INPUT

STRATEGIC MARKET PERSPECTIVE

Electronic Commerce and Transportation

Electronic Commerce Program

DECEMBER 1994

Electronic Commerce and Transportation

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Abstract

Because transportation is a "business-service" industry, its success is dependent upon the overall economy and the need for the movement of goods. Unlike most industry sectors, transportation growth for any single provider is usually at the expense of another firm. Can a true "trading community" exist in such a competitive and economically stressed environment?

In this report, *Electronic Commerce and Transportation*, the transportation trading community, electronic commerce products and services sold into that community and issues surrounding this period of massive organizational change, are described.

Some of the questions answered include: What are the technology demographics of the industry? Are they technologically advanced? Are they conducive to the use of external services? Are they leaders, who can move others into electronic commerce or are they more often driven by external forces? Are there substantive differences in the different mode-bases submarkets (rail, truck, water, etc.) regarding technology (e.g.: electronic commerce)?

Expansion of electronic commerce in transportation will be driven by transport vendors as well as customers needs to connect; the fact that transport companies generate 65% of their own revenues and can support their internal requirements; the use of more than one transport mode to complete a transfer is growing; and the increase in the numbers of "mega carriers" with increased need for electronic commerce.

The report goes on to describe technologies used in the rail, water cargo, trucking and air cargo subsectors as well as pipelines, containers and other modes. Major electronic commerce vendors serving the transportation sector are discussed and conclusions and recommendations are made.

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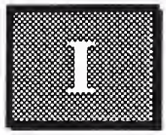

Introduction

A Purpose

The purpose of this report is to explore the evolving uses of, and need for, electronic commerce (EC) within the transportation industry. The analysis identifies the key business trends and issues in this industry sector, its use of technology, the status of electronic commerce and transportation's use of various technology products and services.

Excluded from this report is passenger transport, which is included in INPUT's Electronic Commerce in Travel and Entertainment report.

Key Issues—An understanding of the issues confronted by the industry and its underlying sectors is significant for comprehension of its general information services direction, as well as the future course of EC. With this understanding the market strategies for the focussed information services vendor can become clearer.

- Transportation is generally a business service industry, its fortunes are tied to the economy and the need for the movement of goods. Unlike most industry sectors, transportation growth for any one submarket or single company is usually at the expense of another sector firm. Are there signs that this competitive environment can put together the community required for efficient electronic commerce?
- What are the technology demographics of the industry? Are they technologically advanced? Are they conducive to the use of external services? Are they leaders, who can move others into electronic commerce or are they more often driven by external forces? Are there substantive differences in the different mode-bases submarkets (rail, truck, water, etc) regarding technology and electronic commerce?
- A knowledge of the several concepts and technologies, like Electronic Commerce, EDI, AEI, trading community and logistics is fundamental to understanding the directions of transportation and electronic commerce.

- Are smaller transportation companies without the financial resources, nor the perceived need, for these expensive technologies involved? If not, will they be forced to become involved?
- What are the technology highlights of 1993 and early 1994 that may be predictors of future opportunity in the transportation sector?

The intention or this report is to provide the technology vendor with a working understanding of the transportation sector and its submarket components to assist in constructing strategies. In addition, the report will examine where sector firms are on EC, how they are involved in trading communities, their most common trading partners and the meaning of these factors on the future directions of EC implementation.

B
General Business Trends And Events

As documented by the U.S. Department of Commerce in its 1994 edition of the *U.S. Industrial Outlook*, the U.S. economy grew 2.6% in 1993, a rate of growth identical to the 2.6% experienced in 1992. Key 1993 economic indicators were generally favorable, with before-tax corporate profits growing to 11.8% (from 9.1% in 1992), and the housing and automotive industries showing moderate but steady growth. Inflation in 1993, as measured by *Blue Chip* consensus of approximately 50 private-sector economists, was a mild 2.5%, and is projected at 3.0% for 1994, with a five-year average rate of 3.3% through 1999. The heavy Midwest flooding in 1993 had some impact on agriculture's contribution to 1993 GDP, but that was offset by the expenditures for repairs and replacement from flood damage. An unresolved 1994 federal issue is the proposed Health Care Reform bill, and the effect it may have on health care and the economy, depending upon when, and in what form, it is enacted.

Most economists and business analysts agree 1994 will be another year of moderate, but steady growth, with the U.S. economy improving to 2.9% and corporations maintaining earnings growth at double-digit levels. Much of the corporate growth is attributed to a strong and continuing emphasis on cost cutting and productivity gains—two concepts which have already contributed to corporate gains. Consumer confidence appears to be increasing (as exemplified by the growth in housing starts and auto production), and personal spending is expected to grow from 2.9% to 3.0% in 1994. Areas of economic concern include continued cutbacks in defense spending, a lingering weakness in the commercial real estate market, corporate restructuring (specifically downsizing) that will further limit employment growth and the economic problems that

continue to plague major U.S. trading partners such as Western Europe and Japan.

Overall, however, the outlook for the U.S. economy in 1994 is for controlled, steady growth in the 3% range with inflation at that level or slightly less, and corporate before-tax profits at 10% of better.

C
Report Organization

In addition to this introductory chapter, the report contains analyses of the industry, EC information services market and competitive environment as described below:

- Chapter II, *Executive Summary*—Provides a summary of the research and conclusions developed in this report.
- Chapter III, *Electronic Commerce Overview*—Discusses EC: its relationship with transportation, its product and service components; and how transportation trading communities have evolved.
- Chapter IV, *Transportation Business Overview*—Presents a discussion of the sector's overall business trends and competitive factors. Also discussed are changes, market issues and activities and competitive factors in the transportation industry and its segments that can have an impact on the current and future use of electronic commerce.
- Chapter V, *Transportation Technology and Electronic Commerce*—Explores the sector's IS environment, the key application activities, transportation firms actions as technology vendors and what technologies are indicative of future growth in the sector. Where significant, the separate transport modes are discussed individually.
- Chapter VI—contains INPUT's *Conclusions and Recommendations* for the transportation/electronic commerce market.
- Appendixes:

  A. Contains industry and electronic commerce-specific definitions.

  B. Discusses the Transportation Industry structure, the methodology used in report creation and lists INPUT reports that should be reviewed by the reader to obtain more information on this topic.

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II

Executive Overview

Commerce, communications and transportation have been bound together since the beginning of time. Initially transportation was the enabler of communication and commerce beyond the physical community. For most of history improvements in communications speed was made possible only by improved transportation. The advent of the telegraph a little over a hundred years ago signaled the end of communication's dependence on physical transportation.

Although transportation firms took advantage of communication advances over the years, the flow of the paper to support the transportation of goods tended to lag the actual transfer of goods. It was the need to move vast amounts of goods to sustain the population of Berlin by air during the 1960's that became the first model for what we now call EDI. Though the telegraph-based linkage was rudimentary, that early example of electronic commerce was fundamental to the success of the Berlin Airlift in coordinating two landings a minute, twenty-four hours a day for many months.

Today, Electronic Commerce (EC) promises to revolutionize the fabric of transportation. Its results are expected to include: more efficient operations, staff productivity increases, smoother commerce, more predictable shipments, quicker movements and more satisfied customers.

A
Electronic Commerce (EC)

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

EC is the umbrella term for the collection of commercial communications techniques: EDI (Electronic Data Interchange), faxes, E-mail (Electronic Mail—the word equivalent of EDI) and EFT (Electronic Funds Transfer).

INPUT's strict definition of EC requires that the communications be between companies. Since INPUT estimates that 85% of all the first three types is done within the bounds of a company entity, much of the current flow is not true EC. Exhibit II-1 shows the composition of the total EC market.

Exhibit II-1

Total Market For EC Technology

	INPUT 1993 Estimate ($Millions)	Percent
True EC Portion	600	14.5
Market without Credit and Equipment	2,160	52.2
Total Market	4,135	100.0

INPUT estimates that less than 15% of the current EC technology market supports those activities that are true EC, i.e. between companies. Also that the market is best viewed by removing the massive and matured services which support credit reporting and the equipment that supports EC systems. Projections for growth through the end of the decade for the first two exhibit entries show a combined Cumulative Annual Growth Rate (CAGR) of 22% for all industry sectors.

To understand EC and how it relates to transportation requires an explanation of the EC trading community concept and the components of EC technology.

1. Trading Communities

To analyze the market for electronic commerce systems an understanding of a "trading community" is fundamental in delimiting the logical domain of players who trade with each other and who, therefore, are candidates for interconnection via an electronic commerce infrastructure. A trading community is all the companies that are engaged in some general economic activity. Trading communities are comprised of companies that, in the course of business, need to communicate with each other.

A trading community should not be confused with a vertical industry, such as discrete manufacturing or wholesale distribution. Vertical industry groupings lump together entities within a particular industry sector, who have little need for intra-sector commerce. Such a grouping is irrelevant when one wants to examine systems that support trade relationships among companies.

Most transportation sector firms have the need for participation in multiple communities: they are part of the physical connective linkage within other industry sector communities, and they have their own needs for electronic community with other transportation firms to complete the transfer of goods. INPUT has found that the relative maturity of EC within a transport sector firm is related to the pressures applied by these two community types.

2. EC Components

EC technologies and services are anything that supports the communications involved in a business transaction. This includes sending requests and reports (like: purchase orders, invoices, supporting data) between companies, information to assist sales (like: product information, prices, credit data) and tracking information regarding the progress toward delivery. The traditional breakdown of these components is:

- Network Application Services - network, communications and processing services for data transfer;
- Electronic Information Services - computerized data bases to assist business decision making and commerce;
- Software Products - application packages to facilitate standard data transmission; and,
- Professional Services - consulting services to analyze and implement EC connections.

INPUT calculates that the total market in 1993 for this combination of services for transportation sector firms was generally a minor portion of the total $2.1 billion market. However, INPUT believes that the growth in expenditures projected at 22% for all industry sectors will be small when compared to the growth experienced within the transportation sector. The reasons for this become clear by an examination of the transportation sector business trends, technology directions and their recent EC efforts.

B
Transportation Business

To understand the U.S. transportation industry one must comprehend that their common purpose, the movement of goods and people, is all that links the group of companies into an industry. Transportation insiders do not see themselves as part of an industry, but part of their company's transport mode. The transport modes (rail, air, truck, water and pipeline):

do not share SIC codes, inter-mode competition raises stronger feelings than competition among the entities of a mode and government action and support is normally mode based.

The basis of the transportation service sector is to assist the movement of goods. Raw materials and parts are moved to producers whose finished products are then moved to where customers want them. The transportation sector grows to support growth in the amount of goods to be moved which is a factor not within the control of transportation. Hence, the perpetual struggle has been among the players to increase their share of a relatively fixed market for transport.

There are few exceptions where transportation by itself has created additional business. An example of this is Federal Express who invented the next day package delivery business. Did this innovation in speed induce more packages than would have been presented for transport, or were the vast majority of these packages just diverted from other transportation means? Certainly this was a substantial event that added new transport business, but stories of the ability for transportation firms to create new business are the exception. Most of any sector firm's growth beyond the level of global economic growth is at the expense of an alternative transportation company.

1. Transportation Factors

INPUT believes that five primary factors will drive transportation and increase sector firms need for EC sophistication during the next 5 years. Exhibit II-2 lists these factors.

Exhibit II-2

Primary Transportation Factors

- Hub-spoke driven vs. mode patterns
- Own biggest "customer"
- Multimodal
- Compression - mega-carriers
- Economic growth

The expansion of EC connections in transportation is unique having been driven by two separate forces. Initially the need for internal mode connection was required to do business. This is most exemplified by the creation of RAILINC by railroad companies to support the movement of equipment and shipments among the various companies. More recently EC connections have been forced by the customers of transportation as they have moved into EC to improve the efficiency of their businesses

through the shift to concepts like Just In Time (JIT) operations. Although the importance of these needs differs by transportation mode, their impact will continue and increase in importance over the next several years.

Through the examination of transportation firm revenues and expenditures INPUT has determined that transportation is its own biggest customer with 65% of cash flow never leaving the transportation sector. This is the underlying factor in the growth of EC among transport firms. In addition, our examination of transport's top five customers and suppliers shows that their cross relationships are strong. Both petroleum and wholesale/retail organizations are found on both sides of the cash flow ledger. Although there are substantive differences between the transport sub-modes, this is an indication of the potential for EC implementation to add efficiency for transportation firms.

Multimodal, the use of more than one transport mode to complete a shipment transfer, is the fastest growing sub-segment of transportation. Since this implies the need to move data among companies, this factor is also a driver for EC implementation.

The trend in establishing mega-carriers, like CSX and American President Companies, will continue to blur the traditional lines between transport modes. Acquisitions and mergers will continue to compress the number of major transportation sector players and formerly EC communications will become internal EDI connections. For the vendor of EC technology, the need for connection is more significant than the concern for true EC connection. In addition, the need for smaller carriers to provide electronic connection will be required for their survival.

Finally, our transportation system collectively is an economic enabler. However, the reverse is also true; the continued sluggishness of global economic growth has been shown in the less than prosperous financial results of the transportation industry sector. INPUT believes that the global economy will gather steam through the rest of the decade driven mainly by freer trade agreements like NAFTA and GATT. Transportation firms will prosper in a world that becomes more commerce driven. EC will be the enabler for many firms to take advantage of the economic upturn.

2. Transportation Technology Trends

Examination of technology use within the transportation sector shows several trends that are significant. Exhibit II-3 list the primary trends resulting from INPUT's continuing study of technology. The information is current and has been collected through interviews and questionnaires

from IS professionals and project manager throughout the US regarding application projects during late 1993 and early 1994.

Exhibit II-3

Primary Transportation Sector Technology Trends

- Mainframe bias
- Major users of external technology vendors
- Industry knowledge required

Transportation sector firms show a greater tendency to use mainframe systems for applications development than do other industry sectors. While 41% of all application projects explored were being developed for mainframes, transportation projects showed a 51% mainframe level. INPUT believes that this is related to the long history of computerization at the many large firms within transportation, like airlines and railroads.

INPUT data also shows a higher tendency by transportation firms than other industry sectors to use external technology suppliers. Combined Systems Integration and Professional Services delivery mode use for current application projects for all industry sectors is 36% of all projects. INPUT's data on transportation sector projects shows the use of these external services is for 55% of all projects, 19% higher than the norm. In addition, the outsource contract by SP Rail with ISSC was a precedent setting agreement, as the first major dp outsource agreement in the railroad industry.

Finally, and possibly most significant is the propensity of transportation firms to require industry expertise from technology vendors. This is most apparent in the success of transportation firms to become technology vendors. Examples include:

Rail:

Conrail - ACCESS System provides real-time shipment information to improve the speed of billing.

Santa Fe - entire railroad operations system sold to CN North America (reported price of $50 million).

Trucking:

JB Hunt/IBM - RoadRider system featuring truck-cab mounted PC communications to a centralized control system to be marketed to other trucking firms.

Packages:

Both Federal Express and UPS offer PC-based package tracking packages to their customers that connect to their main data bases.

Although these activities are not all as substantial as the Santa Fe sale, they all show the power of the sector's technology leader firms.

3. Current EC Technology

INPUT research believes that three significant patterns in transportation EC use are of interest and predict future strength. Exhibit II-4 lists these factors:

Exhibit II-4

Transportation EC Patterns

- Major EDI application implementor
- Association base connection

The INPUT data collected during late 1993 and early 1994 found that the most common application project in transportation sector firms involves EDI. Transportation's EDI as 61% of all sample projects was the:

- Highest of any industry sector, and
- A full 25 percentage points higher than the all sector average of 33%.

