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DECEMBER 1991

ELECTRONIC COMMERCE AND TRANSPORTATION

INPUT®

1280 Villa Street, Mountain View, California 94041-1194 (415) 961-3300

Published by
INPUT
1280 Villa Street
Mountain View, CA 94041-1194
U.S.A.

Electronic Data Interchange Program—U.S. (EDIP)

Electronic Commerce and Transportation

EDTTR • 448 • 1991

Abstract

Electronic commerce in the transportation industry involves the use of EDI and other messaging services, electronic data bases and various electronic processing services that facilitate commercial exchanges between shippers, carriers, and service providers. INPUT examines the current state of electronic commerce in transportation: the major trading partners of transportation service companies, their corresponding trade flows, to what degree electronic systems are currently used to support these trade flows, what emergent and needed services there are to establish a solid electronic infrastructure, what the impact of electronic commerce will be and what the major opportunities are for transportation service providers and information service providers.

The report is 89 pages long and contains 38 exhibits. An index of companies mentioned in the report is included.

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I

Introduction

I

Introduction

A

Commerce and Transportation

Transportation, communication technology, and commerce are inextricably bound together. Price/cost changes in one domain directly impact the cost structures of the others. Logistics—which go beyond mere transport and can be defined as the management of inventory whether the inventory is in motion or at rest—are necessary in all business. Exhibit I-1 notes some of the salient interrelationships among transportation, communication and commerce that interested parties must take into account when implementing technological solutions.

EXHIBIT I-1

Relationship between Transportation, Communication and Commerce

- Communication technologies often diminish use of transportation.
- Expansion of business markets drives need for transportation and communication services.
- Transportation and finance are intertwined.
- Technological change in transportation directly impacts industries that rely on transportation.

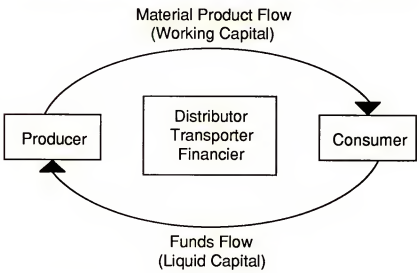
Communication technologies often diminish the use of transportation. A company may discover closer suppliers, better distribution channels, or better manufacturing processes which may help to reduce transport needs. With better communication, a company can operate "smarter" than before and eliminate needless movement of inventories.

On the other hand, a company's desire to increase its geographic market territory and its sourcing spheres will drive the use of both transportation and communication services.

Transportation and finance, both necessary and fundamental services to all companies, are often intertwined. Being successful at buying and selling inventories for a profit—either as a manufacturer or a distributor—entails effectively balancing the flow of funds from the customer to the supplier and the flow of materiel from the supplier to the customer. This is shown in Exhibit I-2.

EXHIBIT I-2

Liquid and Working Capital Flows Are Enhanced through Better Communications



The overall objective is to optimize the flow of both forms of capital as much as possible to favor the financial position of the company. Communication technologies have an enormous impact on both sets of flows by making the flows more efficient.

The relationship between finance and transportation is further underscored by history. Note that today's Wells Fargo Bank was originally an express courier. Lloyd's of London grew by servicing maritime freight.

Transportation is a core industry on which all industrial and distribution industries rely. Changing the capacity of transportation through new technologies changes the capacities of the industries that transportation serves. Because of transport's central and direct impact on the cost structures of other industries, it has a strong multiplier/leverage effect for the technologies it adopts.

B

Electronic Commerce: Definition

As business moves from being conducted in a paper-based to an electronic-based environment, profit opportunities change. Electronic, computer-telecommunication systems—particularly where software, services, and intellectual property play a large value-adding role—bring about new distributions of costs, revenues and competition within an organization, within an industry, and within an entire economy.

Electronic systems allow for the introduction of new products and services to business and consumer markets. Furthermore, users and vendors of information services and technologies are finding that their respective business operations and strategies are becoming increasingly intertwined, with the user relying on the vendor for maintenance and upgrades and the vendor relying on the user to increase its market share and enhance its ongoing technical competence.

Moreover, because information systems are often equivalent or identical to the value-adding function of the user's business, the user of information technologies may opt to sell its system (particularly software and services) and, in a way, replicate its business or a portion of its business for a profit. In this way, an information service user becomes an information service vendor.

The shifting profit opportunities and the intertwined, dual identities of market participants makes for a very dynamic competitive environment, one in which it is increasingly difficult for executives, managers and entrepreneurs to make strategic decisions about how to apply information technologies and where to look for new commercial opportunities and risks.

In a series of reports, INPUT is examining this new phenomenon. As a way of making sense of the myriad of changes to enterprise and industry driven by the adoption of new communication technologies, INPUT uses the term "Electronic Commerce."

Commerce, by Webster's definition, is an act of communication (see Exhibit I-3).

EXHIBIT I-3

Webster's Definition of Commerce

(1) Social intercourse: dealings between individuals or groups in society: interchange of ideas, opinions, or sentiments: interrelationship, connection, communication. (2) The exchange or buying and selling of commodities especially on a large scale and involving transportation from place to place.

Electronic commerce is the augmentation of these basic human-to-human communications with electronic information technologies. INPUT's definition is shown in Exhibit I-4.

EXHIBIT I-4

Definition of Electronic Commerce

Electronic commerce is the electronic, network-based coordination of material, people, and processes that facilitates commercial exchange.

Electronic commerce implies the building of an infrastructure of interorganizational systems through which companies can transact business.

The electronic commerce infrastructure for the logistics/transportation industry includes all software, network services, information services, processing services, and professional services that support interorganizational commercial transactions. It also includes hardware expenditures, but INPUT does not examine these markets.

Specifically, electronic commerce technologies in transportation are:

- Software that supports interorganizational communications for trade (mostly EDI translation software) maintained by shippers, carriers, service providers, government agencies, etc.

- The costs of network/telecommunication/processing services to move and process messages between buyers and sellers (for example, EDI network store-and-forward services, tariff data base services and freight-bill processing services)
- The professional services purchased by users to design and build systems
- The work and money expended to make standardized messages for all the industry to use

Note: Costs of hardware are not included as part of the electronic commerce investment in this study.

Note: Passenger travel is not examined in this report. It is contained in an upcoming INPUT report, *Electronic Commerce in Travel, Tourism and Recreation.*

C
Trading Community: Definition

To analyze the market for electronic commerce systems, understanding the notion of "trading community" is necessary. A trading community is all the companies that are engaged in some general economic activity. For example, in the production and distribution of clothing, there are textile mills, apparel manufacturers, wholesalers, retailers, banks, transportation companies, etc. Exhibit I-5 defines a trading community.

EXHIBIT I-5

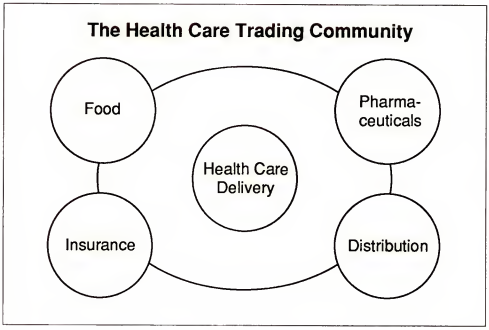
Definition of Trading Community

- A company, its trading partners, and the trading partners of its trading partners
- An expanded vertical market

A trading community is different than a vertical industry, such as discrete manufacturing, process manufacturing, distribution, etc. The vertical industry taxonomy lumps together apparel manufacturing, auto manufacturing, and electronic equipment manufacturing. Such a grouping is irrelevant when one wants to examine systems that support trade relationships among companies. A trading community, therefore, is more of a "value chain" than a vertical industry.

Exhibit I-6 shows the trading community for health care.

EXHIBIT I-6



The concept of "trading community" is useful in delimiting the logical domain of players who trade with each other and who, therefore, are candidates for interconnection via an electronic commerce infrastructure. The trading community is companies that, in the course of business, need to communicate with each other.

D
Trading Communities and Transportation Service Providers

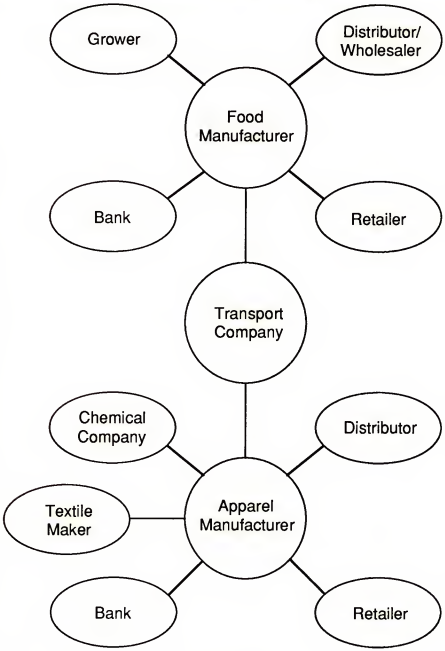
Transportation by itself is not a trading community by INPUT's definition (with the possible exception of ocean port communities, that are composed of trucking companies, steamship companies, terminal operators, port authorities, customs authorities, brokers and forwarders, etc).

However, transportation is a key trading partner in a wide range of trading communities, from grocery to publishing to high-tech field service support and all manufacturing communities.

Exhibit I-7 shows transportation's role in the grocery and apparel trading communities.

EXHIBIT I-7

Transportation Providers Are Primary Trading Partners in Most Trading Communities—Grocery and Apparel Trading Community



Because transportation plays such a significant role in other trading communities, its efforts to streamline its operations through communication technologies has a corresponding streamlining impact on all the other communities it serves.

E

Overview of Report Findings

Deregulation is bringing economic efficiency to the U.S. transportation industry. The lifting of restrictions on entry, routes, commodities, and rates is allowing market forces to determine the price and quality of transportation services. Consequently, today's transportation service providers face a fierce competitive environment.

To compete in this environment, the successful providers are turning to electronic communication/commerce technologies (among other tactics). These technologies allow them to provide better service to customers and to operate at lower costs.

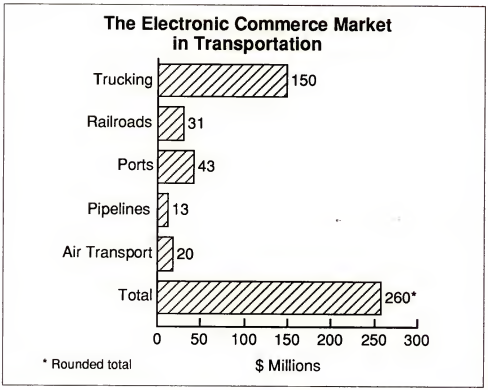
The adoption of electronic commerce systems by transportation companies, albeit still in its infancy, will impact the trading communities where transportation is a significant player. Most impacted are: petroleum, distribution of manufactured goods, business services, construction, auto repair, finance, and aircraft manufacturing.

INPUT estimates that user expenditures on software and services that allow for electronic transaction of business in the transportation industry came to approximately $260 million in 1991.

Exhibit I-8 shows the components of the electronic commerce market, broken out according to transportation mode.

INPUT believes that this amount is very small compared to the potential. For example, INPUT estimates that only one-third of the largest 2,000 trucking companies in the nation are EDI capable. INPUT estimates that of the 1.2 million billable truck shipments made per day, only four percent are facilitated at any point in the completion of the transaction with an electronic commerce service such as an on-line rate data base, an EDI message, a third-party freight-bill processor, or an EFT payment.

EXHIBIT I-8



Expenditure on electronic commerce systems is still a very small proportion—less than one percent—of carriers' total business cost.

Exhibit I-9 shows the percentage of total for-hire transportation revenues (all modes) and the amount spent on electronic commerce systems.

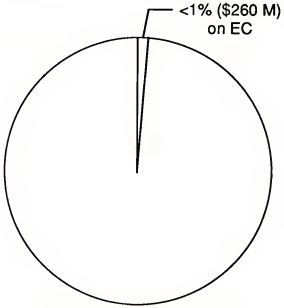
The use of electronic commerce systems and other information services has facilitated the emergence of new industry players such as transportation brokers and intermodal megacarriers and has allowed existing players to reduce the operational costs of their services.

Yet, despite the competitive advantages of electronic commerce systems, they are only successful when enough throughput/volume of business is attained.

The economics of the overall transportation industry are changing. The highly fragmented environment that was maintained through regulation is giving way to a consolidated, oligopolistic industry structure dominated by a few giants. As a result, only a relatively small number of large players can profitably provide the economic capacity demanded by shippers.

EXHIBIT I-9

Expenditure on Electronic Commerce as a Percentage of Total Transport Revenue



Total Transport Revenues*
$122 Billion

*For-hire freight transport only.

The revenue pie in U.S. transportation is not increasing significantly. Most revenue opportunities will arise from shifts in market share among existing competitors as the industry continues its shake-out. Electronic commerce investments will help some competitors capture market share.

Nevertheless, INPUT believes that while expenditures in electronic commerce systems will increase every year through the 1990s, carrier revenues will not increase as fast.

An unfortunate situation arises when investments in electronic commerce won't necessarily allow the carrier to offer new products for which it can charge extra. The investments are competitive necessities—market player 'ante'—which may or may not be recouped. Higher business volumes, realizable for the most part only through expanded market share stolen from competitors, will be the only route to recovering the cost of systems.

As transportation undergoes this period of what can be called frenetic reconstitution of itself (namely, consolidation and electronification), it has the potential to help reconstitute many other industries, value chains and/or trading communities.

Thus, INPUT concludes that:

- Transportation can and should assume a leadership role in the establishment of electronic commerce in trading communities where it plays a primary role.

- Because it influences the linkages among organizations in so many trading communities, transportation can help standardize electronic commerce transactions across trading communities.

- Information services companies (vendors of electronic commerce solutions) should look upon transportation as an entree to participation in other trading communities.

It is inevitable that manufacturers, distributors, and transportation companies will eventually be tied together with EDI and other kinds of communication networks. An increasing portion of business will be coordinated through these integrated networks. In order to be participants in the market for these goods and services, carriers and shippers must make investments in electronic commerce systems.

II

The Transportation Industry: Players and Trade Flows

II

The Transportation Industry: Players and Trade Flows

Trade flows correspond to communication flows. The key groups of customers and suppliers in transportation are those in which electronic commerce systems are being installed.

