December 1993

Dear Colleague:

An electronic requisition form, perhaps created in a Delrina FormFlow software program, is electronically routed for approval. With approval, the requisition is routed to an EDI translation software server and turned into a standardized, X12 850 purchase order. Off it goes to the supplier.

This scenario is happening now!

In two years, it will be widespread.

Enclosed you will find the latest report from INPUT's EDI/Electronic Commerce program, *Workflow and Electronic Commerce*.

The report outlines the issues for merging EDI/electronic commerce software and systems with workflow software. It profiles today's main providers of each technology and it examines case studies where workflow and electronic commerce are integrated.

I hope you will find this report provocative and insightful. Electronic commerce and workflow are highly complementary, as you will see. And the two will help each other become widely adopted.

Please call me with any questions you may have.

Sincerely,

Torrey Byles
Manager, EDI/Electronic Commerce Program

Enc.

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PRINTING/BINDING SPECIFICATIONS

AUTHOR PLEASE COMPLETE:

Project Code: ED3

Cover: **Velobind** ☒ — Soft Vinyl Solid Cover ☐ Soft Vinyl Window Cover ☐ Hard Cover ☐
Hot Strip Paper Cover ☐ — 80 lb. White Paper ☐ Preprinted Paper ☐
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Cover Title—Exactly how it is to appear on the report cover:

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(Binder spine may have 2 lines)

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33-66 ☒ 1/8" spine
67-130 ☐ 1/4" spine
131-196 ☐ 3/8" spine
197-260 ☐ 1/2" spine
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December 1993

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Sincerely,

Torrey Byles
Manager, EDI/Electronic Commerce Program

Enc.

August 1993

Dear Colleague:

Enclosed is your copy of INPUT's report, *Open Systems and Electronic Commerce*. It is one more publication of INPUT's EDI/Electronic Commerce Program.

These are exciting times that we live in. The discontinuities that are taking place just in the information technology industry so often parallel world affairs at large: decentralization, the disappearance of boundaries, and universal cultural symbols that are readable anywhere.

Open Systems and Electronic Commerce examines possibly the two most important trends in information technology today:

- the use of inexpensive interchangable information tools and
- the mass networking of companies.

There are tremendous dynamics of these two trends taken together. This report will help you identify the threats, opportunities, the players, and the issues in this great sea of change affecting us all.

Let me encourage you to call me directly should you have questions not answered by the report or should you simply want to chat about many of the implications of open electronic commerce systems.

Please take a moment to complete and mail the enclosed report evaluation form.

I look forward to speaking with you in the future.

Sincerely,

Torrey Byles
Manager, EDI/Electronic Commerce Program

Enc.

Report Quality Evaluation

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To ensure that the highest standards of report quality are maintained, INPUT would appreciate your assessment of this report. Please take a moment to provide your evaluation of the usefulness and quality of this study. When complete, simply fold, staple, and drop in the mail. Postage has been pre-paid by INPUT if mailed in the U.S.

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2. Please indicate your reason for reading this report:
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   - ☐ Area of high interest
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   - ☐ Business/market planning
   - ☐ Product planning
   - ☐ Future purchase decision
   - ☐ Systems planning
   - ☐ Other _____

3. Please indicate extent report used and overall usefulness:

	Extent		Usefulness (1=Low, 5=High)				
	Read	Skimmed	1	2	3	4	5
Executive Overview	☐	☐	☐	☐	☐	☐	☐
Complete report	☐	☐	☐	☐	☐	☐	☐
Part of report (_____ %)	☐	☐	☐	☐	☐	☐	☐

4. How useful were:

Data presented	☐	☐	☐	☐	☐
Analyses	☐	☐	☐	☐	☐
Recommendations	☐	☐	☐	☐	☐

5. How useful was the report in these areas:

Alert you to new opportunities or approaches	☐	☐	☐	☐	☐
Cover new areas not covered elsewhere	☐	☐	☐	☐	☐
Confirm existing ideas	☐	☐	☐	☐	☐
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Other _____	☐	☐	☐	☐	☐

6. Which topics in the report were the most useful? Why? _____

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DECEMBER 1993

WORKFLOW AND ELECTRONIC COMMERCE

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Abstract

Today, two distinct information technologies are creating a paperless business environment: *Workflow* aims at eliminating paper inside companies, such as memos, requisition slips, and the myriad of internal business forms that are completed for various tasks in the company. *Electronic commerce* aims at eliminating paper among companies such as purchase orders, invoices, ship notices, checks and currency, and other documentation and tokens associated with trade. This report examines the issues, the status and the opportunities of combining workflow and electronic commerce. Specifically, it examines: leading workflow software products today; leading electronic commerce products today; areas where the two are complementary or overlap; trends in electronic commerce that seek a workflow solution; user trends that support a convergence of workflow and electronic commerce; the top five business functions where integrated workflow and electronic commerce systems deliver the greatest benefit; user case studies where workflow and electronic commerce are integrated; how an integrated scenario could become widespread in two or three years; and who the leading software and service vendors are today.

The report is 46 pages long and contains 25 exhibits.

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U.S.A.

EDI/Electronic Commerce Program

Workflow and Electronic Commerce

ED3 • 448 • 1993

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Exhibits

Exhibits (continued)

Introduction

A truly paperless society is not a realistic or desirable scenario.

Nevertheless, the replacement of business procedures that use paper documents with procedures that use electronic information technologies brings efficiencies, reduces administrative costs, and boosts human productivity. Granted, the precise impact of information technology is still highly debatable. Yet, the fact remains: paper-based systems are being supplanted—and in some cases entirely replaced—by electronic systems.

Today, two distinct information technologies are behind this move to "paperlessness:"

- *Workflow* aims at eliminating paper inside companies, such as memos, requisition slips, and the myriad of internal business forms that are completed for various tasks in the company.

- *Electronic commerce* aims at eliminating paper among companies, such as purchase orders, invoices, ship notices, checks and currency, and other documentation and tokens associated with trade.

Taken together, workflow and electronic commerce are the complete solution for a paperless business environment. They are the two information technologies exclusively focused on streamlining business processes through electronics. In effect, this report is on the two most important software tools for business process re-engineering.

A
Scope of Report

This report examines the issues, the status and the potential of combining workflow and electronic commerce. The report focuses on the technologies—particularly software products available today—that are being used to redesign, restructure or "re-engineer" businesses and associated processes.

The report asks the question, "To what extent will information technologies replace paper-based processes, both within and among companies?"

The report provides glimpses of an answer to the question by examining:

- Leading workflow software products today
- Leading electronic commerce products today
- Areas where the two are complementary or overlap
- Trends in electronic commerce that seek a workflow solution
- User trends that support a convergence of workflow and electronic commerce
- User case studies where workflow and electronic commerce are integrated
- How an integrated scenario could become widespread in two or three years
- Who the leading software and service vendors are today

B
Methodology

This report is based on extensive analysis of information technology products. Product documentation and collateral from vendors was used. Corporate background information (including annual reports, 10Ks, and other reports) on vendors was also used. INPUT has an ongoing service that collects this information on over 4,000 information technology vendors.

INPUT interviewed several key workflow and electronic commerce vendors specifically for this report. Also, on an ongoing basis, INPUT interviews key executives in vendor companies.

User data was gathered from several sources. INPUT completed a survey of over 1,600 MIS managers in companies in several industries concerning their IT plans for this year and the next. This information provided the general contextual and some quantitative data in this report.

Three user case studies were conducted or summarized for this report.

Results from other INPUT studies were used, namely, *The U.S. EDI and Electronic Commerce Markets: 1993-1998; Open Systems and Electronic Commerce; Integrated Electronic Messaging: Trends, Issues and Opportunities*; and a private study on the methodologies for business process re-engineering used by the top 10 consulting companies.

C
Related INPUT Reports

This report is part of INPUT's EDI/Electronic Commerce program. Other reports in the series published by the program include those in the following list. For more information, call INPUT's California offices at 415-961-3300.

The U.S. EDI and Electronic Commerce Markets: 1993-1998
Open Systems and Electronic Commerce
Integrated Electronic Messaging: Trends, Issues and Opportunities
Electronic Commerce: The New Foundation for Trade
Electronic Commerce in the Media Industry
Electronic Commerce in U.S. Health Care
Electronic Commerce in Trade and Transportation
Electronic Commerce in Travel and Tourism
Electronic Commerce in Grocery Production and Distribution
Electronic Commerce in Apparel Production and Distribution
Electronic Commerce in the U.S. Federal Government
Electronic Commerce: Comprehensive Market Assessment
Integrated Electronic Messaging: Trends, Issues, Opportunities
Opportunities in Electronic Payments
International EDI Markets, 1992-1997
The U.S. Electronic Data Interchange Market, 1992-1997
EDI in Europe, 1990
The EDI Market in Japan, 1992-1997
Developments in Corporate Electronic Trade Payments
EDI Business Integration Issues

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Executive Overview

Today, two distinct information technologies are bringing about a paperless business environment:

- *Workflow* aims at eliminating paper inside companies, such as memos, requisition slips, and the myriad of internal business forms that are completed for various tasks in the company.

- *Electronic commerce* aims at eliminating paper among companies, such as purchase orders, invoices, ship notices, checks and currency, and other documentation and tokens associated with trade.

Taken together, workflow and electronic commerce are the complete solution for a paperless business environment. They are the two information technologies exclusively focused on streamlining business processes through electronics.

1. Forces Driving Convergence

Because they are complementary, each of the two technologies fosters the adoption of the other. Today, companies are beginning to integrate their internal workflow systems with external electronic commerce systems with trading partners. In the next two years, this trend will become a standard practice, due to several forces: corporate downsizing, business process re-engineering, the success of Lotus Notes, the rise of network operating systems (NetWare, UNIX and Microsoft NT), and the consequent networking within companies as "outbound" workflow projects meet "inbound" electronic commerce projects.

2. Points Where Convergence Will Occur

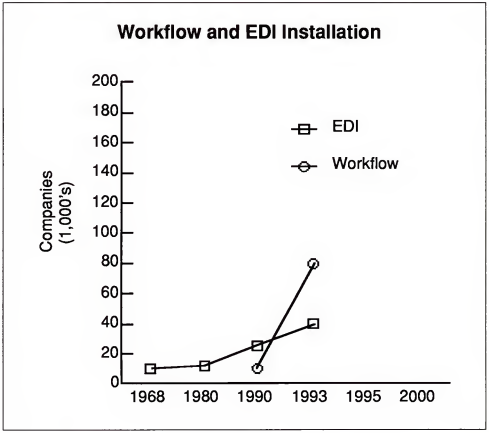
The functional areas within business where workflow systems are best combined with electronic commerce systems are:

- Procurement
- Support for design and subcontracted services
- Billing
- Logistics
- Sales/order entry

3. Installed Bases

The number of companies using workflow and the number using EDI are of the same order of magnitude: perhaps 80,000 workflow-enabled companies versus 45,000 EDI companies. Very few companies today use both in an integrated fashion. The number of workflow installations is growing faster than the number of EDI installations, as shown in Exhibit II-1. EDI has been around for 25 years, and workflow for only three (the most convenient date for its birth being 1990, when Lotus Development Corporation introduced Lotus Notes).

