NETWORK SERVICES DIRECTIONS

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NETWORK SERVICES DIRECTIONS

JUNE 1986

Information Systems Program (ISP)

Network Services Directions

NETWORK SERVICES DIRECTIONS

ABSTRACT

This report, produced as part of INPUT's Information Services Planning (ISP) Program, takes a comprehensive look at network services directions. It includes a technology scan and analysis of networking techniques, profiles of leading and innovative vendors, descriptions of user attitudes toward network services, and discussions of the applications which are now important and those which will likely become more important in the future.

The voice/data/image traffic split is quantified now and in 1991, and user directions toward private and virtual private networks are tracked.

Several case studies describe users' approaches to network services. The report concludes with detailed recommendations to users of network services.

This report contains 318 pages, including 50 exhibits.

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NETWORK SERVICES DIRECTIONS

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NETWORK SERVICES DIRECTIONS

EXHIBITS

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I INTRODUCTION

I INTRODUCTION

A. BACKGROUND

- This report, produced by INPUT as part of the Information Systems Planning Program (ISP), examines network services directions.

  - The term network services is defined as communications services provided by, and predominantly managed and maintained by, a third party.

  - The third party may be a subsidiary or a part of the company providing the basic communications link, or it may contract for the link from another communications vendor.

  - The services may encompass the unaltered "pure" bulk or switched telecommunications pipelines, information storage and forwarding, and protocol/code/speed conversion and/or error correction/detection.

  - Exhibit I-I graphically illustrates this definition.

- Network services can be divided between basic and enhanced services, with the latter blending into the applications available on and through a network. Consideration of network issues and trends cannot ignore application issues and trends, and the report discusses these as well.

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NETWORK SERVICES DEFINED

User A ──── **Network Services**

Carrier

User A Field Office

User B

RCS

Data Base
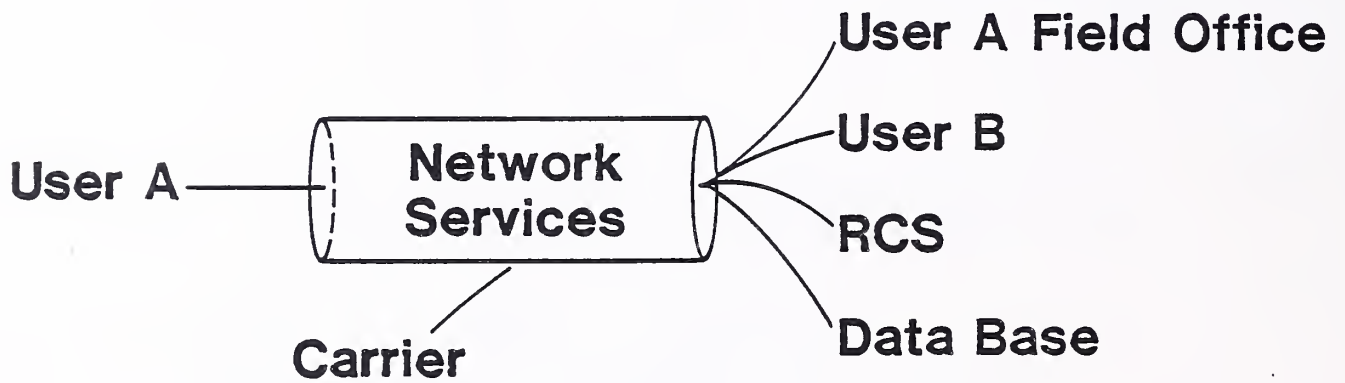
- Switching
- Communications Conversion

- Error Correction
- Store and Forward

- The network services market is one which can be characterized by rapid growth, with new tariffs filed virtually daily and new services being offered by both traditional and nontraditional network services companies.

- Users are coming to terms with the confusion born out of the divestiture of AT&T and the end to one-stop-shopping and are now sorting out the wide range of networking possibilities confronting them.

- The marketplace is continuing its consolidation, with corporate mergers and acquisitions necessitated by competitive realities. This affects users concerned about vendor viability, service levels, and applications.

- Meanwhile, technological advancements continue, with new services being offered or being planned based on fiber optics, T-1 carrier technologies, microwave, and satellites. Emerging technologies being evaluated include the Integrated Services Digital Network (ISDN), mobile data, and FM subcarrier services. Both vendors and users are faced with positioning products to fit existing and new applications.