In this chapter, INPUT identifies the trade flows into and out of transportation. In the remaining chapters, INPUT will characterize the various types of electronic commerce systems that are supporting these trade flows, using this basic map.

A
Key Players

Exhibit II-1 lists the key players in the transportation trading community.

B
Trade Flows

Opportunities to install EDI and other electronic commerce systems are found with the leading trading partners (customers and suppliers) of the transportation industry. It is these trading partners that constitute the trading community.

Installation of electronic commerce systems are cost-justified only with large trading volumes. Therefore, they are installed with the transport sector's major trading partners.

As illustrated in Exhibit II-2, trucking is by far the largest sector of the transportation industry.

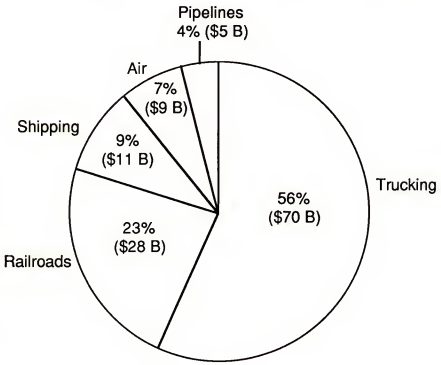
EXHIBIT II-1

Key Players in the Transportation Trading Community

- Carriers
  - Trucking
    - bulk
    - less than truckload
    - van lines
  - Railroads
  - Ships (incl. barges)
  - Air Cargo
  - Couriers
  - Pipeline Operators
- Services
  - Transportation Agents
  - Freight Forwarding/Customs Brokering
  - Freight Bill Processing
  - Public Warehouses
  - Stevedores
- Carrier Suppliers
  - Manufacturers/Dealers
  - Repairers
  - Fuel Purveyors
- Government
  - Customs
  - Federal Maritime Commission
  - Port Authorities
  - Other Government Agencies
    - Food and Drug Administration
    - Environmental Protection Agency
    - Occupational Safety and Health Administration
    - Interstate Commerce Commission
    - Fish and Wildlife Administration
- Trade Associations/International Bodies
- Shippers (transport customers)

EXHIBIT II-2

Total U.S. Transportation Expenditures, 1989 (For-Hire Services Only)



Total: $122 Billion

Source: Department of Commerce
Note: Numbers may not add due to rounding

The top three trading partners to the transportation industry are simultaneously leading suppliers and leading customers. The potential for electronic barter agreements is great. For example, a railroad that hauls petroleum products for an oil company in tanker cars is also buying, possibly from that very petroleum producer, fuel to run the train. With electronic commerce systems helping to account for each partner's use of the other, the net difference owed could be calculated every month and a single check or EFT made. This would render unnecessary the processing of several individual payments.

Although generally not as clearly as in the above example, key trading partners to transport vendors provide the greatest opportunities for electronic commerce systems. This may seem obvious but it is important to note because it is electronic commerce systems that will re-engineer and re-constitute the organizations that use, provide and support transportation as a service to the greater economy.

The transportation trading community is composed of transportation vendors (railroads, trucks, ships, planes, pipelines), various transport service providers, shippers, and materiel suppliers.

The leading trading partners of transportation companies, ranked according to Bureau of Economic Analysis input-output statistics, are shown in Exhibits II-3 (customers) and II-4 (suppliers).

EXHIBIT II-3

Major Transportation Customers

Rank	Name	$ Billions Purchased
1	Transportation Warehousing	31.8
2	Wholesale & Retail Trade	14.3
3	New and Maintenance Construction	8.9
4	Petroleum	8.1
5	Food and Kindred Products	6.6
6	Business Services	5.7
7	Paper, Boxes, Printing, Publishing	5.5
8	Federal Government	5.1
9	Health, Education, Social Services	5.0
10	Iron, Steel, Metals	3.5
11	Finance & Insurance	2.8
12	Agriculture, Livestock, Livestock Products	2.4
13	Eating & Drinking Establishments	2.2
14	Auto Repair & Services	2.1
15	Motor Vehicles & Equipment	1.6
16	Aircraft	1.2

EXHIBIT II-4

Major Transportation Suppliers

Rank	Name	$ Billions Purchased
1	Transportation & Warehousing	31.8
2	Petroleum	17.2
3	Business Services	11.0
4	Wholesale & Retail Trade	5.3
5	Auto Repair & Services	4.5
6	Finance & Insurance	3.8
7	Real Estate and Rental	3.6
8	Repair & Maintenance Construction	3.2
9	Utilities (Electricity, Gas, Water, Sanitation	2.5
10	Eating & Drinking Establishments	2.1
11	Aircraft & Parts	2.0
12	Communications Except Radio & T.V.	1.9
13	Other Transport Equipment	1.4
14	Rubber & Plastics	1.3

1. Transportation

Far and away the most important trading partners to transportation companies, and at the tops of both the major supplier and major customer lists, are other transportation companies. Here the definition of transportation company includes carriers as well as warehouse operators and specifically transport-focused service providers such as freight forwarders, customs brokers, and freight bill processing companies.

Intermodal relationships (where, for example, deep-sea ship companies buy trucking services) and the inclusion of freight forwarders and other service providers makes the transportation industry its own biggest customer/supplier.

2. Petroleum

The next largest transportation industry trading partner, again both in terms of suppliers and customers, is the petroleum industry. It is the industry's second largest supplier (after transportation itself) and the fourth largest customer. Petroleum providers sell $17 billion in fuel to carriers. They buy $8 billion in for-hire carrier services (in truck, ship, pipeline, and rail modes).

3. Distribution

The third largest trading partner to transportation has a similar status to petroleum in that it both buys from and sells to the transportation sector in significant amounts (but not to the gross amount level as does petroleum). This sector is the general distribution sector, including various wholesale and retail industries. Distribution purchases $14 billion from the transport sector, while the transport sector purchases $5 billion from distribution.

4. Business Services

Business services constitute transportation's fourth largest trading partner overall (the third largest supplier and the sixth largest customer). Business services include accounting, legal, advertising, equipment rental/leasing, services to buildings, and others. Information services (and within this, electronic commerce services) are also included in this category. INPUT estimates that electronic commerce services represent only 2% of transportation's total business services expenditure.

The next four leading trading partners—in terms of overall gross commercial exchange (customer and supplier transactions combined)—with the transportation sector are: construction, automobile repair shops, finance/insurance, and aircraft manufacturers.

Exhibit II-5 includes a list of the top eight trading partners to transportation.

EXHIBIT II-5

Leading Transportation Trading Partners (Gross Buying and Selling Commercial Transactions)

Industry	Ranking as Supplier	Ranking as Customer	Largest Dollar Trade Volume ($ Billions)
Transportation	1	1	31.8 (both)
Petroleum	2	4	17.2 (supplier)
Wholesale/Retail	4	2	14.3 (customer)
Business Services	3	6	11.0 (supplier)
Construction	8	3	8.9 (customer)
Auto Repair	5	14	4.5 (supplier)
Finance & Insurance	6	11	3.8 (supplier)
Aircraft	11	16	2.0 (supplier)

The trading partners are ranked according to volume of trade (in dollars) whether as suppliers or customers.

C
Technology and Industry Structure

Primary trading communities that deal with the transportation industry are the most heavily impacted by the introduction of electronic commerce systems by transport vendors.

A change in transportation vendor communication technology changes the behavior of the customers and suppliers with which it does business.

INPUT will examine this phenomenon in the next three chapters.

III

Electronic Commerce at Key Transactional Interfaces

III

Electronic Commerce at Key Transactional Interfaces

In this chapter, INPUT examines the volumes and total expenditures for electronic commerce software and services by the various modes of transport.

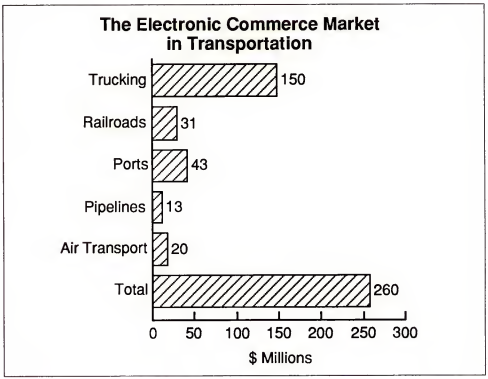
A

Overview and Total Electronic Commerce Expenditures

Total expenditures on electronic commerce services and software across all the basic modes of transportation will be approximately $260 billion for 1991.

Exhibit III-1 shows the component parts of the electronic commerce market, broken out according to transportation mode.

EXHIBIT III-1



The rest of this chapter examines these components of the electronic commerce market in detail.

B
Trucking

1. Background

While the total Department of Commerce estimate for expenditures on trucking comes to approximately $260 billion per year, only $70 billion accounts for the for-hire, commercial (and ICC-regulated) portion. The remainder are expenditures on private-fleet trucking.

The top 150 commercial carriers represent almost half of this $70 billion revenue. A total of 2,500 trucking companies have revenues over $1 million per year. And, according to the 1991 Industrial Outlook, the for-hire trucking industry is consolidating, with a smaller number of companies responsible for a larger overall portion of the industry. Thus, the practical universe of trucking companies that would consider EDI to be a business requirement is in the low one thousands.

INPUT estimates the number of trucking companies that have EDI capability to be approximately 700, or about a third of the practical universe of trucking companies. The top 150 trucking companies offer EDI. Much of the EDI is direct EDI, where shippers dial into the trucking company's computer to receive shipment status updates. Other EDI messages, particularly freight bills and, now, payment remittance notices, are being transferred through third-party value-added networks.

INPUT estimates that there are approximately 1.2 million individual billable truck shipments made per day in the U.S.

(INPUT arrives at its estimate in the following manner : the top 150 carriers make approximately 135 million shipments per year and account for 47% of all revenues, according to the Interstate Commerce Commission. Assuming that revenue per shipment is constant, 135 million shipments represent 47% of total annual shipments. The total number of annual shipments, therefore, equals 287 million, and divided by 240 business days and the number of daily shipments equals 1.2 million.)

Each shipment requires, on average, eight shipper-carrier communications (one bill-of-lading transmission, an advance ship notice, four status updates, one freight-bill invoice and one payment remittance). Total shipper-carrier communications equal an estimated 9.6 million per day.

This data is summarized in Exhibit III-2.

EXHIBIT III-2

Transaction Volumes in the Trucking Community

Total U.S. Expenditures on Trucking (Private Imputed, For-Hire)	ICC Regulated For-Hire Trucking Companies Revenues	Number of ICC Regulated Trucking Companies	Number of Trucking Companies With Over $1 Million/Yr.	Number of Commercial Truck Shipments per Day	Average Number of Shipper-Carrier Communications per Shipment	Number of Total Possible Communications per Day	Number of Possible Communications Per Year 10 x 240
$250 Billion	$70 Billion	43,000	2,500	1.2 Million	8	10 Million	2.4 Billion

Number of EDI Capable Trucking Companies	Number of Shippers Who Use EDI (for Transport)
700	3,000

Exhibit III-3 itemizes the expenditures on electronic commerce services in trucking.

2. Interfaces

Most of the trucking EDI is between the truck carrier and its customer, the shipper.

a. Fuel Suppliers

One area in which trucking companies have implemented electronic linkages with suppliers is for fuel purchases by truck drivers. These linkages are not EDI but are facilitated by credit card purchases.

b. Manufacturers

EDI linkages between trucking companies/dealers and truck manufacturers and parts suppliers are just beginning to be made.

EXHIBIT III-3

The Electronic Commerce Markets in Trucking

	1991 Message Volume	1991 Network and Information Services Expenditures ($ Millions)	Processing Services ($ Millions)	Software
TranSettlements	16 M	2.6	-	-
Sterling Software (1/6 of EDI Revenue)	30 M	5	-	$1.5 M
GEIS (1/6 of EDI Revenue)	40 M	7	-	$600,000
ATA	8 M	1.5	-	-
Other Shipper-Trucker EDI	10M	7.0	-	$3 M
Truck-Supplier EDI	-	5.0	-	-
Tariff, Location, Mileage Marker and Other Data Bases	-	15.0	-	-
Freight-Bill Processing	-	-	100	-
Potential Shipper-Trucker Volume	2.4 B	-	-	-
Total	-	43	100	$5 M

New X12 transaction sets for the exchange of warranty data will allow heavy truck dealers to exchange information with manufacturing and component suppliers.

Unlike cars, heavy trucks carry separate warranties on engines, transmissions and other major components. If there's trouble, both the truck manufacturer and the component supplier may need to be notified of the dealer's warranty claim. Typically, these companies use different, incompatible, proprietary electronic communications systems. Thus, dealers often are forced to purchase and maintain multiple computer systems.

The Automotive Industry Action Group, a trade organization whose members include Mack Trucks, Navistar, Volvo, GM, Ford, and other major truck makers and supplier companies, has developed four standard EDI formats based on X12 syntax. These transaction sets include one for dealers to use in registering original and extended warranties and serivce contracts, a second for transmitting customers' actual warranty claims, a third that speeds responses from manufacturers and suppliers, and a fourth for transmitting service bulletins and product recall registrations.

Implementation of these standardized formats by dealers and manufacturers is in its infancy.

c. Payment: Freight Bill Auditing and Payment Services

This market is composed of third-party service bureaus that help shippers optimize and pay transportation charges. If a company has more than 500 freight bills per month (even if the total cost is only $1,000), its shipping function begins to get complicated and warrants analysis. Up to 85% of a company's transportation charges can be eliminated through intelligent analysis and planning of transportation activities. More effective consolidation of shipments, more attractive product pricing to customers (that reflects true transport costs), and better negotiation of contracts with carriers, among others, are some of the results of gaining a better understanding of freight costs. This better understanding can only come through the information-intensive analysis of carrier freight charges and performance records, a shipper's transportation requirements, etc. This analysis is conducted by reviewing the myriad of details contained in freight bills.

This is a market of approximately $100 million. Its market leaders include Cass Logistics Inc. (St. Louis, MO), Bank of Boston, and Tranzact Systems (Lansing, IL).