EXHIBIT II-1



4. Workflow Adoption Stimulates EDI/Electronic Commerce Adoption

The relatively rapid adoption of workflow should help the adoption of EDI and electronic commerce. Workflow's integrating and architectural features will help EDI become a widely used technology.

All leading workflow software products give the ability for users to define roles, rules and routing of information. In addition, workflow software allows users to assign classes to work steps, which is critical to building a system that automatically tracks and prompts the completion of work. These features are especially needed by EDI users.

Specifically, electronic data interchange, the transmission of business documents in standardized electronic formats, will receive a significant boost from workflow because:

- Workflow software will allow EDI users to integrate their EDI software with internal applications. Today, 80% of the EDI user base does not integrate EDI internally.
- Workflow's features, which allow users to define roles, rules and routing, will help bring order to the myriad of official EDI standard formats—which today exceed 300.

In addition, recent developments among users of electronic commerce would be well served by the adoption of a workflow architecture. These developments are:

- The emergence of trading community databases (such as product catalogs, directories and transaction archives)
- The use of E-mail with EDI trading partners
- EDI projects that lead to a complete business process re-engineering project and vice versa
- Interactive EDI standards, especially in health care and the hospitality industries
- Network operating systems and event-driven EDI environments
- Volume-based pricing for EDI software

Exhibit II-2 lists the features of workflow software that address the problems of EDI and electronic commerce.

EXHIBIT II-2

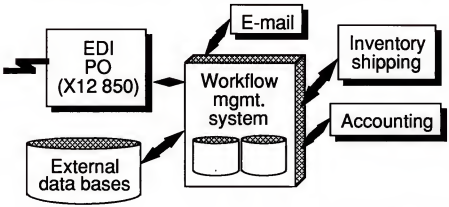
Workflow's Solutions for EDI's Problems

Workflow Feature	How Feature Addresses EDI Need
Underlying architecture aims to make all human work activity more efficient.	Commercial exchange, as a specific kind of workflow, is made more efficient.
Roles, rules and routing bring coherence and integration to multiple applications and associated interactions of employees.	Allows EDI messages to be routed to appropriate applications/personnel. Allows multiple internal applications to be integrated for full EDI effectiveness.
The classification of workflow messages and applications according to an overall work-process context.	Establishes a general data model and taxonomy of finite categories into which all EDI data formats can be placed. Keeps standards from multiplying endlessly.
Workflow software lets users explicitly identify players, objectives, tokens and other constituents of work.	The several developments in EDI/electronic commerce (e.g., E-mail, databases, interactive standards) have yet to be placed in a comprehensive framework.
Combines structured and non-structured data in a single integrated messaging system.	Allows EDI to be integrated with E-mail, facsimile, electronic information services and other applications.

An architecture combining workflow and EDI is shown in Exhibit II-3.

EXHIBIT II-3

An Architecture Combining Workflow and EDI



Source: INPUT

5. Competitive Environment

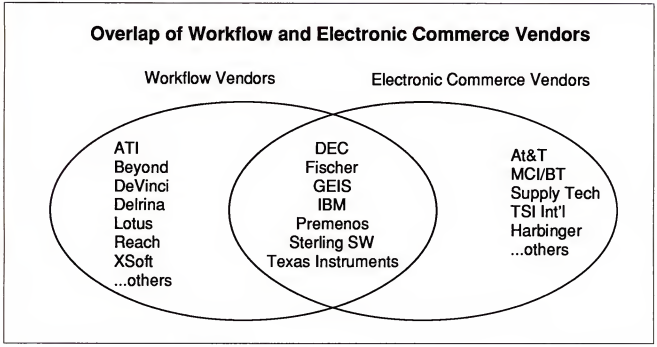
Today's leading vendors of workflow software are: Action Technologies Inc., Beyond Incorporated, Delrina Technology Corporation, Digital Equipment Corporation, Lotus Development Corporation, and Reach Software Corporation.

Today's leading vendors of EDI and electronic commerce are: Advantis (formerly IBM Information Network), American Business Computer, Digital Equipment Corporation, GE Information Services, Premenos, Sterling Software, Supply Tech, and TSI International.

Vendors of both camps are just beginning to recognize that they must offer an integrated workflow/electronic commerce solution to users. GEIS has made an alliance with Delrina. GEIS and Sterling Software have introduced integrated EDI/E-mail software that ties into on-line database services. DEC has reorganized previously separate product groups (including EDI, workflow, messaging, document management, imaging and others) into a "workgroup systems" group. Merger activity has occurred between vendors of E-mail and EDI, such as Fischer International/Blue Rainbow and Harbinger/America Online. Workflow vendors are seeking partners and/or marketing managers in the EDI/electronic commerce arena.

Workflow and electronic commerce vendors are shown in Exhibit II-4.

EXHIBIT II-4



6. Results of Convergence

The convergence of workflow and electronic commerce will:

- Bring efficiencies to users and, in particular, finally give EDI users the efficiency gain most have been lacking.
- Bring hitherto separate vendor camps (workflow vendors and EDI vendors) together in a variety of partnerships, alliances and mergers.
- Accelerate growth in the markets for workflow software, EDI software, network messaging services and electronic information services. The EDI software and network services markets will especially benefit from the convergence.

7. Recommendations

Users should consider both workflow and EDI/electronic commerce software and services to solve their intercompany systems needs.

Vendors of workflow should consider entering the EDI/electronic commerce market.

Vendors of EDI/electronic commerce should introduce new products that embody worflow concepts and features.

Technology Trends in Workflow and Electronic Commerce

This chapter surveys the status and direction of today's workflow and electronic commerce products and services. It demonstrates that workflow products are beginning to offer critical integrating components that electronic commerce products have been lacking for some time and, thereby, have prevented large-scale adoption of electronic commerce.

Key points:

- Software and services for workflow and electronic commerce are highly complementary.
- Workflow software is interconnecting workers inside a single company; electronic commerce connects applications among companies.
- All workflow software is distinguished by its capabilities to assign roles, rules and routing of messages and data among people and applications. These capabilities are needed in electronic commerce tools.
- Electronic commerce products and services that are coming out parallel many of the components found in workflow products (directories, integrated messaging, real time, network management, etc.)

A
Workflow Software Products

1. Leading Products

Exhibit III-1 lists the leading workflow products on the market today and the vendors of these products.

EXHIBIT III-1

Leading Workflow Software Products and Vendors

Vendor	Product	Price	Environment	Appl.Interface
Action Technologies, Inc.	Workflow • Analyst • AppBlder • Manager • Client Library	 $495 $1,495 $6,000 $2,000	Lotus Notes SQL server (MS/Sybase), OS/2; soon: UNIX, NT, other SQL	SQL Notes DDE
Beyond, Incorporated	BeyondMail	$995 (10-user license)	MHS (Novell Netware & Banyan VINES)	DDE OLE
Delrina Technology Corporation	FormFlow • AppBlder	$1,840 (10-user license) $399	Windows. Supports MHS, MAPI, Lotus Notes	dBase Paradox FoxPro SQL
Lotus Development Corporation	Notes	$995 client & server $495 per user	Windows, Macintosh, VIM	DDE
Reach Software Corporation	WorkMAN	$2,495 (5-user license) $1,495 (additional 5-user licenses)	MHS (Novell NetWare & Banyan VINES) soon: MAPI, OMI, Notes	DDE SQL

2. Definitive Characteristics of Workflow Software

The following discussion concentrates on the common characteristics of the leading workflow products. The discussion reveals the definitive characteristics of workflow software.

a. Roles, Rules and Routing

Roles, rules and routing sums up what workflow software today is all about.

All the workflow products share the characteristic of letting users:

- Assign roles to the participants in a workflow (sales manager, accounting clerk, company XYZ, etc.)

- Set up rules so that information and messages will be routed appropriately among people and databases (if the total sales amount is above $10,000, route to sales manager for approval; if the message from participant X is a request, then participant Y's choices of response are either to accept, decline, or counteroffer; etc.)

b. Application Interfaces

With several variations, workflow products interface to applications software in two basic ways:

- Microsoft's Dynamic Data Exchange, a method by which data and files can be swapped among applications where those applications are running within a Windows environment.

- SQL database language, a language for interfacing with relational databases that has become standard. Today's major database software vendors (Oracle, Sybase, Informix, ASK/Ingres, and IBM) all use SQL.

DDE is especially useful for small companies that create applications in spreadsheets or databases. An SQL interface is typically to a higher performance, often mission-critical application than the applications that would interface in a DDE fashion.

DDE and SQL are easily the de facto interface standards that workflow products are using to integrate workflows with computer applications.

c. Programming and Application Development

The workflow products typically have some kind of scripting language that enables the user to define the roles and the rules of routing. Delrina has its "Intelligent Forms Language," Beyond has "BeyondRules," and Reach and Action have their ways for defining things.

d. The "Forms" Metaphor

Beyond, Delrina and Reach adhere to a forms metaphor. The workflow environment that the users of these products will see on the workstation screen has the appearance of a paper business form. It is into these on-screen forms that the user inserts data. This graphical user interface, according to these vendors, helps users make the transition from the paper to the electronic environment. In addition, the on-screen form format can be printed out. The resulting paper form can then be incorporated into the company's traditional paper system (of routing, file cabinet storage, etc.).

Lotus and Action do not explicitly adopt the form metaphor. Nevertheless, users are able to create forms using these products.

e. Other Capabilities

The workflow products have other features. Many of them have message storage and organizing capabilities. These enable each individual person to file and access the messages/information that transpires during work in an efficient way. Some of the products, such as those of Beyond, Inc., have explicit network management tools—namely the ability to synchronize and keep updated address directories of all the people involved in a workflow network. Delrina offers security measures using the RSA standard for keys and encryption. Most of the products have some sort of tracking capability so that users (particularly the manager user) can keep track of the status of work and what tasks need to be done next.

B

EDI/Electronic Commerce Software Products

Electronic commerce software (EDI, E-mail, payment, and others) is used to prepare and send computer files to corporate trading partners. (The consumer market for electronic commerce software is not included here.)

Electronic data interchange software is the most prominent element of electronic commerce software. This discussion focuses on this segment of software.

For more details and discussion of other kinds of electronic commerce software and service offerings, see INPUT's report, *The U.S. EDI and Electronic Commerce Markets: 1993-1998*.

1. Leading Electronic Commerce Software Vendors

Exhibit III-2 lists the leading vendors of EDI software and products. Note that there are over 30 vendors of EDI software. This list identifies vendors of the top-selling products. For a complete listing of vendors, see Chapter V and INPUT's reports, *EDI Vendor Profiles and Competitive Analysis* and *The U.S. EDI and Electronic Commerce Markets: 1993-1998*.

