help agencies.

- Service record data bases that maintain the production and after-sale service records of industrial and consumer equipment. Examples include keeping track of repairs to heavy equipment or industrial plant installations.

- Processing services, particularly in the areas of accounts receivable/payables and inventory modelling/replenishment. Networks, given the kind of data that they are already moving, are in the position to optimize product and funds movements among companies.

- The provision of "macro" accounting information that lets manufacturers know what the true costs of various distribution channels are. The network can add cost accumulations and value additions across a series of intermediaries in a value chain. Providing value-chainwide accounting services across the value chain would help each particular intermediary determine competitive possibilities.

- Processing services that have traditionally been performed by niche players, such as magazine subscription agenting, freight bill processing, factoring, company credit appraisal, insurance claims processing, etc.

- Providing commercial trade data generated by EDI traffic. Similar to the transaction data bases, this service would be open to any purchaser (regardless of whether it contributed to the trade data). Such a service would be similar to the information services of Dun & Bradstreet, Dow Jones, or Mead Data Central.

- The provision of economic-indicator data to governments. EDI-based trade in the future will be a major source for determining inventory levels, price movements on consumer and industrial goods, whether certain countries are complying with trade bloc pricing rules (in a European context), etc.

- Clearinghouse services for the dissemination of sales data of final consumer purchases to upstream suppliers (as is happening in the retail-apparel-textile trading community) and the complementary dissemination of inventory data in the reverse direction. VANs could provide additional processing services on this data that would help the intermediary points in a given value chain optimize their production.

- Trade opportunity bulletin boards that list items wanted and for sale, and the respective parties to contact

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- Barter services, especially among companies in countries that have currency and/or trade restrictions. Network providers could help enact commercial trade that equated goods shipped to one party in terms of goods owed to another party, facilitate triangle deals where a company in Germany sells to a company in the Soviet Union and the Soviet Union provides another country goods, or assist in the clearing of buy backs—government-ordered domestic purchases that foreign corporations are often obligated to make.

- Business analysis and economic planning services to companies in the areas of procurement, selection of sales channels, financial planning, and cash management

- Other communication-related services (facsimile, E-mail, private data networks, and telephone) so that companies can have one-stop shopping for all telecommunication needs

In addition to the above service offering recommendations, VANs are also recommended to run their companies like a utility. Optimizing computing resource needs through effective price schedules is crucial to generating revenues. Once customers are signed on to a network, the network has a captive revenue base. Revenues are a numbers game: prices per unit of service may be insignificant but, multiplied over thousands of transmissions and over months and months, they add up.

b. Professional Service Firm Recommendations

- Offer systems integration services for designing organizations.

- Develop expertise in specific functional areas and their associated information technologies. Functional areas include purchasing, accounting, logistics, manufacturing, MIS, and treasury management. Technologies include imaging, bar coding, and work group network systems.

- Make marketing alliances with application software companies so that one company's integration services are bundled with another's software when an EDI application is requested.

- Acquire expertise in broad vertical markets, such as transportation, finance, distribution, etc. Sell this expertise in multiclient deals where the company provides systems integration to whole trading communities. Port community projects (that integrate Customs agencies, freight forwarders, customs brokers, ship lines, truckers, warehouse contractors, and terminal operators) are examples. Other communities ripe for this kind of EDI consulting are retail, construction, and entertainment/media.

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- Make marketing alliances with network providers.

- Be knowledgeable of new developments in accounting practices, procedures, and governmental regulations. Change is coming and will have radical impact on organizational design and the information systems that support organizations. EDI will play a role here. Become fluent in activity-based accounting principles.

c. EDI Software Vendor Recommendations

- Incorporate or provide interface capabilities to complementary EDI technologies in the company's product. Such products include bar coding software/systems, imaging systems, network servers, network architectures, etc.

- Focus on vertical markets to sell to. Develop products that optimize value chains.

- Software maintenance is a growing area of value-adding services. Offer services that help users expand EDI trading partners, and integrate existing applications. Maintaining a data base on customers (the standards versions that they use, the message types they use with partners, etc.) is an essential marketing and service tool.

- Consider the company's customer data base an asset. It should contain EDI profiles of customers: what version of software they have, versions and kinds of EDI transaction sets that they use, trading partners they deal with, etc. Creative use of the data base can lead to additional customer services and new products. Sell data from it to VANs and other service providers.