This high level of development, whether driven by their customers, other transportation firms or their own perceived needs, shows a rapid modification to their history of development. For the EC technology vendor this should be a signal of future business. These new systems will require network services, equipment and professional assistance and force similar development by trading partners. INPUT believes that this pattern shows that the potential business within transportation is much greater than its history.

As has been stressed during this report, transportation is not a homogeneous industry, but more a collection of transport mode industries. Within the transportation sub-sectors different patterns emerge than are obvious across the entire industry. Primary among these are the network structures that support mode-based communications. The existence and formation of association-based networks is the norm for three modes: Railroads formed RAILINC as part of the Association of American Railroads; Pipelines communicate over several GEIS run networks like PETRODEX; and Water Carriers have developed EC software for their new OCEAN system through their

Information Systems Agreement. With the exception of Federal Express, who maintains their own network, Air Carriers tend to connect through the existing passenger system networks. Trucking firms are unique having no common network for EC among their companies, since there is limited need for shipments to pass intra-mode. Instead truckers rely on connections directly with shippers and with other networks.

4. Future Directions

INPUT believes that the future of transportation industry EC will be based on expanded use of current technologies and that they will be part of breaking down the historical inter-mode barriers. Exhibit II-5 lists the primary future direction and their technology basis.

Exhibit II-5

Transportation Future Directions

- Seamless shipment
- AEI will drive EC expansion throughout transportation
- Trucking will model from JB Hunt/IBM's RoadRider System

The needs for transportation to provide the apparent seamless movement of shipments regardless of company and mode transfers is a customer requirement. The rapid growth in multimodal transport has brought efficiency to the movement of goods. EC is a requirement to control these movements and provide customer information and service. It is the connective tissue among the thousands of companies moving goods every day in the US and throughout the world.

Primarily driven by a railroad initiative, the attachment of AEI tags to transportation components will allow real-time tracking of every shipment. This will also introduce vast new amounts of data as all players in commerce, from container owners to retailers, seek to obtain and use the newly available location information. These will initially be rudimentary and cover only part of the components, but transportation's customers will require more. Assisting in fulfilling this need will provide opportunity for all vendor types.

The model for connecting trucks to the emerging location and information networks exists in the RoadRider system built by the JB Hunt/IBM partnership. Although this system may not be successful in achieving a marketing success, the capability potential is obvious when the truck cab is turned into a communications center.

The lead of US firms in EC should be translated into North American, hemispheric and global leadership for these firms. Their counterparts in other countries can be brought into these emerging systems to form the transportation industry that has never been.

C
Recommendations

INPUT's research into EC within the transportation industry sector has determined it to be a much more fertile market for technology than has been the case. The market will be driven by this industry sector's need to capture and solidify customer relationships through providing better information and service. EC will be the mechanism to fulfill this customer need.

Exhibit II-6

Vendor Recommendations

- Industry expertise
- Recognize the growth paths
- Mainframe will shift to client server
- Do not overlook allied businesses

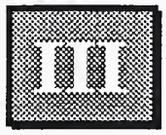
Transportation will continue to require vendors to be expert in their industry, possibly their sub-sector. This has been and will continue to be a prerequisite of basic importance. The successful vendor is advised to acquire the credentials.

Where is the growth? INPUT believes that it is all around in the transportation sector. The current development binge of EDI applications coupled with the rapid implementation of AEI hardware is not the end, but rather the beginning. Transportation firms will need assistance in tying the pieces together. They will need to develop paths and applications to capture and use the explosion of data inherent in component tracking. Their customers will also need to find way to obtain and use the new information. Even small players will need the means to participate if they intend to survive the 1990 s.

Even current application development is primarily implemented in mainframe environments. This will require the technology vendor to be prepared to address the mainframe customer and traditional IS organizations, e.g. conservative, centralized departments. INPUT believes

that this will change as client server environments make more inroads within the transportation sector.

Finally, vendors should look to the extended transportation service businesses. Container owners and servicers, private carriers and equipment owners will be interested in the locating capabilities of AEI. They may also be responsible for the equipment mounted AEI tags themselves.



Electronic Commerce Overview

Electronic commerce in transportation requires some initial definition before proceeding.

Transportation and communication were one and the same a hundred years ago. Before telegraph, radio and telephone, written communications had to be passed from hand to hand and verbal communication was face to face. Today transportation and communications remain, each to the other, enablers of the other as the electronic images of paper move at light speed and packages traverse the globe overnight.

A third element—commerce—is also linked inextricably with transportation by its very definition:

> *Commerce is the exchange or buying and selling of commodities, especially on a large scale and involves transportation from place to place.*

Without commerce there would be little reason for the transportation of goods. As commerce has become global, advanced communications connect sellers and buyers, yet the goods still flow over a chain of transport elements. Sometimes the speed of commerce seems little changed. It can still take days for a posted letter to move across town and moving a car from a Detroit factory to a California customer takes a week to ten days.

Electronic commerce has and will change this picture, as two examples explore. By fax, the written word is received on the other side of the world within minutes, eliminating potential postal services' lags. Electronic commerce could facilitate the trip of an automobile moved: on a truck, three different railroads and a final truck for delivery, only to sit at the dealer for two days because, "new cars are not cleaned on the weekend". Electronic commerce could have facilitated the shipment by having:

- Provided tracking information (retrieved from AEI readers) on its location and its time of arrival at the next transfer point

- Smoothed the transfers with EDI-assisted communications
- Alerted the car dealer of its Friday arrival so cleaning could be scheduled.

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

The promised result is:

- More efficient operations for the companies
- Increased staff productivity
- Smoother commerce
- More predictable shipments, quicker movements and more satisfied customers for transportation.

A
What is Electronic Commerce?

Electronic Data Interchange (EDI), faxes, Electronic Mail (E-mail) and Electronic Funds Transfer (EFT) are names for the types of communication that can be EC.

Generic EDI is the transfer of information in very specific formats, theoretically designed for direct entry to the receiver's computer system. The majority of EDI software is translation-oriented, i.e., at one end it converts sender files to the expected EDI communication format and at the receiving end converts EDI communication format records to the format for computer entry. In some cases, this has grown to facilitate data movement among new subsidiaries and quickly address computer interface issues as applications move to different platforms and systems architectures.

The genesis of fax and E-mail communication was to provide instantaneous word communication, generally within a company. The real difference between the two has been in the transmission technology employed—fax was analog and E-mail data. Although transmission technologies have merged, faxes transform scanned input to data to provide better resolution and E-mail transforms data to an analog stream to talk to a fax—it has only recently become a form of EDI. Once the information is translated from computer data to a fixed form of data or the reverse—digital fixed format fax data capable of direct entry to a

computer—it can be classed as a form of EDI. It becomes EC when it crosses company boundaries.

Simplistically, EFT is really just a form of EDI with a transaction set structured by the financial services community. Although EFT is EC because of the involvement of more than one company, the accounts involved may all be owned by a single company. The qualifier is that the company and financial institution have replaced paper transfer with electronic. In fact more money is transferred electronically than in other forms, like cash and checks with most of the transfers among financial industry entities.

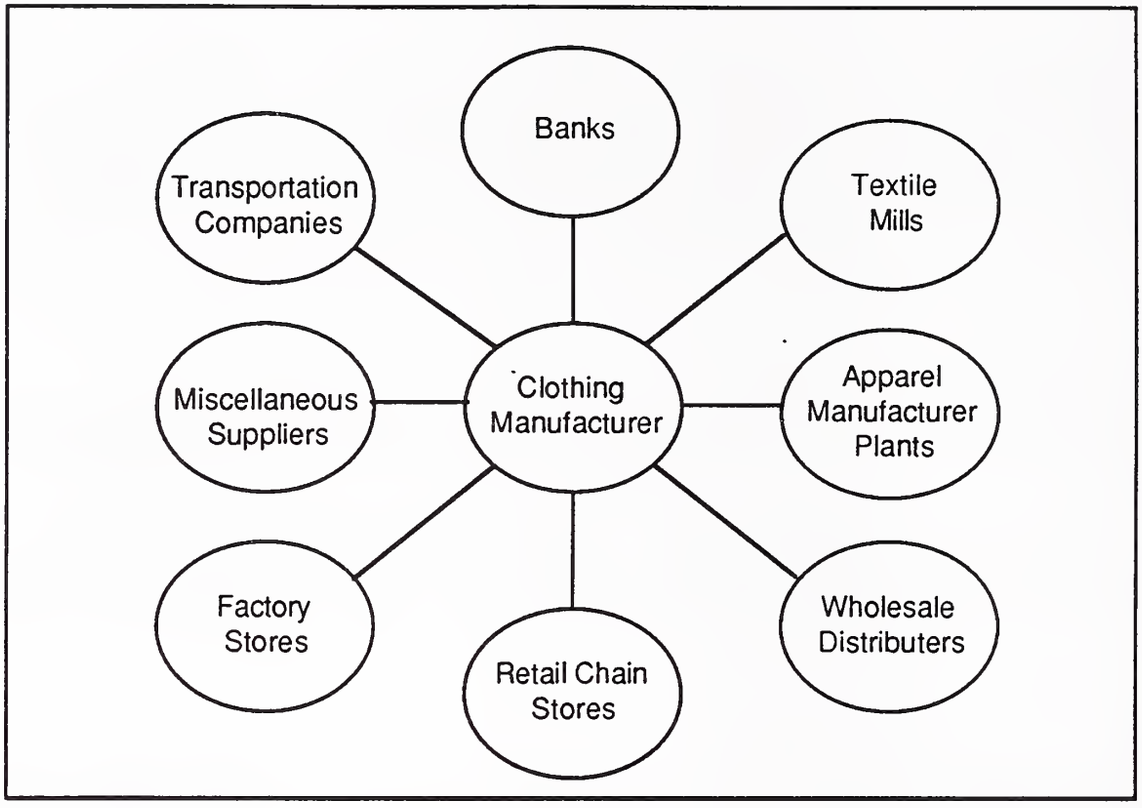
Although the intention of EC is for the direct movement of data from one company's computer system to anothers, this uninterrupted flow is not the norm. More frequently the data is manually reviewed prior to entry. Additionally, most commercial networks find their mailbox services popular—where receivers empty their mailboxes periodically rather than get direct transmissions.

B
Trading Community

To analyze the market for electronic commerce systems, understanding the notion of "trading community" is necessary. A trading community is the collection of companies 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 III-1 diagrams a trading community.

EXHIBIT III-1

Generic Trading Community



A trading community is different than a vertical industry, such as discrete manufacturing or wholesale distribution. A vertical industry grouping combines entities within a particular industry sector that have little need for intrasector commerce. Such a grouping is irrelevant when examining systems that support trade relationships among companies. A trading community, therefore, is more of a "value chain" than a vertical industry.

The concept of "trading community" is useful in limiting the logical domain of players who trade with each other and who, therefore, are candidates for interconnection via an electronic commerce infrastructure. A trading community is comprised of companies that, in the course of business, need to communicate with each other. Most transportation sector firms have the need for participation in multiple communities—they are part of the physical connective linkage within other industry communities and have their own needs for electronic community with other transportation firms.

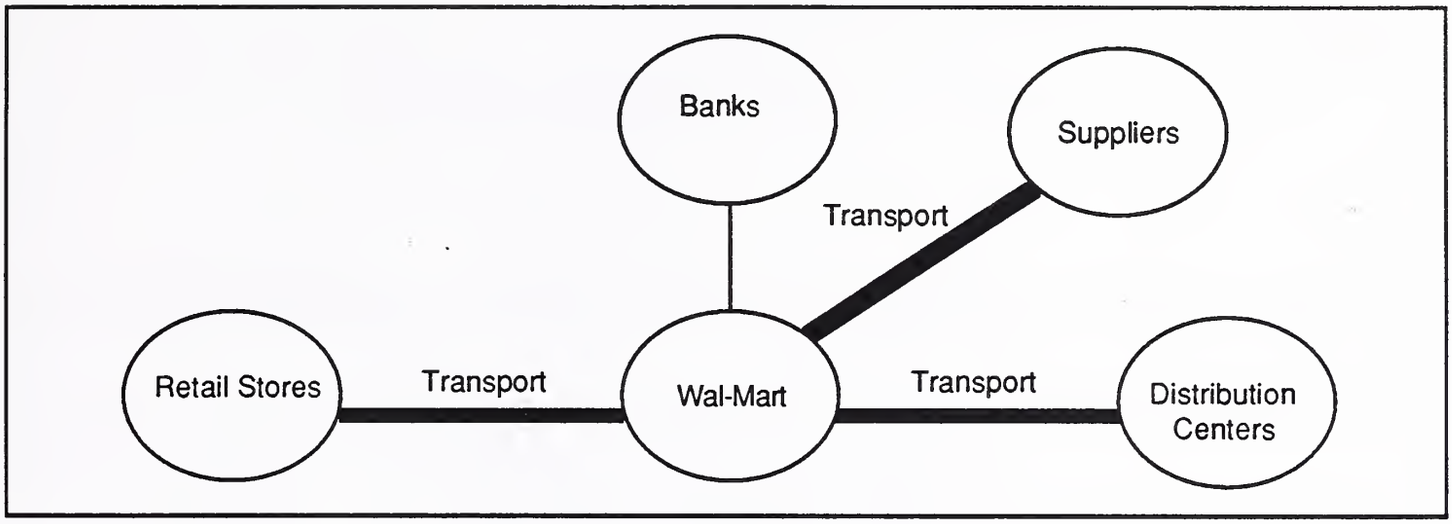
1. Transportation's Role in Another Sector Trading Community

Wal-Mart is one of the most electrified of organizations and is often described as the pattern for others to follow, as Exhibit III-2 shows. Wal-Mart is a classic hub and spoke for the EDI community, electronically connected to suppliers, transportation companies and its own facilities

(distribution centers and stores). Its community comprises more than 1,500—all electronically connected.

Exhibit III-2

Wal-Mart, Typical Advanced EC Trading Community



Transportation suppliers are really the physical connective links with and among the Wal-Mart spoke entities. Their existence as suppliers is different in some respects, although their role is substantial. To the transport firms: they must be a service entity to the spokes and the hub, and frequently between other transport firms. Hence, they must be capable of communication with various partners: the original shipper; their transport customer; possibly another transport company who sees them as a customer and Wal-Mart, the eventual customer. Transport is in the unenviable position of having to follow the dictates of multiple EC situations, even with a single shipment. To maintain its business it must frequently submit to the EC demands of others.