- Applications which have been the primary revenue generators for network service vendors are peaking and new applications are being found. Further, as new technological approaches make possible cost-effective channels of communications, new applications will be developed to fill the communications pipelines and meet emerging needs.

B. SCOPE

- This report addresses the issues suggested above. More specifically:

    - Chapter II is an Executive Summary of the entire report.

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-   Chapter III provides an overview of network services to identify trends, technologies, and standards which are now important and which may become more important in the future.

-   Chapter IV profiles representative network services companies, high-lighting nontraditional vendors and providing examples of services newly available from companies in strategic alliances with others or formed through mergers and acquisitions.

-   Chapter V presents an analysis of market factors and trends detected by INPUT and identifies which applications are now important and which will become more important. It also discusses user needs, network usage in selected industries, and regulatory issues.

-   Chapter VI contains the case studies to describe how user organizations are approaching the growing proliferation of available network services and how such services are being used both for competitive advantage and cost-effective communications.

-   Chapter VII presents several speculative scenarios and projects future applications, analyzing their potential impact on network services.

-   Chapter VIII summarizes the study and contains recommendations.

•   The appendices contain a glossary of terms used in the report plus the research questionnaires.

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C.   METHODOLOGY

- The research for this report came from several converging information streams.

    - INPUT first questioned a majority of its clients to determine what issues needed consideration and clarification in this report.

    - Ninety-nine user interviews were conducted in February and March 1986, using the questionnaire in Appendix B. Exhibit I-2 is a profile of the interview sample.

    - Twelve network service vendors were also interviewed in the same period to gather perspectives on the issues and topics discussed in this report. Their comments have been evaluated by INPUT with the under-standing that vendors often have a self-interest in promoting certain views and opinions.

    - INPUT has conducted several consulting studies bearing on network services directions. While no proprietary information is revealed, the knowledge gained is represented in this report.

    - Network service product literature and secondary research were reviewed to complete the analysis.

D.   PURPOSE

- The purpose of this report is to detect and analyze market, application, and technological trends as an aid to users in evaluating network services.

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EXHIBIT I-2

INTERVIEW PROFILE

Discrete Manufacturing	21
Process Manufacturing	11
Transportation	9
Medical	5
Services	7
Utilities	3
Retail	6
Banking	13
Insurance	8
Government - State and Local	8
Education	4
Other	4
Total	99

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MSP2

- The vendor profiles are intended to provide indications of services which may fit applications and to provide indicators of vendor viability.

- The user research findings provide a benchmark by which users can evaluate their own activities and formulate plans for the future.

E. RELATED REPORTS

● Interested readers are referred to the following related INPUT reports:

- <u>Micro-Mainframe: End-User Experiences</u> describes the advantages and limitations of various M-M methods, suggests implementation strategies, and projects changes in the technology and marketplace.

- <u>Micro-Mainframe: Corporate Impact</u> describes the organizational and technological effects of M-M in the corporation in light of the growing demand of end-user access to corporate data bases. The impact of M-M products on the current inventory of standalone micro and mainframe software is also analyzed.

- <u>LAN/CBX: Planning for Change</u> reports current experiences with these data and data/invoice communications technologies and looks at the future of office-oriented communications devices.

- <u>Integrated Voice/Data Communications.</u> This report describes the current effort toward voice/data integration and discusses some of the problems and possibilities of such integration. It examines the limitations imposed by present technology, analyzes the requisite functional areas, and includes recommendations for future planning.

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- <u>Network Management and Control Systems</u> describes approaches and problems relating to network management, identifying relevant techniques, defining troubleshooting requirements, and specifically discussing packet switched network problems.

- <u>Electronic Data Interchange</u> discusses the electronic transfer of business information between organizations in a structured application. This report describes EDI activities in several industries, profiles services and software vendors, and analyzes issues affecting acceptance of EDI. Market forecasts and recommendations to industry participants are included.

- <u>Telecommunications Security</u> describes the current state of security within data processing and telecommunications, examines and analyzes the breadth and limits of current technology, and describes efforts toward a national data encryption standard. It concludes with recommendations for future planning.

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II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- This Executive Summary is designed in a presentation format to:

    - Help the busy reader quickly review key research findings.

    - Provide a ready-to-go executive presentation, complete with script, to facilitate group communications.

- The key points of the entire report are summarized in Exhibits II-1 through II-7. On the left-hand page facing each exhibit is a script explaining its contents.

INPUT

A.   USERS WERE CONFUSED

- The convergence of computers and communications is now upon us.