- Offer product features that facilitate integration and ease of use.

C

The Future

For a description of how the economy will be changed by EDI, the reader is referred to INPUT's study, *The Electronic Data Interchange Market 1990-1995*. The following is a brief description of how the structure of EDI itself may change in the future.

1. Universally Generic Communication Standards

Two seemingly opposing tendencies are at work today in regard to EDI data standards: the number of standards families are consolidating to two basic groups (ANSI X12 and EDIFACT), yet the number of actual transaction sets and message types are proliferating to accommodate ever-changing business communication typologies (witness the new standards for health claims, travel/tourism/leisure, or government statistics). Furthermore, some EDI users and vendors are calling for a redefi-

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nition of data needs of EDI transaction sets and the re-evaluation of the functionality of existing business transactions.

Some experienced EDI implementors are suggesting to limit the basic number of message types to a finite number (approximately 20 to 30), but allow modification to suit specific industry factors. Trade groups would be responsible for this modification.

In line with this suggestion is the recent discovery in linguistics that there are a finite number of message types inherent to human conversations for action. Conversations for action (as opposed to other kinds of conversations) are those that occur when humans work and are involved in exchange. EDI is communication of this type. The basic message types (sometimes called "conversational moves" or "speech acts") are requests, offers, and promises.

As mentioned in Chapter VI, Action Technologies Inc. has pioneered this finite set of linguistic moves in its groupware product, The Coordinator. Users of the system are kept informed on the kind of activity they are expected to take.

Generic EDI standards could be based on this "speech action" architecture. The basic message types could be kept to a manageable number while variations could multiply according to specific business needs. Nevertheless, standardization across industries would be maintained, as each message would be identified as one of the basic conversational moves.

2. Accounting Principles

As it eliminates certain activities and gives rise to new potential activities, EDI shifts the value of people and assets. Understanding and taking advantage of these shifts requires more precise, perhaps qualitatively different accounting practices from the mainstream practices of today. Furthermore, EDI enables new kinds of data collection to take place, thus facilitating improved accounting.

As elaborated already in Chapter V, activity-based accounting concepts are a new direction in cost accounting. INPUT recommends this new direction and encourages EDI users and vendors to develop EDI systems that work in conjunction with these concepts.

3. Uncertainty and Nonrationality

EDI, especially standards development, is inherently an attempt to anticipate the conditions for future commercial exchange. It is the building of an infrastructure that can enact, to a varying degree, recurrent commercial exchanges for specific products and services. The system is built now to

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take care of exchanges that will occur in the future. In order for the mechanization of these exchanges, all the possible conditions that may arise in some future trading scenario must be spelled out—from the specifications communicated in the EDI message to the legal terms and conditions agreed upon by the trading companies.

Predicting the future is impossible. And the development of EDI is no different. It might be nice to think the world is building a single, monolithic electronic environment that allows the automatic processing of commercial exchanges. But there are upper limits to how far one can anticipate the technical and commercial requirements of such a monolithic system. To paraphrase the Austrian economist Friedrich von Hayek, it is not by design but by action that economic value chains are organized and optimized.

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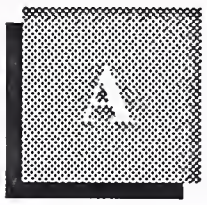
Appendixes



Appendix: Glossary of EDI Terms

ACCS—"Access," the Aluminum Customer Communication System.

ACH—Automated Clearinghouse, a banking industry mechanism for electronic funds transfer. *Also see* NACHA.

AIAG— The Automotive Industry Action Group, a trade association. Also refers to EDI formats developed by the association.

ANA—Article Numbering Association. The U.K. industry group that introduced bar coding to that country and developed the Tradcoms EDI standard.

ANSI—American National Standards Institute.

ASC— Accredited Standards Committee.

Bar Coding—A standardized product identification method that facilitates data entry through scanning of coded printed labels.

Batch Processing—A data processing/data communications method that groups transactions. *Compare to* Real-Time Processing.

CAD/CAM—Computer-Assisted Design and Computer-Assisted Manufacturing, a set of applications that use graphics to manage these functions.