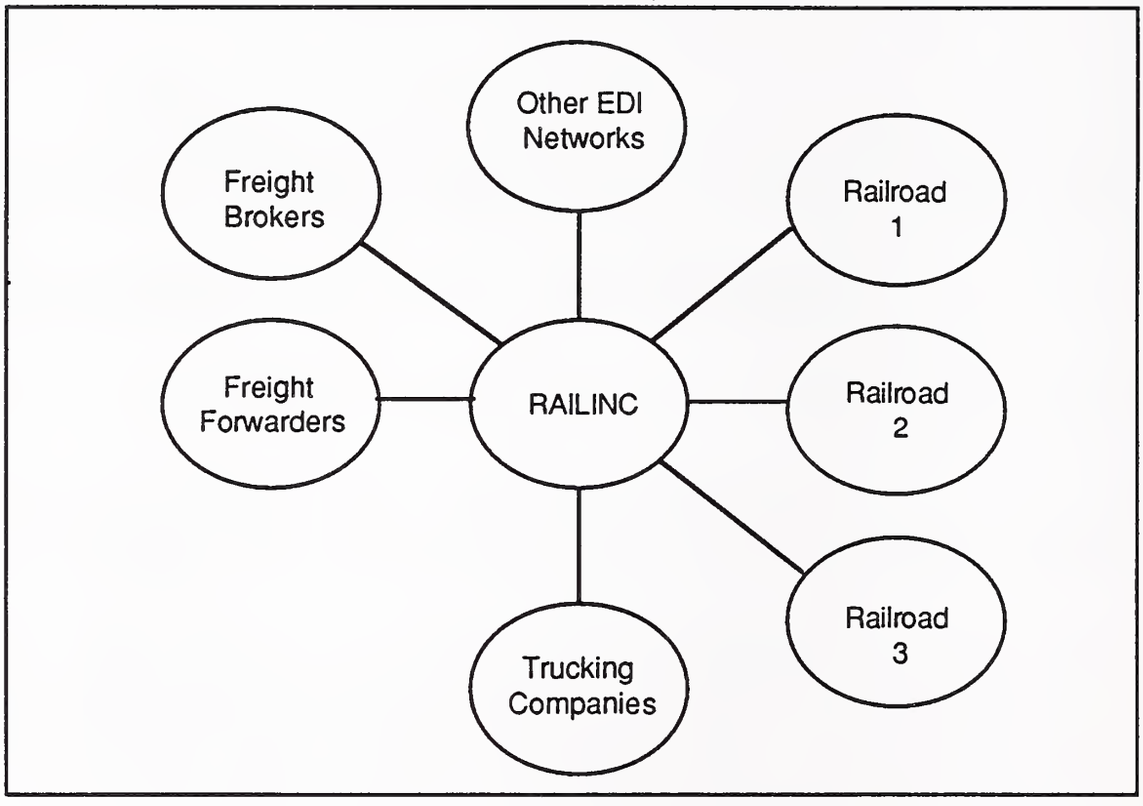
2. Intratransportation Trading Community

Transportation firms have been active in EC since prior to the concept's naming. In part, this was driven by their need to communicate among themselves regarding the shift of shipment and equipment from one company to another. The railroads present the best example, even in its early days as railcars full of goods moved from one railine to another. Its original impetus was to assure the return of its empty cars. Getting them returned was such a large problem, that daily charges for idle cars (demurrage) were instituted as a penalty. Hence, both sides had an early interest in railcar tracking and communication for demurrage charges and other fees among the interline players. In fact, the earliest railroads had telegraph lines for communication laid along their right-of-way. This led to the early EDI-like communications and the American Association of Railroads (AAR) formation of RAILINC in 1982 to create

systems and manage a communications network facilitating railroad communications. From its beginnings this was primarily a network servicing railroads in first the U.S. and then North America. This (Exhibit III-3) is the model of the early mode-based networks, in this case built on a community association base.

Exhibit III-3

RAILINC Network Diagram



Although this looks like the picture that might be done of a hub and spoke trading partner community, it is different. The primary customer and supplier of transportation is transportation (a Chapter V topic) and intertransportation company EDI is a business transaction facilitator. These connections have been done primarily to facilitate intramode exchange. The recent past has seen changes caused by intermodal—shipments that travel on more than one mode—truck and rail is the most common. Hence, intermode communication has advanced greatly to support the flow of data and charges. The Ocean Carriers Electronic Access Network (OCEAN) system developed by and for U.S. water carriers is the newest association and mode-based trading community system.

C
Electronic Commerce Components

Electronic commerce implies the building of an infrastructure of interorganizational systems through which companies can transact business. The electronic commerce infrastructure for an industry includes software, network services, information services, processing services and professional services that support interorganizational commercial transactions. Although equipment is part of the implementation of EC, the costs of hardware are not included as part of the electronic commerce market in this study.

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 (i.e., EDI network store-and-forward services, tariff database 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 the use in industry

EC technologies and services are anything that supports the communications involved in a business transaction. This includes sending requests and reports such as: purchase orders, invoices, supporting data between companies as well as information to assist the sale such as: product information, prices and credit data along with tracking information regarding the delivery progress.

Exhibit III-4

EC Components

Component	Expenditures, 1993 (Millions)	Growth,1992-1993 (Percent)
Network Application Services	926	14%
Electronic Information Services	822	16%
Software Products	362	28%
Professional Services	50	25%
TOTAL	2,160	17%

Exhibit III-4 does not include credit services ($1.4 billion) because it is not significant to this discussion. Network Applications Services (NAS) is the largest segment of the of the electronic commerce support market. Although its 1992 growth was the slowest of the four service types, INPUT expects this to accelerate through the end of the decade. In part this is predicted by the higher growth rates of the other service segments, i.e., sales of software and professional services occur before increased network activity.

1. Network Applications Services

NAS includes the fees charged by commercial Value-Added Networks (VANs) for the transmission of EC data (e.g., EDI, E-mail, fax, etc.). Not all EC travels on commercial VAN networks, hence, the actual total is much greater. Exhibit III-5 shows the top five EC VAN vendors in the U.S. and their 1993 revenues.

Exhibit III-5

EDI Network Services Market

Vendor	1993 Revenues (Millions)	Y-T-Y Growth (Percent)
GEIS	72	38
Sterling	41	38
Advantis	37	16
RAILINC	15	15
Kleinschmidt	13	8

General Electric Information Services (GEIS) is the largest (and most rapidly growing) NAS supplier in revenue terms. Although GEIS was originally formed to support GE's own needs, it has become a commercial entity with only 3% of the 38% growth from internal sources. The last two on the top five list are of interest in this report, since RAILINC and Kleinschmidt are primarily transportation industry-based VAN and information suppliers.

2. Electronic Information Services (EIS)

The primary use of EIS is for credit information, but INPUT views this EIS application with minimal growth potential in transportation. Three companies have risen to the top in credit data and have achieved a mature market. The two other areas—marketing and sales, and product and price information—are seen as the growth areas in EIS. Of these two, only product and price is significant in transportation. The most substantive are; tariff databases (for all transport modes), equipment parts (aircraft, trucks and railroad equipment), pipeline data and equipment location (soon to be enhanced by AEI).

3. Software Products

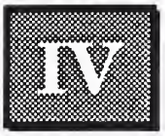
Software for the EC market is grouped by type: EDI, EFT, E-mail and others that include specialized access software for databases. The E-mail market is the fastest growing (33% in 1993), though only some E-mail packages are used for EC-type communications— Commerce Connection from Sterling and Business Talk by GEIS. EDI is also rapidly growing (28% in 1993) and is usually an EC enabler. The slowest growth is in EFT (8%) for software to support financial transactions with banks.

The EDI software market is also split by platform type with the sales of PC based the highest ($70 million in 1993), with Supply Tech, EDI Inc. and TSI International as its leaders. Mainframe is second ($40 million 1993 sales) led by Sterling, DEC and IBM. Mid-range products captured $21 million in 1993 sales, with Premenos (the IBM supplier) and Sterling the largest. Though the smallest, UNIX, is the fastest growing (70%), led by American Business Computer (allied with NCR and GEIS) and Premenos.

4. Professional Services

EC-related professional services is the smallest current service category at $50 million in 1993. The primary suppliers, beyond the major Big 6 and professional services companies, are the major EC players (i.e., VANs and software suppliers). The key in the EC professional services market involves knowing the client's business and the expectations of EC partners.

Transportation, whose firms are often forced to comply with its major customer's wishes, frequently ends up with solutions from the major hub-spoke vendors—Sterling and TSI. This tends to prove the strategy of these vendors, supported by their software and professional services revenues.



Transportation Business Overview

In order to provide technology services to the transportation industry, a vendor should have a basic understanding of the business and fabric of its technology use. This chapter provides information regarding the transportation sector, the business in general and the differences between the modes. The discussion also includes how the industry is changing and becoming more integrated across modes.

A
The Business of Transportation

A cornerstone of the Industrial Revolution was the "separation" of work into basic elements that fostered mass production. This breaking down into parts helped create separate industries and services, like the transportation industry. As different modes of moving goods and people were developed, separate industries were created to work and manage the differences presented by the transport method.

Actually, there is no transportation industry, nor has there ever been. Instead it should be viewed, as it is by its insiders and the federal government through history, as a group of competing industries based on its means of transportation—air, rail, truck and water transport. Each was created by the birth of a transport technology and struggled to survive and grow against the competition of the day. The first railroad, the Baltimore and Ohio, was built to connect Baltimore, Maryland and the Atlantic Ocean with the Ohio River and shared the same general route as the Chesapeake and Ohio Canal. Both were quicker and easier modes of travel than their predecessor—animal powered wagons. Since that time, the C & O Canal has become a bike path and the B & O routes were consumed by the mega-carrier, CSX Transportation. In the same era animal-powered wagons evolved into multitrailer trucks that shared crowded roads with private automobiles while airplanes crisscrossed the skies.

1. History

The following table is derived from U.S. Department of Commerce figures and numerically portrays the change of domestic intercity freight between 1980 and 1990 and the relative proportion for each transport mode:

Exhibit IV-1

Freight Transportation , 10-Year Comparison

	Ton Miles in Billions		Change Market Share %		
	1980	1990	Percent ?	1980	1990
Railroads	932	1,071	14.9%	37.5%	37.5%
Trucking	555	735	32.4%	22.3%	25.8%
Oil pipelines	588	577	-1.9%	23.8%	20.2%
Waterborne	407	462	13.5%	16.2%	16.2%
Domestic air	5	11	83.3%	0.2%	0.4%
Total	2,487	2,856	14.8%		

Source: U.S. Department of Commerce

The table shows a 10-year upward trend in total cargo volume of nearly 15% for all sectors. The exception to increased volume was the oil pipeline mode, which had a modest drop. Although often related, gas pipelines are in the energy sector and excluded from this report. The term "ton-miles" relates to the movement of a ton of goods one mile, by this measure railroads are the largest. Rails exceeded industry growth slightly and water was slightly below. The biggest gainers were trucking, also successful in increasing market share and air cargo with astounding growth, mainly based on the 1980s fast growing small package business—primarily Federal Express that is included with air cargo.

Like much of transportation, in freight you can find a decidedly different picture by using other numbers. Exhibit IV-2 shows the split of domestic freight in 1992 and the revenues for transportation submarkets.

Exhibit IV-2

Transportation Submarket Freight Share Comparison

	Ton-Miles	Intercity Tons	Revenues (B)	Revenues (Percent)
Rail	37.4%	25.0%	$ 30.	8.3%
Truck	27.6%	43.1%	$293.	80.1%
Oil Pipeline	19.3%	16.3%	$ 20.	5.5%
Water	14.3%	15.4%	$ 9.*	2.5%
Air	0.4%	0.1%	$ 10.*	0.8%

* Include international revenues

ENO Transportation in America, 1993

On the basis of "inter-city tons"—the actual tons moved without consideration for distance and revenues—freight transportation is different. Rails haul the most long-distance freight. Trucks move the most freight, but for shorter distances than trains, and take in the most revenue. Pipelines make more than twice as much as water for similar amounts of tonnage. The real revenue per ton winner is air, making more than water, although it carries relatively minuscule tonnage.

2. Transportation Community

When the transportation sector is viewed as a singular entity in terms of customers (revenue source) and suppliers (expense category), the picture is of an industry that is its own biggest customer. Exhibit IV-3 shows the percentage of trade with the top five in each group.

Exhibit IV-3

Top Transportation Sector Partners

Customers		Suppliers	
Type	Percent	Type	Percent
Transportation	30%	Transportation	35%
Wholesale/Retail	13%	Petroleum	19%
Construction	8%	Business Services	12%
Petroleum	8%	Wholesale/Retail	6%
Food Industry	6%	Auto Repair and Service	5%
Top Five Total	65%		76%

As is obvious from Exhibit IV-3, transportation is its own biggest customer, with 65% of inbound and outbound cash flow within the sector. This factor is created by the shipment hand-offs and includes the increasing role of intermodal as a transportation norm. Within the transportation type are the many service organizations, including: freight forwarders, warehouse and customs brokers. This is the primary factor in the long-standing EDI connections within the transportation sector.

Petroleum is second, appearing on both lists with a gross cash flow of 27%. In this case, the balance is negative for most transport modes, whose fuel usage far outweighs its fuel transport business. The mode usage characteristics are significantly different for fuel as a portion of expenses; trucking averages close to 15% of costs, about 14% for air and 7% for rails. Interestingly, the transport mode that moves the most petroleum—pipelines—is the one that does not require fuel. For most transport modes fuel payment is a growing EDI/EFT connection.

Wholesale/Retail is the third type that appears within the top five of both lists. Combined they are the second largest customer and the fourth largest supplier-type for transportation companies. The cash flow involved with this type constitutes 19% of the total.

B
Transportation Subsectors

Combined, transportation is a service industry involved in the movement of goods, i.e., raw materials, parts and finished products. The keys for selection among the various modes are; price, service and timeliness. Although there are similarities between the modes, there are also distinct differences in the business and players within each transport mode.

1. Railroads

There are currently 12 major railroads in the U.S. and about 500 smaller rail carriers. The major, or Class I railroads (revenues in excess of $250 million), account for approximately 90% of the freight volume. The smaller railroads are local, regional, switching or terminal lines. They serve to connect the major lines, offer service to areas the majors have abandoned and facilitate movements. When the railroad vision expands to cover the North American continent, it will include Canada with two major railroads (the Canadian Pacific and the government-owned CN North America) and FNM, the government-owned rail system that serves

Exhibit IV-4 shows some of the railroad mode's general characteristics.

Exhibit IV-4

Railroad Overview

Biggest U.S. Companies *	M - Union Pacific
	M - CSX
	Norfolk Southern
	Burlington Northern
	Conrail
Revenues	Top Five = 67%
Biggest Shipments	Coal - 40% volume, 23% revenues
	Farm - 11% volume, 8% revenues
	Chemicals - 9% volume, 14% revenues
	Intermodal - <1% volume, 19% revenues

* Canadian Pacific would be within the top five M Mega-carrier

Standard & Poor's Industry Surveys

Most rail EDI was initiated with other railroads to support the need to pass railcars from line to line to complete a movement. It has grown to respond to shipper information needs and support the increased company transfers involved in intermodal. Future increases in cross-border traffic will see increases in the need for railroad customs transactions.

Railroads have also taken the lead in Automatic Equipment Identification (AEI)—the placing of unique identification tags on equipment and track-side readers. The American Association of Railroads (AAR) has mandated that by 1995, all equipment that crosses interline must have AEI tags. The total number of units this involves is in excess of 1.5 million and the rail carriers are on track to meet the deadline.

2. Trucking

Trucking is much more fragmented than railroads, with more than 50,000 separate carriers. The truck mode has three basic carrier types: truck-load (TL), that move full trucks for shippers; less-than-truckload (LTL), usually bigger than packages, but shipments that must be shifted

from truck to truck to maintain efficiency and use; and private carriers, that are owned and operated by shippers. Some splits of this traffic are calculated to isolate certain significant elements; local delivery—primarily private carriers, and package—part of LTL, but does not include the air carrier Federal Express (which would have been about 2.5% by itself). Exhibit IV-5 shows the relative revenues for truck carrier types in 1992.