EXHIBIT III-2

Leading EDI Software Products

Vendor	Product	Price
Advantis	DataInterchange	contact vendor
American Business Computer	EDI-Server	$50,000-$300,000, including equipment
Digital Equipment Corporation	DEC/EDI VAX 3100-VAX 9000	$10,000-$90,000
GE Information Services	Benchmark EDI*PC EDI*UNIX	contact vendor
Premenos	EDI/400	$6,000-$28,000
	EDI/e	$10,000-$60,000
Sterling Software	Gentran -MVS, VSE	$37,000-$110,000
	-VAX	$7,000-$35,000
	-AS/400	$7,500-$47,500
	-PC	$1,295-$3,000
	-UNIX	$7,500-$42,500
Supply Tech	STX	
	-PC	$2,495
	-MVS	$19,500
TSI International	Trading Partner	
	-PC	$495-$900
	-MVS, VAX	$30,000-$200,000

2. Definitive Characteristics of EDI Software

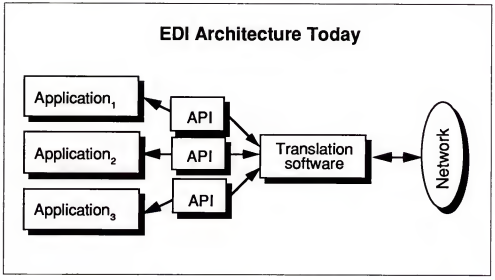
At this time, the most dynamic EC software category is EDI translation software.

EDI software performs at least the first, if not all, of the following kinds of functions:

- File translation: converting data that is arranged in a given file format into an arrangement of another file format.
- Mapping: a development tool with which the user maps data fields of one format to the desired data fields of a target data format.
- Communication: the control of telecommunication transmission sessions via a modem.
- Application program interface: software that integrates EDI translation software with specific applications software. It is sometimes given as a preformatted map or template along with translation software.
- Store and forward ("mailboxing," or "switching") of messages: only the large EDI software packages (in the $40,000 to $400,000 price range) provide this clearinghouse function.

Exhibit III-3 depicts the role of EDI software and its relationship to the internal applications of a company and its external trading partners.

EXHIBIT III-3



C

Trends in Electronic Commerce that Seek a Workflow Solution

Some key developments in EDI and electronic commerce today underscore the fact that EDI users are seeking (if not explicitly, at least, implicitly) a workflow solution. These developments are:

- Eighty percent (80%) of EDI users not integrated
- Trading community databases
- E-mail with trading partners
- EDI projects requiring BPR; BPR projects requiring EDI
- Interactive EDI standards
- NOS and event-driven EDI
- Volume-based pricing for EDI software

1. EDI Non-Integration

The single greatest obstacle to successful electronic data interchange programs in companies today is integrating EDI software and communications with internal processes. Eighty percent (80%) of the 42,000 EDI users in the U.S. and Canada are simply receiving electronic purchase orders and then printing them out for later data entry.

2. Trading Community Databases

Electronic information services (databases) are being established in several industries. These databases are of two forms: product catalogs or company directories. They facilitate the electronic commerce in the industry/trading community because they identify the things and the parties involved in commercial transactions. These catalogs parallel the architectural feature of workflow software of maintaining databases of the roles of parties involved in the workflow. Today there are databases in the industries of apparel/retail, books, shoes, sporting goods, auto parts, electronic components and semiconductors, music CDs (in Australia), stationery and office supplies, pharmaceuticals, construction materials and accessories, airplane parts, transportation services, and others. Data warehouses archive transaction data (such as point-of-sale data). Most workflow software allows users to archive messages/information for later review.

3. E-Mail with Trading Partners

Advanced EDI users are beginning to establish E-mail linkages with their trading partners. Initially, the linkages connect MIS departments so that the two departments can work out the details of implementing the EDI system that links the company. Other departments, however, start to establish linkages with their respective peers in the trading company. Exhibit III-4 lists the departments and the subjects that are common for E-mail discussion.

EXHIBIT III-4

Intercompany E-Mail Conversations

• **Merchandising/ Marketing**	• **MIS**
- Sales forecast reviews	- EDI standard reviews
- Promotions, deals, specials	-System changes/enhancements
- End-of-season sales	-Others
- New products	• **Finance/Accounting**
- Others	-Billing issues
• **Buying/Logistics/Manufacturing**	-Payment issues
- Modes of transport to be used	-Receiving issues
- Types of pallets to be used	-Shorts (credits/debits)
- Lead-time reviews	• **Performance measures**
- Receiving capacity planning	-Service levels achieved
- Transportation capacity planning	-Inventory turns achieved
- Manufacturing capacity issues	-Safety stock reviews
- Others	

This merging of E-mail with EDI helps drive the integration of a single company's applications and personnel. Workflow is certainly a primary solution, given this need. The EDI vendors of Digital, Fischer International, GE Information Services, Premenos and Sterling Software have introduced integrated workstation software that combines E-mail and EDI

capabilities. GEIS and Sterling are offering their software in conjunction with on-network database services, as mentioned above. For more information, see INPUT's report, *Integrated Electronic Messaging: Trends, Directions, Opportunities*.

4. Combining EDI and Business Process Re-engineering

The major EDI software and service vendors are experiencing rapid growth in their respective professional services businesses. Systems integration and business process re-engineering consulting is becoming crucial for successful EDI. EDI vendors are responding to user need in this domain and are offering services. Likewise, leading consulting firms—Andersen Consulting, Price-Waterhouse, McKinsey—and others are combining their formerly separate practices of EDI and business process consulting. They found that when a client project started in one specialty, it soon entered into the domain of the other specialty. The tools of business process re-engineering are often workflow. Therefore, just as BPR and EDI are being considered mutually necessary, so too could EDI and workflow.

5. Interactive EDI Standards

Several industry groups are developing interactive EDI standards. These standards allow for two computer applications (with and without human intervention) to respond to each other in simple "if-then" statements. For example, an MRPII system may send the following message to a supplier's system: "If 20 widgets are shippable this afternoon, please send as soon as possible; otherwise, wait until further instructed." Such messages need a conversational or workflow structure. Today's workflow products have the beginning of such structure. Interactive standards are being developed in the following industries: health care, automotive, travel/hospitality, and other manufacturing.

6. Network Operating Systems and Event-Driven EDI

The emergence of network operating systems will encourage EDI to be integrated with workflow. Sales of UNIX EDI software is currently increasing by 70% per year. UNIX EDI software is the single fastest growing EDI software segment (see INPUT's report, *The U.S. EDI and Electronic Commerce Markets: 1993-1998*). Among the many advantages for conducting EDI in a UNIX environment (for more details see INPUT's report, *Open Systems and Electronic Commerce*), one of the chief ones is getting away from batch processing. As soon as EDI messages are received, they can be processed. Or, as soon as an application creates a file to be sent to a trading partner (for example, the accounts receivable application creating an invoice), the file can be immediately processed into a

standard EDI format and sent. By creating an "event-driven" atmosphere, UNIX allows the EDI user to be more responsive to trading partners. This internal routing of messages that UNIX provides could very easily be incorporated into a workflow architecture.

7. Volume-Based Pricing for EDI Software

There are now approximately 13 software vendors offering UNIX-based EDI translation software. UNIX EDI software is the fastest growing segment of the EDI software market—70% growth from 1992 to 1993. Vendors are pricing their UNIX packages according to the size of the processor/platform on which the package runs. A package that runs on a low-end IBM RS/6000 is priced around $6,000, while the same package for an HP 9000 may be $150,000. Volume-based pricing is more sensible to the market. Users are given more price points that match more precisely their performance levels. Volume-based pricing corresponds to the "per-seat" or site pricing of workflow software. Volume-based pricing along with per-seat pricing makes adoption of the two technologies easier than do monolithic pricing structures.

D
Why Electronic Commerce Needs Workflow

Workflow and EDI implementations (now roughly equal in terms of companies using each) will come together. This is good news because workflow has much to offer EDI and electronic commerce.

> *The commercial transaction is itself a specific kind of workflow. Therefore, workflow software can be applied to it just as fruitfully as other workflows.*

Exhibit III-5 pinpoints the specific benefits that workflow technology brings to EDI and electronic commerce technology.

EXHIBIT III-5

Workflow's Solutions for EDI's Problems

Workflow Feature	How Feature Addresses EDI Need
Underlying architecture is aimed at making all human work activity more efficient.	Commercial exchange, as a specific kind of workflow, is made more efficient.
Roles, rules and routing bring coherence and integration to multiple applications and associated interactions of employees.	Allows EDI messages to be routed to appropriate applications/personnel. Allows multiple internal applications to be integrated for full EDI effectiveness.
The classification of workflow messages and applications according to an overall work-process context.	Establishes a general data model and taxonomy of finite categories into which all EDI data formats can be placed. Keeps standards from multiplying endlessly.
Workflow software lets users explicitly identify players, objectives, tokens and other constituents of work.	The several developments in EDI/electronic commerce (e.g., E-mail, databases, interactive standards) have yet to be placed in a comprehensive framework.
Combines structured and non-structured data in a single integrated messaging system.	Allows EDI to be integrated with E-mail, facsimile, electronic information services and other applications.

1. EDI's Integration Problem Solved

With 80% of the EDI user base not integrating their EDI software with the rest of the company's information systems, the potential efficiency gains of EDI are not realized. Workflow software offers a way to integrate EDI software with the rest of the company's systems.

It does this in a number of ways:

- Workflow allows for external messages (EDI, free-text E-mail, and other structured or semi-structured messages) to be routed to appropriate people and applications inside the company. This issue has never been addressed by EDI software vendors. A purchase order isn't just sent to

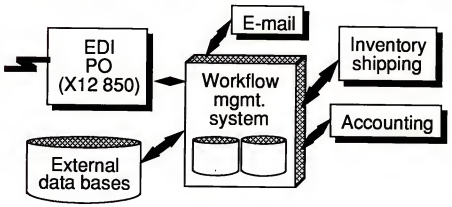
XYZ company. It is sent to Josephina B., sales rep, at XYZ company. Likewise, a ship notice is sent to Larry, down in receiving; an invoice is sent to Jasvir, in accounting; and so on. EDI software today just dumps messages on a company's doorstep, rings the doorbell and runs.

- Workflow allows for the many separate applications within a single company (order entry, shipping, accounts receivable, etc.) to be integrated. Again, this integration of internal applications with each other is mandatory for the full efficiency of EDI to be realized.

Exhibit III-6 depicts an architecture that combines workflow with EDI software. The workflow server orchestrates all applications as well as the use of the EDI translation software.

EXHIBIT III-6

An Architecture Combining Workflow and EDI



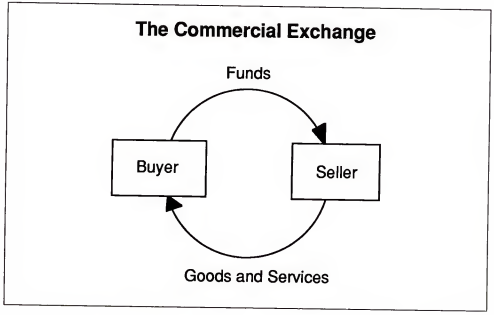
Source: INPUT

2. EDI Data Formats Given Comprehensive Model

A commercial transaction is itself a workflow. This workflow needs to be specified according to roles, responsibilities, stages, conditional decision points within the flow of events, etc. Workflow can provide this "framing" of the exchange workflow.