CARDIS—Cargo Data Information System, a concept for trade documentation automation promoted by the National Council on International Trade Documentation. Never implemented in its proposed form, "CARDIS Element Systems" have been developed by several vendors serving the international trade community.

CCD— Cash Concentration and Dispursement, an electronic funds transfer format.

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CEFIC—The Brussels-based Council of European Chemical Manufacturers, which sponsors an EDI project.

CIDX—Chemical Industry Data Exchange, a standard based on X12.

CLM— Car Location Messages, applied to railcar logistics.

CLO—Computerized Loan Origination. An EDI application being developed by the mortgage banking industry.

Compliance Checking—A function that verifies that document information is received in the right order and in the proper format.

COMPORD—Computerized Ordering, an EDI system developed by the American Iron and Steel Institute.

COPAS—Council of Petroleum Accounting Standards, an industry association developing EDI standards.

CSI—Commercial Systems Integration. A professional service whereby vendors take complete responsibility for designing, planning, implementing, and sometimes managing a complex information system.

CTP—Corporate Trade Payments, an electronic funds transfer application.

CTX—An electronic funds transfer mechanism that is compatible with the EDI X12 standard, and which carries information about a payment as well as transferring value.

DISA—The Data Interchange Standards Association, the ANSI X12 secretariat.

DISH—Data Interchange for Shipping, a project sponsored by a European group of shippers, carriers, and agents.

EDI—Electronic Data Interchange. The computer-to-computer communications based on established business document standards, or using translations by EDI software housed on users' computers, located at remote computer service bureaus or on value-added network processors.

EDIA—The Electronic Data Interchange Association, formerly known as the Transportation Data Coordinating Council.

EDICT—Istel's U.K. EDI service.

EDIFACT—EDI for Administration, Commerce, and Transportation, the evolving international EDI standard.

EDX—Electronics Industry Data Exchange, based on the X12 standard.

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EFT—Electronic Funds Transfer, the transfer of monetary value.

Electronic Mail—The transmission of text, data, audio, or image messages between terminals using electronic communications channels.

Electronic Mailbox—A store-and-forward facility for messages maintained by a transmission or processing facility.

EMBARC—An EDI standard being promoted for use in the paper, printing, and publishing industries.

EMEA—Council for Mutual Economic Assistance, an Eastern European bloc EDI association.

FASLINC—The Fabric and Supplier Linkage Council, a textile industry association dedicted to EDI development and other industry needs.

GTDI—General Trade Data Interchange, an international standard, developed from TDI, accommodating compromises of French participants in SITPRO, the agency behind U.N. certification of the standard. Is evolving into EDIFACT.

HCFA—Health Care Financing Administration, a U.S. government agency responsible for Medicare administration. Also describes a format (HCFA 1500) for healthcare insurance claims.

ICOPS—The Industry Committee on Office Products Standards, sponsored by two office products trade associations, for EDI applications.

IGES—International Graphics Exchange Standard, by which CAD/CAM graphics can be transferred electronically.

IIR/ACORD—Standards for paper and electronic insurance documents, developed by the Insurance Institute for Research and the Agent Company for Research and Development organizations, which have merged.

Interface—The insurance industry term for EDI, applied to agent/company communications, ideally using IIR/ACORD formats.

IRC—International Record Carrier, a common carrier providing messaging and network services, no longer limited to international communications.

IVANS—Insurance Value-Added Service, provided on IBM's Information Network by an insurance industry association.

JEDI—The Joint Electronic Data Interchange Committee, which consisted of representatives of industry trade associations coordinating development of a reference EDI dictionary for the creation of new EDI transactions, segments, or data elements for international use. Its work has largely been supplanted by UNECE Working Party 4.

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JIT—Just-in-time, an inventory management philosophy that plans delivery of needed materials and components immediately prior to final manufacture or assembly.

LDI— Logistics Data Interchange, information about the location of materials in transit through the manufacturing/distribution cycle.

Mapping—The process of linking specific fields of internal document layouts to an EDI standard by segment, data element, and coded value. This needs to be done for each application receiving or sending EDI data.

NACHA—National Automated Clearing House Association, a banking services industry group.

ODETTE—Organization for Data Exchange through Teletransmission in Europe, an automaker's association EDI standard.