The market can be divided into three segments:

- Banks (focused more on payment services than on services that optimize a client's transportation)
- Small, privately-held and regional service bureaus (technically unsophisticated: no EDI, no user-based reporting)
- Large full-service freight bill service and payment companies

3. Carrier Electronic Commerce Profiles

a. Ryder Truck Rental

Ryder Truck Rental (Birmingham, AL), in addition to consumer rentals, performs transportation services to corporate customers. It leases its truck tractors, trailers, and drivers. In some cases, it hires independent drivers to

drive its trucks for hauling of customer shipments. It uses EDI (TDCC and proprietary formats) to coordinate the deployment of these resources. With some of its larger customers (such as Monsanto, Zellerbach, and GE Lighting) it electronically picks up ship orders, sends freight bills after the shipment is made and, during the course of shipment, provides shipment status reports.

b. Consolidated Freightways

Consolidated Freightways is a $4.2 billion transportation conglomerate that operates regional and national trucking services and intermodal services (trucking to railroad, port to trucking), and recently acquired Emery Air Freight, one of the top five overnight couriers in the country.

Over 2,000 of CF's trucking service customers communicate with CF using EDI. The predominant messages are the TDCC 210 (freight bill) and the 214 (shipment status). CF also handles TDCC/X12, strictly X12 (800 series) and proprietary formats for rail and air service messages. According to a CF EDI manager, a "huge influx" of customers is requesting the use of X12 820 payment remittance notices and, in increasing numbers, paying CF electronically for services rendered.

Some of CF's largest customers are Target, K mart, Mervyn's, Ford Motor Company, and the U.S. government, all of whom use EDI extensively with their suppliers. The only suppliers with which CF itself is using EDI are the railroads, which are billing CF using the TDCC 410 message.

A typical CF truck shipment will be the cause for the transmission of eight messages between CF and the customer: a bill of lading, advance ship notice, pick-up notification, status update estimating time of final delivery to a CF terminal, status update estimating time to next service hub, status update declaring the time that the shipment left the service hub, an invoice, and a payment remittance.

4. Electronic Commerce Vendor Profiles

a. Cass Logistics, Inc.

Cass Logistics (St. Louis, MO) provides freight payment, audit, rating, and software services to shippers allowing them to outsource the accounting and control of logistics costs. The company has been in business since 1956. It has over 700 clients in the manufacturing, distribution and transportation industries. It processes more than 18 million transportation and warehousing transactions per year with an annual value exceeding $4 billion.

Cass' 1990 revenues were $25.5 million. Approximately 80% of Cass' revenue is derived from processing services, 10% from applications software product licenses, and 10% from professional services.

Cass Logistics' sister company, Cass Bank & Trust Company, and Cass Logistics, Inc. are owned by the holding company Cass Commercial Corporation, which reported revenue of $35.4 million in 1990.

b. Comdata Holdings Corporation

Comdata Holdings Corporation (Brentwood, TN) provides processing services to the transportation, leisure and gaming, and retail industries. The largest segment of this $160 million company is its transportation services, which provide funds transfer and other information management processing services to trucking companies.

In 1989, Comdata Transportation Services processed more than 28 million funds transfer and related transactions, valued at $4.3 billion, for 9,000 trucking customers.

The division's products are centered around the Comchek[R] card, a magnetically encoded card issued for each vehicle in a customer's fleet. The card is used at participating truck stops for fuel purchases, repairs, phone calls, travel cash, and other cash needs—with functions and dollar amount limits predetermined by the trucking company.

Daily reports are available summarizing amounts of fuel purchased, cash advanced, phone charges, and repairs ordered.

Load Matcher is an on-line data base of trucks and loads available across the U.S. and Canada. Load Matcher lists all the opportunities nationwide for trucks and loads available in the geographic location users specify. Details about trailer needs and the loads to be hauled can also be posted. Approximately 5,000 loads and 3,000 trucks are available daily through the data base.

c. TranSettlements, Inc.

TranSettlements, Inc. (Atlanta, GA) became one of the first major providers of mainframe EDI translation software and network services during the mid-1980s. The network services offered then and currently serve the trucking industry and its shipper customers. In 1990, TranSettlements sold the EDI software side of its business to TSI International, and with it approximately 160 software customers.

TranSettlements, Inc. is a subsidiary of Winship Group, a privately held $60 million transportation consortium. The company was formed in 1977 to research, develop, market and support EDI delivery services.

TranSettlements, Inc. is the developer and marketer of TranSend, a value-added network. TranSend supports the following communications protocols: SNA, 2780/3780, and asynchronous and bisynchronous schemes. It provides WATS-based dial-in and scheduled or priority dial-out services. In-network EDI translation services are available. TranSend customers pay no fees for interconnections with other networks.

TranSettlements today has approximately 750 customers for its EDI mailbox network service. Sixty percent are trucking companies and the remainder are large shippers. A handful of railroads are customers, and TranSettlements is interconnected with Railinc, where it picks up Car Location Messages.

TranSettlements' business with railroads is almost entirely related to trucking operations. Piggyback and intermodal modes of transportation result in trucking companies' wanting to know the location of their truck trailers.

TranSettlements handles approximately 1.3 million EDI messages per month.

d. Tranzact Systems

This $13 million-per-year freight bill auditing and service company provides software, network, and professional services to manufacturers that contract for large amounts of transportation per month. Based in Lansing, IL, Tranzact's business is aimed at helping shippers to optimize shipments and thereby achieve the least costly mix of transportation services.

Starlite is a PC-based software package that allows shippers to analyze their freight bills. Tranzact helps shippers in routing and control of shipments and negotiating contracts with carriers. It maintains the rate schedules for most major carriers, and a data base used to pre-rate and optimize shipper transportation costs. It also sells software containing this tariff data.

Tranzact has EDI and direct data communication connections with shipper and carrier companies. It also receives freight bills in paper from shippers (which it charges $.60/bill to process).

In a typical information flow, the shipper sends bill-of-lading information to Tranzact at the same time as it sends it to the carrier. After the delivery, the carrier sends the bill directly to Tranzact or via the shipper. Tranzact audits the bill charges against the bill of lading and the relevant contract (if any). In some cases, Tranzact will pay the carrier on the shipper's behalf.

C
Railroads

1. Background

In 1990, there were 13 major independent freight railroads or affiliated railroad systems, defined by the Interstate Commerce Commission (ICC) as Class I carriers on the basis of having operating revenues of $93.5 million or more in 1989. These carriers accounted for more than 90% of the carloads handled by the railraod industry. The freight railroad industry also encompasses more than 500 smaller carriers (independent of Class I railroads), including local, regional, and switching and terminal railroads.

The degree to which this community is using electronic commerce systems is statistically illustrated in Exhibit III-4.

EXHIBIT III-4

Electronic Commerce Railroad Community Statistics

Total U.S. Railroad Revenues ($ Billions)	Number of All Railroads in U.S.	Number of ICC Class I Carrier Revenue >$93 Million	Percentage of Total U.S. Railroad Revenues Accounted by Class I	Number of Possible EDI Communications per Day	Number of Railroad Customers Who Use EDI	Number of Railroad Suppliers Who Use EDI
28	500	13	90	1 Million (20 Million/ month)	2,000	300

Exhibit III-5 estimates the expenditures on electronic commerce by railroads.

EXHIBIT III-5

Electronic Commerce Market in Railroad Transport

	1991 Network and Information Services Expenditures	Software
RAILINC	$14 M	$3 M
Southern Pacific	$150,000	$150,000
CSX	$300,000	$300,000
Kleinschmidt	$10 M	—
Other Railroads	$1.1 M	$1.1 M
Total	$26 M	$5 M

2. Interfaces

Most railroad EDI is conducted with other railroads.

a. Links to Customs

Railroads are establishing links with U.S. Customs to allow them to electronically send manifest data to expedite border crossings.

b. Automatic Equipment Identification

The Association of American Railroads stated that automatic equipment identification (AEI) technology will be mandatory on all railroads by January 1995. A nationwide AEI network would allow for real-time tracking of rail cars and ability to confirm to shippers where each car is. Such an ability will allow trains to compete head-to-head with trucks, according to some railroad officials. Such a system would require the installation of radio transponder tags on approximately 1.2 million railcars and placement of radio scanners at railyards, junctions, and crew change points. An earlier attempt at automatic identification (using bar codes) cost millions of dollars and never got off the ground. Each transponder tag costs $30; radio scanner units cost $30,000.

3. Carrier Electronic Commerce Profiles

a. Southern Pacific

Southern Pacific is a $2.3 billion rail transport company. It conducts EDI with approximately 150 suppliers, mostly other rail companies, and over 2,000 customers. Its centralized EDI switching hub processes from 250,000 to 300,000 messages per month. SP offers its customers software that allows them to connect to the SP network and do EDI. SP Liberator is a set of modules (on diskettes) that run on a PC. The modules enable customers to obtain movement, location, and weight information about shipments; send shipping instructions; and obtain current intermodal rates. SP offers mainframe software that supports electronic billing, electronic freight bills and electronic funds transfer.

SP spends approximately $300,000 per year on EDI. This includes expenditure for internal software development and network services. SP employs 19 people to support its EDI function.

b. CSX Transportation

CSX is an $8.2 billion transport conglomerate. For its rail business, it is conducting EDI with 250 suppliers and 1,500 customers. Both of these numbers are expected to almost double in the next twelve months. Currently, CSX processes approximately 6-8 million EDI messages per month from it trading partners. CSX has spent from $400,000 to $600,000 per year on its EDI programs over the past few years. It has 50 full-time employees working on EDI.

Eighty percent of its supplier base (including other railroads) is connected to CSX using EDI. To buy fuel, the largest single expense category, CSX does not use EDI per se with fuel providers. Instead, railroad engineers use a debit card type of transaction. Whenever they fill up an engine's tank, they pay immediately using electronic funds transfer. This procedure has been in place for two years.

4. Electronic Commerce Vendor Profiles

a. RAILINC

RAILINC Corporation is a wholly owned computer and communications subsidiary of the Association of American Railroads (AAR). RAILINC has more than 400 customers. In addition to the major North American railroads that form the membership of the AAR, RAILINC's customers include shippers, equipment leasing companies, rail industry suppliers, freight forwarders, government agencies, and non-railroad transportation companies.

Since 1977, RAILINC has operated a value-added network for EDI messages. Currently, of the average of 15 million messages per month, 50% are waybills (sent by railroads to other railroads), 40% are car location messages (from railroads to a number of parties), and the remaining 10% are divided up among advance consists, bills of lading, rates, purchase orders, invoices, freight bills, and others. RAILINC processes, on average, 9 billion characters per month.

RAILINC's principal services and products include:

(1) An EDI network

(2) TRAIN II—TeleRail Automated Information Network, which collects information on freight car movements across the U.S., Canada, and Mexico. Sixty-eight railroads report to this system, submitting over 1.5 million car movement records daily.

(3) UMLER—the Universal Machine Language Equipment Register, a data base containing information on the physical characteristics of the more than five million registered freight cars, trailers, and containers.

(4) Data exchange—RAILINC serves as the clearing house for the exchange of data on interline freight settlements, car hire, car repair billing, freight loss and damage, and switching. Participants use this data to make monthly settlements of joint revenues and shared costs, thereby avoiding the significant expense of duplicate accounting and administrative processes.

(5) RELOAD—a processing service that uses linear models to minimize the costs involved in distributing railroad equipment. Originally developed for the expensive multilevel rack cars used to ship automobiles, RELOAD has been expanded to include some types of box cars and heavy-duty flats. The system saves 260 million empty-car miles annually for a dollar savings of $91 million per year.

(6) Shipment tracing—Shippers, their agents, and freight forwarders can access car location messages for all major railroads.

(7) Software—RAILINC has developed several PC software products designed to offer inexpensive and easy-to-use access to the network.

D

Ocean and Water Transport

Exhibit III-6 itemizes expenditures on electronic commerce services in the port, deep sea shipping, and U.S. Customs community.

EXHIBIT III-6

The Electronic Commerce Market in Port Communities, Deep Sea Shipping and U.S. Customs

	1991 Network and Information Services Expenditures ($ Millions)	Software ($ Millions)
Automated Broker Interface	3	3
Automated Commercial System	-	-
Export Declarations	1	1
Port Communities		
- NY/NJ	7	-
- Other Ports	5	5
Container Location	13	-
Tariff Data Bases	5	-
Total	34	9

1. Interfaces

a. U.S. Customs: Automated Commercial System

Approximately 830 billion tons of commercial cargo are shipped into or out of U.S. ports (according to the Department of Commerce, 1991 Industrial Outlook). For the inbound (import) shipments (almost 500 billion tons), 10 million customs entries are generated to release this cargo into the country. Ninety percent are entered—transmitted to—U.S. Customs electronically, via the Automated Broker Interface.

Also, shipping lines carrying freight into the country are now electronically submitting cargo manifests directly to Customs, via the Automated Commercial System, for 75% of all inbound tonnage.

On the outbound (export) side, approximately 10 million export declarations per year are made to the Bureau of Census. (This agency regulates the shipment of sensitive technologies and merchandise to foreign countries.) Less than 20% are submitted electronically via the ELAIN system.

ELAIN is an umbrella of automated systems designed by U.S. Customs to expedite the movement of imports through the Customs inspection/assessment procedures. It has focused on the interface between the customs broker and Customs (the Automated Broker Interface, or ABI) but also includes the submission of cargo manifests by air and shipping carriers, interfaces between port authorities and customs, and interfaces with other government agencies.

Customs brokers make approximately 95%-97% of all entries to Customs in the U.S., according to the National Customs Brokers and Forwarders Association of America, Inc.

To clear a shipment through customs, brokers take the information from a shipper's invoice, interpret and classify it, refine the data elements, then transmit the invoice, entry or entry summary to Customs. Customs uses it to evaluate whether it wants to examine the merchandise, using edits and validations built into the program.

More than 80% of import entries are now filed electronically.

Customs realized that the electronic interface was valuable, not only for computations and verification of customs duties, but also for analysis from an examination and enforcement standpoint.

In 1990, the option for brokers to pay import duties electronically was made available by Customs. The electronic payment option has been successful. Textile and apparel importers are the predominant users.

There were 1,169 interface participants as of January 1989. Of these, 923 were operational; the remaining participants were in the test or developmental phases.

A Treasury/Office of Management and Budget study in 1988 showed Customs' productivity increases of more than 10% a year since 1983, due to the implementation of the automated system's network of systems. Customs employees reported in 1988 and 1989 that productivity gains outnumbered losses 5 to 1.