Exhibit III-7 shows the basic workflow of the commercial exchange.

EXHIBIT III-7

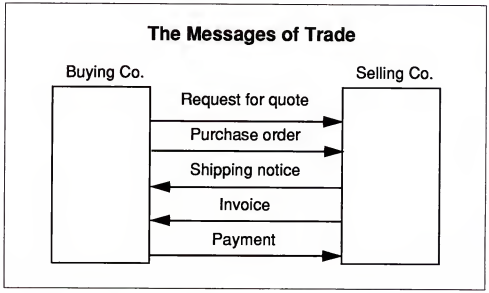


Since prehistoric times, trade has always been a communication act between trading partners. At the core, it consists of two parties exchanging promises. One party makes the promise, "I'll give you this if you give me that." The second party makes a second promise (if the exchange is to happen), "Okay, I agree; I will give you this if you give me that." And so on.

Once this initial exchange of "promise messages" has been made, a whole set of auxiliary communications will typically follow. These messages ensure that the trade will meet the initially stated conditions. For example, weighing the merchandise and reporting to the buyer what the weight of the goods is might be required in order to complete the trade. Also, when buying on credit, the seller follows up with a later communication requesting payment for the goods. In other words, the seller sends an invoice. The invoice, in effect, is a message.

Exhibit III-8 shows the many messages of trade.

EXHIBIT III-8



EDI data formats have been standardized around these messages. Today, there are three basic families of standard formats: ANSI X12 (of the USA), EDIFACT (of the United Nations), and the CCI (of Japan).

These formats number in the hundreds and continue to proliferate. A general, comprehensive data model is needed to bring coherence to these formats. Looking at the commercial transaction as a workflow will do this.

For example, Exhibit III-9 places the X12 formats into the conversational workflow framework of Action Technologies, Inc.

EXHIBIT III-9

EDI Messages in Workflow Framework

Workflow Move	Corresponding X12 Trans. Sets
Request	Purchase order Request for quotation Invoice
Offer	Response to request for quotation Inventory advice
Counteroffer	P.O. change
etc.	etc.

This framework brings order to the ever-expanding EDI syntax. It also provides a general framework for developing interactive EDI transaction sets. Interactive EDI could turn all applications into true client/server interactions (see INPUT's report, *Open Systems and Electronic Commerce*).

Convergence of Workflow and Electronic Commerce

This chapter draws conclusions from user implementations and vendor offerings about the degree to which workflow and electronic commerce systems are converging.

A

Forces Driving the Convergence of Workflow and Electronic Commerce

Listed below are the forces that are driving companies to interconnect internal workflow systems with systems that connect with trading partners (electronic commerce systems).

- Three years of corporate downsizing
- Business process re-engineering
- The success of Lotus Notes
- The rise of network operating systems (NetWare, UNIX, NT) and networking

The first two drivers are business issues that lead to a demand pull for workflow/electronic commerce integration. The latter two are technological drivers, leading to a supply push where the enabling technology allows users to do things that they hadn't thought of doing before.

In addition to the above general trends, a specific dynamic of the convergence of workflow and electronic commerce is underscored by their respective origins as IS projects within companies.

- Workflow implementations typically begin at a small workgroup or departmental level and spread outward. Electronic commerce implementations typically begin with the MIS department and spread inward.

Corporate downsizing and the consequent re-engineering of business processes has led companies to build information systems that tie internal and external workflows together.

1. Downsizing

Downsizing has led companies to seek to make remaining employees more productive by adding information technologies or using IT more effectively. Downsizing also has led to the outsourcing of many formerly internal business functions. For example, graphics production departments are being jettisoned from many corporations in favor of using outside graphic design firms. The former trend favors the implementation of workflow technologies; the latter trend favors the implementation of electronic commerce technologies.

2. Business Process Re-engineering

Companies are pursuing business process re-engineering from two directions: Either a company will start with an EDI program with trading partners, which will lead it to rethink its internal applications of accounting, order entry/sales, production, inventory and shipping; or it will begin by rethinking its internal applications and will eventually realize that it should build EDI/electronic commerce capabilities into the new systems. Re-engineering—competitive elimination—is also taking place at an industry level. Old, inefficient ways of doing business are being replaced by more efficient ones. Trading communities, often at the instigation of a large company, a trade association, a network service provider or some other "community facilitator," are streamlining the workflows of entire communities. Examples of community workflow re-engineering are found in pharmaceutical distribution, shipping port communities, health care claims processing, and the textbook publishing industry, among others. In many cases this results in industry consolidations and the elimination of intermediaries (many distribution industries, for example, are being consolidated). In many cases, new kinds of services—based on information technology—are coming into being (such as compiling market data on products).

3. The Success of Lotus Notes

Lotus Notes has been the definitive groupware/workflow product since its introduction in the late 1980s. There are now approximately 1 to 2 million users of Notes. It has gained wide recognition as a tool for corporate re-engineering. It has been endorsed and/or resold by the leading business consulting firms (such as Andersen Consulting, Price Waterhouse, etc.). Notes is a widely used platform on which VARs and other independent software developers build add-on products or systems for specific business solutions. Lotus Notes has defined the market for groupware/workflow. Furthermore, Notes is being used for intercompany applications (see Chapter III, the Young & Rubicam case).

4. The Rise of Network Operating Systems and Networking

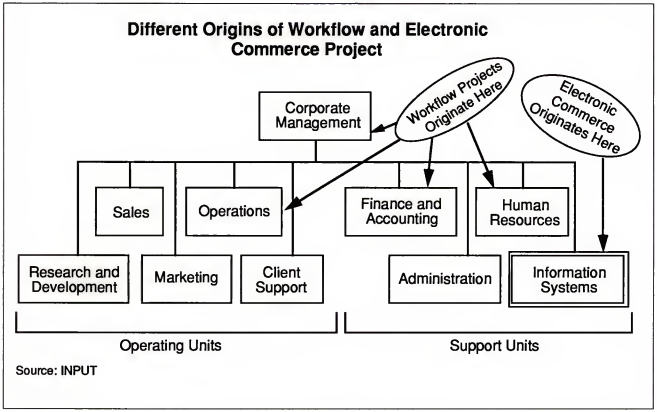
The 1990s is the age of the network operating system and networking. The 1980s placed a PC or workstation at every worker's desk. Now it is time to hook them together. UNIX, NetWare, and Microsoft NT are facilitating this trend. A company's internal and external systems are being interconnected. The combined use of E-mail and EDI between companies is one example of this complete networking. INTERNET is another example. For more details on these latter phenomena, see INPUT's reports, *Integrated Electronic Messaging: Trends, Issues, Opportunities* and *Open Systems and Electronic Commerce.*

5. "Outbound" Workflow Projects Meet "Inbound" Electronic Commerce Projects

Workflow implementations typically begin at a small workgroup or departmental level and spread outward to include more and more groups/departments within the company and eventually the whole enterprise. Workflow implementations deal with focused internal tasks squarely within the boundaries of the company. Electronic commerce implementations typically begin with the MIS department, deal directly with the MIS shops of trading partners and establish links between mainframe-based and/or mission-critical applications. Electronic commerce implementations deal with tasks that occur at the boundaries of a company. As each project grows in volume and scope, eventually they will intersect. Integration will then take place. This natural convergence should be widespread by the end of 1995.

Exhibit IV-1 shows the respective origins of workflow and electronic commerce projects.

EXHIBIT IV-1



Source: INPUT

B

Business Functions Amenable to Workflow/Electronic Commerce Solutions

This section describes the five functional areas in which businesses most need an integrated workflow/electronic commerce solution. The five areas are:

- Procurement
- Support for design and subcontracted services
- Billing
- Logistics
- Sales/order entry

Note: the exhibits in this section highlight the relevant system components of an integrated workflow/electronic commerce solution.

1. Procurement

a. Description

This is the classic case in which a procurement action is first originated in a company by someone filling out a requisition form. It is routed, using an internal messaging system, to get the appropriate signatures or authorizations. Eventually, it is sent to the EDI translation server and turned into an electronic purchase order and sent to the supplier company. Meanwhile, a record of the PO is sent to the accounts payable and possibly receiving departments of the company so that these groups will know what to do when the invoice and shipment arrives.

Workflow software facilitates task completion within the company. Electronic commerce systems complete the tasks among the company and its supplier.

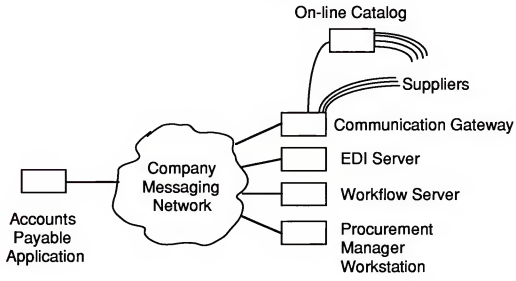
Eighty-five percent of all EDI installations today began as an automation of the procurement function.

b. Illustration

Exhibit IV-2 depicts an integrated procurement workflow/EC system.

EXHIBIT IV-2

Integrated Workflow/Electronic Commerce System for Procurement



c. Applicable Industries

Any industry that buys tangible products from distributors or manufacturers is an applicable industry. The process is especially pronounced in companies with repetitive buying patterns.

2. Support for Design and Subcontracted Services

a. Description

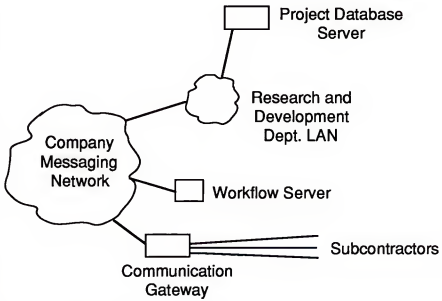
A company needs specialized services performed. It employs a company that has expertise in the area. Through an iterative cycle of proposals, specifications, counterproposals, refinements, design changes and basic design evolvement, a product is specified, made and delivered by the subcontracted company. Here, workflow is spread between departments of two companies.

b. Illustration

Exhibit IV-3 depicts an integrated design workflow/EC system.

EXHIBIT IV-3

Integrated Workflow/Electronic Commerce System for Subcontracted Design Services



c. Applicable Industries

CAD/CAM industries:

- Electronics
- Semiconductors
- Aerospace
- Automotive components
- Apparel and shoes

Business services:

- Advertising
- Legal
- Architectural and engineering
- Commercial and industrial construction services
- Real estate services (brokering, mortgaging lending, title, etc.)