Ordernet—Sterling Software's EDI service. Also refers to EDI standards developed by the National Wholesale Druggist's Association for use in pharmaceuticals.

Rapporteur—Used to describe an expert appointed by the United National Economic Commission for Europe Working Party 4, the primary group developing the EDIFACT international EDI standards.

RCS—A Remote Computing Service facility that arranges to process some or all of a user's workload. Similar to a VAN (below) but without network services.

Real-Time Processing—A data processing or transmission method with data entered interactively. Response to input is fast enough to affect subsequent input. The results are used to influence a currently occuring process.

SAFLINC—The Sundries and Apparel Findings Linkage Council, an association in the apparel and related industries promoting EDI and other industry needs.

SAM—Shippers Administrative Messages, a logistics service/application.

Secretariat—The administrative organization providing business and coordination services for various EDI standards-creating and maintenance bodies.

SITPRO—Simplification of Information Trade Procedures, a European EDI standards and trade facilitation agency that reports to the Department of Trade and Industry.

SMMT—Society of Motor Manufacturers and Traders. An automotive industry association responsible for the ODETTE project.

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Store-and-Forward—The capability of a transmission or processing facility to hold messages or data until requested, or until a prescheduled time.

SUPER—Study for the Utility of Processing Electronic Returns, an Internal Revenue Service test for electronic filing.

SUPERB—The IRS' electronic filing test program for business returns.

TALC—Textile/Apparel Linkage Council, a subcommittee addressing EDI standards.

TAMCS—Textile/Apparel Manufacturers' Communications Standards.

TCIF—Telecommunications Industry Forum, an industry group involved in EDI, bar coding, and similar technologies.

TDCC—The Transportation Data Coordinating Committee, an early advocate for EDI, now known as the Electronic Data Interchange Association. Also refers to U.S. EDI standards.

TDI—Trade Data Interchange, an international shipping standard. *Also see* GTDI.

TEDIS—An EEC program to promote trade EDI throughout industry and government.

Tradanet—An ICL (U.K.) EDI service.

Translation—Transforming information sent in one format to another format.

UB82—A format for health claims insurance submissions.

UCS—Uniform Communications Standards, the EDI standards used by the grocery industry, based on X12, and coordinated by the Uniform Product Code Council.

UNECE—United Nations Economic Commission for Europe. Despite its name, a broadly-based representational body developing the international EDI standards called EDIFACT.

UNJEDI—United Nations Joint EDI committee developing technical and procedural standards on EDI.

VAN—Value-Added Network. A common carrier network transmission facility, usually augmented with computerized packetizing, which may also provide store-and-forward switching, terminal interfacing, error detection and correction, and host computer interfaces supporting various communications speeds, protocols, and processing requirements.

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VANGUARD—A U.K. Department of Trade and Industry-sponsored awareness and promotional program for VAN and EDI services.
VICS—Voluntary Interindustry Communications Standards, a committee developing EDI standards between retailers and manufacturers.

WINS—Warehouse Information Network Standards, promoted by two representational associations, the International Association of Refrigerated Warehouses, and the American Warehousemen's Association.

WP4—Working Party 4 of the Economic Commission for Europe, commissioned by the U.N. to develop trade facilitation procedures and international EDI standards.

X.400—An international electronic messaging standard.

X12—A set of generic EDI standards, approved by the American Standards Committee.

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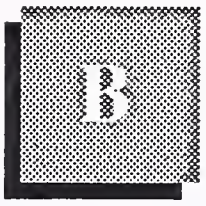