Exhibit IV-5

Truck Carrier Relative Revenues-1992

Carrier Type	Revenue (Percent)
Local delivery	41%
Private carriers	30%
For hire - ICC carriers	29%
Truck load (TL)	16%
Less-than-truck-load (LTL)	13%
Package	5%

U.S. Department of Commerce

Private carrier revenues are inferred rather than actual since they are part of their served companies, but their volumes exceed those of the for hire carriers. Industry experts believe that private cartage will diminish as evidenced by the growth in contract carrier's Ryder System ($5.3 billion) and Penske Truck Leasing ($902 million).

Although the lines between the carrier types continue to blur, an overview of the three primary trucking submarkets is of interest. Exhibit IV-6 is a trucking overview.

Exhibit IV-6

Trucking Overview

Biggest U.S. Companies		
TL	**LTL**	**Package**
JB Hunt	M - Consolidated Freightways	UPS
Schneider National	Yellow	
Warner Express	Roadway	
Revenue Shares		
JB Hunt 2%-3%	CF 11%	UPS 85%
Top 100 - 15%	Top 10 - 48%	
*Number of Companies **		
50,000	2,000	6
96% < $1 million	42% > $5 million	Almost all
Issues		
Driver retention	Terminal costs	Air competition
Differentiation	Differentiation	10 million packages a day

*Standard & Poor's Industry Surveys M=Mega Carrier, *=INPUT estimate*

The structure of U.S. trucking is the most fragmented of the transportation modes, with more than 50,000 companies. Although the majority (more than 90%) of these firms have revenues of less than $1 million annually, there are some very substantial carriers, particularly within the submarkets.

The truck load submarket has the most companies, primarily small and functioning to deliver full truck loads door-to-door. It is also led by two of the largest trucking firms in "trucking revenue" terms—JB Hunt and Schneider National. Although their combined share is little more than 5%, they are each three times as big as any other TL carrier. They are also leading the rush to intermodal to counter their primary issue, long-haul driver retention, with extensive sets of agreements with railroads and a shift from trailers to containers. The desire of shippers to have a single primary carrier, superior management and technology should cause the big to get bigger and the bottom to disappear in TL.

The LTL business is very different than the truck load business. LTL carriers use load transfer terminals to shift shipments for more efficient

movement. For national LTL carriers, 500 terminals are required with lower numbers to provide regional coverage. The big three—CF, Yellow and Roadway—dominate in the national and regional markets having acquired regional firms to extend their customer base. These carriers are also highly automated, require strong management and finances and seek primary carrier status with shippers.

UPS means package. Its volumes and revenues constitute more than 80% of the entire package business. combined with arch rival Federal Express, the two have defined the business with the technology and efficient operations that one- and two-day delivery requires. UPS' recently expanded package weights cut into the business formerly considered LTL.

Actually, trucking companies have not had the need to conduct EDI with other companies in their submarket. Their strength and business has been defined by their ability to provide door-to-door service within company boundaries. Their problem is the lack of communication within the company with shippers and the other mode carriers. Trucks form the first and last shipment legs for most other transport mode carriers, hence, their connections to the other modes.

3. Oil pipelines

Oil pipelines (gas pipelines are included in Energy) are a major factor in the movement of goods, though they deal in just one commodity. In 1992 they were responsible for 55% of all petroleum ton-miles (Water-41%, Truck-3%, Rail-1%). Most pipelines are owned by oil companies, or their subsidiaries, and are very profitable because of the few employees required for operation.

Intramode transfer of product through pipelines is not only common, it is continuous among the 200 leading companies. The petroleum industry of Canada and the U.S. is highly integrated from jointly-owned drilling and oil fields to the "swapping" of product headed to retail locations. Association-supported Electronic Commerce—among the petroleum companies to manage the transfer of products through pipelines and maintain intercompany accounts—has been a facilitator of these movements. Industry experts attribute a savings to the oil industry of more than $500 million annually based on their EC use.

4. Water Carriers

Waterborne commerce in the U.S. primarily falls into two categories—deep sea and inland cargo on the Great Lakes and rivers. The biggest fleet is barges and towboats on the Mississippi River system. This group primarily hauls bulk cargos in competition with railroads. NAFTA has

already caused increased intermodal activity for barge lines as they form one of the railroad links into Mexico, i.e., Burlington Northern who has no direct rail link to Mexico.

U.S. deep sea ocean carriers continue to struggle with their problems of regulation. The big two of U.S. ocean trade are American President Lines (APL) and CSX's Sealand subsidiary. They have challenged U.S. policy makers to alter the regulations that force them to buy U.S. built ships, staff them with U.S. crews as well as other regulations that make their costs and prices not competitive. Their threat is to "re-flag" some or all of their ships.

The biggest EC technology event culminating in 1994 was in the water submarket, i.e., the establishment of standards for EDI among the ocean carriers. The major 1994 systems story in the water submarket is Ocean Carriers Electronic Access Network (OCEAN). The system is the culmination of an effort that required the U.S. Maritime Commission to allow the ocean carriers to act together through the Information Systems Agreement (ISA). The ISA members—American President Lines, A.P. Moller-Maersk Line, P&O Containers, Sea-Land (part of CSX), Crowley American Transport, Hapag-Lloyd and Orient Overseas Container Line—established or joined the group to unify and standardize EDI and other transmissions for their submarket. The result is a PC-based EDI package created to ISA specifications by TSI International.

The creation of standards and a system to support intraocean carrier EDI is a reflection of the growing need for information transfer within the mode. This growth is caused by the increases in terminal and vessel sharing among the mode's firms. The function of the PC package is to reduce the cost for shipper and carrier EDI connection to promote ocean carrier shipping activity.

5. Air Cargo

Based on ton miles, air cargo is hardly even a factor in the overall freight picture, with only a .4% share. However, the 1993 traffic growth for air cargo was up when compared with passenger. The U.S. Air Transport Association (ATA) reported a 3.6% growth during 1992, the Association of European Airlines (AEA) reported a 6% growth, while the Airports Council International (ACI) observed that Latin America was even hotter with a 12% increase. These increases are a surprise during a poor year for economic growth.

Federal Express is the leading U.S. air cargo carrier. However, U.S. airlines also carry cargo, primarily on passenger planes, with only Northwest having "cargo only" planes. In the near future, airlines are expected to request the establishment of truck lines to carry cargo

directly to customers. This request by several international airlines will probably be introduced first on a bilateral basis with European countries. This would alter the current traffic from airports to customers by the trucking companies.

Surprisingly EDI is not a matured area for the highly automated U.S. airlines. Generally, connections that exist at airlines are to parts suppliers, petroleum companies and their own ARC (Airline Reporting Company) network to pay travel agents. Except the "freight only" carriers (like Federal Express, Airborne, Roadway and CF's former Emory Air), airlines have had little impetus to use EC with shippers.

INPUT believes this will change as airlines struggle to reduce costs. However, U.S. airlines see their cargo business as a minor factor compared with their passenger business and EDI connections are back burner.

6. Multimodal

In view of the many small companies in transportation, there are few major freight carriers that remain exclusively within their traditional mode niche. UPS is the largest U.S. transportation company and is regulated as a trucking firm, but it has a similar aircraft capacity as rival Federal Express. CSX is the largest rail-based company in revenue terms, but its subsidiary, Sealand, carried more containers by water than any other U.S. water carrier. Federal Express is the largest U.S. air cargo carrier but its more than 30,000 ground vehicles are not ICC-regulated, much to the consternation of the trucking industry.

Fostering the merging of modes is freight transport (the high growth multimodal—or the movement of a specific shipment by more than one transportation mode). Although the most common style is called intermodal involving truck and rail, "multi" includes water and air cargo. With the exception of bulk commodities like coal, petroleum and grain, the common envelope for goods is becoming the shipping container. Much is happening with these common transportation elements, such as:

- The U.S.'s two largest trucking firms —J B Hunt and Schneider National—are shifting their trailer fleets to containers.

- Double-stack railroad capability—special cars that carry containers two high which doubles train capacity without increasing length—accounted for almost 80% of all rail container movements in 1993. Until the completion of the Sarnia Tunnel between Canada and the U.S. (expected in 1994), this form of rail transit is not possible to the U.S.'s northern neighbor. The tunnel will allow CN North America (the Canadian, partially government-owned, railroad) to run these higher cars straight through to destinations in Canada.

- The growth in railroad intermodal continued to out pace almost all other growth factors in transportation with the 1992 to 1993 increase of 7.9%, and a record seven million movements. Rail industry people say that it could have been even more had they had more rolling equipment and better working load/unload yards. Most of the big rails are increasing capacity as fast as they can.

7. Mega-carriers

Several transportation sector firms have expanded their franchise beyond the traditional mode boundaries. INPUT has selected and profiled five transportation firms that have prospered by moving into this class.

a. CSX, Corporation

1993 Financial - Revenues $8.9 billion, Profits $359 million
FORTUNE Transportation List - 5 of 50
Base business: Railroad (3rd largest in revenues) - CSX Rail
Significant subsidiaries:

- Water

  ACBL (Barge - largest U.S. Barge line)

  SEA-LAND (Ocean - largest volume of containers in U.S. trade)

- Trucking

  CMX (trucking)

  Countrywide (trucking)

- Services

  TDSI (warehousing)

  CSX Technology (IS)

  CTI (JIT)

  California Temp Controlled (refrigerated specialist)

b. Union Pacific

1993 Financial—Revenues $7.6 billion, Profits $530 million (3rd highest profit on Fortune Transportation 50 List)

FORTUNE transportation list—8 of 50

Base business—Railroad (largest rail in rail revenues) - UP RAIL

Significant subsidiaries:

Air

Skyways

Rail

30% ownership in Chicago Northwestern Rail (7th largest U.S. railroad)

Trucking

Overnite Transportation (6th largest LTL trucker)

Skyways

Logistics

UP Logistics

Services

Skyways (JIT, international)

UPFS (rail broker)

UP Technology (IS)

c. RYDER System

1993 Financial—Revenues $5.3 billion, Profits $ (61) million

FORTUNE Transportation List - 11 of 50

Base Business—Ryder Truck Rental (Leasing and Fleet Management)

Significant subsidiaries:

Trucking

- Ryder Freight Systems (TL Trucking)
- Ryder Bulk Transport
- Ryder Temperature Controlled
- Auto Carrier Companies

Logistics

- Ryder Distribution Resources (logistics)

Services

- Ryder International Customs (customs broker)
- U.S. Parking & Shipping (garage and warehousing)

d. Consolidated Freightways

1993 Financial—Revenues $4.2 billion, Profits $51 million

FORTUNE Transportation List—14 of 50

Base business—LTL trucking (3rd largest in revenue) - Consolidated Freightways

Significant subsidiaries -

Air

- CF Air (formerly Emory Airfreight)

Trucking

- CONWAY CO'S (non-union regional LTL carrier)

Services

CF TL Services (truck load -TL, customs broker, intermodal)

e. American President Companies

1993 Financial—Revenues $2.6 billion, profit $80 million

FORTUNE Transportation List—21 of 50

Base business—water, ocean carrier—American President Line

Significant subsidiaries:

Trucking

APAD (automotive carrier)

APT

Railroad

API (international stack trains, terminals)

Logistics

APC (marketing, logistics)

APD (JIT)

With the exception of Ryder, all the mega-carriers were profitable beyond their mode average. Ryder's loss was related to SFAS 106, the accounting change recognizing retirement benefits.

CSX Corporation is the most involved external to its mode, with more than half its revenues generated by nonbase (i.e., rail) business. Union Pacific is aimed at extending its lead in rail size by gaining voting control over Chicago Northwestern, although industry experts say the two railroads almost function as one. CF becomes the largest LTL-based transportation company, though only third in direct LTL revenues. American President's lower level of revenues is related to its dependence on its base business as a U.S. water carrier.

C
Transportation Business Summary

Competition among transportation firms has always been fierce between the different modes of travel. The story within mode has not been very

different, particularly when routes are parallel. Cooperation has been a factor only when required and has fostered what little intramode community exists today. Much of the competition has been price-oriented, particularly since deregulation freed rates from fixed schedules. Shippers got bargains, but service issues persisted as the long-term price competition cut transport staffing and fostered a contraction in the number of firms. Now, with parallelism diminished and carrier hand-offs more common there is a growing mood to community; first within mode and second among modes with the trend to provide enhanced service.

INPUT foresees a continued blending of "surface" freight, i.e., rail, truck and water primarily driven by the close relationship and information exchange inherent in the fast growing intermodal traffic. The terms "seamless" and "end-to-end" will increasingly be expected by shippers and customers, with the mode of transport transparent. The question to be answered is—who will step forward to become the true "transportation company"? CSX and some other mega-multimodal carriers are there today.

The Information Age is replacing the specialization of the preceding era with integration and unification across former companies and the industry's traditional mode barriers. Technology, information and communications will be the foundation for global business. Transportation will be the delivery mechanism and will have to build or conform to the information bridges among the parties.

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Transportation Technology and Electronic Commerce

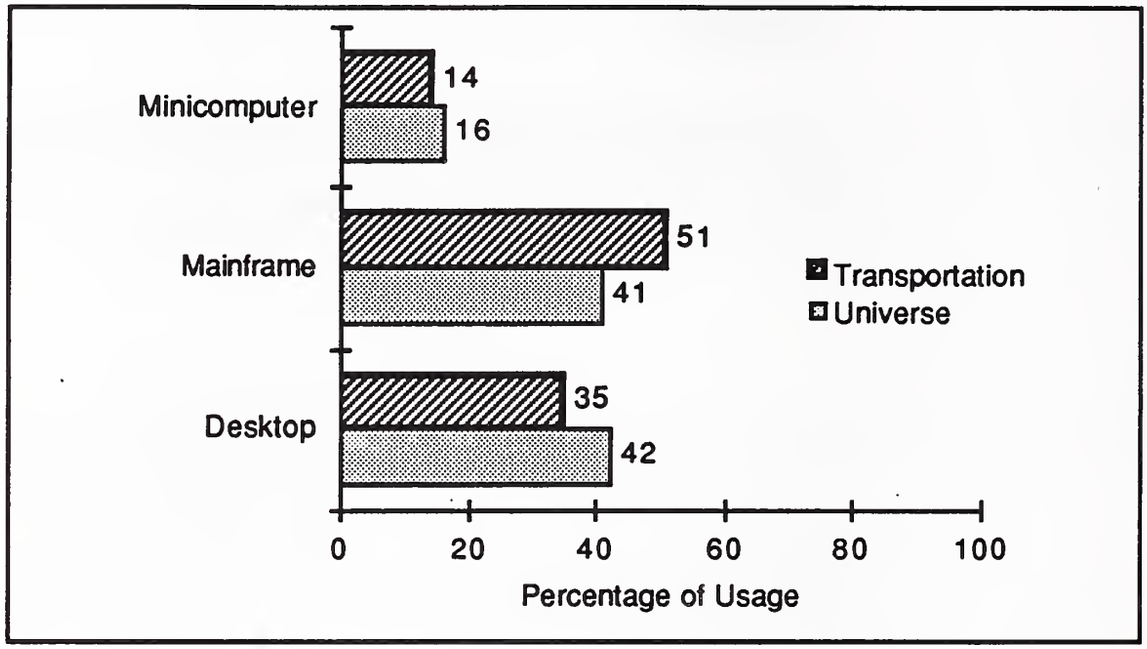
Electronic Commerce must be fitted within the technology fabric of an industry. A review of where the transportation industry places its emphasis is important. What platform type is favored, how likely are these firms to use external services? Are there indications of its EC development and future direction?