Import volume increased 100% from 1980 to 1989. Customs personnel increased only 7%. Customs sees automation as an important tool to offset the widening discrepancy between labor and workload.

The Office of the Automated Commercial System is developing interfaces with other federal agencies, including the Food and Drug Administration, the U.S. Department of Transportation, the Consumer Product Safety Commission and the U.S. Department of Agriculture.

Also, many U.S. port authorities that have implemented EDI or EDI-like programs are tying their community networks to the ACS. A tie-in allows the port to notify its community members of a ship arrival (and its associated cargo) and the release of cargo through the customs inspection process. Such information is of immense value to steamship agents, consolidators, warehouse operators and others in the community. Without electronic delivery, these groups would have to physically visit the local customshouse office and look up ship arrivals and cargo releases on paper printouts.

b. Port Authorities

EDI hubs sponsored by port authorities were pioneered by such ports as New Orleans, Savannah, Miami and New York/New Jersey.

Their existence begs the question: how many hubs are needed? A small freight forwarder may have to use a VAN to communicate with its shipper customer, a direct line to a large carrier, and a port system to communicate with Customs.

i. Georgia Ports Authority: COBRA

COBRA is the EDI service offered by the Georgia Ports Authority. It is used to schedule the movement of imports and exports through the ports, linking ship lines, U.S. Customs, other U.S. agencies (USDA, FDA, etc.), brokers, and freight forwarders.

According to a Port official, a very small percentage of total shipping movements are handled by EDI. Five ship lines use EDI to download manifests. Another 50 to 60 mailboxes are on-line for the local companies and government offices. The ship lines send messages through GEIS. The local agencies are connected directly to COBRA's computer through lease lines. COBRA originally ran on a PC. In 1991, the Ports Authority switched over to a Sterling Software Gentran package. EDI volumes are approximately 500,000 characters per month.

ii. Port of New Orleans: CRESCENT

The Port system runs on a central computer. Users can send and pick batch messages in the mailbox facility or interact directly with the system in an on-line, data entry mode. The main focus of the system is to allow steamship lines to deliver ship manifests to the Port. The manifest is the basis by which the Port bills for wharfage and other Port services.

Fifteen ocean carriers use the system, but only one uses EDI with it. The others hand-key manifest data from their terminals directly into the CRESCENT computer. The Port of New Orleans has a single terminal yard from which carriers send cargo release and cargo booking instructions. The instructions request the terminal operators to use the trucks and containers in the yard (which are owned, in most cases, by the carriers) and tell them when and where to move shipments. While the carriers may create these instructions manually, CRESCENT creates TDCC formatted messages and delivers them to the terminal yard's mailbox.

The Port translates many documents by creating standard format messages out of on-line entries and creating human-readable, E-mail messages out of EDI transmissions. Altogether, 15 ocean carriers, one public container terminal, U.S. Customs, and four river stevedores communicate with each other through CRESCENT. CRESCENT accounts for 80% of all import cargo going through New Orleans.

Despite the high usage, only 15%-25% of the ocean carrier manifests come into CRESCENT in electronic form—the rest are all in paper. This percentage is lower than at other U.S. ports because only 20% of the ship lines that call at New Orleans are on Customs' AMS (whereas nationwide, 80% of all inbound bills of lading are submitted electronically by ocean carriers to Customs).

The Port of New Orleans doesn't charge users for its EDI system. It is a business cost for the Port: its desire is to get the ship manifest submitted electronically because it helps the Port determine its bill more easily.

iii. Ports of New York and New Jersey: ACES

These ports handle 43% of all U.S.-Europe trade and 32% of all U.S.-Far East trade. In 1988 they began the port community EDI system called the Automated Cargo Expediting System (ACES). Unlike earlier port systems (such as New Orleans or Georgia), ACES is not based on a port-based hub computer but entirely employs a third-party network where all users of the system have mailbox accounts to originate and pick up EDI communications.

ACES has approximately 60 users and averages 3 million EDI messages per month. It is interconnected with the EDI community network of the port of Hamburg, Germany. This connection is principally used by freight forwarders at the respective ports (often, offices of the same company) to communicate. Other uses for international port-to-port connections are the transmission of hazardous materials, and of bay plans, which describe the container layout on ships. ACES is also talking with the ports of Rotterdam, Le Havre, Bremen, and Singapore about establishing similar connections.

ACES uses the network services of GE Information Services (GEIS). (GEIS is also the provider of the port system in Hamburg.) ACES renewed a three-year contract with GEIS in June 1991. GEIS provides the service to the port. GEIS bills each user directly. The port pays nothing. Only senders pay for transmissions.

GEIS has a special rate structure for ACES users. It charges a $550 one-time start up fee and $150 for each mailbox that a user wants. Senders are charged 2.5 cents per 100 characters at peak hours, and 1.8 cents per hundred at off-peak times. In addition, a sender is charged 20 cents for each communication session at peak, and 15 cents during off-peak. Each user is billed a minimum of $50 per month. Each user is given software that allows it to connect to the ACES network.

ACES users can only communicate with other ACES users.

iv. Port-to-Port Connections

Electronic message systems are being established between U.S. and international port authorities. Such systems allow the exchange of data on ship arrivals and departures, hazardous cargoes, ship manifests, and customs processing status. Electronic transmission of this information would cut paperwork, increase productivity and give the shipping, tranportation and trade commlunities more advanced notice of arriving goods.

The ports of Seattle and Singapore have an operational interconnection. The Ports of New York and New Jersey are working on connections with the German ports of Hamburg, Bremen and Bremerhaven. The Port of New Orleans is setting up a connection with the Port of Marseilles.

c. Foreign Trade Zones

Several U.S. foreign trade zones have sought to develop EDI systems to expedite the strict record keeping required by U.S. Customs for moving goods in and out of the zones. Many of the zones are reluctant to talk of their work because they are afraid of giving away valuable information to competing trade zones.

Nonetheless, the National Association of Foreign Trade Zones is pressuring Customs to set guidelines for implementing EDI. The zones to date are developing systems with local Customs offices in an ad hoc manner.

d. Container Location

There are approximately 5 million shipping containers in the world today used by the international shipping community to haul freight. These containers are cleaned and serviced after use at container storage depots in ports throughout the world. As a shipping line drops off an empty container to a depot for service, an Equipment Interchange Receipt (EIR) is created. The OSI, in the early 1980s, created an EDI format for the EIR. Electronic EIRs help shipping companies and container owners/lessors keep track of their containers. Approximately 80% of the tracking moves of containers can be followed through EDI. Fifty percent of all containers are owned by less than 20 companies.

Oakland, CA-based CEDEX (Container Equipment Data Exchange) offers a service to lessors and ship lines in tracking containers. It offers a software package that is used by service depots to create EIRs. It uses Control Data's Redi*Net to move the messages between the depots, shipping lines and lessors worldwide. With the purchase of Redi*Net by Sterling Software ORDERNET, CEDEX is re-evaluating its network service provider.

This is a very specialized EDI market. A typical container is used two or three times a year. It is serviced every time it is used. A number of EIRs can be generated for a single deployment of a container. Assuming a charge of $.25/kilocharacter, the VAN market for container location amounts to approximately $13 million worldwide.

e. Trade Leads and Data Bases

A variety of other electronic communication systems are servicing the port and international trade communities.

The World Trade Center's NETWORK is an international electronic trade lead and messaging service. It is accessible in the mode of E-mail/electronic bulletin board as well as touch-tone phone. Using a touch-tone phone, users can browse and download posted trade leads to a facsimile machine. The World Trade Centers Association is an association of over 200 world trade centers in 65 countries.

Swift Global Communications, Inc. provides a service to shipping companies that allows them to broadcast their sailing schedules and ship position reports to a stored list of facsimile machines. Swift provides cheaper telecommunications charges than standard carriers do.

PIERS (Port Import/Export Reporting Service) is a division of Knight Ridder's *The Journal of Commerce* (business newspaper). PIERS is a computerized data base of key information from ship manifests and bills of lading for all vessels calling at U.S. ports. Details of commodities, ocean carrier names, consignees, shippers and locations are loaded weekly into the system.

2. Carrier Electronic Commerce Profiles

a. Maersk

Maersk is a privately owned Danish company that operates deep-sea ship lines, two trucking companies in the U.S., stack railroads, an air freight business, shipbuilding (in Europe), and operates/leases oil drilling stations.

In the U.S., Maersk has approximately 75 trading partners with which it conducts EDI. Although 50 of these are with customers (largely freight forwarders and customs brokers), the greater volume of messages is with Maersk's transport suppliers, railroads and terminal operators. Maersk also electronically submits all ship manifests to the U.S. Customs Automated Commercial System.

Maersk's highest volume trading partners are railroads. It uses primarily four railroads to move shipments to or from inbound destinations. Its EDI traffic with these is summarized in Exhibit III-7.

EXHIBIT III-7

Maersk's Principal EDI Traffic

With Four Railroads:	
Waybills	9,000/month
Freight Bills	14,000/month
Car Location Messages	500,000/month

Maersk is involved in a number of EDIFACT pilot projects in Europe.

3. Electronic Commerce Vendor Profiles

a. Lamarian Systems Inc.

Lamarian Systems Inc. (Landover, MD) is a wholly owned subsidiary of NYNEX (acquired by the RBOCs in July 1990). It offers systems integration and automation services to customs and port authorities, and transport-oriented software packages. It has introduced a software product

aimed at freight forwarders called Freight Agency Managment System or Freight/AMS. The package was developed by Stowe Computing Australia and marketed in Australia under the name Infotrac.

E

Air Transport and Couriers

1. Interfaces

Air cargo and courier services are also adopting EDI and electronic commerce systems rapidly. The use of handheld computers by courier services is causing an explosion in data transmission from field service courier representatives to headquarter computers.

The volumes in courier services are high relative to the bulk air cargo. Fedex carries one million packages per day. UPS carries 10 million per day.

a. Fuel Suppliers: Avnet

Avnet is a series of EDI data formats by which airlines can procure fuel from oil suppliers. Members of Avnet are KLM Royal Dutch Airlines, British Airways PLC, United Air Lines, American Airlines, Shell Oil Co., Chevron Corp., Sun Oil Co., and Esso Oil Co.

Avnet has three message formats: invoice, delivery receipt (generated at the point of refueling), and price notification. Price notifications are used by oil companies to inform airlines about price changes taking place under the terms of a previously signed contract.

b. Manufacturers

i. Specification 2000

Passenger airline carriers are using EDI to purchase fuels and airplane spare parts from manufacturers. The EDI capability and network is called Specification 2000 (or "Spec" 2000) and is managed by the Air Transport Association (Washington, DC) which is the U.S. domestic body of the International Air Transport Association. EDI is also used by air couriers to interact with shippers and customs authorities (see Air Couriers section below). Recently, airlines have begun an effort to use EDI in conjunction with computer reservation systems and related passenger service functions (see Travel and Tourism below, under Services).

Specification 2000 is one of the oldest EDI systems in the world (it began in the late 1950s). Today, approximately 60 airline companies around the world and 75 to 80 major parts manufacturers conduct business over it.

Although there are approximately 6,000 suppliers to the aircraft industry, and Spec 2000 only has about 2%, the system still captures roughly 70% of the dollar purchases airlines make for replacement parts and supplies.

In 1989, Specification 2000 launched a product catalog service that allows the manufacturers to place their catalogs on-line for airlines to inspect. Also in 1989, Spec 2000 launched its Avnet system, the fuel purchasing system. Avnet is the only Spec 2000 service that uses ANSI X12 formats. All others are proprietary. Although some of the member airline companies want to convert all Spec 2000 to a combination of X12 and EDIFACT messages, others are resisting such a change due to the high software conversion costs. All airline software that interfaces with the Spec 2000 network is developed in-house.

ii. Aircraft History Data Bases

Aviation Data Inc. (Wichita, KS) compiles a data base of the ownership of airplanes (from airliners to private propeller planes) from the factory door to the graveyard. The information is primarily used by airline companies, aircraft manufacturers, government bodies and oil companies. The business, founded in 1966, is privately held but claims that its revenues have grown 40% per year for the past two years. The information (which includes mileage logged and some maintenance data for each aircraft) is useful to aircraft designers in determining successful aircraft designs. Oil companies use it to determine where to stockpile aviation fuel products. Government bodies use it in investigating accidents.

c. Community Network Systems

Community systems for air transport have had little success to date in being accepted as a viable means for communication. Two were inaugurated in the U.S. (in New York and in Miami) and failed. Now individual carriers have initiated their own, often inviting competing carriers to come on board. The community systems are centered around airports and connect air carriers and their "customers," freight forwarders/agents, customs authorities, and customs brokers.

British Airways PLC (with partner KLM Royal Dutch Airlines) has launched a system in the U.S. called Cargo Agents Reservation Air waybill issuance and Tracking (CARAT). British Airways is giving away free microcomputer software to agents and forwarders to hook into the system.

Scandinavian Airlines has launched its own system called Tradevision. The airline is selling software and an add-in integrated circuit board for PC users at $3,500 for the package. It is charging a base fee of $200 per month to tie into the network. Transaction charges are additional.

Nippon Cargo Airlines is also introducing a community communications system.

2. Electronic Commerce Vendor Profiles

a. Société Internationale de Télécommunications Aéronautiques (SITA)

A Paris-based trade association for worldwide airline companies that has 28 major airlines as members, SITA operates an international data communications network for its members. The U.S. part of the network is run by Airinc (Annapolis, MD). SITA's network is attached to the Automated Commercial System of U.S. Customs. The system allows for the electronic submission of cargo manifests and import customs entries.

b. Airinc Inc. (Annapolis, MD)

A non-profit organization that provides communications services to the airline industry operates the Airinc network. There are plans to expand the network with an OSI-based architecture to be called Aeronautical Telecommunications Network (ATN). ATN will initially connect U.S. and international airlines and the Federal Aviation Administration. It is expected to become the infrastructure network for global communications among members of the airline industry and travel agencies connected to reservation systems. One of Airinc's operating companies is Aeronautical Radio Inc., which is developing the new network. Aeronautical Radio Inc. operates the existing communication network services of Airinc.

The two main communications services for the airline industry basically serve as the intermediaries between airline and FAA networks and systems, which don't interoperate.