- Whereas the previous focus was on computing, there is more attention now being paid to the communications aspects of the information dyad. This takes the form of:

    - Internal communications, within and among work groups, between geographically distributed divisions, and among communities of interest.

    - External communications, with trading partners and, in some cases, with government regulatory agencies or trade associations.

- With the divestiture of AT&T and the end to one-stop shopping for communications needs, users were faced with a confusing environment and many remain confused. The causes include:

    - The rise of new carriers and new services.

    - Deregulation leading to competitive market forces.

    - The complexities of international communications.

    - Developing technologies.

    - Changing tariff and pricing structures.

    - Evolving, and sometimes competing, standards, such as the Integrated Services Digital Network.

- Users are aware that processing costs are decreasing while communications costs rise. They want more control of network expenses.

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EXHIBIT II-1

USERS WERE CONFUSED

Costs

Carriers **?** Divestiture

ISDN Technology

- II -
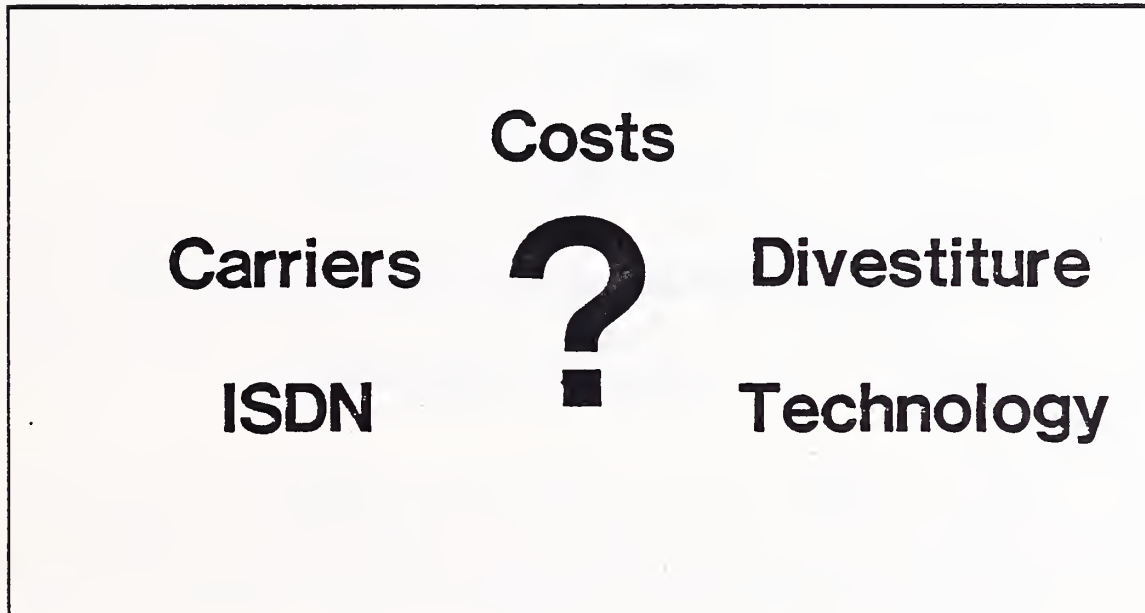
B.   USERS ARE EXPERIMENTING

- While the dust has yet to settle from AT&T's divestiture, users are coming to terms with the new communications environment. They are aware of new options and many are experimenting with alternative approaches to needed network services.

- Many users are implementing private networks. The "Be Your Own Bell" strategy is more than a fad; it is driven largely by users wanting independence from network service vendors and more cost control. Another factor is their frustration due to long delays in getting needed services.

- In addition to hybrid networks combining private and public networks, new "virtual" private and software-defined networks afford both user control and the economies of a shared backbone network. These are being viewed favorably.

- Bypass methods such as microwave Digital Termination Services (DTS), satellite services using flexible small dishes (VSAT), lightwave systems, and cable television (CATV) data services are also available.

- Additionally, new networks such as fiber optic services are evolving, offering economical, wideband capabilities to users needing and able to manage the bulk capacity services now provided.

- Over the horizon is the Integrated Services Digital Network (ISDN) which will provide universal service using standard interfaces and access schemes.

EXHIBIT II-2

INPUT®

USERS ARE EXPERIMENTING

- "Be Your Own Bell"

  - Hybrid Networks

  - Virtual Private Networks

  - Bypass Options

- ISDN

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C.   THE NETWORK APPLICATION MIX IS CHANGING

- Voice, time sharing, and data base access remain the dominant applications tied to network services. However, new services are now being offered.