A
General Transportation Technology.

INPUT has created and maintains a database containing application system projects collected by INPUT through questionnaire responses and interviews with project managers at various businesses and government agencies within the U.S. The data is current, having been collected during 1993 and early 1994 as part of INPUT's continuing process of data gathering to support its delivery of up-to-date market information. The full base contains information on more than 2,500 application systems divided by standard industry sector classification (SIC codes). Relevant to this research is the material extracted pertaining to transportation sector firms, as compared with the entire database.

Exhibit V-1

INPUT Sample—Application Platform Usage



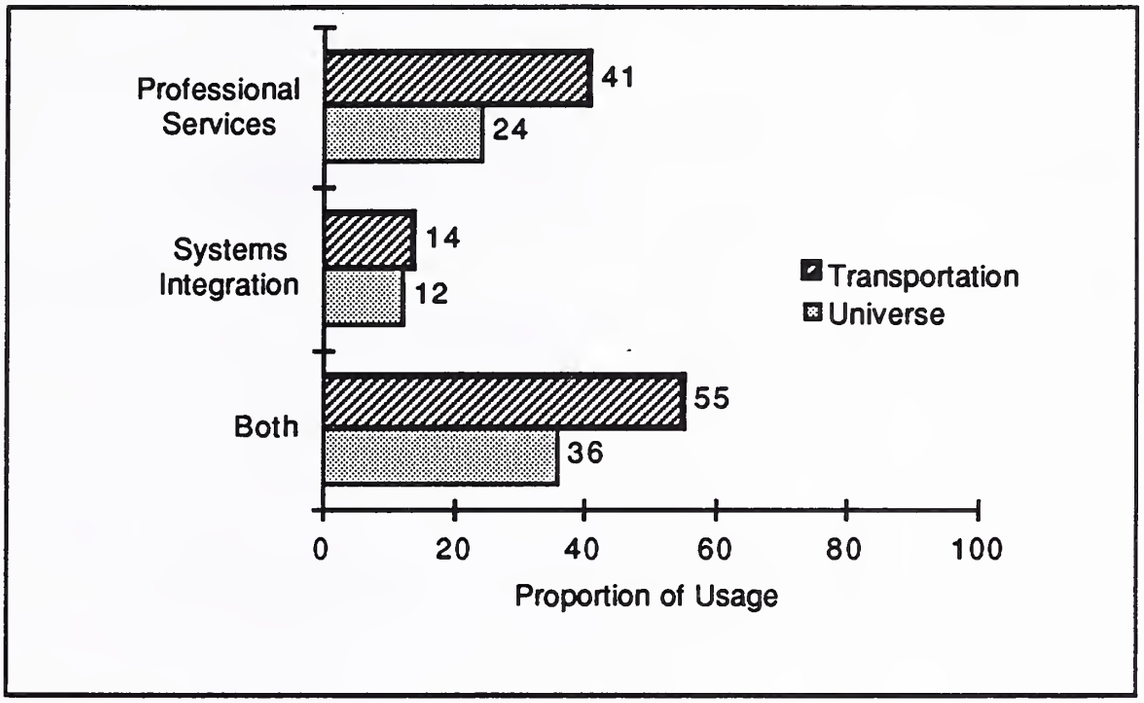
Analysis of this data shows transportation sector application projects tend to be significantly more mainframe-based than the average for all industry sectors in INPUT's sample. INPUT believes the major reason for this relates to the substantial numbers of large firms within transportation that have been involved with computers for decades. These would include airlines and major railroads that have major computer users since the 1960s. This, combined with established information services organizations supports the favoring of mainframe solutions.

To provide a picture of the use of two particular service markets within the transportation sector, INPUT applications sample analysis was done of professional services (PS) and systems integration (SI). Combined, these are two of the primary support functions related to application development.

Exhibit V-2 graphs the use of these services, comparing the usage by the full sector database and transportation sector applications.

Exhibit V-2

INPUT Sample—External Services Usage Proportion

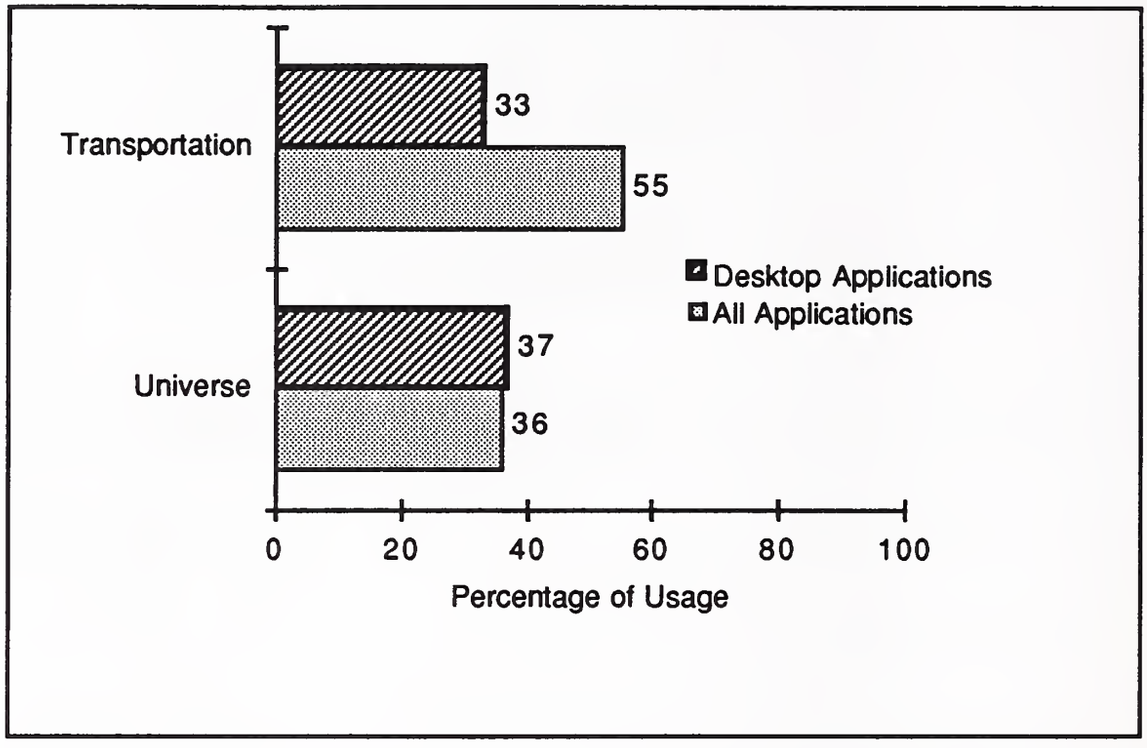


Transportation sector firms tend to use external service support for their application projects much more frequently than the average of all sectors. INPUT's application projects sample shows that more than half (55%) of all transportation sector projects involve either professional services or SI contractors. This implies that firms within transportation know they are in need of external expert advice and assistance with application systems. This should place this sector's firms among the targets for the vendors of these services.

Finally, analysis was done for the use of external services for desktop systems. Desktop systems are those where the application is implemented on a client/server or workstation processor. This definition would not eliminate the existence of mainframe within the network, but these solutions require that the processing be done within the desktop environment. Exhibit V-3 shows the results of this analysis of the universe of all sectors and those of the transportation sector.

Exhibit V-3

INPUT Sample—Use of External Services in Desktop Systems



INPUT analyzed the impact of desktop systems on the normal sector patterns in its use of external services. On average the total base of projects showed little difference in the use of these services for desktop applications (36% overall, 37% for desktop solutions). However, when viewed by industry sector some surprising differences were obvious. No industry sector displayed the average. Some sectors became much heavier users, while others showed a tendency to use less external services with desktop systems. The transportation sector was one of the latter. Its use dropped from 55% to 33%. Certainly this sector's lower than normal use of desktop solutions for application projects (Exhibit V-1) is matched by this result. However, the primary reason is the high level of PC-based turnkey packages created to solve generic transportation issues. An example is the need for all players to become involved in EDI to effect seamless transfers and the availability of inexpensive PC software to meet this need.

Although the variation between companies may be a better predictor of opportunity than total sector analysis, the tendencies shown for a sector can be valuable to vendors. INPUT's current analysis of the transportation sector shows that: mainframe solutions are clearly dominant; firms in this sector tend to be high users of professional services; and its use of desktop systems tends to be for pre-packaged solutions rather than as the platform for application implementation.

B
Electronic Data Interchange

The most common application found in INPUT's sample of 1993 projects hardly fits as a new innovation. Rather it is an indication of a major effort by transportation to implement a routine concept—EDI.

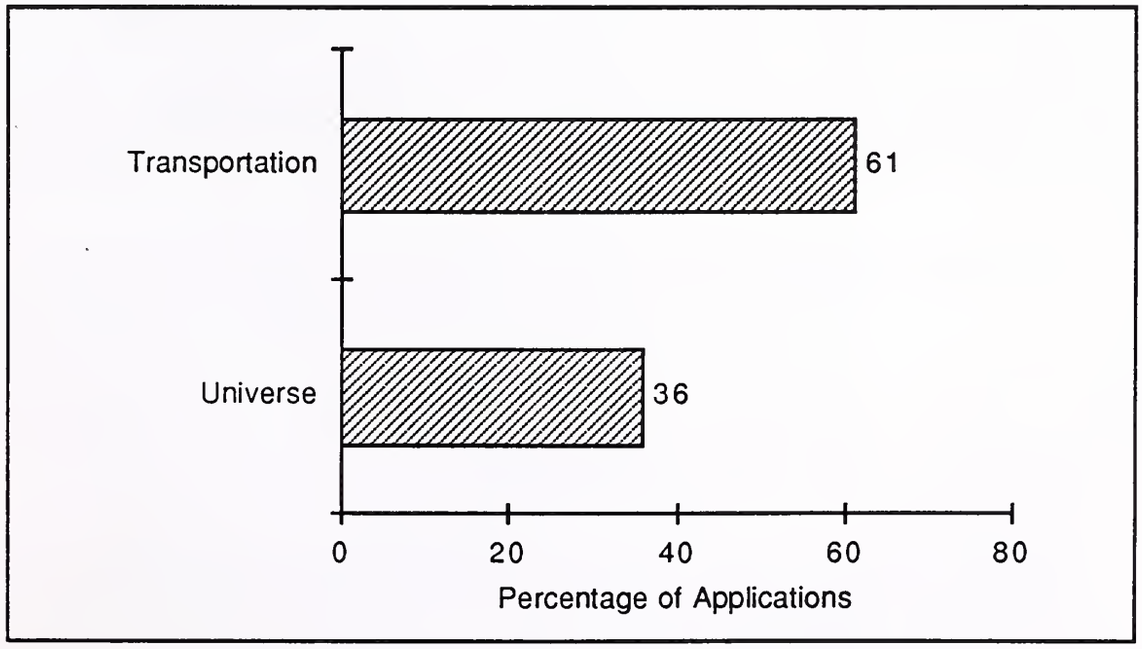
The glue that allows transportation to function and has promoted gains in efficiency is EDI. Projects at all but the smallest sector companies are in the process of adopting or expanding capabilities. For the most part this is to keep rather than attract business.

Transportation firms that could have extended their once-held lead in the implementation of EDI, are now using EDI at the insistence of firms in the other industry sectors they serve. This is not to say that some transportation firms are not heavily involved with EDI processing. Rather that the transportation sector's expenditures for EC constitute only 18% of the total expended by all industry sectors.

Exhibit V-4 shows INPUT's sample of those projects having at least one EDI component. Shown is the percentage of projects for all sectors and those within the transportation sector.

Exhibit V-4

INPUT Sample—Applications That Include EDI Component



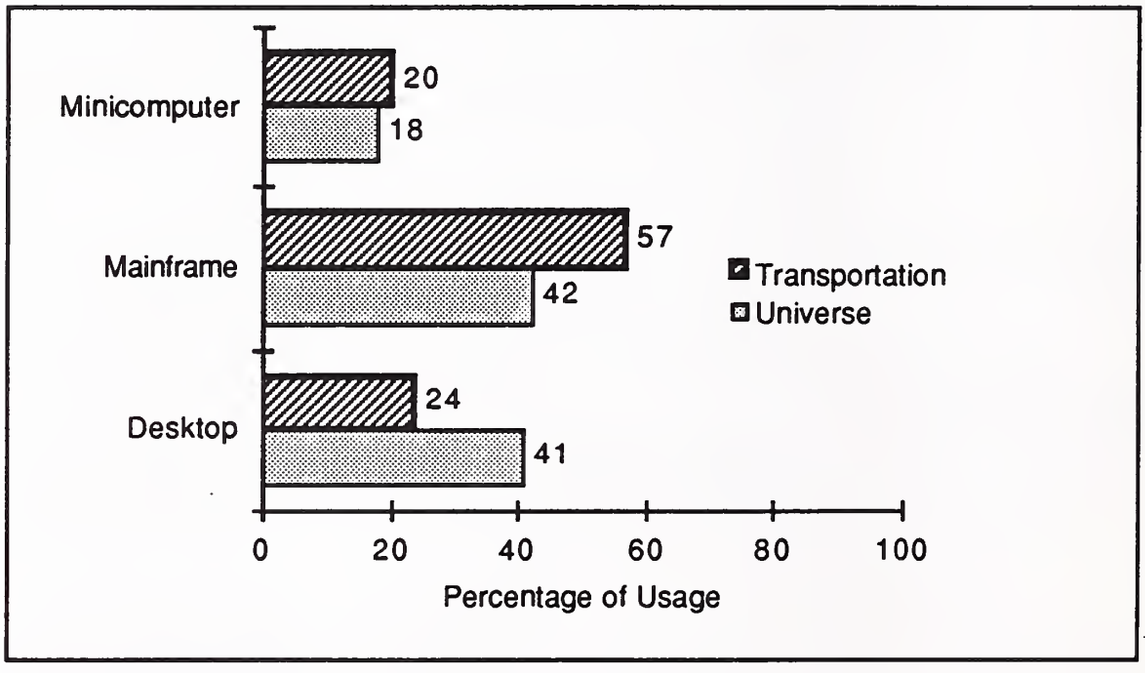
In INPUT's sample, transportation showed the highest percentage of any other industry sector with regard to EDI (61%). This is particularly

significant when compared with the 36% average found for the entire sample of projects. Whether the sector's impetus is derived from its customer's pressure or its own desires matters not. Transportation is moving rapidly on EDI.

An analysis of the platform being used for EDI application implementation was performed. Exhibit V-1 shows transportation applications exhibited a much higher use of mainframe platforms than the percentages shown by other sectors. Exhibit V-5 compares the implementation platform percentages for the entire INPUT sample to those indicated as within the transportation sector.

Exhibit V-5

INPUT Sample - EDI Application Platform Usage



The data shows that more than half of the transportation sector's EDI application projects were on mainframes. This exhibit is almost identical to Exhibit V-1 Application Platform Use, except that transportation's preference for mainframes is even stronger with EDI projects. This is contrasted by the high use of desktop environments for EDI exhibited by the universe percentages.