A packet switching messaging system—the AIRINC Data Network Service—executes the necessary protocol conversion between the various types of networking systems, so that messages can pass between airlines and related organizations, regardless of differences in the communications technologies those parties use.

The messaging system handles some five million messages per day and links about 500 user organizations in the airline comnmunity worldwide, providing applications for air traffic operation and reservations.

Aeronautical Radio also provides a VHF-based system, the Aircraft Communications and Reporting System, which sends flight data to and from an aircraft.

F
Pipelines

The electronic commerce market in the pipeline business is dominated by GEIS and data base services such as Data Transmission Network.

Exhibit III-8 depicts user expenditures on electronic commerce service related to pipeline usage.

EXHIBIT III-8

The Electronic Commerce Market for Pipelines

	1991 Network and Information Services Expenditures ($ Millions)	Software ($ Millions)
Data Bases	10	-
GEIS' Petrodex	3	-
Total	13	-

1. Interfaces

U.S. and Canadian petroleum companies are highly integrated. Pipelines literally tie companies together. Drilling operations and properties are jointly owned and operated. Distribution of refined products to retailers is shared among companies constantly swapping each other's supplies to cope with the vagaries of daily demand at the gas pump.

Paralleling the product flows are information—largely accounting information—flows. Since the mid-1970s, oil company accountants have developed EDI systems for the movement of this data. The systems are collectively called Petrodex, and they are a family of EDI applications that electronically exchanges accounting information among companies. GE Information Services is the sole network service provider of Petrodex.

The American Petroleum Institute (API), the Council of Petroleum Accountants Societies (COPAS) and the Petroleum Accountants Society of Canada (PASC) have sponsored the creation of Petrodex's EDI data formats.

A survey in 1988 by the American Petroleum Institute estimated that the North American petroleum industry would save $505 million per year by using EDI to facilitate the movement of accounting and other business data among oil companies.

Today, almost 15 different transaction set types are in use by slightly more than 200 leading petroleum companies. More transaction sets are on the drawing boards.

Four of the Petrodex applications keep track of oil and natural gas swaps between companies.

- Petroex (different from Petrodex) provides details on oil product swaps. Truckers who supply service stations pull oil supplies from terminals of various oil companies. Petroex checks the truck driver's authorization and keeps track of how much s/he took.

- Recon automatically reconciles Petroex swaps, debiting and/or crediting a company showing its net position relative to other oil companies with which it has a swap relationship.

- Terminal Administration and Billing System (TABS) allows oil companies to set the allowable amount a trucker can pull from a trading partner's terminal under an oil swap agreement.

- Crude-Net allows oil companies to exchange remittance and invoice detail on purchases of crude oil among companies.

Three other Petrodex applications monitor oil and gas pipeline use.

- Gas*Trac allows companies to reserve and schedule pipeline services for the transport of natural gas.

- Pipenet performs the same function as Gas*Trac but for oil products.

- Gas Revenue Accounting Data Exchange (GRADE) allows companies to move payment data related to Gas*Trac exchanges.

Three applications serve the mainstream EDI functions of sending invoices, purchase orders, and funds transfers.

- Joint Interest Billing Exchange (JIBE) is used for moving expense bills. In jointly undertaken exploration and operation efforts, the designated operator company sends these electronic bills to its partners to get reimbursed for its expenditures on behalf of the consortium.

- Joint Audit Data Exchange (JADE) allows the exchange (on diskettes only at this time) of data required for joint-interest auditing. JADE helps reduce the time an operator's audit coordinator spends preparing and assisting joint venture auditors.

- Purchase orders (the ANSI X12 850) are used to buy equipment and supplies.

A variety of other EDI applications serve other functions:

- Geologic Data Exchange allows the transmission of more than 1,000 types of geological data as it is being collected at drilling sites. It helps companies prepare three-dimensionial maps of the Earth's mantle, the ultimate objective being to predict where oil deposits lie.

- Check Stub Data Exchange (CDEX) gives owners of oil producing properties sales and production data so that they can calculate royalty credits.

Other applications are designed with the following advanced EDI services in mind:

Real-Time EDI

- Well logging information is sent from drilling sites to oil company operational management offices. Data such as bit torque, mud/fluid properties and drill pressures are relayed to control rooms for real-time monitoring of drilling activity. Data is standardized to facilitate sending it to multiple owners of oil wells.

Data Bases

- Computerized Equipment Pricing System (CEPS) is a data base for the pricing of frequently used oil-field equipment and material. CEPS provides pricing of tubular and equipment items, and rail and truck tariff rates. It contains more than 25,000 date-sensitive price records dating from February 1983.

- Coppe allows refiners and crude oil producers to post product prices electronically.

Electronic Funds Transfer

- Petroleum Treasury Advisory Group (PTAG) is customizing the ANSI X12 820 payment instruction/remittance advice to allow oil companies to pay each other.

2. Electronic Commerce Vendor Profiles

a. Dwights Energydata Inc.

Dwights (Denver, CO) provides data relevant to exploration and production of oil and natural gas. It makes available three primary data bases:

- Production data on every oil well in Canada and the U.S. (over one million properties), updated monthly; and data acquired by hand from state and federal government offices (where permits are filed).

- Activity data: new drilling rigs installed, permits filed, etc., updated daily; and data acquired by hand by company representatives talking with rig operators.

- Reservoir data

Other data bases are available. The company publishes in both on-line and CD ROM formats.

The company also offers timeshare and remote computing services to oil and gas company clients, as well as consulting in energy-market research and fuel-products engineering.

In 1990, Dwights was chosen by the Interstate Natural Gas Association of America to compile and maintain a data base of location codes for use in EDI transactions among natural gas pipeline providers and users.

Dwights will build and operate the data base. Location-code data will be supplied on a voluntary basis from the gas transporters including interstate and intrastate pipelines, distribution companies, and operators of gathering systems.

A committee of the Interstate Natural Gas Association of America (INGAA) will retain control of the data, the supporting software and any change in user fees to access the data. The one-time development of the data base and related software will be funded by the INGAA Foundation. Ongoing operations will be funded through a nominal fee paid by shippers and other companies that retrieve the location information. INGAA officials will charge $2,000 to $2,500 for an annual subscription to the data (12 monthly issues, either on CD ROM or magnetic tape). The interface/retreival software for the location-code data is included on the medium.

Dwights is over 60 years old. It entered the computing services business in the 1970s, and used GEIS for its computing and network needs. Now it has its own backbone network and data centers and no longer uses GEIS. It is privately held and has offices in Dallas, Denver, Oklahoma City, Houston and Bellaire (TX). The data center in Denver is DEC-based; the one in Dallas is IBM-based. Dwights has approximately 150-175 employees.

G
Intermodal and Third-Party Services

During the 1980s, a new kind of total transportation company began to emerge, offering intermodal and contract logistics services. Customers could turn to a single provider for all its transportation needs—less-than-truckload, truckload, rail, air, deep-sea, etc.

1. Electronic Commerce Vendor Profile: Global Logistics Venture

In 1990, a consortium headed by AMR—the holding company of American Airlines—and CSX Corporation—the transportation conglomerate—launched a comprehensive electronic communication gateway service for shippers, carriers and transportation service providers. The service is intended to give shippers a single window through which they can look into the data bases of the world's major carriers, brokers, forwarders, and other logistics service providers.

The consortium is called Global Logistics Venture (GLV), and is headquartered in Cary, North Carolina. Its service is called Global Trade Management System.

At the time of publication, the service was still getting off the ground. According to GLV officials, the consortium is composed of other but unidentified partners and is still seeking partners.

The backbone of the the service will be EDI. For each shipment, GTMS collects a central set of data that is used to generate transportation and billing documents, customs documents, payment instruments and other standard logistics documents. Through this collection of data, the shipper will be able to track shipments of cargo around the world, at the shipment and line-item levels.

GLV supports all EDI standards and, according to literature, will provide VAN services that go beyond logistics and include other business functions enabled by EDI, such as product design and billing.

A reservation/tracking/billing system for cargo shipment is orders of magnitude more complex than airline reservations, because:

- The nature of the product is multi-modal (air, truck, rail, and ocean modes of transport will be integrated in a single system)

- The rate structure for each mode is highly complex and heterogeneous (determined by a host of factors including regulations, level of service, various formulas, kinds of cargo, weight and destinations)

- The number of service providers in cargo transportation is much greater than the relatively consolidated passenger airline industry. The number of carrier data bases makes interconnection a daunting challenge.

- The design and adoption of standardized data formats in the transportation industry has evolved since the 1960s and was piecemeal, rather than being set and implemented by a single entity as it was for proprietary computer reservation systems. Translation and conversion of data formats is thus a primary challenge of the logistics system.

With its now legendary expertise in building the world's first and most successful computer reservation system for passenger airlines, INPUT believes AMR is the most qualified candidate to make a comparable system for logistics.

GLV's Global Trade Management System will make use of AMR's and CSX' private data networks. Also, the GLV has developed EDI software for users of its system.

H

Shipper Electronic Commerce Profiles

1. Procter & Gamble Co.

The multibillion-dollar consumer products manufacturer uses primarily rail and truck modes for its U.S. transportation of products. Inbound movements are split almost 50-50 between rail and truck. The vast majority of outbound shipments are made by truck.

P&G has centralized its transportation EDI functions. Electronic transactions are sent and received through the corporate offices in Cincinnati.

P&G conducts EDI communications with approximately 175 carriers. Message types include:

- Load Tendering—sent by P&G manufacturing plants to the carriers requesting transportation services. Currently 35% of the plants send ELT data. P&G intends to have 100% participation by 1993.

- Shipment Status—sent by carriers to P&G. Carriers send these reports on a daily schedule to a P&G mailbox. P&G picks them up periodically during the day. They are used to answer shipment status requests by P&G customers and measure delivery performance of carriers. Railroad waybill messages (normally exchanged between railroads only) and car location messages are also sent to P&G for the purpose of shipment status reports.

- Freight Bills—sent by the carriers to P&G. P&G electronically receives 80,000 bills per month for outbound transportation services and 10,000 EDI bills per month for inbound transport services. This represents 80% of all transportation bills submitted.

- Electronic Bill Payment—P&G pays over 50% of all freight costs via electronic funds transfer.

P&G is preparing its systems to send the delivery discrepancy transaction, which is sent by carriers when a shipment is damaged, short or over the stated amount.

P&G normally does not use freight tariff data bases. Most transportation rates are established by negotiated contracts.

Three people currently serve as the focal point for the coordination of transportation EDI efforts at P&G.

2. Racal Milgo (Sunrise, FL)

Racal Milgo, a $250 million maker of telecommunications equipment, conducts network-based EDI with five trading partners (3 customers and 2 material suppliers). From its main transport carriers it receives freight bills (some in TDCC formats, some in proprietary formats) on magnetic tape. It plans to convert the magnetic tape transfers to network transfers by early 1992. As it sends small shipments of electronic equipment, Racal Milgo uses express/air couriers and van lines (van lines are better equipped to carry delicate freight, as opposed to standard trucking carriers). Its main couriers—Emery, Mayflower, and Fedex—have all expressed willingness to implement EDI. Due to austerity measures at Racal Milgo in response to the recession, the company has reduced its EDI implementation group from seven people to two. Racal Milgo uses the Translator MVS EDI mainframe software package from Sterling Software.

IV

Needed and/or Developing Electronic Commerce Services

IV

Needed and/or Developing Electronic Commerce Services

In chapter II, INPUT examined the magnitude of commercial activity in the transportation sector (showing, for example, that trucking is the largest single mode of transportation).

Electronic commerce interorganizational systems are more than simple telecommunications lines between trading partners. EC requires a whole host of needed services and technologies. The most important kinds of services are listed in Exhibit IV-1.

EXHIBIT IV-1

Needed and/or Developing Electronic Commerce Services

- Infrastructure utilities and resources
- System development tools
- Real time
- Payment services
- Communitywide solutions
- New third-party services

In this chapter INPUT examines the opportunities for these kinds of services in the transportation community.

A
Infrastructure Utilities

Inherent in any information/communication system (paper or electronic based) is a system of symbols. An electronic automated system requires a greater degree of logical consistency among its symbols than does a paper or oral system.

Developing and maintaining the symbol system for an electronic commerce infrastructure is a critical function and service opportunity. Infrastructure utilities are services that must be available to make the entire infrastructure work as an integrated whole. Exhibit IV-2 lists those utilities.

EXHIBIT IV-2

Infrastructure Utilities and Resources

- Directories, data bases, UPC data bases
- Product, company, location codes; classification systems
- Message formats
- Other standards (e.g., operating systems)

Such infrastructure utilities are analogous to the software utilities/libraries that are part of any computing facility, from micro to mainframe (including such things as operating systems, emulators, job accounting programs, disk management utilities, data dictionaries, etc.).

In electronic commerce systems, where systems are interorganizational and shared by a trading community, similar systemwide utilities are required. Instead of being contained in a corporate data center, however, these services must be made available to the entire community. Because they are available for a fee, they are also a business opportunity.

These new utilities serve the entire multi-organizational network and leverage the overall capacity of the network. They provide further standardization of interfaces among organizations and applications, ensuring that everyone is referring to the same network elements (such as mailbox addresses, companies, products, system terms, etc.).

1. Directories and Data Bases

Directories and data bases help the network stay in synchronization.

a. Automated Tariff-Filing Systems/Tariff Data Bases

Tariff data bases serve two purposes: they tell shippers what transportation costs will be, given pick-up and destination points; and they allow government regulatory bodies to monitor carrier prices to ensure fair competition.

Electronic tariff data bases have two benefits: they allow for the efficient, error-free communication of rates between carriers and shippers; and they facilitate the mandatory filing of rates by shippers to government authorities.

The data bases have a major drawback, however: rate structures, especially for deep-sea shipping, are often complex and difficult to codify in machine processable formats. They often involve mathematical formulas, lengthy rate schedules, and many exceptions.

It is with the exceptions that ship lines make most of their profit. The base fee charged for the average shipment accounts for only 40% of a ship line's total income. Assessorial fees account for the rest and virtually all ship profit. These are fees for services other than simply moving goods, such as currency adjustments and surcharges for certain destinations.