3. Billing

a. Description

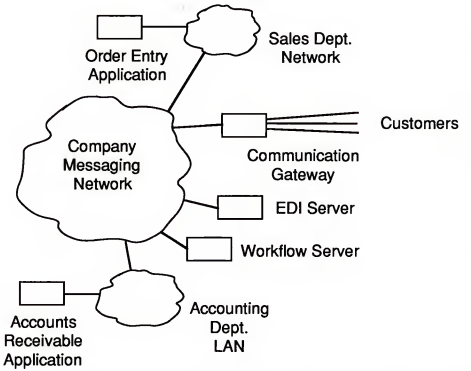
In many instances, an integrated workflow/electronic commerce solution for billing is just the other half of a procurement solution (see above). Not always, however. In many industries (insurance, utilities, financial services), billing is a complex business process often involving several parties besides the original buyer and seller. Workflow is used for internal processing of billing documents. Electronic commerce is used for the intercompany file transfers.

b. Illustration

Exhibit IV-4 depicts an integrated billing workflow/EC system.

EXHIBIT IV-4

Integrated Workflow/Electronic Commerce System for Billing



c. Applicable Industries

Manufacturer-to-manufacturer and manufacturer-to-retailer linkages (flip side of procurement) are applicable.

Insurance industries:

- Health care
- Property and casualty

Process manufacturing:

- Petrochemical

Utilities:

- Power
- Telephone

Industry-specific settlement clearinghouses:

- Securities industry
- Airline ticket settlements

- Student loan settlements
- Factoring
- Mortgage banking services

Billing service bureaus:

- Freight bill
- Advertising
- Payroll processing
- Equipment leasing
- Collection agencies

4. Logistics

a. Description

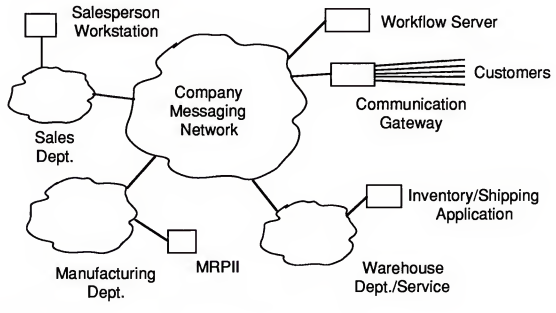
Manufacturers, retailers, and importers need logistics services, which can be defined as the management of inventories at rest and in motion. Logistics, in other words, involves warehousing as well as transportation.

b. Illustration

Exhibit IV-5 depicts an integrated logistics workflow/EC system.

EXHIBIT IV-5

Integrated Workflow/Electronic Commerce System for Logistics



c. Applicable Industries

This business function is identical with the industry segment, logistics, which includes:

- Transportation (trucks, trains, ships, planes)
- Warehousing
- Freight forwarding
- Customs brokering.

d. Issues

The industry needs image processing capabilities. There is much paperwork in the transportation industry. Scanning capabilities are necessary.

5. Sales and Order Entry

a. Description

Sales force automation is a driving force. Mobile sales representatives deal with customers, taking orders on the road. Order and contact messages need to be routed appropriately.

Automating sales and order entry is almost identical to automating the billing function—the emphasis is in order taking, not billing for shipping the order. Nevertheless, the one leads to the other. The best integrated solution automates both functions.

b. Illustration

Because order entry automation is so closely connected to the automation of billing functions, the exhibit for the billing workflow (Exhibit IV-4 above) depicts the order entry workflow.

c. Applicable Industries

Applicable industries for sales and order entry are the same as for the billing function.

d. Issues

Needs are driven by sales force automation initiatives.

C
Case Studies

1. Young & Rubicam

a. Description of Business

Y&R is an advertising agency headquartered in New York City, with offices throughout the world.

b. Project Objective

Young & Rubicam's objective is to automate the traffic process and improve customer satisfaction by having greater interaction with clients.

c. Project Background and Description

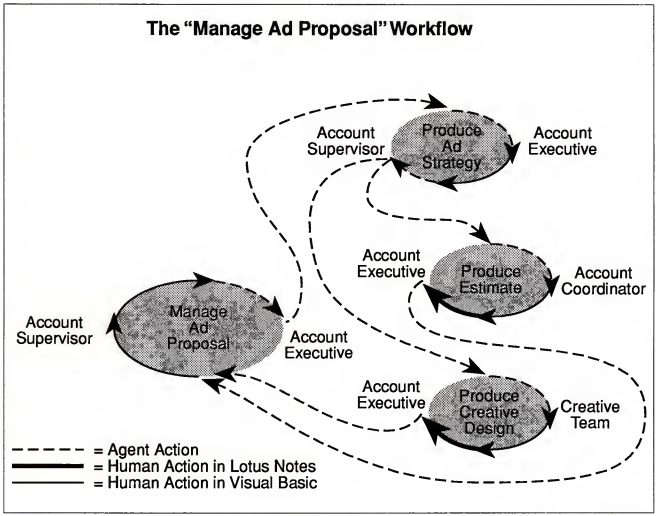
The CIO of Y&R was looking for ways to improve the company's customer satisfaction. He came upon ATI's workflow framework. Later, he saw how this framework could be deployed using Lotus Notes.

A pilot project was started in the San Francisco office. It was set up with one of the office's largest accounts, Chevron Oil.

The objective of the project was to automate the traffic process. The traffic process refers to the ongoing iterative exchange of ideas and specifications when an ad client requests specific advertising services from an agency. For example, if Chevron wants to increase its market share in Southern California, it turns to Y&R. Over some weeks, the two companies develop the ad campaign and collateral. Lots of interaction, unstructured and freely directed, takes place.

Exhibit IV-6 shows the workflow of this installation.

EXHIBIT IV-6



Courtesy: Young & Rubicam

d. Vendors and Technologies Used

Y&R used Action Technologies Inc.'s workflow engine and design tools, which run on Lotus Notes.

e. Linkage of Internal Workflows with Trading Partners

Y&R's traffic automation system provides a very critical link between the ad agency and its client. The system conveys work orders, requests for proposal, change orders and other basic tasks of commerce always found in a business transaction. The system conveys these tasks, not in the language of standard (X12 or EDIFACT) electronic data interchange, but in the semi-freeform structure of Lotus Notes with Action Technologies'

workflow engine. Here, the structure is not of the data within a single document (as in today's EDI); rather, the structure is on the position of the given document/message relative to the other documents/messages that comprise the overall work process.

For the billing of clients, Y&R uses the automated system and processing services of Donovan Data Systems. Here, Y&R sends invoice data electronically to Donovan and Donovan bills the appropriate client parties. This system uses some X12 EDI standards as well as proprietary data formats established by Donovan to transmit the data.

In the future, Y&R wants to link its traffic workflow system with the Donovan billing system. Y&R also plans to store all advertising collateral that it produces for a client on CD ROM. The CD ROM archive will tie into the workflow and billing systems. This way there will be complete records of individual jobs.

Y&R does not anticipate using the workflow system with suppliers, except possibly with media companies. One manager expects that for media companies (i.e., a film studio) with which Y&R does repeat business, it would make sense to implement the workflow system. Other suppliers, however, do not do enough repeat business to warrant establishing a system. Y&R frequently puts out to bid many of its subcontracts and therefore doesn't have a lot of repetitive business dealings with the same vendor.

Y&R wants to extend the workflow system to other groups within the company. Many of these groups act as "suppliers" to the advertising account rep and production groups, such as direct mail services, studios, merchandising, and other groups.

f. Project Status and Results

At this stage of the pilot project, Y&R's client (Chevron) interacts only as an observer. Chevron is in the process of upgrading the systems for its advertising/marketing department. With workstations for everyone, Chevron will tie into the Y&R system.

2. Texas Instruments

a. Description of Business

Texas Instruments (TI), headquartered in Dallas, Texas, is a $6 billion-per-year high-technology company with sales and manufacturing operations in more than 30 countries. TI develops, manufactures and markets semiconductors, defense electronic systems, software productivity tools, computer systems and peripheral products, electrical controls, metallurgical materials and consumer electronic products.

b. Project Objective

The project objective is to consolidate the company's worldwide procurement activities into a single purchasing system in order to leverage the company's enormous purchasing volumes (currently $3.8 billion per year of materials) into discount agreements with its suppliers.

c. Project Background and Description

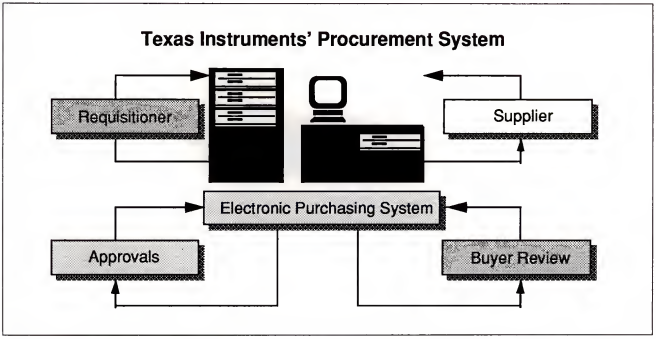
The project began in 1984 and is 80% complete.

The core of the system is a workstation module that gives buyers access to worldwide ordering information and an electronic purchasing system that allows non-buyers to order directly from approved manufacturers and arrange prompt delivery. With access to worldwide buying information, a buyer can make sure the company is getting the best price and find opportunities for new volume agreements.

The system consists of databases containing all authorized suppliers and contract information worldwide (for both single suppliers and commodity suppliers). Workstations allow menu-driven electronic requisitioning for paperless processing of requisitions, including a paperless routing and approval system, and an electronic buyer's module.

Exhibit IV-7 illustrates the basic architecture of TI's electronic procurement system.

EXHIBIT IV-7



Today, 65% of TI's purchase orders are electronic.

d. Vendors and Technologies Used

TI developed its Enterprise Procurement System using its CASE tools and internal personnel and resources. Equipment for the system is IBM MVS mainframes and OS/2-based personal computers.

e. Linkages of Internal Workflows with Trading Partners

TI's system uses databases and internal E-mail/routing so that non-buyers can requisition materials. Requisitions are approved and relayed to buyers, or in some cases, directly to suppliers. TI is building a product catalog for internal use so that TI personnel can know what is available to purchase.

The internal routing of requisitions is connected to an EDI software module that prepares the purchase order to be sent to the supplier. TI gave many of its suppliers PCs with software so that they could receive electronic purchase orders.

f. Project Status and Results

Costs:

- TI has spent $20 million since 1986 in developing the system.

Benefits:

- The estimated reduction in materials and labor costs is $30 million per year (includes shortened order and product cycle times; more defect-free lots; volume discounted purchases and paperless orders).
- Negotiated volume discounts are saving $3.2 million annually in materials costs.
- Quality contracts are negotiated with 1,000 suppliers; electronic tracking of supplier performance allows TI to measure compliance.
- The number of suppliers has been cut in half, from 30,000 to 15,000.
- TI's ordering cycle was cut from 16 days to four.
- Product cycle time was cut by 50%.
- Buying staff was reduced by 30%.
- Deliveries are now on-time 75% of the time; not 21% of the time as before.