In summary, the transportation sector expenditures for EC are percentage-wise lower than other industry sectors. Secondly, EDI appears to be an IT application priority within transportation (Exhibit V-4). Finally, transportation shows a high use of mainframe EDI relative to the overall sample (exhibit 5-5). The 1993 application development levels for EDI will continue for several years until transportation EDI expenditures reach or exceed parity with those of other sectors. In

addition, transportation will alter its mainframe preference to favor client/server environments as its IS departments become comfortable with the technology. This platform shift will probably be accompanied by an increased need for external services (specifically PS and SI) at the desktop and client/server level, not the current trend.

C
Specific Sector Technology Actions

Although radically altered systems stories are not frequent and are usually seen in hindsight, the transportation industry has some interesting current systems events. An exploration of these is an informative venture that tends to reinforce the issues and how IS has reacted. For convenience they are grouped by transportation sector.

1. Railroad

Beyond the rapid installation of AEI equipment, railroads have created a software. Conrail's ACCESS system uses EDI for the railroad's customers and can provide real-time shipment status reports. The system is PC-based and connects to Conrail's mainframe for data. Atlantic Container Lines and Hershey Chocolate, USA were early users. The primary advantage according to Conrail is the quicker billing time provided by the system.

Secondly, Santa Fe's full rail operations system was sold to CN North America, the government-owned railroad in Canada, for a reported $50 million. Although the sale does not approach the cost of development by Santa Fe, it does show the strength of its new "customer-oriented" mainframe-based implementation.

Finally, RAILINC is in the process of a vendor bid review to replace at least a portion of its network and systems.

2. Water

The major 1994 systems story in the water submarket is the Ocean Carriers Electronic Access Network (OCEAN). The system requires the U.S. Maritime Commission to allow ocean carriers to act together through the Information Systems Agreement (ISA). The ISA members: American President Lines, A.P. Moller-Maersk Line, P&O Containers, Sea-Land (part of CSX), Crowley American Transport, Hapag-Lloyd and Orient Overseas Container Line established or joined the group to unify and standardize EDI and other transmissions for their submarket. The result is a PC-based EDI package created to ISA specifications by TSI International. Expectations are for the system to clear beta test by late

1994. OCEAN is a reflection of the increased need for the transfer of information among the ocean carriers. Previously it was like trucking of today, with little need for intramode transfer of cargo.

SPARCS (Synchronous Planning and Real-time Control System) is a Macintosh-based system from Navis of Oakland CA. and provides enhanced planning for the loading and unloading of ships at American President Lines and Matson Navigation. The system is being expanded to integrate logistics with truckers and customer service and eliminates much of the formerly manual operations.

3. Truck

There are interesting areas of development in trucking. Federal Express although officially an air carrier is mentioned because of the product competition with UPS.

RoadRider is the result of a four-year joint development by J.B. Hunt and IBM. The truck-cab end of the system is a ruggedized, touch-screen IBM PS/1 with the capability to use three different communications links via radio or satellite to the company's centralized headquarters. The system is designed to provide continuous location and status information for dispatchers as well as onboard capabilities. Data entered by drivers is immediately available to dispatchers rather than the old way of telephone communications. Hunt estimates that even with only one-third of the trucks, on-line truck use is up 5%, phone costs are down 60% and fleet managers can do their jobs rather than answer driver phone calls. The system is said to provide the support for the service required by JIT auto makers and consistently meet schedules for efficient intermodal operations.

The package battleground is in the customer's PC with free tracking software Federal Express's PowerShip or UPS's MaxiShip. Though "given" as a way to track packages, most customers use the built-in label printing and reporting capabilities. The future for these could be the ability to track shipments with other carriers. As for the package companies, they say they get more business after the software is installed.

4. Air Cargo

The two largest airlines in Japan, Japan Airlines (JAL) and All Nippon Airways, are preparing for substantial increases in air cargo volumes. JAL expects nearly 20 times more volume in 2000 than it handled in 1990 and is increasing mechanization and robotics use to deal with the increases. All Nippon is upgrading its cargo support systems by 1995 to enhance its freight management.

D
Transportation EC Use Patterns

INPUT researched the use of EC by the various transportation modes. The use of company networks was not included. Exhibit V-6 shows the percentage of network usage, based on revenues for commercial VAN networks from transportation sector companies.

Exhibit V-6

Percentage of Network Revenues, by Transport Mode

	Percentage of EC Network Revenues
Railroad	23.8
Trucking	16.4
Water	16.2
Pipeline	13.2
Air cargo	1.3

The maturity of EDI and, hence, higher network use is based on the particular mode's history of need. Railroads are highest, but primarily among itself. Trucking is second mainly with its connections to shippers and as part of the completion of cargo movement for other carrier modes. Water is a very close third, not because of a long standing need for intramode transfers, but, like trucking, to facilitate the completion of cargo movement. Air cargo is accurately in the lowest position, but its use is higher than the network numbers reflect. This low number is caused by its own extensive network capabilities.

E
Transportation EC By Transportation Mode

Since original electronic interchange in transportation was within transport mode, expanding the structure of the existing transportation trading communities is of interest.

1. Railroads

The original purpose of rail interchange was the tracking of railcars and equipment that moved interline. The amount of equipment involved exceeds 1.5 million units. Hence, this has always been a significant issue,

since many journeys traverse multiple lines (e.g., no U.S. railroad runs from the East Coast to the West Coast). RAILINC was formed as a subsidiary of the AAR railroad association to facilitate the transactions among the railroads that have grown in variety and type to include full EC capabilities. Also connected to RAILINC are trucking and water carriers to support intermodal movements. Finally, Kleinschmidt, Inc. is connected to RAILINC to provide access for its customers to railcar location information.

The two major network providers to railroads are RAILINC and Kleinschmidt. In addition, major railroads have always maintained communications contact with each other and at least 10% of the EC transaction traffic is passed directly among the railroad systems and with shippers (possibly other transport modes).

Two EC issues are obvious for railroads. NAFTA will increase national border crossings and need for customs communications. This will either be via communication through customs brokers or directly from the rail firms potentially through RAILINC. The second issue revolves around the implementation of Automated Equipment Identification (AEI) and the need to make this vast new information source available to interested parties, including other transport firms involved in a shipment, shippers and customers. Will this form a new set of EDI transactions; are there new security and privacy issues; and will the new real-time location knowledge present evidence of inconsistencies in invoices, demurrage charges and flawed operations?

2. Trucking

The trucking industry is more fragmented than the other transport modes, with more than 50,000 carriers. The American Trucking Association (ATA), has not taken the plunge into the creation of a network structure like railroads. Instead its role has been to educate and advise its members about EC. It also provides technical assistance, but states an aversion to favor any particular EC service provider.

Primary network services suppliers to the trucking industry, in order of size, are GEIS, Sterling and TranSettlement. These three network providers have garnered more than 80% of trucking's current commercial network EDI business. However, the market in trucking for EC has yet to be really tapped. Only about one-third of the top 2,000 trucking firms are users of EDI. Most of the traffic is handled directly by shippers dialing-in to the trucking firms not over commercial networks. In some cases, shippers are provided with PC software or fax data for information directly from their primary trucking supplier's systems, e.g., Roadway Express and Carolina Freight.

Although there seems to be little network potential among the trucking mode players, two potential opportunities come to mind supporting private carrier back-hauls to decrease the cost and the building of an LTL shared terminal support that would allow regional LTL's to connect with each other without building redundant terminal locations. A variant to this last would be the establishment of a common use terminal system as a replacement for some of the existing physical terminal networks.

3. Water

Ocean shippers have had several electronic network entities built for their use beyond their own systems. The primary entities are:

- Government systems, i.e., Automated Broker Interface (ABI) for inbound freight and ELAIN for outbound
- Port authority-sponsored EDI hubs.

Ocean carriers and brokers involved in ocean traffic have been the primary users of the systems run by the U.S. Customs Service that process electronic customs documents. Ocean carriers generally use third-party customs brokers (95% plus) to process through these systems, but the future may see changes since the port hubs have connected with the U.S. Customs' systems.

Most major ports provide hub systems for the carriers who call, with network connection dominated by GEIS and Sterling. The port systems' real purpose is to assist the water/land transfer process. The carriers are generally billed directly for their use by the network vendor and the port responsibility ends with providing the network interface. This was initially a competitive tool, but has become a common facility provided by most port authorities. Port-sponsored network arrangements also have as customers the land-based, truck and rail that move shipments after unloading.

The Big 7 of U.S. shipping (not all are U.S.-based carriers) have created their own set of standards and contracted with TSI International for the creation of OCEAN, hub (mainframe) and spoke (PC) applications software for use among themselves and for their primary trading partners. More significant than the software, was the creation of the community group Information Systems Agreement (ISA) and its establishment of EC standards. The ISA covers Atlantic shipping and a similarly intentioned group exists for Pacific shipping (PISA). Since some of the group members are the same, the PISA result will be similar to that of the ISA.

4. Pipelines

Pipelines were an outgrowth of the U.S. oil industry's need to distribute its products on a national scale. Oil pipelines remain primarily owned by oil companies and its use of EC is in concert with the ends of that industry. Pipeline automated transactions support the historically shared oil fields and fuel reserves and the common supply swapping between the companies to counteract the variable retail market.

Petrodex, run by GEIS, is the primary vehicle for the exchange of financial information to support the intramode product flows. The Petrodex fifteen transaction sets cover three different applications supporting product swaps, monitor pipeline use and traditional EDI functions (invoices, purchase orders, etc.). However, these form a minor portion of petroleum company EC to support drilling operations, equipment pricing, product pricing and EFT.

Again, the primary characteristic of this sophisticated set of intra-mode EC activities is related first to community business needs.

5. Airlines—Cargo

Airline passenger operations is discussed in the INPUT report on Electronic Commerce—Travel and Entertainment. Airline cargo operations is not a mature EDI user, particularly among its mode partners. In part, this is related to the infrequent transfer of shipments among the carriers. Its general EDI is involved in connection to its suppliers:

- Avnet for fuel KLM, British Air, United, American, connected to fuel suppliers
- Specification 2000 one of the oldest EDI networks with approximately 60 airlines and more than 70 parts suppliers as customers. Used for fuel, parts, some shippers and customs
- SITA, a Paris-based international airline trade association operates a network that permits communication among most of the world's airlines primarily with passenger information. For cargo this includes customs and manifests.

The real EDI strength in air cargo is the sophistication and control systems originated with Federal Express and emulated by all other package carriers (even the trucking-based entities).

6. Containers

The world's estimated five million containers used for cargo shipment are typically used two to three times annually. When containers are left at storage facilities for cleaning and service (a process that is expected between each use), a special EDI transaction, the Equipment Interchange Receipt (EIR) is generated and cataloged by the Container Equipment Data Exchange (CEDEX). CEDEX provides a service for shippers, lessors and transportation companies for the tracking and sourcing of empty containers. Data is made available through Redi*Net, now a part of Sterling Software.

Although the container has generally been viewed as a commodity piece of equipment, things are changing. AEI tags are, or will be, placed on many of these boxes and the real-time location potential could eventually replace the need EIR, if readers are installed at storage depots. If AEI becomes a container standard several issues will be introduced, including who will pay for the AEI tags, will their servicing be done at depots, does Sterling's acquisition set them up for establishing an AEI network?

Also, containers themselves and their uses are changing. Railroad double stack increases their positive differential in rates and will soon become common in Canada. Major truckers are shifting to containers to take advantage of the intermodal handling efficiencies possible with containers verses trailers. New container types may even modify long held assumptions, such as:

- Special containers to hold bulk products
- Intelligent containers that can control internal environments to eliminate parasites, provide product appropriate ventilation and warn of temperature problems.

Although these specific examples may not grow in numbers, the simple cataloging by size in twenty foot equivalent units (TEUs) and a few other types will not survive as containers become more specific and their self-contained capabilities increase.

The world's container pool will increase as containers become even more common as a shipping tool. Additionally, the original investment in a container and the cost for service will increase causing an increase in the owners' need for information and ability to keep units in service more of the time. AEI and EDI pairing will have to answer the data need, and in order to comply, depots will be required to become more sophisticated.

6. Summary

The relative maturity of EC among firms within a transportation mode is related to the historical need for that mode to cooperate to deliver a shipment. Railroads had this need since its beginning. The relatively recent advent of terminal and ship sharing by ocean carriers to increase efficiency has prompted its creation of intra-mode EC standards.

Pipelines are also sophisticated EC users internal to its mode. However, this is mainly in keeping with the needs of its shipping customers the oil producers who often double as pipeline owners.

Trucking exhibits the other side of working together, a limited need for intramode transfers. Trucking has historically taken shipments door-to-door, with its advantage based on the free-flowing highway network. Hence, there has been no impetus for collegiality. Although LTL trucking has routinely shifted goods between trucks through its networks of terminals, primarily these shifts are within the trucks of one company. Trucking's EC activity has been direct with shipping customers and with other transport modes.

Service entities are the potential losers with the advances in EC connection by the transportation industry mode-based firms. As mode-based companies become more technologically sophisticated, freight forwarders and brokers along with logistics companies and customs brokers will be pressured as automated channels become commonly used directly by traditional transportation sector firms. In addition, many transportation companies now offer competitive services and prices by their direct intermodal capabilities.

F
Electronic Commerce Vendors in Transportation

Electronic Commerce technology is generally viewed as a composite of the four service and product types; network services, software products, electronic information services and professional services. Although all were explored on a general basis in Chapter III, this views transportations situation.

1. Network Application Services (NAS)

The current market for commercial network services was nearly $85 million in 1993 for transportation sector firms. This calculation yields transportation with about 8% of the total NAS expenditures by all industry sectors. This does not include direct connections between sector firms, nor the direct communication with transportation firms with

shippers that bypasses commercial networks. Direct EDI traffic is significantly higher, possibly more than double, than transportation firms use of commercial VAN vendors. Exhibit V-7 lists the leading suppliers to transportation firms, with INPUT's estimate of their market share.

Exhibit V-7

Leading NAS Vendor Shares in Transportation

Vendor	Market Share (Percent)
GEIS	28
RAILINC	16
Kleinschmidt	13
Sterling	12

General Electric Information Services (GEIS), the number one Value-Added Network (VAN) in the U.S., holds the largest share of the transportation market based on its reputation and services to transport association-based networks. With the exception of railroads and air cargo, it constitutes the leader in each the other major transportation modes. RAILINC is second based on its creator, the American Association of Railroads (AAR) and intramode volumes. Kleinschmidt is a specialized transportation sector network supplier with a bridge connection to RAILINC data for shippers and trucking firms and should prosper with intermodal growth. Sterling's hub and spoke (i.e., transportation is generally the spoke entity) and port association business has them firmly within the leader group.

2. Electronic Information Services (EIS)

Electronic Information Services vendors are mode-based in their service area. Currently major EIS users are in three transportation submarkets: trucking, water and railroads. Their usage is anticipated to increase at greater than the projected 16% Compound Annual Growth Rate (CAGR) over the rest of this decade. This will be driven by the implementation of AEI and driver/engineer data communications which will increase the areas of high current EIS use. Exhibit V-8 portrays the current use by these three submarkets.

Exhibit V-8

EIS Use by Trucking, Water Carriers and Railroads

Submarket	Expenditures ($Millions)	Uses
Trucking	15	Location /Tariffs /Geographic
Railroads	10	Location
Water Carriers	17	Container Location /Tariffs

The increasing shared use of AEI-tagged equipment by all three submarkets, namely containers, coupled with the increased value of these units and the shipper's desire for real-time information will result in substantial increases in the already number one EIS expenditure item. These submarket firms will also be driven by their need to justify the expenditures for tagging and reader equipment.