Another issue concerning electronic tariff data bases is whether the government or the private sector should operate them. The government, by virtue of regulating tariffs, creates the data base. In the deep-sea shipping mode, Knight-Ridder has created its own commercial tariff data base, Transax. The Federal Maritime Commission, the regulator of ship tariffs, also has developed a tariff data base.

Makers of tariff software for the shipping industry include Data Exchange International Inc., Transax Data (Bridgewater, NJ subsidiary of the Journal of Commerce Inc.), Mariner Systems Inc., (San Francisco, CA), and TNT-Alltrans (Wayne, NJ), a unit of the TNT Group.

The Interstate Commerce Commission is responsible for monitoring the tariffs of all modes of transportation. The agency receives thousands of tariffs and tariff supplements each day.

Electronic tariff-filing activities at the ICC vary depending on the mode involved.

- *Railroads*. Carriers are filing tariffs electronically on an experimental basis. They are using their own equipment, which is placed at the agency's offices, but paper copies of the tariffs still must be filed at the commission.

- *Trucking*. Plans are on hold for electronic tariff filing because of conflicting views within the industry on how to do it. These issues include what type of formats should be used, who is responsible for holding the data and the records, and the cost of transferring from a paper to an electronic tariff-filing system.

To serve their customers, many trucking companies are building electronically accessible tariff data bases. Some are designed for EDI interconnection, others use interactive voice response interfaces allowing customers to use their telephone key pad. Especially for regional trucking companies, the latter is a very popular application.

b. Specification 2000: On-Line Parts Catalog

As part of the Spec 2000 electronic procurement system in the airline industry, the Air Transport Association and the International Air Transport Association make a parts data base available. Airline manufacturers list products on the data base and airline companies can search the data base to make purchases.

A Los Angeles, CA-based printer, Continental Graphics, was awarded the contract to administer the data base. The printer was chosen because it already had much of the CAD and digitized specification data on the airline parts already in its computer-aided design and printing systems. It was a natural progression for this company to move from a paper to an electronic system.

c. X.500 Directories

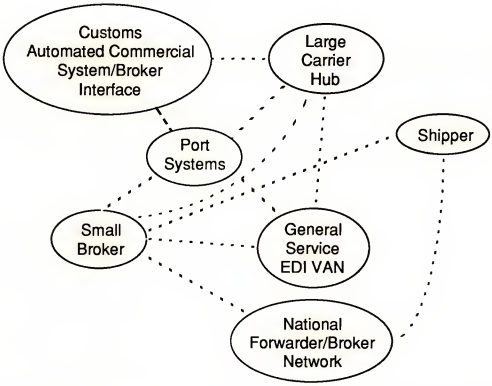
The X.500 international standard (developed by CCITT and ISO committees) is a set of guidelines that establishes a specialized, distributed data base structure for commonly identifying elements on a data network. The most typical element is the address of a user's mailbox, but can include addresses for printers and other devices, application servers, and others.

The X.500 directory will be useful in the transportation industry because the existence and continued creation of many overlapping networks that tie the community together. For example, a small freight forwarder may have to talk with a ship line, a port authority, and a shipper/customer using three different mailboxes.

Exhibit IV-3 shows how multiple networks might serve the transportation community and therefore require a directory service connecting the networks.

EXHIBIT IV-3

Multiple Mailbox Hubs in the Transport Community Necessitate Directories



d. Mileage Marker Data Bases

Rand McNally-TDM, Inc. (Skokie, IL) produces a data base (on-line and in CD ROM formats) that contains the mileage amounts between shipping and receiving points for all roads in the U.S. and Canada. The Highway Mile Marker allows the user to enter the origin and destination points, including any stop-off points, and the system will display the mileage between all points, and the total miles. The data base can be interfaced with proprietary tariff schedules for rate making and billing. Rand McNally-TDM makes a similar product, Railroad Milemaker, for the railroad industry.

e. Other Services

Other data base services that facilitate exchange include the bulletin board system sponsored by the World Trade Centers Association. The association is an affiliation of, typically, city-sponsored world trade organizations. It has built an internationally accessible data base that allows traders

to list trade opportunity announcements (for sale, wanted, investment opportunities, etc.). The data base is accessible via E-mail and facsimile terminals.

The Port Import-Export Reporting Service (PIERS), a service of Knight-Ridder, is a data base of shipments into and out of all U.S. ports. The service tells what the cargo is and who the exporter and importer (consignee) are, in addition to other information. This kind of detailed cargo movement data is useful to marketers of transportation services as well as marketers of products that are complementary or competitive to the merchandise in a given shipment.

2. Codes and Classification Systems

Codes specify the things—products, places, companies, ship-to locations, bill-to locations, and other entities—in the game of logistics. They must be standardized so that everyone involved in the game refers to the same things.

a. Company Location Codes

Digital codes for geographic locations are critical to establishing a machine processable language for transportation communications. Pick-up, ship-to and bill-to locations are necessary when the service requested is the transportation of things from point A to point B.

The Federation of Automated Coding Technologies (FACT) has taken the initiative that recommends code symbologies for use in the automatic identification of companies and company site locations. FACT's effort, called "Initiative 2000" helps companies that use bar code ID technologies and EDI come to a consensus on what codes to use, how to use them, the strengths and weaknesses of each symbology, and the advances that the sponsors of the symbologies could make to meet the needs of users of automatic identification.

FACT endorses three existing symbologies: the Dun's number, the International Article Number (developed by the European Article Number Association and referred to as the EAN) and a new identification standard put forth by the International Standards Organization under the auspices of the Open Systems Interconnect (OSI) model. The Dun's-Plus-4 number, a newer, longer version of the Dun's number, has not been fully endorsed because Dun & Bradstreet, the purveyor of the symbology, has not yet formalized usage guidelines for the new version.

Also, ocean and rail industry groups have initiated an effort to make a central file containing customer identification codes. The Transportation Data Xchange, a Chicago computer services company owned by a consortium of railroads, has been charged with administering the initial specification building process. The codes are to be ready by January, 1993.

Coding schemes have various advantages and disadvantages. The Dun's number is the least expensive to implement. Companies don't have to pay to get an assigned number, as they do for the OSI number (which costs $1,000). Dun's assigns numbers to companies as the company opens new locations. The OSI code, however, is more efficient (is composed of fewer characters) than the 13-character Dun's number. Dun's 13-character number, although not a problem for EDI transaction sets, is a problem for bar codes, where a typical line has 21 characters. A long location identification number does not allow the inclusion of product or serial number codes on the same line.

FACT, founded in 1985 as a result of work done by the Automotive Industry Action Group (AIAG) and now administered by the Automatic Identification Manufacturers, Inc. (AIM USA), is composed of representatives from many standards groups, trade associations and corporations, including ANSI and X12 DISA.

b. Pipeline Codes

The Interstate Natural Gas Association of America (INGAA) is building an electronic data base of common codes that identify receipt, delivery, and other gas transfer points. The data base will help simplify the electronic exchange of information for all shippers transporting gas on any pipeline system. In a bid process, the INGAA selected Dwights (Denver, CO) to build and operate the data base. Dwights is a long-time information provider to the oil and gas industries—it is over 60 years old—and it provides data bases and market consulting services to energy companies.

The location codes will facilitate the electronic exchange of key industry documents, such as nominations (requests for pipeline use) and metered volume statements (records of pipeline use—essential for billing and control purposes). EDI improves the natural gas industry's administrative procedures with more timely and accurate operational information. Such improvement helps to eliminate natural gas imbalances.

A typical pipeline requires the timely execution and tracking of thousands of transportation transactions. The paper-based and older computer systems were inadequate to process these transactions. Gas accounting problems and imbalances between gas receipts and deliveries resulted in significant costs to pipelines and shippers alike.

In 1990, the INGAA, working in conjunction with the Council of Petroleum Accountants Societies and the American Gas Association, published EDI guidelines, called GAS*FLOW, that are intended to help shippers and pipeline companies electronically manage the transportation business. A critical component to GAS*FLOW is access by the shippers and pipeline companies to frequently referenced pipeline locations. The access has to

be inexpensive, available electronically, and from a single source. Dwights was slected from 10 bids received in April 1991 after a request for proposal was sent to 30 vendors. The contract award was in the $50,000 to $70,000 range.

Dwights will build and operate the data base. Location-code data will be supplied on a voluntary basis from the gas transporters, including interstate and intrastate pipelines, distribution companies, and operators of gathering systems.

A committee of the INGAA will retain control of the data, the supporting software and any change in user fees to access the data. The one-time development of the data base and related software will be funded by the INGAA Foundation. Ongoing operations will be funded by a nominal fee paid by shippers and other companies that retrieve the location information. INGAA officials will charge $2,000 to $2,500 for an annual subscription to the data (12 monthly issues, either on CD ROM or magnetic tape). The interface/retreival software for the location-code data is included on the medium.

There are approximately 5,000 pipeline users in the U.S., according to the INGAA. At its most successful, the market for selling these codes could be $1 million per year.

Extracted code numbers will be in ASCII format. Whether or not the codes can be directly downloaded into pipeline procurement and accounting systems will depend on the capacity of the user's application software.

c. Code 128

The Uniform Code Council developed the first UPC codes (bar codes) to identify grocery industry products in 1973. In the late 1980s, the Council developed a standard method of bar coding shipping containers comprising many distinct line items of material. The idea is to have a single, scannable bar code that identifies an entire shipment of products. The code points to the individual purchase orders that led to the creation of the shipment and eases receiving and processing of the shipment by the buyer. This has come to be known as the UCC/EAN-128 Serial Shipping Container Code and is typically used in conjunction with EDI. (EAN is the acronym for European Article Number).

Code 128 was pioneered by large retail and apparel manufacturers (the Voluntary Interindustry Communication Standard committee; a subcommittee of the UCC). Due to its success, the use of Code 128 and its function in an EDI communication flow is now being adopted in virtually all industrial sectors.

The UCC and EAN are now considering extending Code 128 to include applications identifiers (AIs). AIs will allow senders to indicate other parameters concerning the shipment: weight, freshness, batch number, length, and other variables determined by trading partners.

d. The Harmonized Code

The Harmonized Code is a merchandise and commodity classification scheme intended to standardize the identification and description of traded goods. Adopted by the major trading countries in 1988 and the U.S. in 1989, the nomenclature facilitates not only the shipping of products, but customs processing and statistical comparisons between countries.

Product classification codes that were specific to a country or a government body impeded trade efficiency. Before the harmonization of codes, one manufacturer, shipping its product through a number of countries via a number of transportation modes, found that it had to reclassify a light bulb 17 times for a single international shipment.

Clearly, a standard classification of products using a digital code greatly facilitates the automation of international trade and transportation. Documentation and processing procedures are more amenable to computerization with a universal code.

e. Freight Container Identification Codes

The International Standards Organization, working in conjunction with national bodies (in the U.S., the Association of American Railroads, the American Trucking Association, and the American National Standards Institute), will make available an international coding scheme for freight containers some time in 1992.

The identification technology uses a transponder device that is coded with a unique ID number and physical descriptions of the container. The transponder is attached to the container. When drawn past a stationary radio reader device, the transponder emits its identification data.

Transponders cost approximately $40 each. There are five million containers worldwide (making the total bill for just transponders $200 million). The radio interrogator units, which transorm the codes into information a computer can read, will cost $15,000 to $20,000.

3. Message Formats

The standardized message formats for EDI in transportation consist of the ANSI X12 standards (100, 200, 300, 400 series) and the EDIFACT standards of the United Nations. The ANSI standards were originally under

the jurisdiction of the Transportation Data Coordinating Council and are still often referred to as the TDCC standards, despite their officially being under the authority of the ANSI Accredited Standards Committee X12.

There are freight-related transportation message formats in the EDIFACT standard for international shipping communications. (There are also EDIFACT standards for passenger transportation. These are examined in INPUT's report, *Electronic Commerce in Travel and Tourism.*)

A set of six transportation messages have been developed with the acronym IFTM (International Freight Transport Messages). The messages are for a transport booking provision, booking confirmation, bid confirmation, letter of credit, bill of lading, and an arrival notice. In addition, there are four message formats developed to correspond with customs authorities. All messages are still in the draft stage. A handful of pilot applications are the norm —mostly in Europe—for these message sets.

In addition to the standard formats, the transportation industry is characterized by a multitude of proprietary formats. Some of these should not be considered message formats so much as interface formats.

Many large transporation companies, medium to large freight forwarder/ custom brokers, and many port authorities allow users to dial directly into their respective data bases (some in interactive voice response systems) for shipment updates. Although there are TDCC formats for the shipment update, these proprietary systems remain.

Also, the Automated Commercial System of U.S. Customs developed its own message formats outside of the EDI standards bodies, although Customs is working with international customs houses to use EDIFACT standards.

4. Interface Technology

Interface technologies are the glue that binds the components of the electronic commerce infrastructure. They include technologies for data acquisition, as listed in Exhibit IV-4, and system development tools, as listed in Exhibit IV-5.

EXHIBIT IV-4

Interface Technologies: Data Acquisition

- Automatic identification (bar codes, transponders, etc.)
- Interactive voice response
- EDI-to-facsimile conversion

EXHIBIT IV-5

Interface Technologies: System Development Tools

- Graphical interfaces
- 4GL programming languages
- Query languages
- CASE tools
- Business modeling tools

a. EDI to Facsimile

Carolina Freight Corp. (Cherryville, NC) has an EDI service called Caro-Fax. The trucking company's mainframe can generate transmissions detailing shipper manifests, shipping status reports, messages and exception reports and send these to shipper facsimile machines. The same data drives the company's EDI transmissions. Approximately 2,000 of Carolina Freight's customers use this application.

b. Interactive Voice Response

American President Lines Ltd., a subsidiary of Oakland, CA-based American President Companies, offers its shipper customers its EagleLink system. Through touch-tone telephones, shippers can find out the time their shipments left an originating port, the name and voyage number of the ship, when and where the cargo was discharged, if it was released by customs, and if so what the charges were, and other information. The customer simply pushes in the bill-of-lading number on the phone keypad. The system conveys the information by reading a computer data base containing the information and then, through a software process, concatenating prerecorded words (spoken by a human operator).

Interactive voice response systems have become very popular with transportation companies to convey tariff schedules and shipment status reports to their customers.