Appendix: EDI Transaction Sets/ Messages

ANSI X12 Transaction Sets

ID#	REF#	Title	Availability/Status
104	X12.100	Air Shipment Information	In Development
110	X12.101	Air Freight Details and Invoice	In Development
114	X12.102	Air Shipment Status Message	In Development
204	X12.103	Motor Carrier Shipment Information	In Development
210	X12.104	Motor Carrier Freight Details and Invoice	In Development
213	X12.105	Motor Carrier Shipment Status Inquiry	In Development
214	X12.106	Motor Carrier Shipment Status Message	In Development
217	X12.107	Motor Carrier Loading Route Guide	In Development
218	X12.108	Motor Carrier Tariff Information	In Development
300	X12.109	Functional Group Totals	In Development
301	X12.110	Reservation (Booking Request—Ocean)	In Development
303	X12.112	Confirmation—Ocean	In Development
304	X12.113	Shipping Instructions—Ocean	In Development
310	X12.118	Freight Details and Invoice—Ocean	In Development
312	X12.119	Arrival Notice—Ocean	In Development
313	X12.120	Shipment Status Inquiry—Ocean	In Development
315	X12.122	Status Details—Ocean	In Development
322	X12.127	Terminal Operations Activity—Ocean	In Development
323	X12.128	Vessel Schedule and Itinerary—Ocean	In Development
324	X12.129	Vessel Stow Plan—Ocean	In Development
361	X12.136	Carrier Interchange Agreement—Ocean	In Development
404	X12.138	Rail Carrier Shipment Information	In Development
410	X12.139	Rail Carrier Freight Details and Invoice	In Development
411	X12.140	Freight Details and Invoice Summary—Rail	In Development
417	X12.141	Rail Carrier Waybill Interchange	In Development
418	X12.142	Rail Advance Interchange Consist	In Development
419	X12.143	Advance Car Disposition	In Development
420	X12.144	Car Handling Information	In Development

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ID#	REF#	Title	Availability/Status
425	X12.149	Rail Waybill Request	In Development
426	X12.150	Rail Revenue Waybill Response	In Development
427	X12.151	Rail Waybill Response	In Development
429	X12.35	Railroad Retirement Activity	In Development
431	X12.65	Railroad Station Master	In Development
440	X12.152	Shipment Weights	In Development
499	X12.170	Application Acceptance/Rejection Advice	In Development
622	X12.173	Intermodal Ramp Activity	In Development
810	X12.2	Invoice	ANSI-86, Release 1-2-3-4
811	X12.39	Consolidated Service Invoice/Statement	In Development
812	X12.40	Credit/Debit Adjustment	In Ballot
813	X12.62	Electronic Filing of Tax Returns	In Development
814	X12.61	Residential Mortgage Loan Application	In Development
815	X12.42	Cryptographic Service Message	In Ballot
816	X12.66	Organization Relationship	In Development
817	X12.67	Electronic Routing and Acknowledgment	In Development
818			
819	X12.43	Operating Expense Statement	Release 3-4
820	X12.4	Payment Order/Remittance Advice	Release 1-2-3-4
821	X12.24	Financial Information Reporting	Release 4
822	X12.25	Customer Account Analysis	Release 3-4
823	X12.38	Lockbox	Release 2-3-4
824	X12.44	Application Advice	In Ballot Comment Resolution
825	X12.46	Payment Status Report	In Development
826	X12.19	Tax Information Reporting	In Ballot
827	X12.47	Financial Return Notice	In Subrelease 041
828	X12.45	Payment Status Inquiry	In Development
829	X12.48	Payment Cancellation Request	In Subrelease 041
830	X12.14	Planning Schedule with Release Capability	ANSI-86, Release 1-2-3-4
831	X12.49	Control Totals	In Ballot Comment Resolution
832	X12.13	Price Sales Catalog	ANSI-86, Release 1-2-3-4
833			
834			
835			
836	X12.54	Contract Award	In Ballot Comment Resolution
837			
838	X12.17	Trading Partner Profile	In Development
839	X12.31	Project Plan and Status Report	In Development
840	X12.7	Request for Quotation	ANSI-86, Release 1-2-3-4
841	X12.51	Specifications/Technical Information	In Reballot
842	X12.21	Nonconformance Report	In Development
843	X12.8-	Response to Request for Quotation	ANSI-86, Release 1-2-3-4
844	X12.26	Product Transfer Account Adjustment	Release 3-4
845	X12.27	Price Authorization Acknowledgment/Status	Release 3-4
846	X12.28	Inventory Inquiry/Advice	Release 1-2-3-4
847	X12.63	Material Disposition	In Development