- Network services providing "pure" communications links are often viewed as commodities. The applications available through a network is an important factor in vendor selection.

- Important applications will likely be:

    - Electronic data interchange, the exchange of business documents between trading partners.

    - Electronic mail, particularly as universal access standards are implemented.

    - Graphic systems such as linked computer assisted design and engineering workstations.

    - Teleconferencing in voice, video, and computer modes.

    - New consumer-oriented applications such as point-of-sales, credit card authorizations, and, in the longer term, videotex.

    - Additional business and consumer telemetry applications such as alarms, meter reading, and remote equipment fault diagnostics.

- The net result is that data will become a larger part of the mix.

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EXHIBIT II-3

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THE NETWORK APPLICATION MIX IS CHANGING

User Estimates

Image 5%

Data 20%

Voice 75%

1986

Image 6%

Data 37%

Voice 57%

1991

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MMS1 MSP2
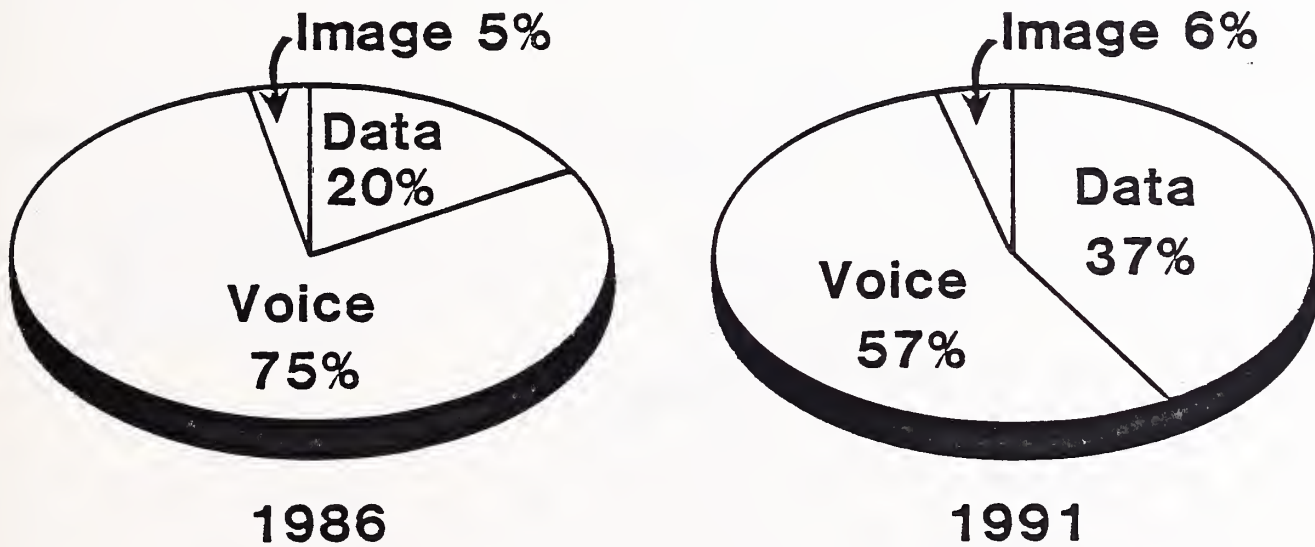
D.   THE MARKET IS CONSOLIDATING

- Whereas the intent of divestiture and deregulation is to encourage competition, leading to cost and technological innovation benefits for users, it now appears the costs of competition on vendors is leading to a different environment.

- Examples of consolidation can be regularly read in the business pages of local newspapers. They include:

    - The merger of U.S. Telecom and GTE Sprint to form U.S. Sprint, combining now separate voice and data networks.

    - The purchase of RCA by General Electric, combining data communications services.

    - The purchase by British Telecom of an ITT division.

    - The partial ownership of MCI by IBM.

- Additionally, there are many examples of strategic partnering represented by joint ventures, marketing agreements, and internetworking which may be a prelude to more formal, future bonding.

- These amalgamations may mean the eventual return of communications monopolies; however, a more likely scenario is an oligopoly of a few major companies with the actions of each affecting the others.

- In the interim, constellations of communications companies are developing, linked formally or informally, to provide end-to-end services and often equipment to users.