D

User Requirements of Workflow/Electronic Commerce Solutions

User-level requirements:

- Security
- Role designation and authority (directories and intelligent routing)
- Item designation (catalogs)
- Multimedia capabilities (especially imaging/scanning, but also video)
- Integrated messaging (E-mail, EDI, database interfaces, facsimile; to a lesser extent, voice systems, such as voice response)
- Network and transport services (possibly enabled by the network operating system)
- Workflow design tools

System-level requirements:

- Open environment (OS and API levels)
- Modularity
- Interoperable components
- Flexibility
- Scalability

E

The Potential for Convergence

Key points so far:

- Workflow and electronic commerce are natural friends; workflow specifically solves some of the chief problems of EDI.
- Workflow implementations typically begin deep within the boundaries of a single company (in a single department) and work outward (to include the whole enterprise). Electronic commerce implementations typically begin on the periphery of companies and work inward to the applications. A convergence of the two kinds of information systems projects will be widespread in two years.

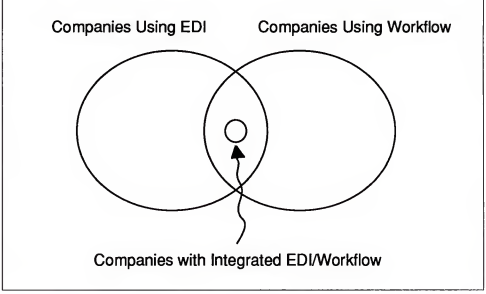
- There are only a handful of truly integrated intercompany workflow systems, systems that connect complementary workflows of two companies engaged in trade.

- The number of workflow installations (counting companies, not users) are of equal magnitude to EDI installations: in the scores of thousands. There are 42,000 companies in the U.S. using EDI; there are approximately 80,000 companies using workflow software products.

The present situation is represented in Exhibit IV-8.

EXHIBIT IV-8

Workflow/Electronic Commerce Convergence, 1993

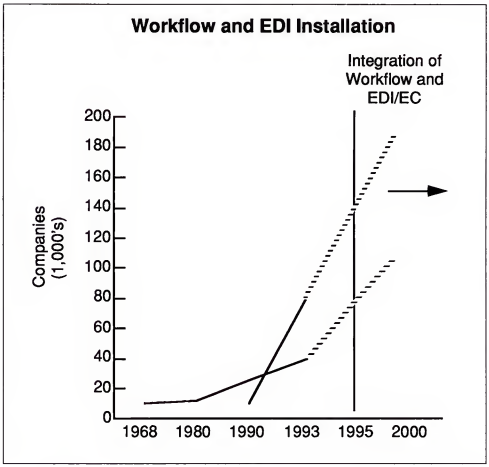


Companies using EDI are roughly equal to the number of companies using workflow (in the scores of thousands—definitely not millions). Furthermore, there is overlap: many companies use both EDI and workflow in the same company. But despite the overlap, only a negligible number of companies at this time have integrated workflow and EDI/electronic commerce systems. This is shown graphically in the exhibit by the small circle within the overlap region of the two large sets.

The rapid growth in workflow installations (namely Lotus Notes, BeyondMail, Delrina FormFlow, and Reach WorkMAN) should have spillover effects that encourage EDI use. As more companies use workflow to automate internal processes, many of them will realize that they need EDI. Therefore, workflow installations will be a driving force for EDI. Workflow installations could become the upper limiting factor of EDI. In other words, EDI will grow no faster than workflow installations. Workflow installations represent a specific prospective market for EDI software and services.

Exhibit IV-9 shows the installations of workflow and EDI software over time. Workflow is being adopted faster than EDI.

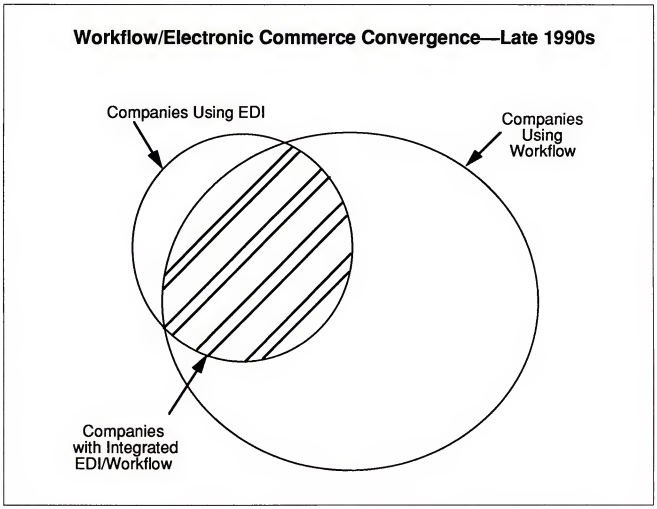
EXHIBIT IV-9



With the rapid growth in workflow software (especially compared to the growth in EDI), in a few years perhaps millions of companies will be using workflow. Only hundreds of thousands of companies will be using EDI. Furthermore, most companies using workflow will also be conducting some kind of electronic commerce and will have workflow and electronic commerce integrated. Rarely will companies conducting both workflow and EDI *not* have the two systems integrated.

This scenario is depicted in Exhibit IV-10.

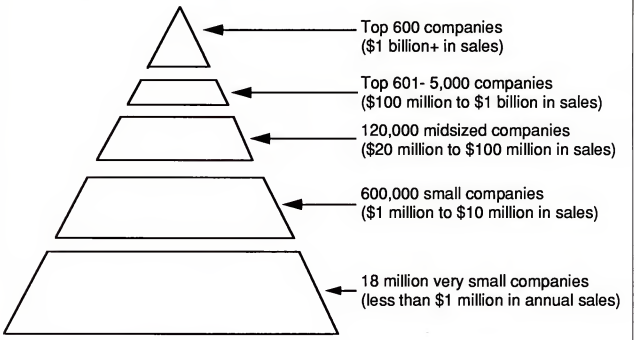
EXHIBIT IV-10



The goal is to reach the millions of small companies. Exhibit IV-11 shows a segmentation of companies in the U.S. by size.

EXHIBIT IV-11

Size and Distribution of U.S. Businesses (Corporations, Partnerships and Proprietorships)



Sources: Internal Revenue Service, *Forbes*, *Fortune*, INPUT

Typically, EDI installations start with large companies and percolate to the suppliers of these large companies. Workflow starts in the departments of large and midsized companies and percolates outward. Thus, widespread internal-to-external automation by combining workflow and EDI/electronic commerce could occur in the late 1990s for millions of companies.

Providers of Workflow and Electronic Commerce Tools

This chapter reviews the leading vendors of workflow software. For more information about these vendors or for profiles of EDI and electronic commerce vendors, see INPUT's report, *Electronic Commerce Vendors and Competitive Assessment,* and INPUT's Vendor Analysis Program.

A Overview

1. Today's Workflow Vendors

Below is a list of the principal workflow software providers:

Mass Markets/OEMs

Action Technologies, Inc.
Beyond, Inc.
DaVinci Systems Corp.
Delrina Corporation
Fischer International Systems Corporation
JetForm Corporation
Laser Data, Inc.
Lotus Development Corporation
Reach Software Corporation
WordPerfect Corp.
XSoft (Xerox Corporation)

Solution Providers

Digital Equipment Corporation
GE Information Services
FileNet Corp.
IBM
NCR
Sterling Software, Inc.
Texas Instruments
ViewStar Corp.

a. Characteristics of Today's Workflow Vendors

Mass marketers typically sell workflow software that:

- Runs on PCs or UNIX workstations
- Requires users (or VARs, systems integrators, or consultants) to install with little support from the vendor
- Is less than $1,500 and generally less than $500 per user-seat
- Is basically a mail/network system with intelligent routing functions
- Is easy to install and use
- Is often sold through channels (including VAR, systems integrator, independent consultants, or OEMs)

Solution providers typically sell workflow software that:

- Runs in PC, UNIX, mainframe or other proprietary environments
- Comes bundled with a vertical market or application-specific focus
- Comes bundled with equipment and is sold as a turnkey system
- May involve systems integration services on the part of the vendor
- Is priced, on average, in the tens to hundreds of thousands of dollars
- Has an ongoing service revenue component

b. Origins of Today's Workflow Vendors

These vendor companies originated in four different segments of the information software and services industry. These segments and associated vendors are:

- PC/LAN environments (Action Technologies, Beyond, DaVinci, Delrina, JetForm, Lotus, Reach, WordPerfect, and XSoft)
- Mainframe/proprietary environments (Digital, Fischer, IBM, NCR, Texas Instruments)
- Image processing (FileNet, Laser Data, ViewStar)
- Commercial network providers (GEIS, Sterling Software)

c. Trends of Today's Workflow Vendors

- Now, the segments are coming together and forming the "workflow" (or groupware) software (and services) market.
- All vendors, notwithstanding their respective origins, are offering PC-based and open solutions and abandoning proprietary environments. Proprietary environments are rapidly disappearing. In other words, today's workflow products almost without exception run in DOS, Windows, UNIX, NetWare, OS2, and (soon) Microsoft NT environments.
- The most rapidly growing workflow vendors are the mass marketers. The slowest growers are the image processing vendors. Vendors who were originally mainframe/proprietary vendors have shown great agility in reorienting their offerings to address the new PC and open environments of the 1990s. The commercial network service providers are the most likely to acquire or make alliances with the other vendors to get into the workflow arena.

2. Today's Electronic Commerce Vendors

Below is a list of the principal vendors of electronic commerce network and software solutions.

Network Services and Software

Advantis
GE Information Services
Harbinger EDI Services
Immedia
Sterling Software, Inc.

Network Services Only

AT&T
MCI/BT

Software Only

Digital Equipment Corporation
Fischer International Systems Corporation
Premenos
Supply Tech Corp.
TSI International

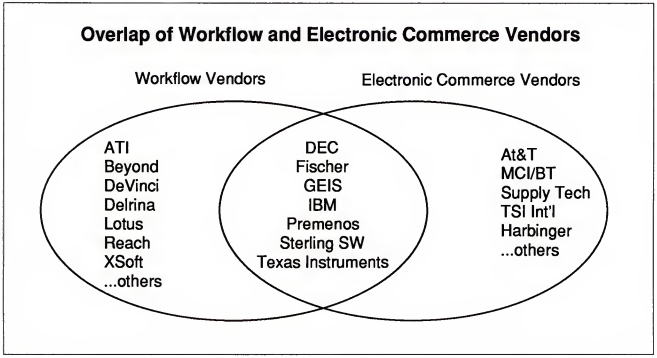
For more information on these companies, see selected profiles below, as well as INPUT's reports, *The U.S. EDI and Electronic Commerce Markets: 1993-1998* and *EDI and Electronic Commerce Vendors and Competitive Analysis.*

3. Relationships Between Vendors of Workflow and Electronic Commerce

Integrated electronic data flow from one company's internal workflow into another's requires interfacing workflow and electronic commerce systems. Such interfacing is best achieved when vendors build products to interoperate with others. Doing this is often best accomplished when vendors enter into alliances or reseller programs, acquire or license another's product, or engage in some other deliberate effort of coordination.

Exhibit V-1 shows the two camps of vendors—workflow and electronic commerce—and the degree to which they have come together.

EXHIBIT V-1



The companies in the overlap section of the exhibit have products in both categories.

Until 1993, the two groups developed and marketed products in relative isolation. Each group was too busy with its own marketplace to establish rapport with the other.