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ID#	REF#	Title	Availability/Status
848	X12.36	Material Safety Data Sheet	In Development
849	X12.50	Response to Product Transfer Account Adjustment	Release 3-4
850	X12.1	Purchase Order	ANSI-86, Release 1-2-3-4
851			
852	X12.52	Product Activity Data	In Ballot
853	12.64	Routing and Carrier Instruction	In Development
854			
855	X12.9	P.O. Acknowledgment	ANSI-86, Release 1-2-3-4
856	X12.10	Ship Notice/Manifest	ANSI-87, Release 1-2-3-4
857	X12.29	Shipment and Billing Notice	In Development
858	X12.18	Shipment Information	Release 4
859	X12.55	Freight Invoice	In Ballot Comment Resolution
860	X12.15	P.O. Change	ANSI-86, Release 1-2-3-4
861	X12.12	Receiving Advice	ANSI-86, Release 1-2-3-4
862	X12.37	Shipping Schedule	Release 2-3-4
863	X12.41	Report of Test Results	Release 3-4
864	X12.34	Text	Release 4
865	X12.16	P.O. Change Acknowledgment	ANSI-86, Release 1-2-3-4
866	X12.57	Production Sequence	In Subrelease 041
867	X12.33	Product Transfer and Resale Report	Release 2-3-4
868	X12.30	Electronic Form Structure	In Ballot Comment Resolution
869	X12.11	Order Status Inquiry	Release 2-3-4
870	X12.23	Order Status Report	Release 2-3-4
879	X12.60	Price Change	In Development
920	X12.174	Loss or Damage Claim—General Commodities	In Development
924	X12.175	Loss or Damage Claim—Motor Vehicle	In Development
925	X12.176	Claim Tracer	In Development
926	X12.177	Claim Status Report and Tracer Reply	In Development
928	X12.178	Automotive Inspection Detail	In Development
980	X12.179	Functional Group Totals	In Development
990	X12.180	Generalized Feedback	In Development
996	X12.32	File Transfer	In Ballot Comment Resolution
997	X12.20	Functional Acknowledgment	ANSI-86, Release 1-2-3-4
998	X12.181	Set Cancellation	In Development
	X12.3	Data Element Dictionary	ANSI-86, Release 1-2-3-4
	X12.5	Interchange Control Structures	ANSI-87, Release 2-3-4
	X12.6	Application Control Structures	ANSI-86, Release 4
	X12.22	Segment Directory	ANSI-86, Release 1-2-3-4
	X12.56	Interconnect Mailbag Structures	In Development
	X12.58	Security Structures	In Ballot
	X12.59	Semantic Support	In Development

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EDIFACT Messages

The United Nations Working Party 4 (UN/ECE/WP.4) and conferred UNSM (United Nations Standard Message) Status on the Purchase Order (ORDERS) Message, which now joins the Commercial Invoice (INVOIC) in Status 2. In September 1990, the UN/ECE/TRADE/WP.4 conferred Status 1 (Draft for Formal Trial) on fifteen messages in the areas of transportation, customs and finance (see listing below). There are currently over 90 messages in various stages of development and approval in the UN/EDIFACT system. The following is a summary of Status 2 and Status 1 messages:

STATUS 2 (Registered)

ID	Name
INVOIC	Commercial Invoke
ORDERS	Purchase Order

STATUS 1 (Draft for Formal Trial)

ID	Name	PP#	Committee
CUSDEC	Customs Declaration	EPP-081	Government
CUSRES	Customs Response Message	EPP-082	Government
IFTMFR	International Forwarding and Transport Message Framework	EPP-053	Transportation
IFTMAN	Arrival Notice	EPP-142	Transportation
IFTMBC	Booking Confirmation	EPP-139	Transportation
IFTMBF	Firm Booking	EPP-138	Transportation
IFTMBP	Provisional Booking	EPP-137	Transportation
IFTMCS	Instruction Contract Status	EPP-141	Transportation
IFTMIN	Shipping Instructions	EPP-140	Transportation
CREADV	Credit Advice	EPP-057D	Finance
CREEXT	Extended Credit Advice	EPP-057E	Finance
DEBADV	Debit Advice	EPP-057C	Finance
PAYEXT	Extended Payment Order	EPP-057B	Finance
PAYORD	Payment Order	EPP-057A	Finance
REMADV	Remittance Advice	EPP-057F	Finance

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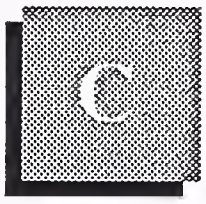

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