INPUT did not include the petroleum database services that collect substantial revenues from pipeline's parent petroleum firms, since the data is not pipeline-related. The common factor for internal transportation sector EDI network vendors is their connection to mode-based associations. The success in transportation of Sterling, and other hub and spoke-based suppliers is by the contact generated at the urging of the major hub shippers.

3. Software Programs.

The market for EC software is scattered among many firms with the biggest share recorded for the "other" category. Major suppliers to the transportation sector include the alphabetically ordered:

GEIS strategically considered the entry point to sophistication in EC with its full-service offerings and driven by its large network presence. It is also a specific presence in transportation with its specific services, including:

- CARGO*LINK - Their global network for shipping data, consignment tracking and E-mail
- Sole supplier to the World Trade Center Association
- ACEs port-based EDI community networks.

GEIS's software products are available for all platform types, except UNIX.

Sterling Software - A full-service EC supplier (i.e., software, network and professional services). Beyond direct sales, its entry into transportation has been via its hub relationships through ports and other industry sectors. Sterling's software products are well received by users and can be provided for all levels of platform. In addition, its network has the global reach that transportation firms will need to survive.

Premenos Corporation - Leader in EDI software for the mid-range platform market. Its software is either UNIX, or IBM's AS400 and RS/6000-based. Premenos is the supplier to IBM of mid-range software and its relationship with IBM may bolster its transportation market share as the ISSC/Advantis presence in the sector expands.

St. Paul Software - A small firm, but strong in transportation based on its beginnings as a supplier to the railroad industry. This has grown from railroad to railroads; as it now is a supplier through RAILINC. It can provide all facets of EDI service and its network service bureau has a small volume focus that could fit many of the firms in the fragmented transportation sector. St Paul provides PC and mainframe software solutions.

Supply Tech, Incorporated - Has the largest installed base of PC-based EDI software. Its primary base is driven from its beginnings supporting automobile manufacturers who needed transportation connections to feed their growing JIT mode of operation. This has expanded to cover other transportation dependent manufacturers. It does not provide network operations and has an affiliation with GEIS. Supply Tech's products function in PC and the rapidly growing UNIX environments.

TSI, International - The developer of the PC package to support the water carrier's OCEAN system is profiled in section G.

4. Professional Services (PS)

Transportation has shown its higher propensity to use PS external services for applications projects than most other industry sectors. This should translate into opportunity for PS EDI vendors with transportation experience. Beyond the Big 6-type firms and specific transportation industry firms, those involved in EC within the three other vendor markets could translate their EC expertise into PS strength. Companies like TSI International, GEIS, Sterling and ISSC/Advantis should be able to take advantage of the applications generated by transportation sector initiatives.

G
Impact of New Technologies.

1. EDI Message Formats

The controversy of message formats, EDIFACT or ANSI X.12 rages but few in transportation, seem to be concerned. In 1987 a committee of the United Nations developed what they called "the only acceptable international standard for EDI EDIFACT. North American (Canada, Mexico and U.S.) transportation firms continue to use, as they have for years, the ANSI X.12 code structure. ANSI X.12 is also the predominant code for Pacific Rim countries. Although the issue would seem to loom large, the easy availability of PC-based translation software makes it insignificant.

2. Automatic Equipment Identification (AEI)

Both the American Trucking Association (ATA) and the American Railroad Association (AAR) are in the process of implementing the standardized international coding scheme used for location tracking of freight containers and freight transport equipment. There are three basic components of these systems: vehicle mounted transponders (tags), stationary interrogator units (radio reader/transmitters) and the computer systems to collect and use the data. The tags are small, normally passive electronic devices about 2 inches by 9 inches. Two tags, one on each side, are placed on each unit. The tag contains a specific number, unit type, ownership identification and an indication of the vehicle side. Interrogator units are located at fixed locations along railroad tracks, highways and in transfer yards. When activated by an interrogator the transponders respond with their contained identification data.

There are seven tag types in all: locomotives, railcars, end-of-train devices, shipping containers, trailers, chassis and tractors. The AAR has mandated that all interline equipment which moves on another company's tracks will be tagged by the end of 1994. It is expected that more than two million pieces of equipment will be tagged by 1995. With two tags per unit the cost will exceed $60 million for just the tags. Additional expenditures include: interrogator units ($20,000 to $30,000 a piece) and communications and software to hold and use the data. Amtec of Dallas is the primary supplier of the tags and interrogator units.

3. Communications

The desire for companies to communicate directly with their dispersed traveling entities (like truck drivers and railroad engineers) has spawned

the growth of several competing systems. Some are based on satellites like Qualcomm's OmniTRACS, others on cellular (UPS's multi-vendor solution), or J.B Hunt's hybrid of three different modes others are traditional radio-based systems. One of the most aggressive communications initiatives is the IRIDIUM Communication System led by Motorola, but supported and owned by many companies around the world. IRIDIUM proposes the launch of 66 low-orbit satellites over the next 10 years that will support digital communications to anywhere on the globe through cellular-like phones. These phones are expected to be dual-mode allowing access through terrestrial cellular networks as well as the satellite network.

H
Selected Vendor Profiles

INPUT has selected three vendors who have a significant presence in the transportation sector and its use of EC. In addition to their presence, their recent activities indicate substantial growth opportunity that may include strategy changes.

TSI International was chosen for its role in providing software to implement the EDI standards for the ocean water carriers. This set of standards should bring an electronic cohesion to a submarket that has taken the initiative to confront its common issues. Properly exploited, TSI could translate this project into similar arrangements for other submarkets.

ISSC, the wholly owned services subsidiary of IBM, had a very successful year with transportation sector firms. It achieved the first data processing outsourcing contract from a railroad (Southern Pacific) and partnered with JB Hunt, developed its RoadRider system that includes truck cab-mounted PC's and full data communications. By folding into ISSC its Advantis subsidiary ISSC is poised to be a powerful solution vendor to transportation capable of crossing mode lines. If ISSC can get all of its pieces working together, build an industry focused team and promote its renewed transportation expertise, it could rapidly become the premiere vendor in several areas.

RAILINC was initially a railroad service organization that provided a center for the transfer of railroad operational data among the railroads. In a sense, it could have been viewed as an effort by the big Class I railroads to help itself establish intramode electronic communication, by helping the smaller railroads step up to EDI. RAILINC has become much more, primarily by its connection to virtually all North American railroads and as a repository of the data regarding equipment, trailers and

containers (currently with more tan three million entries). Through its parent association AAR, railroads have taken the lead in AEI equipment tagging for the whole of the transportation sector. It can expand its equipment database and become the information supplier for all containers and transportation equipment locations, expanded by the AEI real-time potential. Or, it could disappear, if its capability for technology investment lags behind the needs of its clients. What it will be by the end of this decade is an open question.

1. TSI International

45 Danbury Road
Wilton, CT 06897
Phone: (708)761-8600
President & CEO: Constance F. Galley
Status: Private Corporation
Total Employees: 150
1993 Revenues: $20 million*
* INPUT estimate

a. General Description

TSI International, founded in 1967, develops and markets software products for IBM mainframe and PCs focussed on the solutions for the delivery of data to production systems. In 1978 TSI introduced the KEY/MASTER data input software system, which became the leading system of its type. In 1989, Warburg, Pincus Ventures chose TSI for its financial support in the development of an EDI product. The result of this capital infusion was its Trading Partner mainframe EDI translation software product, introduced in 1990. In 1990 TSI also acquired the license and customer base for TranSettlement's TranSlate EDI package and Foretell Corporation the marketer of PC-based translation software.

b. Products and Services

Approximately 40% of TSI's revenues are based on its EDI mainframe and PC products, with the remaining 60% from its industry standard Key/Master products. It has kept to its core business of software sales and its acquisitions have fit this model. Its long history in EDI has brought it into contact with transportation companies, though often as part of its contracts with shippers, like Wal-Mart.

Specific EDI products include:

- Trading Partner, a mainframe-based EDI management software package, that can process all varieties of EDI messages and map it to a client's applications.
- Trading Partner PC, the first Windows implementation of an EDI translator, supports most network interfaces and handles all standard EDI formats. Also available are a line of "kits" for spoke companies to major hub shippers, e.g., Sears and Allstate Insurance, with many more in the process of development,
- TranSlate, an EDI translation package for all platform levels, licensed from the network operator TranSettlements.

c. Strategy

TSI has traditionally sold its EDI management ideas and software to major trading companies (hubs) then proceeded to assist its supplier companies (spokes) with connections. The largest of these has been Wal-Mart with at least 1,500 suppliers. This strategy is effective since one major sale begets multiple opportunities, many of them within the transportation sector.

The direct transportation project OCEAN for the major U.S. ocean carriers, is really similar to TSI's basic hub and spoke approach. OCEAN is the creation of Trading Partner to fit the specific needs of the ocean carriers. The only difference is that the carrier's hubs will be spokes to other hubs.

In addition, industry experts suspect that TSI may be close to the merger of its two product sets, manual and electronic data entry. This would open its large KEY/MASTER client base to the easy addition of EDI capabilities.

d. Challenge

TSI has historically not been involved in the operation of communication networks. In one respect this has been a blessing to its bottom line, since few companies make much money from its EDI network operations. The converse of this could present TSI problems since its competition can provide full EDI services. Because of issue one, they have been more financially successful.

2. Integrated Systems Solutions Corporation (ISSC)

560 White Plains Road
Tarrytown, New York 10591
Phone: (914) 333-3030
Chairman & CEO: Dennie M. Walsh
President: Sam Palmisano
Status: Subsidiary
Total Employees: 10,274
Total Revenue: $1.84 billion
Non-captive revenue: $657 million
Fiscal Year End: 12/31/92

a. General Description

ISSC was formed as an operating division of IBM in 1991 and was established as a separate subsidiary in March 1992. Its original formation was the combination of several IBM services systems operations, systems integration, consulting, voice and data networking, applications software development and business recovery services. The primary client (64% of revenues) of ISSC was and remains other units of IBM.

In December 1992, IBM and Sears, in a joint venture, formed ADVANTIS. This venture was the combination of the two companies networks under a single entity. Although the financial details are unknown, IBM holds the majority interest in ADVANTIS. ADVANTIS network support and operations became part of ISSC in 1993.

In transportation ISSC has had some significant successes:

- In March of 1993, Hertz Corporation signed a five-year, $80 million contract for ISSC to take over operations of IBM-based systems, provide business recovery services and a majority of applications development.

- In December 1993, Southern Pacific Rail Corporation signed a 10-year, $415 million outsourcing contract with ISSC, the first for the railroad sector. The contract calls for complete IS management including: systems operations, application development, business recovery and new technology implementation.

In addition to the obvious, this precedent could produce more interest in outsourcing within transportation, enhance ADVANTIS as a transportation industry VAN network supplier and provide ISSC an inside track on other railroad projects, e.g., ATCS and AEI.

b. Products and Services

ISSC's products and services are fairly standard systems and network operations, systems integration, technology consulting, applications development and maintenance and business recovery services. In fact, IBM has offered most of these services for some time, but not in a unified combination. ISSC believes this new combination will unleash the inherent potential and create a technology powerhouse.

c. Strategy

The strategy is simple. Establish IBM-ISSC as a world-class supplier of systems operations, systems integration, business systems recovery and network services. IBM had historically left much of this terrain for others as they concentrated on manufacturing and operational software. This new strategy places them firmly in competition with EDS, CSC, SHL Systemhouse, CAP GEMINI and Perot Systems. Based on IBM's recent financial performance it is doubtful anyone will cry foul as they did in the 1960s.

d. Challenge

Although ISSC has shown very good results, will it be able to break from the culture and history of IBM to succeed? ISSC was created without its own sales force a possible problem. Its entry to customers is only after the regular IBM salesman has identified prospects on product sales calls.

Its traditional outsourcing approach to Southern Pacific against the more aggressive re-engineering approaches offered by EDS and Perot Systems. Will this conservative style of proposal continue to be favored or will it prove to be not what the customer in seeking? The transportation sector may be just the right place for ISSC to prosper.

3. RAILINC Corporation

50 F Street, N.W.
Washington, D.C. 20001
Phone: (202) 639-5500
President: Henry W. Meetze
Status: Subsidiary
Parent: Association of American Railroads (AAR)
Total: Employees: 130
Total Revenue: $18,000,000
Fiscal Year Ending: 12/31/93

a. General Description

RAILINC was founded in 1982 to provide network services for the transportation industry's railroad submarket, including: EDI, industry databases (e.g., railcar locations) and software products. Although primary clients include the major North American railroads, RAILINC also provides services to short lines, equipment leasing firms, shippers, other network applications vendors and government agencies. Railroads still provide about two-thirds of RAILINC's revenues.

b. Strategy

RAILINC was established as a for-profit subsidiary of its parent non-profit association. It seeks to provide quality services to all areas of the transportation industry.

Although RAILINC is perceived as a captive processing service for the railroad industry its databases and network capabilities are used by other transportation and industry sector firms for railroad information. Client satisfaction has and continues to be rated very high, particularly within its niche market. Competition could be a major future factor from more full service VAN providers, particularly with AEI information pressing its capacity.

The most significant recent event was its RFP sent in late 1993 for an outsourcer to enhance railroad intercommunications, including the creation of a computer network and repository system. The RFP for a network could signal the replacement of Railinc as a major transportation information processor. However, since RAILINC frequently contracts for major development projects, this could be its preparation for increased demand.

c. Products and Services

Network services provides about 90% of RAILINC's revenues, with the remainder from software products.

RAILINC does not discriminate its network applications services from its database access traffic. Its databases are the key to much of its transactions.

CLM - Car Location Message service collects transactions from railroads to maintain the base of equipment locations.

Data Exchange System - Consolidates equipment hiring and repair information and provides electronic information to equipment owners.

EDI - The RAILINC system provides traditional EDI for more than 400 clients.

Databases:

- TRAIN II (Telerail Automated Information Network)An international freight car database. Currently more than 150 clients use this data that tracks the movement of railcars, trailers and containers via railroad nationwide.
- UMLERA computerized version of the Official Railroad Equipment Register containing information on more than three million registered railcars, trailers and containers.
- RAILINC recently added an accident reporting system accessable by all railroads. Data is to be entered within 30 days of an accident and is made available to other railroads to avoid prolonged delays in addressing preventive measures.

d. Challenges

RAILINC is primarily a captive processing service for the rail industry. Use by others is generally restricted to communication regarding railroad shipment legs. The advent of more sophisticated tracking (AEI), train control and dispatch could press its capability to keep up. Its new accident reporting system that shortens the time for accident reporting to 30 days would seem out of place for an industry headed for "real-time" location information.

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Conclusions and Recommendations

Commerce, communications and transportation have been bound together since the beginning of time. Initially transportation was the enabler of communication and commerce beyond the physical community was made possible only by transportation advances. Transportation ceased to be the mechanism for communication with the advent of the telegraph a little over a hundred years ago. Today, communication called electronic commerce (EC) promises to revolutionize the fabric of transportation enabling greater efficiency in the movement of goods, lower costs and more seamless shipments.

A Conclusions.

1. Electronic Commerce

Electronic commerce, that includes the familiar terms EDI, EFT and E-mail, is the collective term for these processes when:

- It functions between companies
- Facilitates commercial exchange.

INPUT sees EC as one of the true growth areas for technology vendors for the remainder of this decade and beyond.