In 1993, this began to change, as indicated by the following events:

- GEIS (a major electronic commerce vendor) made an OEM alliance with Delrina (a major workflow vendor).
- GEIS and Sterling Software introduced "electronic commerce" workstation software (and allied network services) that combined EDI, E-mail, and directory and bulletin board access.
- Digital Equipment reorganized its many product groups (EDI, workflow/routing, imaging, document management, groupware, messaging, and PC integration) into a single "Workgroup Systems" group.
- Fischer International, a workflow and secure messaging software vendor, purchased the rights to a line of EDI software from a now-defunct vendor (Blue Rainbow Software International).
- Several user implementations are employing workflow products (namely, Lotus Notes, Action Technologies' WorkFlow, and Delrina's FormFlow) for intercompany "electronic commerce" applications.
- Several vendors from both groups, workflow and electronic commerce, have initiated talks about possible relationships.

These events indicate the start of a convergence of workflow and electronic commerce systems. INPUT believes that in 1994 there will be a frenzied coming together of these two groups of vendors. This will be entirely user—market—driven. Users are rapidly approaching the point at which they will need to integrate internal with external workflows. See section A in Chapter IV, "Forces Driving the Convergence of Workflow and Electronic Commerce."

B
Companies

The profiles below describe the products and strategies of workflow and/or electronic commerce software and service vendors. The profiles pertain only to these companies' workflow and electronic commerce products, not their entire product lines. For information regarding the complete product lines of the large vendors in particular, such as Texas Instruments or Sterling Software, please refer to INPUT's report, *EDI and Electronic Commerce—Vendor Analysis and Competitive Assessment.*

1. Action Technologies, Incorporated

1301 Marina Village Parkway
Suite 100
Alameda, CA 94501
tel: 510-521-6190
1992 revenues: not available

a. Company Background

Action Technologies, Inc. (ATI) was founded in 1983 as a developer of office automation and workgroup software. Its first product, The Coordinator, was one of the first groupware products in that it was LAN-based E-mail with filtering, group calendaring, and project management built into messages. The Coordinator was subsequently licensed to DaVinci Systems Corp. Action's next product, the Message Handling System (MHS by Action Technologies) was sold to Novell, Inc. and went on to become a de facto E-mail standard. Since 1992, ATI has been solely dedicated to the development and marketing of workflow systems.

b. Products

ATI produces the ActionWorkflow System, which consists of four components:

- ActionWorkflow Manager. A database server that contains the directories and definitions of business processes and monitors the status of transactions occurring in workflows. It uses the Microsoft/Sybase SQL Server database and the Lotus Notes database, either independently or together, and relies on industry-standard E-mail for transport. A server license starts at $6,000.

- ActionWorkflow Analyst. Running under Microsoft Windows, the ActionWorkflow Analyst lets business analysts and consultants analyze, graphically depict and automate the flow of work in companies. Once designed, the workflow structure is embedded in the ActionWorkflow Manager server. A single copy costs $495.

- ActionWorkflow Application Builder. Provides analysts, administrators, users and programmers with the tools to customize workflow routing, roles, and relations between people and electronic forms. It works in conjunction with Microsoft/Sybase SQL Servers and Lotus Notes databases and has rapid prototyping, debugging and testing tools. Templates that capture standard business patterns of business processes in different industries are included. A single copy is $1,495.

- ActionWorkflow Client Library. Provides application program interfaces to make common software applications on the market today workflow enabled. It consists of a number of programming languages, including C++, Visual Basic and PowerBuilder. An unlimited use license fee is $2,000.

c. Customers

Early adopters of ATI's workflow products are Bankers Trust, EDS, General Motors Europe AG, The IBM PC Company and Young & Rubicam.

d. Market Strategy and Assessment

ATI's framework for workflow and business process re-engineering is the most powerful of workflow products on the market by far. The company breaks down work into a finite number of constituent parts. Its ActionWorkflow product is the software that organizes and interconnects the people and processes according to this fundamental framework.

The Action framework greatly simplifies and clarifies business processes. In past years, the originality and simplicity of ATI's product has been difficult to communicate to users and the reseller community. But the atmosphere seems to be more accepting now. ATI's sister company, Business Design Associates (a professional services firm located in Emeryville, CA), and its subsidiary, The Workflow Institute, are helping educate large users in ATI's approach to business process re-engineering.

ATI is a small company and is taking the OEM route in selling its product. This means that it seeks alliances with value-added resellers and large software vendors.

ATI needs to get product out the door and establish strong relationships with resellers. Since 1992, it has been slow to do both. A reorganized management structure appears to be ameliorating these shortcomings.

2. Beyond, Inc.

Cambridge, MA
617-621-0095
Number of employees: 50

3. Delrina Technology Corporation

895 Don Mills Road
500-2 Park Centre
Toronto, Ontario, Canada
M3C 1W3
tel: 416-441-3676
number of employees: 275
Revenues: $35 million (nine months ending March 31, 1993)

a. Company Background

Delrina designs, develops, markets and supports mass market software products for use on personal computers. It launched its first product in 1989. It has two main products today: software that automates the creation and routing of office forms and software that turns a PC into a facsimile machine.

b. Products

- Delrina FormFlow. A workflow development tool for building applications to automate the movement of structured information as defined by business rules and procedures. It ties to leading SQL databases, E-mail systems (through VIM, MAPI and SMF/MHS), and has its own "intelligent forms language" for customization and rules.

- PerForm PRO Plus. Advanced capabilities related to automating structured information. Included are object-oriented form design tools, tools to link forms, database functions for collecting and storing information from standard databases, and the ability to create forms applications. It uses Windows' DDE and OLE capabilities for data exchange in a client/server environment.

- WinFax PRO. Windows-based facsimile communications and management software. Users are able to fax from within Lotus and Microsoft spreadsheets, Microsoft Word and WordPerfect software. Users can also combine output from different Windows applications into a single outgoing fax.

- The Far Side Daily Planner. A day timer/calendar for the PC desktop that features the cartoons of Gary Larson.

c. Customers

Delrina has a broad customer base that includes Fortune 500 companies, small businesses, government departments and agencies, educational institutions, users and consumers. As of October 1993, Delrina had approximately 1.5 million installations of its software products.

d. Market Strategy and Assessment

Delrina employs a multichannel distribution strategy to reach its customers that includes: distributors to retail outlets; retail chains and mail order; direct to large companies; government and end users; hardware and software vendors; manufacturers (OEMs); value-added resellers and system integrators; and international channels. Delrina has agreements with various OEMs whereby its products are bundled or otherwise made available to customers. The list of OEMs includes IBM, NCR/AT&T, Microsoft, Borland, Compaq, Hewlett-Packard, GEIS, Uarco, Gateway 2000 and U.S. Robotics. Delrina's PRO VAR program supports third-party consultants, developers, VARs, systems integrators, LAN consultants and trainers who implement systems that involve Delrina products.

Delrina is growing spectacularly, with an average revenue growth rate of 50% per year for the past four years. It has helped create the market for forms software, of which it estimates to have a 70% market share. It is riding the wave of facsimile software. It has the right products at the right time and continues to make the right moves. (Its success parallels Intuit Software's in its rapid rise based on close attention to customer requirements.)

Delrina's alliances and channels are critical to its further success. Its relationship with MCI/BT North America and GEIS help to open it to the EDI and electronic commerce markets. However, the phenomenal growth in its main product lines has kept Delrina management from focusing on the EDI market. Delrina management is in the process of putting EDI on the priority list.

Delrina's form and facsimile products combined provide inexpensive electronic commerce solutions that are easy to install. Already, companies such as Sony Corporation of America are sending purchase orders to suppliers using Delrina form and facsimile software (using a special message transport service from MCI). Suppliers also use Delrina software to receive the purchase orders. This kind of inexpensive electronic commerce solution could shake up the existing EDI industry.

4. Digital Equipment Corporation

Workgroup Systems Group
110 Spit Brook Rd.
Nashua, NH 03062
tel: 603-881-6100
number of employees: 200 core product and market specialists

a. Company Background

The Workgroup Systems Group of DEC was formed in 1993. It consolidated, under a single marketing and product team, all of DEC's workflow and electronic commerce software products, including: workflow/routing, EDI, messaging, groupware, imaging, document management, and PC integration tools. As in all DEC endeavors, the group is extensively matrixed into other parts of DEC so that the core group has access to product, administrative and sales personnel throughout the company.

b. Products

TeamLinks. A product line designed to provide standard desktop computers and applications with a wide variety of network services. Requires DEC's PATHWORKS product, a network product.

Network Application Support

All-in-1 Phase II

c. Market Strategy and Assessment

Digital's corporatewide strategy toward open systems and support of non-DEC environments is especially beneficial for it to be a major provider of office automation, workflow and electronic commerce solutions to companies. That its showcase office automation/E-mail/workflow product, TeamLinks, runs in Windows, Macintosh, Motif, UNIX and Microsoft NT environments (as well as VMS. Digital's proprietary operating system) is a sign that DEC is addressing the realities of the marketplace: that the marketplace is heterogeneous and PC based. This is quite a departure—and a much-needed one—from DEC's old top-down approach with All-in-1. DEC wants to effectively integrate and manage environments with heterogeneous PC LANs installed.

Digital's corporate strategy for the 1990s is "the open advantage." It delivers this advantage to customers through its Network Application Support (NAS) architecture—a system specification that addresses the requirements of several IT vendors—and All-in-1, DEC's specific applications and solutions for business.

The recent reorganization of Digital's workgroup software products into a single product/marketing group will undoubtedly bring greater focus and penetration in the marketplace. It is a good move. Digital has good technology and is opening up its products both in terms of providing for UNIX environments as well as making APIs to legacy environments (namely MVS).

Digital has many customers for its workgroup products, and with this consolidation of product and market managers, it should realize greater visibility in the marketplace. The lack of a coordinated market effort has hurt Digital.

5. Fischer International Systems Corporation

4073 Mercantile Avenue
Naples, FL 33942
tel: 813-643-1500
number of employees: 150
1992 revenues: $20 million (INPUT estimate)

a. Company Background

Fischer International, founded in 1982 and privately held, designs, develops, and markets communications and security software. In the third quarter of 1993, Fischer purchased the license to EDI software of Blue Rainbow Software International. It created a subsidiary company to manage this product and hired an executive from Premenos, a competing EDI vendor, to run it. The EDI software acquisition complements Fischer's products for E-mail, workflow and security. Its founder and CEO, Addison Fischer, was formerly in the intelligence community.

b. Products

- Emc2/TAO—E-mail and office automation
- Watchdog—a line of microcomputer security products
- IOF—a productivity aid for TSO and CICS environments
- Multinet—a line of EDI translation software and E-mail software for PC-DOS, AS/400, System 3X, and UNIX environments. Recently purchased from Blue Rainbow International.

c. Customers

Fischer claims to have 2,000 customers worldwide. Large customers include Federal Express, Prudential, General Dynamics, Control Data Corp., General Motors, the U.S. Army and U.S. Navy, the U.S. Department of Justice, VISA, the IRS, General Foods, General Electric and Blue Cross/Blue Shield.

d. Market Strategy and Assessment

Fischer's strength is in security software (encryption, authentication and digital signatures). With its acquisition of EDI software, Fischer will be able to offer customers a complete electronic commerce solution, including internal E-mail, secure EDI transmissions and digital signatures. "All (Fischer's products) come together in a 'secure EDI workstation,'" according to a Fischer executive.