B
Payment and Credit Services

Financial and transportation services are closely intertwined: both are concerned with moving capital (whether liquid or working) as quickly as possible and both are transaction intensive. The movement of goods will always trigger a movement of funds. It is natural that the "movers" (of either category) should work together in unison. Applying electronic commerce brings better coordination to this work.

There are a number of areas of electronic commerce that tie in finance and transportation—for example freight-bill processing and credit services for truck drivers (already mentioned above).

1. International Trade Documentation

A handful of major U.S. banks (as well as many large foreign banks) are offering their customers the ability to apply for or create letters of credit from PC terminals at the customer site. These services are aimed at importers and exporters.

Letters of credit often accompany other documents (such as bills of lading) in the communications between intermediaries (especially freight forwarders) in an international transaction. Sending electronic letters of credit greatly assists this multi-party processing.

Most of the banks that offer electronic letter of credit services do so to bolster the bank's business in international trade. Many banks will give free software to their customers for this purpose. Some of the banks that make it possible for their customers to file electronic letters of credit are shown in Exhibit IV-6

EXHIBIT IV-6

Banks That Offer Electronic Letters of Credit

- Hong Kong and Shanghai Bank
- Citibank
- Manufacturers Hanover
- Chase Manhattan

Chase Manhattan has a service called Micro Letter of Credit. Customers pay $150 per month for this service; often the fee is waived. It allows the import traffic controller to arrange letters of credit electronically from a PC. Chase has approximately 90 customers using this service. Chase developed its own formats for the transmission of data. It will use EDIFACT formats for letters of credit when the formats are ready and when customers specifically ask for them. Chase uses its corporate global data network to transfer letters of credit among its far-flung branches.

From 1988 to the end of 1990, Chase offered a service called Chase Trade Exchange. It provided electronic transmission of all documentation related to importing and exporting (including ocean bill of lading, export declaration, commercial invoice, air waybill, certificate of origin, packing list, documentary collection letter/amendment/tracer, electronic mail). The service was little used. The market wasn't ready, according to company spokespersons. Also, the service relied on the cooperation of foreign banks and other entities, which were often not prepared to deal electronically.

C
Communitywide Solutions

Communitywide solutions occur when a community of companies that trade with each other jointly sponsor an electronic commerce system. Port systems are examples of this in transportation. These systems provide the whole community (freight forwarders, transportation companies, terminal operators, warehouse and yard providers, Customs, etc.) with messaging and data base services.

The National Customs Brokers & Forwarders Association of America, Inc. (NCBFAA) has proposed the building of a national messaging network to facilitate communication among brokers, forwarders, shippers and carriers. The network project has been put on hold as members see whether their network service needs are already being taken care of through other existing networks.

V

Impact of Electronic Commerce on the Transport and Shipper Communities

V

Impact of Electronic Commerce on the Transport and Shipper Communities

Electronic commerce refers to interorganizational systems that coordinate trade (or other data exchange) between two or more commercial entities. The characteristics of the medium through which trade is conducted affects the trade itself (note, for example, the effects of programmed trading on the behavior of the stock market).

As the requests, offers, promises and related elements of a commercial transaction are communicated in an electronic medium rather than a paper one (including money itself), new possibilities emerge for business organization. These include a restructuring of enterprises, industries and new offerings in products and services.

This chapter examines the reorganization of the transportation industry and the trading communities in which transportation plays a key role.

A
Impact on Transportation

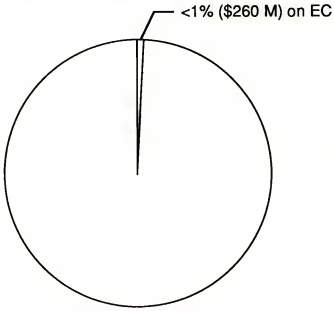
1. Community Efficiency

INPUT estimates that for-hire transportation revenues (transportation bought on the open market; not transportation capacity internal to a firm) were $122 billion in 1990. Less than 1% of this amount ($260 million) is being spent on electronic commerce systems, as shown in Exhibit V-1.

INPUT estimates that only 4% of all communications involved in transportation are conducted via electronic commerce systems. This is communication between shipper and carrier, carrier and carrier, or carrier and third-party organization (e.g., freight-bill processor, government regulator, etc.).

EXHIBIT V-1

Expenditure on Electronic Commerce as a Percentage of Total Transport Revenue



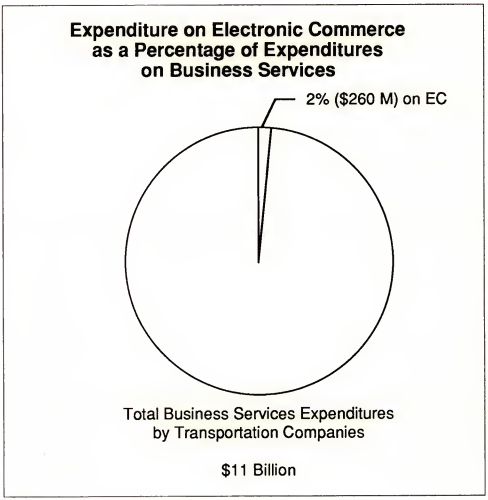
*For-hire freight transport only.

Electronic commerce also represents a very small portion of the total purchases of outside business services made by the transportation industry every year. (Business services include legal, accounting, advertising, equipment rental, building maintenance, miscellaneous repair, architectural, and other services.) The $260 million is only 2% of the $11 billion that transportation vendors purchase in business services, as depicted in Exhibit V-2.

It may be argued that the electronic commerce systems in transport are highly leveraged. A very small expenditure ($260 million) is coordinating a very large industry output ($122 billion).

INPUT believes this argument to be misinformed. For example, INPUT estimates that only 4% of all possible commercial exchange transactions are conducted electronically. Other modes of communications (particularly paper and oral agreements) are being used. (Albeit, the electronic mode may be the most productive, in that it handles the most important or key transactions among parties.)

EXHIBIT V-2



Despite the lack of a precise "factor of efficiency" that electronic commerce systems have in the transportation industry, INPUT believes that electronic commerce plays a decisive role in transportation.

- INPUT believes that electronic commerce makes for some degree of greater efficiency by reducing transaction costs among players.

- Though electronic commerce may not contribute to increases in overall output of the industry, its greatest attractiveness is that it allows transport vendors (carriers or vendors to carriers) to remain in the market. Electronic commerce contributes to the staying power of those parties that make investments in it because it makes their operations less costly (potentially increasing their earnings) and/or increases their customer service and, thereby, customer satisfaction.

The revenue pie in U.S. transportation is not increasing significantly. Most revenue opportunities will arise from shifts in market share among existing competitors as the industry continues its shake-out. Electronic commerce investments will help some players capture market share.

2. Changes to the Competitive Environment

Some of the effects that electronic commerce has on a trading community are listed in Exhibit V-3. These effects should not be considered to be caused, but rather enabled by electronic commerce. Also, these effects are often not mutually exclusive but are different aspects of the same phenomenon.

EXHIBIT V-3

Changes to the Competitive Environment as a Result of Electronic Commerce

1. Elimination of intermediaries
2. New outsourcing service options/niches
3. Shifted transaction costs
4. Users becoming vendors
5. Impacts on product pricing (e.g., yield management)
6. Product changes

In the transportation industry, the most pronounced effects are those of:

- Elimination of intermediaries (industry consolidation)
- New outsourcing service options
- Shifted transaction costs

a. Elimination of Intermediaries/Industry Consolidation

The transport industry is consolidating into a handful of megacarriers that offer one-stop shopping for all shippers' needs.

For example, the number of ICC Class I and II carriers (truckers making more than $1 million per year) decreased 27% between 1980 and 1989.

One-stop shopping includes the provision of services that had traditionally been handled by an array of middlemen. These services include several types of brokerage, forwarding, freight consolidation, warehousing, information processing services (including freight bill auditing and payment, tracking, EDI, transaction processing, MIS reporting) and fleet operations (vehicle leasing and management, container control, intermodal trailer operations, etc.).

Carriers have begun to offer a large array of service beyond the box on wheels, including information in various forms, warehousing, consolidation, sequencing of parts for assembly, customs brokerage, bonded warehousing, international EDI and other related services, all outgrowths of their traditional offerings. Megacarriers are offering one stop shopping.

Examples of these megacarriers are shown in Exhibit V-4.

EXHIBIT V-4

Megacarrier Organizations

CSX

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

American President Companies

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

Consolidated Freightways

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

Union Pacific

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

Ryder

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

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

This consolidation of transportation carriers is enabled in part by electronic commerce systems.

b. New Outsourcing Service Options

Not only are vendors of transporation services realigning and consolidating, but customers are outsourcing more of their transportation needs (particularly companies in the $50 million to $5 billion in sales range).

Third-party logistics management (by such market entrants as Menlo Logistics or Ryder Truck Rental) is an emerging market niche, the viability of which has yet to be proved. Nevertheless, electronic communication systems have made this new service possible.

Another outsourcing niche that has been aided by electronic commerce is that of the transportation broker. Brokers match shippers with carriers, constantly booking freight reservations at lowest prices. Their profits come from buying freight wholesale and selling it at retail.

During the 1980s, the number of transportation brokers increased dramatically. It continues to increase. Prior to 1980, fewer than 100 brokers were licensed by the ICC to arrange interstate movements of freight by motor carriers. In 1990 there were more than 6,500 licensed brokers, with 9,500 permits outstanding.

This increase in the brokering niche has been partly enabled by electronic commerce systems, which give brokers the ability to have more individual carrier rate data at their fingertips.

Skyway Freight Systems Inc. (Santa Cruz, CA) illustrates the creation of this business niche through the use of electronic systems.

c. Shifting Transaction Costs

This is another way of looking at the outsourcing trend by shippers. It is an important trend, in that if outsourced transportation is actually cheaper than running a transport function internally, there is a huge market for outsourcing. Correspondingly, there is a huge efficiency gain to be made in the transport industry.

Two-thirds of the Department of Commerce's estimates on the size of the transportation sector in the U.S. economy are transport services that a company provides for itself through its own in-house fleet. If this moves to outside contractors, it will represent a huge make-over of the transportation industry and the industries that it serves.

B
Impact on Shippers

Today, many corporations are cutting their logistics and transportation staff due to short-term pressures on purchasing and marketing executives, despite the fact that:

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

Some of the impacts that electronic commerce systems may have on an organization are listed in Exhibit V-5. The impacts apply to both vendor and user organizations.

EXHIBIT V-5

Changes to the Enterprise

1. Work flow re-engineering
2. Faster cycle times
3. Changed profit centers
4. Changes in management focus/strategy and company identity
5. Changes in accounting systems and definitions
6. Changes in the use of management information

1. Case Example: Westinghouse

The EDI program at Westinghouse illustrates some of these impacts.

In a switchover that is becoming common among large users of trucking transportation, Westinghouse calculates its transport bill (of one of its carriers) on its own, rather than receiving it from the trucking company. This relieves the trucking company, Yellow Freight, of preparing and sending the invoice.

Westinghouse calculates the correct rate for the specific shipment—using a tariff data base—generates a freight bill, and pays Yellow Freight.

With this system, Westinghouse has cut its freight bill processing costs by 20% and expects to save up to 50% in the long run, once the new program's development costs have been absorbed.

Westinghouse and Yellow Freight worked together to develop this system.

C
Financing the Electronic Commerce Infrastructure

1. Background

Electronic commerce systems are interorganizational. They compose an infrastructure by which an entire community of companies can conduct commerce. A collection of interorganizational systems constitutes a single, monolithic transorganizational infrastructure that is shared by the greater community of trading companies.

Financing the infrastructure (let alone designing and implementing it) is critically important relative to the competitive and financial gains and losses that the infrastructure generates. The financing issue is difficult because unlike applications and systems that a company implements internally and therefore wholly pays for, an interorganizational system is shared by a community and therefore its costs and benefits are also shared.

Equitably distributing costs and benefits is difficult, as it is a complex equation of:

- Usage volumes of the each of the respective participating users
- Amortization of fixed costs over time
- The degree to which all parties in the trading community are on the network or not (the scale economies of the infrastructure)

Three types of organizations have direct yet assymetrical stakes in the financing process:

- Small users
- Large users
- Vendors

Large users have more to gain from an electronic commerce platform (because their transaction volumes are higher) than small users. Larger companies may or may not shoulder a larger financial burden in building the infrastructure. They may not shoulder a burden commensurate with the value they gain from it.

The flip side to the user's concern for how much to spend on an electronic commerce system is how much a vendor can justifiably charge.

Vendors, particularly value-added service providers, set prices with an eye on their competitors and an eye on price elasticity. First, they consider what the market will bear. Then, they try to figure which arrangement gives the greatest gross revenue: low prices and many users or high prices and fewer users.

Also, vendors may offer lower prices because the product will be resold to other trading communities. The service provider considers the loss in potential revenues to be a cost of product research and development. Here again, the strategy is to amortize the development costs of the service over a large number of users.

A fourth category of organization that may have an interest in the infrastructure is regulatory bodies. These can play a role in the community's infrastructure as, for example, does U.S. Customs, which both requires EDI and provides some EDI services.

The challenge to equitable financing of electronic commerce systems is to determine prices so that an entire trading community—big users, small users and vendors—is willing to participate and invest in the system. Without full participation of all users in the trading community, the full benefits are not realized, because then all parties must do business in two ways (paper and electronic) instead of one (electronic). In addition, without profits for the vendors, there will be no platforms offered by third parties.

Some of the important dynamics and issues regarding finance are listed in Exhibit V-6.

EXHIBIT V-6

Issues of Electronic Commerce Infrastructure Financing

1. Early adopters versus later adopters
2. Large hub users versus small spoke users
3. Third-party community systems integrators
4. Trade groups

One issue is between early adopters versus later adopters. The first companies to adopt EDI and other trading community systems often incur a greater expense in implementing interorganizational systems than later adopters because they must pay for the educational ramp-up. Later adopters can avoid the pitfalls and receive advice directly from early adopters or the time-tested expertise of vendors and service providers. Furthermore, with fewer other companies on the interorganizational network, the pioneer adopter has less utility from the infrastructure than the later adopter.

Another issue is between large hub users versus small spoke users. Often the large company will receive the greatest benefit from the interorganizational system because its trade volumes are higher than those of its trading partners. Because of this, some hub companies will provide free software to their trading partners. Most large railroads and deep-sea shipping companies provide their customers with software to send and receive bills of lading, shipment status messages, invoices and other documentation.