INPUT estimated in 1993, that the current 38,000 EDI users would nearly double to 70,000 by 1997. Also, that expenditures for external services to support EC would grow from approximately $600 million to $2.5 billion over that same period, 24% increase.

Changes in the patterns of EC are expected to follow the globalization of commerce. Today half the expenditures on EC are in North America and the proportion becomes 68% when the United Kingdom and Japan are added. Tomorrow's patterns will be first within the trading blocks (like the EEC, NAFTA and East Asia) followed by global expansion as freer trade agreements become effective trade generators. U.S. businesses, based on their technology lead could ride EC, and its generated productivity improvements into a new era of global economic leadership.

Exhibit VI-1 expresses the key conclusions regarding trends and components specifically relevant to the transportation sector.

Exhibit VI-1

Electronic Commerce Conclusions

- Two types of trading communities support transportation
- Software and Professional Services components are high growth
- Major VANs growth is much higher than component growth

Transportation firms are involved with two different types of trading communities between transportation firms, and as part of the trading communities of other industry sectors. The creation of these and the historic mode of vendor entry could be significant.

The genesis of the existing transportation trading community has been to support the needs of transportation companies to communicate with each other in the normal course of business. The primary example is RAILINC which was created to facilitate the communication among railroads regarding the passage of railcars and shipments from one company to another. The creation of RAILINC was through a trade association, a pattern that has been repeated by water carriers and pipeline companies. Trucking and air carriers have not had the history of needing others of their transport mode to perform door-to-door shipment, hence, they have not created an intramode community. Instead the firms of these modes tend to use commercial VAN suppliers, the communal networks of other modes, or their own internal communications capabilities. INPUT believes that business globalization, the need to reduce LTL terminal expense and increased intermodal shipment will increase the need for association style trade communities in these industries.

The trading communities that transcend a particular transportation mode, yet always include transport companies, are those created by other industry groups. Transportation firms become involved in these communities, because their role is to move goods among the trading

communities, because their role is to move goods among the trading community partners. Since shipper firms tend to insist on transport firm compliance with their EC initiatives, most firms in the highly competitive freight business acquiesce. Hub and spoke vendor entry to the transport partners of these community types has proven to be effective. In most cases the freight company does what it is told.

The fact that EC software and professional services sales are high growth is indicative of a strong market and future strength in network vendor growth. INPUT believes that software and professional services will continue to be strong through decade end. In addition, the normal pattern first software then network will show increases in network use slightly lagged behind the other two components.

Of note is the much stronger growth in the two major commercial VANs (GEIS and Sterling) of 38% when compared with this component's average of 14%. These two vendor's growth is more than double the growth of the others. This will continue and consolidation will occur as VANs push to achieve profitable size. Smaller network entities will be forced to find niche areas (like RAILINC's large base of freight locations) and specialized services.

2. Transportation Business

The role of the freight transportation sector is in assisting the movements of goods. Raw materials and parts are moved to producers whose finished products are then moved to customer locations. The business of the transportation sector grows only to support growth in the amount of goods to be moved. Hence, transport firms are generally driven by factors that are not within its control. Hence, the perpetual struggle is for the players to increase their share of a relatively fixed market. This creates a very competitive market where service, price and timeliness are all important.

The transportation sector is consolidating led by the creation of multimode capable companies (the mega-carriers). Those who wish to continue as single mode specialists will be forced to work together with those of their own mode and other modes. EC is the connective mechanism among these companies and the avenue to decreased costs and improved service.

Finally, transportation sector firms must become EC proficient to compete with industry leaders. The time has past for EC to create a competitive advantage; it is now needed to keep up with peers. To do this many will need help from EC technology vendors.

3. Transportation/EC Directions

INPUT's in-depth study of the transportation sector's use of technology and EC activities has produced some interesting conclusions. Exhibit VI-2 lists some of the more significant study results based on a review of INPUT's sample of more than 2,500 application projects.

Exhibit VI-2

Technology and EDI Activities

- Most sector application projects (51%) are on mainframe platforms
- Sector firms tend to use external services more (55%) than other industry sectors (average 36%)
- Transportation sector firms use external services less frequently (only 33% of projects) for desktop applications
- 61% of all transport application projects were EDI-related, verses the average of all sector's 33%

INPUT results of the study of application projects conducted during late 1993 and early 1994 should be part of the knowledge base for potential vendors. Although the differences between individual companies is believed to be more significant than the pattern shown of the whole fragmented industry, the tendencies are significant. It indicates an industry rapidly moving to implement EDI, either for internal reasons or as forced by its customers. Additionally, external service providers are quite commonly used, particularly for mainframe-based projects.

Exhibit VI-3

Transportation Technology Projections

- AEI will become the new driver for EC expansion
- JB Hunt/IBM's RoadRider system may be the model for truck cab automation
- OCEAN, the water carrier standards and system should expand to cover that transport mode
- Airline-based cargo carriers will move to save expense via EDI

AEI tags will become standard accessories for transportation equipment and shipping containers. The completion of tagging by railroads by early

1994 will signal the beginning. Shippers and all transport modes will force the ability to improve location information. This will also create opportunity for vendors: networks will see increased traffic seeking locations; EDI software will have to be modified to support this information potential and application systems will be needed to utilize the new data source.

The Road Rider system developed by JB Hunt and IBM will create an initial competitive advantage for the number one truck load carrier. However, the system is expected to be sold another potential problem for the many under capitalized companies in the truck load submarket. The success of this system depends on the extent of advantage created, and its ability to attract more customers to Hunt and mainframe-based product pricing.

The OCEAN system's concept and apparent execution will insure its success in fostering more uniform communications among the worlds ocean carriers. It could also be the mechanism that promotes higher levels of sharing, e.g., ship space, containers and terminals.

Airline-based cargo operations have traditionally been the poor cousins for the passenger- based companies. U.S. cargo operations will become more pressured by changes in international agreements and increased trade potential. European air cargo carriers are jointly working on new systems and U.S. carriers will have to follow. In addition, the newly cost conscious airlines should soon be looking at the potential savings potential in EDI.

B
Recommendations

This study has resulted in many potential recommendations for vendors seeking to do business with the transportation industry. The transportation sector has often been overlooked by vendors because of its low profit margins and requirements for industry submarket knowledge. Transportation can be a fertile ground for properly directed vendors.

Exhibit VI-4 lists the primary strategies seen in our study, beyond the basic requirement that a vendor have industry knowledge. These may not seem very revolutionary, but they have proven their worth.

Exhibit VI-4

Selected Vendor Recommendations

- Understand and exploit trading communities
- Use the power of the "hub" firms to achieve entry to their transport partners
- Work with associations to gain admittance to their member firms
- Be prepared to address mainframe-based customers
- Do not overlook the allied businesses, e.g., container owners, etc.

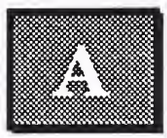
Trading communities have been a key for many of the major vendors, e.g., TSI International and the many ocean carrier partners.

The major EC players have also adopted a strategy that sells first to hubs and follows the chains to the spoke firms. This should be a primary avenue and the connecting transport companies will follow the edicts.

Associations have provided much of the base for the two leading VANs, GEIS and Sterling. Although their VAN operations have had trouble achieving profits, their full service capability has given them entry into many areas. Both are port system vendors and GEIS currently has much of the VAN pipeline business. Open transportation sub-markets are air cargo and trucking, but they would not be easy. Airlines already have several networks that could be used. So far, trucking has resisted favoring a VAN, but there may be opportunity in the LTL submarket.

INPUT's sample shows transportation to be mainframe-biased in platform. Although this is true in some sectors primarily large firms the industry will be moving to client/server and is heavily involved in PC's. However, the apparent mainframe orientation is indicative of a more conservative, centralized IS department. Vendors should be aware of this and be prepared.

Finally, vendors should look for business in the extended transportation service businesses. Some of these are: container owners interested in location and a new potential to broaden their assets; private carriers who may need to provide EDI capability for their customers; equipment owners and leasing companies with interest in equipment locations eventually to track stolen units.



Definitions

AEI - Automatic Equipment Identification is the term normally used for the millions of radio transponder tags placed on freight equipment and shipping containers. In reality there are three basic components of these systems: vehicle-mounted transponders, stationary interrogator units (reader/ transmitters) and the computer systems to collect and use the data.

Transponders are small, passive electronic devices about 2 inches by 9 inches called tags. Two tags, one on each side, are placed on each unit. Tags have and are being placed on shipping containers, trailers, locomotives, freight cars, etc. The tag contains a specific number, unit type, ownership identification and an indication of the vehicle side. 1993 costs were about $30 per tag.

Interrogator units are radio transmitter/receivers located at fixed locations along railroad tracks, highways and in transfer yards. The interrogator units send out a low power signal, less than 20 watts. Transponders modulate this power to respond to the interrogator unit with their contained identification data. Interrogator units send this information along with their location identification to collection computers for processing. Although the location is only known as of the last interrogator passage, this is still a substantial advance in tracking. These units cost about $30,000 apiece.

Railroads are the most significant users, choosing to remain with a terrestrial-based communications system. Rails are under an AAR edict to tag all equipment that moves across other company rails (about 1.4 million equipment pieces) by the end of 1994. Intermodal truckers are a piece of this, but do not have the same forced timetable. Current use is primarily within the carrier who has placed the interrogator units. However, the sharing of shipment location data other transport and shipper/receiver companies is expected to occur rapidly (likely through EDI transmissions.)

Double stack - These are special low flatbed railcars that permit containers to be loaded two high. The advantage is in doubling the capacity of a train without increasing its length. The disadvantage is that these higher and heavier loads can not travel in all areas, particularly true in many parts of Mexico. Prior to the Sarina Tunnel from the U.S. to Canada, double stack between the two countries will be impossible.

EC - Electronic Commerce is the electronic, network-base coordination of material, people and processes that facilitates commercial exchange between companies.

EDI - Electronic Data Interchange is the communication of coded data that can be directly entered for automated processing as part of a business transaction. The key element is that it can be directly entered, not that it always is (many EDI receivers let the transactions pile up in a mailbox, until they are ready). The format basis is highly structured and standardized between the two or more parties.

GPS - Global Positioning System is a satellite communications-based system developed by the U.S. Department of Defense to provide precision global location determination. Though built for military purposes, the basic theory is being used in nearly all transportation segments. It requires a special frequency receiver that can determine its position on the globe within three meters. Its ability to provide continuous location sensing is superior to other methods, e.g., airlines and the FAA see this as the eventual replacement for radar-based systems for Air Traffic Control. Its implementation by land and sea transport firms is to gather data on "vehicles" and eventually the precise location of cargo containers. The location data can also be captured by onboard computers and communicated to a transportation company's computers for processing.

Intermodal - A railroad term for any shipment transported by a railroad, via a trailer or container, that begins and/or ends with another transportation mode.

IVHS - The Intelligent Vehicle Highway System generally uses land-mounted radio equipment to identify passing vehicles equipped with special transponders and, potentially, communicate with them. The initial application appears to be for automated, nonstop toll collection by deducting each passage from a prepaid account. Advocates see cutting congestion, possible nonstop truck weights and, futuristically, automated highways where close-spaced vehicles drive themselves under computer control as advantages. Detractors see invasion of privacy as a problem, because vehicle locations could be known by those with computer access. This is a variant of AEI.

Multimodal - A transportation term used to describe a shipment that is moved by various modes during its journey from shipping point to ultimate customer. It is used to designate those not directly fitting the railroad "intermodal" definition. However, many use the two terms interchangeably.

Trading community - A trading community is the collection of all a company's trading partners. In an extended sense this also includes the trading partners of your trading partners, e.g., although a product is received through a local distributor it could be shipped directly from the manufacturer. Hence, the manufacturer and the transport company are extended trading partners. For any one company the potential trading community would also include other potential suppliers and customers for a business.

Trading partner - A trading partner is any company that a company does business with in either a customer (they pay you for goods or services) or a supplier (you pay them for goods and services to run your business) role. Government agencies that are part of conducting business are included as trading partners(particularly significant in transportation are: U.S. Customs, other countrys' customs for international shipments and the ICC for Tariff filings by rail and truck.

Transponder - The dictionary defines a transponder as: "a radio or radar receiver-transmitter activated for transmission by reception of a predetermined signal". The use of these devices is in conjunction with AEI and IVHS technologies that use radio signals to activate vehicle-mounted transponders, to identify and communicate with specific vehicles.

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B

Industry Structure, Methodology and Related Reports

Appendix B describes the structure of the transportation industry and explains INPUT's research methodology and the techniques used in the preparation of this report. Section 3 lists the allied INPUT Reports that should be used to complete the picture portrayed.

A Industry Structure

The transportation industry encompasses all service businesses primarily involved in the movement of goods and people. To those who work in these businesses it is not a single industry(it is a group of competing industries based on their mode of transport, i.e., railroad, trucking, etc. Assigned SIC codes for the transportation sector firms serves to re-enforce these mode distinctions, since the two primary digits designate mode. The modes are quite different in vision, economic forecast and their use of technology. Hence, this report will consider each of these "transport mode" entities as segments within the overall sector.

Sector Definition - The transportation service industry sectors, as defined by INPUT, include:

- Railroads, SIC code 40, including passenger, general freight and the rapidly growing intermodal traffic
- Local and Interurban Passenger Transit, SIC code 41, commuter transport, generally public subsidized, but frequently operated by other sector firms.
- Trucking, SIC code 42, for hire motor freight
- U.S. Postal Service, SIC code 43s only entity

- Water, SIC code 44, freight, (domestic and international)
- Air, SIC code 45, covering passenger and freight, domestic and international.
- Pipelines, Sic code 46, covers petroleum lines, and excludes natural gas carriers that are part of the energy industry
- Services, SIC code 47, covering the specialized businesses that include travel agents, freight forwarders, etc.
- Package delivery firms are classed in SIC codes 44 and 45, dependent upon their parentage, i.e., Roadway Express with trucking, Federal Express is an air cargo, etc.

B
Methodology

This report is based on data that has been gathered during 1993 and the first half of 1994 as part of INPUT's ongoing market analysis program. Trends, market sizes and growth rates are based upon INPUT research and in-depth interviews with users in the transportation services industries and the IS vendors serving the industry. INPUT maintains ongoing relationships with, and a database of all users and vendors it interviews. Interviewees for the research portion of this report were selected from this database of contacts.

INPUT Library - In addition, extensive use was made of INPUT's corporate library located in Mountain View, California. The resources in this library include on-line periodical databases, subscriptions to a broad range of computer and general business periodicals, continually updated files on more than 3,000 information services vendors, and the most up-to-date U.S. Department of Commerce publications on industry statistics.

Financial Data - It must be noted that vendors may be unwilling to provide detailed revenue breakouts by product/service market or industry. Also, vendors often use different categories of industries and industry segments, or view their services as falling into different product/service markets from those used by INPUT. Thus, INPUT must estimate revenues for these categories on a best-effort basis. For this reason, the product/service markets and individual segment forecasts should be viewed as indicators of general patterns and trends rather than specific, detailed estimates for individual years.

C
Related Reports

- *Electronic Catalogs: Issues and Opportunities*
- *Electronic Commerce in Health Care*
- *Electronic Commerce in Government*
- *Electronic Commerce in Retail and Wholesale Distribution*
- *Electronic Commerce in Manufacturing*
- *Metrics of Electronics Commerce* (to be published in 1995)
- *Electronic Commerce Market Analysis and Forecast, 1994-1999* (to be published in 1995)

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