Fischer's strategy is to provide tools that allow customers to seamlessly connect internal workflows (among people, departments and applications within a single company) to external workflows (the people and processes associated with the company's trading partners).

Fischer's edge in secure message transport is an important differentiator. It will make electronic commerce more appealing to the millions of small companies.

Fischer is a midsized company that is growing quickly and has large customers. It is well positioned from market and technology standpoints.

6. GE Information Services

Rockville, MD
301-340-4000
1992 revenues: $640 million (INPUT estimate)

a. Company Background

GEIS is the IT vendor with the largest revenues from electronic commerce services: $80 million in worldwide EDI network revenue ($52 million in North America alone), $103 million in intercompany messaging worldwide ($73 million in North America) and another $2 million in EDI software sales (these figures represent 1992 revenues). GEIS, altogether a $650 million company, has other electronic commerce-related businesses in processing services.

b. Products

EDI and EDI/EFT software. GEIS sells EDI translation software for PC-DOS, UNIX, and MVS environments.

Network services. Its EDI*Express and Business Talk services are its messaging services for the corporate customers. (GENIE is its consumer E-mail service.)

Electronic information services. GEIS offers several electronic catalogs listing merchandise for business-to-business transactions. Catalogs include those for retailers/apparel manufacturers, shoe and sporting goods vendors/retailers, book publishers/retailers, and in-the-future computer products.

GEIS has reseller agreements with several companies, namely American Business Computer (for UNIX EDI translation software) and Delrina (for forms software).

GEIS has its own packet-switched network and extensive processing facilities; some of this equipment dates back to the 1970s.

c. Market Strategy and Assessment

GEIS is embarking on a multiyear strategy to revamp its network infrastructure with open/UNIX-based equipment and software. GEIS anticipates greater acceptance of open/UNIX systems in general. With its own network highly open, it expects customers to more easily tie into its services and it expects to offer greater value-added services as a result.

GEIS has been merging its Business Talk service (primarily an E-mail service aimed at the corporate user) with its EDI services to deliver an integrated electronic commerce solution to companies.

7. JetForm Corporation

560 Rochester St.
Suite 400
Ottawa, Ontario, Canada
K1S 5K2
tel: 613-594-3026
1992 revenues: $3 million

JetForm develops, markets, and sells forms automation software products. The company's core software product is JetForm-Design, a WYSIWYG tool used to create electronic forms or to replicate existing paper forms.

8. Lotus Development Corporation

55 Cambridge Parkway
Cambridge, MA 02142
1992 revenues: $900 million

a. Company Background

Incorporated in 1982, Lotus introduced its first product, 1-2-3, in 1983. This single product, a spreadsheet, launched it into the hundreds of millions of dollars in annual revenues. In addition to its spreadsheet products, the company has developed or acquired presentation graphics and word processing products in its efforts to build a strong presence in each of the predominant desktop application categories. Lotus introduced Lotus Notes in 1990 and the product has become the definitive workflow software product. The combination of Notes and cc:Mail, the leading LAN-based electronic mail product, has established the company as a leader in PC-based communications software. Augmenting its product offerings, the company formed a consulting services business to assist customers in effectively utilizing their computer resources.

b. Products

Spreadsheets: 1-2-3 (for Windows, Macintosh, OS/2, UNIX, IBM System/370, VAX/VMS and All-in-1)

Presentation graphics: Freelance Graphics

Word Processing Products: Ami Pro and LotusWrite

Communications Products: Notes and cc:Mail

c. Market Strategy and Assessment

Lotus believes electronic mail represents a substantial opportunity in the software industry over the next three to four years. cc:Mail products, which are tightly integrated with the Lotus suite of products, put Lotus in a position to capitalize on the anticipated growth of electronic mail in networked computing environments. The company also believes that because electronic mail has the potential for greater desktop penetration than any other application, cc:Mail products provide Lotus with an added opportunity to introduce customers to its entire suite of integrated products.

9. Reach Software Corporation

330 Potrero Ave.
Sunnyvale, CA 94086
tel: 408-733-8685
number of employees: 40

10. Sterling Software, Inc. (EDI Group)

4600 Lakehurst Court
Dublin, OH 43017
614-793-7000

Sterling Software, Inc. (Dallas, TX) is a $400 million software vendor with worldwide distribution and customer base. It has grown largely through acquisition, its most recent and largest being Systems Center, Inc., a $130 million vendor of systems software modules for IBM mainframe computers. With the Systems Center acquisition, Sterling reorganized into four divisions: Federal Systems, Systems Software, International and the EDI Group.

The EDI Group, based in Dublin, OH, is the focus of Sterling's EDI and electronic commerce business. The group's 1992 revenues were approximately $57 million, with $32 million coming from network services, $23 million from software (EDI translation and EDI/EFT software) and $2 million from education and training services.

Though Sterling may be smaller than GEIS, its chief competitor, in revenues, it has always been profitable in the EDI business (an accomplishment that GEIS has not achieved, except perhaps recently). Sterling doesn't own its network lines. It has extensive mainframe and processing facilities which it is upgrading to UNIX platforms in its operation Condor.

With the acquisition of Systems Center (and its extensive international distribution network) by corporate Sterling and the acquisition of a small U.K. EDI software vendor, Sterling's EDI Group is now moving quickly to build a global EDI/electronic commerce service. The former president of Sterling's EDI business, Bill Plumb, has been advanced to the Executive Vice President of Sterling's International Division. He is expected to play a key role in building the international EDI business.

Sterling is strong in both networks and software for electronic commerce. In late 1992, it broadened its strategic focus to concentrate on "electronic commerce" (not just EDI), and in 1993 it launched one of its first products in its expanded product line, Commerce Connection, a software package that has associated network services. Commerce Connection primarily provides EDI users with E-mail, directory and library capabilities so that EDI Coordinators of different companies can communicate/coordinate their EDI systems with each other.

11. Texas Instruments

6500 Chase Oaks Blvd.
Plano, TX 75023
214-575-3500

TI offers a full line of EDI software, but moreover, TI's Information Engineering Facility (applications software, CASE development tools, and UNIX-based products) allows it to re-engineer a client company's operations from top to bottom. TI is positioning itself as a full solutions provider (not just a vendor of individual technology products). It is targeting the largest companies and offering them a complete makeover of information systems that is intended to give competitive superiority in whatever industry the client is in. TI views EDI and electronic commerce as just one facet of a company's information system.

TI's Integrated Procurement Management System (IPMS) connects internal routing of requisitions to procurement, EDI and a centralized corporate communication gateway. Originally built for TI's internal use, TI is now commercializing the system. IPMS was built for IBM MVS environments, but is being moved to UNIX environments.

TI's biggest barrier has been that its products are aimed at mainframe shops. Today's opportunities are found with UNIX, Windows, OS2 (to some extent) and soon Microsoft NT environments. MVS mainframe environments are rapidly shrinking. Products for these environments are not likely to be successful.

12. XSoft

(a division of Xerox Corporation)
3400 Hillview Ave.
Palo Alto, CA 94303
415-813-7850
number of employees: 450

a. Company Background

XSoft, one of nine independent business divisions of Xerox Corporation, is a worldwide software supplier that develops, manufactures, markets and supports client interface and document services software operating on industry-standard UNIX and PC computing platforms. The software is intended to improve individual and group productivity.

b. Products

XSoft's products cover: office productivity, compound-document publishing, international document translation, content-based search and retrieval, and personal productivity. In addition, XSoft supports work group collaboration through a series of shared document services products.

A key workflow product is:

- Globalview Desktop, a set of modular, affordable, interoperable applications for document creation and distribution. This product runs on PC and Sun SPARC platforms. Modules begin at $1,495.

c. Market Strategy and Assessment

XSoft distributes its products through a combination of direct sales and indirect channels. XSoft has agreements with Ingram Micro, GTSI, Egghead and GST, a European republisher. XSoft also works with value-added resellers. Direct sales support is supplied by Xerox USCO and XCI (North America), Rank Xerox (Europe) and Fuji Xerox (Japan). XSoft also distributes through OEMs such as Siemens AG.

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Conclusions and Recommendations

Through case studies, individual product profiles and a demonstration that "commercial exchange" is one kind of "workflow," this report has shown that workflow and electronic commerce systems are naturally suited for each other. And, in fact, there are instances where they are integrated, as they should be.

Workflow systems are easier for companies to implement and use than electronic commerce systems. Consequently, they are being adopted faster than electronic commerce. More companies already use some form of workflow software than use EDI. Only small numbers of companies have tied workflow systems to EDI/electronic commerce systems. In many of these cases, EDI software is not used to communicate with trading partners. Instead, workflow software is used. For example, there are implementations of Delrina's FormsFlow and Lotus Notes that connect several companies to facilitate their commerce.

Several conclusions:

- Workflow software may be an easier way to establish intercompany electronic commerce than traditional EDI.
- Many of the problems that EDI users have run up against and many of the recent requirements of EDI are addressed, in design, by today's leading workflow products.
- In only two to three years, users may widely recognize the need for an enterprise IS solution that combines workflow (for internal routing of information) and electronic commerce (for communications with trading partners).
- EDI software and services, instead of being sold as standalone products, could be assimilated into a larger category of workflow products and services.

Based on this logic and the resulting scenario, the following recommendations are offered:

- Users should keep in mind that their relationship with customers and suppliers represents a kind of workflow that can be enhanced through automation. Today's tools for automation are *both* workflow *and* electronic commerce products services. The user is encouraged to shop around for the tools that best fit its needs.

- Vendors of workflow need to recognize that their products can be used in an interorganizational context, not just an intraorganizational one. If the workflow vendor is serious about entering the EDI/electronic commerce markets, it could gain a lot of leverage and quickly come up to speed by partnering with an EDI/electronic commerce vendor (or by seeking assistance from INPUT). The EDI/electronic commerce market has many unique characteristics (such as "hub-spoke" and "trading community" formations) that require unusual marketing strategies and tactics.

- Vendors of EDI and electronic commerce software and services need to recognize the "threat" and/or opportunity that workflow provides. These vendors should either develop their own workflow products or partner with existing workflow vendors.

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  - Forecasts
  - Awards (FAIT)
- **Commercial Application LEADS**

CUSTOM PROJECTS

For Vendors—analyze:

- **Market strategies and tactics**
- **Product/service opportunities**
- **Customer satisfaction levels**
- **Competitive positioning**
- **Acquisition targets**

For Buyers—evaluate:

- **Specific vendor capabilities**
- **Outsourcing options**
- **Systems plans**
- **Peer position**

OTHER SERVICES

Presentations to user groups, planning meetings, etc.

Acquisition/partnership searches

Newsletters

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