A third issue involves third-party community systems integrators. Here, a third party takes on the responsibility of integrating a trading community. In transportation, port community systems are an example of this. Here, financing takes into consideration the strategy of the third party. That is, low prices for users may be a strategy by which the third party develops market share and/or develops a commercial service that it can replicate in other communities. Thus, the third party is willing to subsidize the community.

Trade groups must also be considered in a discussion of infrastructure financing. Trade groups often help subsidize the development of an electronic commerce system for a trading community. In the food business, the Uniform Code Council and its development of the UCS EDI standard is an example of this. Here, the membership of the trade group (often the largest companies in the given industry) shares the costs of development equally. Membership fees and volunteer efforts of the members subsidize the development of the system.

2. The LINX versus the ACES Port Community Systems

The port authorities of Seattle/Tacoma and the authorities of New York/New Jersey offer EDI systems to their respective communities. Each authority contracted with a third-party network service provider to provide the technical and network services. LINX (the Seattle/Tacoma community system) uses Sterling Software ORDERNET as its community VAN and integrator. ACES (the New York/New Jersey system) uses GE Information Services.

Although the respective port authorities contracted with the VANs for the service initially, users of the services are directly billed by the VANs. In both systems, all support assistance is provided by the VAN directly to the user.

The pricing and consulting costs that the VANs charge differ in many important ways (see Exhibit V-7). The differences favor alternative uses of the EDI infrastructure and a different distribution of costs and benefits among participants.

EXHIBIT V-7

EDI Port Community Price Schedules: Port of New York/New Jersey versus Port of Seattle/Tacoma

Service/Fee	GE Information Services ACES	Sterling Software ORDERNET LINX
Start-up initialization fee (One-time charge)	$550 ($250 if already a GEIS user)	None
Minimum billing	Applied to other charges $50 per month usage	$900 per year (covers transmission up to 300,000 characters per month)
Mailbox Fee	$150 for each mailbox (one-time fee)	2 free mail boxes with sign-up. $5.00 per month per extra mailbox
PC Software	$120 yearly maintenance fee; connects to ACES network only	Not included; any PC EDI translation software package
Connect Time and Processing Fees	Sender only pays. Peak: 25¢ per 1,000 characters Off peak: 18¢ per 1,000 characters	For all data in excess of 300,000 characters/month - Data sent: 10¢ per 1,000 characters - Data received: 10¢ per 1,000 characters
Session Fee	Peak: 20¢/session Off peak: 15¢/session	No charge (toll-free call to Sterling's hub)
Billing	GEIS bills user directly	Sterling bills user directly
Additional Services		
• In-Network Format Translations	Available	$50.00/month
• Public Network Interconnect Service	$25.00/month/network	$25.00/month/network
• EDI-to-Fax Conversion	Coming	- 50¢ per document - 25¢ per 1,000 characters - 45¢ per minute connect time (In lieu of the 10¢/1,000 characters processing fee)

The major difference is that the ACES system is less expensive to the small-volume user than the LINX system. However, as volumes increase, the ACES system overtakes the LINX system in expense. Large-volume users pay more on ACES.

This is shown by a hypothetical example in Exhibit V-8.

EXHIBIT V-8

Small-User versus Large-User Costs: ACES versus LINX

Small User

Assume company sends five and receives five EDI documents per day, twenty days per month. Each document averages 1,000 characters.

	ACES	LINX
Fixed initialization Cost	$550 start up $150 mailbox $700*	$3,000 EDI software $3,000
Monthly Variable Cost	$50 minimum	$75 minimum charge

* Includes one on-site visit if user in NY area

Large(r) User

Assume company sends twenty and receives twenty EDI documents per day, twenty days per month. Each document averages 1,000 characters.

	ACES	LINX
Fixed costs	$700	$3,000
Monthly Variable Cost	$100 connect time (assume peak) $80 session charge (assume each document sent has its own session. All sessions at peak) $180	$75 minimum charge $50 transmission charge (for the 500,000 characters over the 300,000 limit) $125

The single most important contributor to ACES' lower entry cost is that ACES provides users with free software. With the LINX system, users must purchase their own EDI software (typically, $3,000 for a PC package). (The ACES software, it is important to note, runs only for ACES transactions and cannot be used for EDI transmissions outside of ACES.)

The next factor that makes ACES less expensive than LINX for the small user is the lower monthly minimum charge by GEIS: $50 versus Sterling's $75. (Both VANs' monthly minimum charge is applied toward the other charges.)

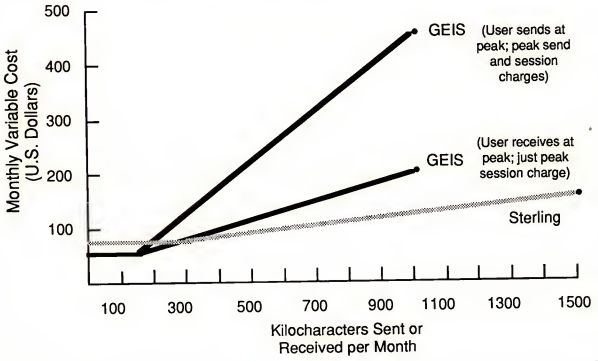
Another factor that may make GEIS' prices more attractive to the small user is GEIS' practice of charging only for characters sent. Sterling charges for characters both sent and received, albeit at lower rates.

This assymetry in per-character charges may, again, favor the small user. Small users may receive more documents (typically, orders) than they send. And large users are the ones who originate (send) the orders.

But after a user passes the threshold of sending about 200 EDI documents per month (10 per day), the LINX system becomes relatively less expensive than the ACES system. The price/volume crossover point is illustrated in Exhibit V-9.

EXHIBIT V-9

Network Charges as a Function of Volume: ACES versus LINX



Thus, ACES is a system designed for easy entry by the small, mom-and-pop port community player (such as a freight forwarder or customs broker). ACES is the less expensive of the two systems in terms of initial entry into an electronic commerce trading network.

Such a price schedule is appropriate for the New York/New Jersey port community, where there are 300 customs brokers/freight forwarders, none of whom control more than 2% of the cargo going through the port. The LINX community (largely a container port) is more consolidated than that of New York. For example, there are only 128 brokers/forwarders (42% of New York's number), all of whom handle at least 4% or more of the port traffic.

Where the community is populated by many small-volume players, in order to get the whole community on-line, pricing should be set so that low volumes are relatively affordable. For the community that has fewer but proportionately larger players, the pricing can have an expensive entry point but larger volumes should carry a relatively low incremental/marginal cost.

So the pricing of each port system, at this point in their respective histories, appears to be appropriately suited for the demographics of their respective marketplaces, although it may be too soon to judge. The next question is: given these prices and demographics, who will make more money—GEIS or Sterling?

In terms of revenue generated from the minimum monthly fee, although GEIS' fee is lower, GEIS potentially has a larger customer base and therefore its gross revenue may be higher.

GEIS has, on average, higher per-kilocharacter revenues—21.5 cents versus Sterling's 20 cents. Although Sterling charges at much lower rates, it charges for both sending and receiving transmissions, whereas GEIS charges only for sending messages. But Sterling's rate of 10 cents per kilocharacter (sent or received) is revenue for Sterling at the rate of 20 cents, because every kilocharacter sent by one party is a kilocharacter received by another. In effect, Sterling charges twice for the same kilocharacter: once to the sender, once to the receiver.

Though the price/volume income may be higher for GEIS, Sterling may make up for any difference through EDI software sales. Users are not required to buy Sterling EDI software but are encouraged to by the port. Sterling's initial $270,000 consulting fee also may offset any lower earnings potential it has on the transactions side.

The comparison of ACES with LINX illustrates the dimensions of financing an electronic trading community. Which electronic commerce infrastructure (in this case, ACES or LINX) is financially more attractive to

users? Which infrastructrue is more attractive to the provider of the infrastructure? As we have seen, it depends on pricing, trading community demographics, and per-user transaction volumes. Nevertheless, INPUT believes it is too soon to tell which one is superior.

VI

Conclusions and Recommendations

VI

Conclusions and Recommendations

INPUT believes that due to the transaction and communication intensiveness of the transportation industries, electronic commerce systems are having and will continue to have a dramatic impact on transportation. Indeed, along with banking/finance, health care, distribution and communications, INPUT believes that transportation will be among the industries most profoundly altered by electronic commerce systems.

A
Electronic Commerce and Transportation

The transportation industry is undergoing a transformation similar to the transformation agriculture underwent around the turn of the century and to the transformation that banking is undergoing currently. That is, the industry is replacing human labor with technological systems. The resulting economies of scale (tremendously increasing the productivity of the remaining labor component) are inducing a consolidation of the absolute number of players in the transportation industry. Exhibit VI-1 summarizes the changes.

EXHIBIT VI-1

Electronic Commerce and Transportation

- Industry consolidation
- Electronic commerce systems a competitive requirement
- Systems necessary, but not sufficient to maintain market share

The deployment of electronic commerce and other information services increases the ability of carriers to offer new products (e.g., brokering services and third-party logistics) as well as to lower the costs of existing products. Yet, despite these competitive advantages, success is only

attained when the systems are given enough throughput/volume of business. It is possible for most of the competitors to lose out when all competitors in a line of business automate, even though the production of the service becomes more efficient for each competitor.

The economics of the overall industry are changing. The highly fragmented environment that was maintained through regulation is giving way to a consolidated, oligopolistic industry structure with only a few very large players.

As the industry cost curve flattens (as a result of investments in systems that have multiplied human productivity), only a relatively small number of large players can profitably provide the economic capacity demanded by shippers.

INPUT expects the relationship between growth in expenditures on electronic commerce technologies (by carriers, primarily) and growth in output of carriers (in terms of carrier revenues) to tend toward an inverse relationship: as electronic commerce investments rise, output rises more slowly because the same level of service can be delivered at less cost.

In other words, electronic commerce investments won't necessarily allow carriers to offer new products for which they can charge extra. The investments will simply be competitive necessities—marketplace 'ante'—which may or may not be recouped. Higher business volumes (which are realizable for the most part only through expanded market share taken from competitors) will most probably be the only route to recovering the cost of systems.

- Growth in total revenues/output of carriers is slowing (for example, in trucking, revenues grew 8% from 1988 to 1989, but only 4% from 1990 to 1991).

- Employment in some modes is actually falling, specifically in railroads.

- Total ICC Class I and II truckers (truckers with greater than one million dollars in annual revenues) decreased 27% between 1980 and 1989.

Deregulation during the 1980s (a lifting of restrictions on entry, routes, commodities, rates and so forth) has produced great efficiency but also fierce competition.

By some estimates, deregulation has resulted in $65 billion annually in reduced logistics outlays: $30 billion in savings from reduced inventory storage, and about $35 billion less in freight payments. Deregulation, however, has also generated a fierce competitive environment.

The revenue pie in U.S. transportation is not increasing significantly. Most revenue opportunities will arise from shifts in market share among existing competitors as the industry continues its shake-out. Electronic commerce investments will help some competitors capture market share.

Manufacturers, distributors, and transportation companies will eventually be tied together with EDI and other kinds of communication networks. An increasing portion of business will be coordinated through these integrated networks. In order to be a participant in the market for these goods and services, carriers and shippers must make investments in such electronic commerce systems.

As transportation undergoes this period of consolidation and electronification, it has the potential to play a pivotal role in reshaping many of the industries and trading communities that it serves.

INPUT concludes that:

- Transportation can and should assume a leadership role in the establishment of electronic commerce in the trading communities in which it plays a primary role.
- Transportation, because it influences the linkages among organizations in so many trading communities, can help standardize electronic commerce transactions across trading communities.
- Information services companies (vendors of electronic commerce solutions) should look upon transportation as an entree to participation in other trading communities.

B
Recommendations

1. Carriers

Carriers will increasingly be responsible for more of the cost of inventory as delivery schedules between manufacturers and customers tighten. Maximizing the use of tools for planning deliveries within a tight schedule—which maximizes load efficiencies and least-cost routing—will become increasingly important. In addition, customers, suppliers, and carriers must be able to share data processing facilities for real-time tracking of products en route.

Transportation, along with labor and materials, is one of the highest cost factors in manufacturing and distribution. A way to reduce this cost significantly in the future will be throught elimination of as much paper flow as possible, as well as through attention to load factors and enhanced routing of transportation vehicles to maximize the capital equipment rate of utilization. Electronic communication systems should be considered for such solutions.

- Continue to invest in EDI and other electronic communication systems to remain competitive.
- Team with other carriers to provide intermodal services and/or to build communication platforms, reservation systems, tracking systems, etc. that all share.
- Focus the electronic systems to deliver a specific product or service to customers.
- Determine how EDI, fax, data bases (for example, for rate information) and other communication technologies could contribute to more efficient operation and better customer service.

2. Electronic Commerce Vendors

A major consideration for electronic commerce/IS vendors is the increasing need for high-speed, reliable communications of data, documents, and records by carriers, shippers, and retailers that is forcing much tighter computer services linkage among all those involved in a transportation network.

Transportation carriers—to survive over the long term—will have to be financially strong, which will require large economies of scale to provide the lowest cost, highest quality transportation service. This will involve continuing consolidation in the transportation industry in the 1990s, and could include an acceleration in the rate of intermodal mergers and/or alliance activity.

In addition, the carriers, shippers/suppliers, and customers/retailers will eventually be tied togethr into networks that provide for electronic documents and data transmission across companies and computers through simplified, single-interface access systems.

- Potential sales for EDI software are highest in the trucking sector of transportation modes.

- Identify information and communication needs in specific trading communities with whom transportation companies conduct business (e.g., retail, finance). The building of data bases, bulletin boards, etc., is needed. Infrastructure services and utilities (as discussed in Chapter IV) are potentially numerous and lucrative.

- Focus on selling services/systems/solutions to the top trading partners of transportation companies, which include: other transportation companies, petroleum companies, wholesalers/retailers, business service providers, construction companies, vehicle manufacture and service providers, and insurance/banking providers.

- Sell complete solutions. Customers want more integrated services.

- Work with trade industry associations to enter specific markets.

Appendix

A

Index of Companies Mentioned in this Report

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