EXHIBIT II-4

THE MARKET IS CONSOLIDATING

- 17 -
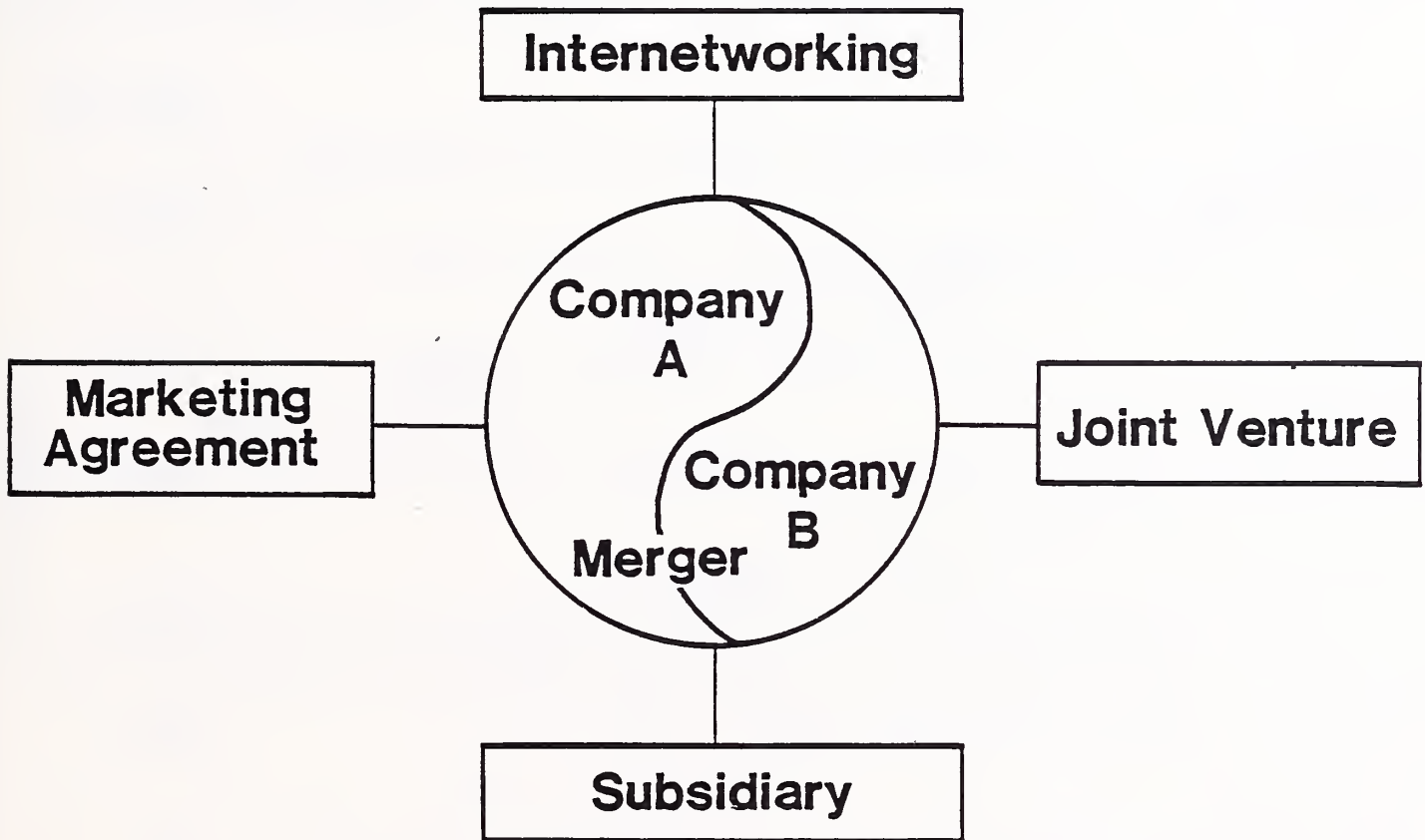
E.   THE NETWORK SERVICES MARKET IS GROWING

- A healthy economy and growing awareness of the benefits of telecommunications mean continued growth in the network services industry as a whole.

- Data communications, now representing approximately 20% of corporate network service traffic, will increase. These increases are tied to:

    - The acceptance of microcomputers in business and the demand to link these tools to other processors.

    - The importance of information in the modern age.

    - Increasing activity on a multi-national level.

    - New applications.

- While the proportion of voice traffic will decrease, it too will continue to grow in the 10% range.

- INPUT estimates the 1985 market for network services (voice and data) at $80 billion, growing at an average annual growth rate of approximately 10% to become a $132 billion market by 1990.

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EXHIBIT II-5

INPUT®

THE NETWORK SERVICES MARKET IS GROWING

VOICE AND DATA

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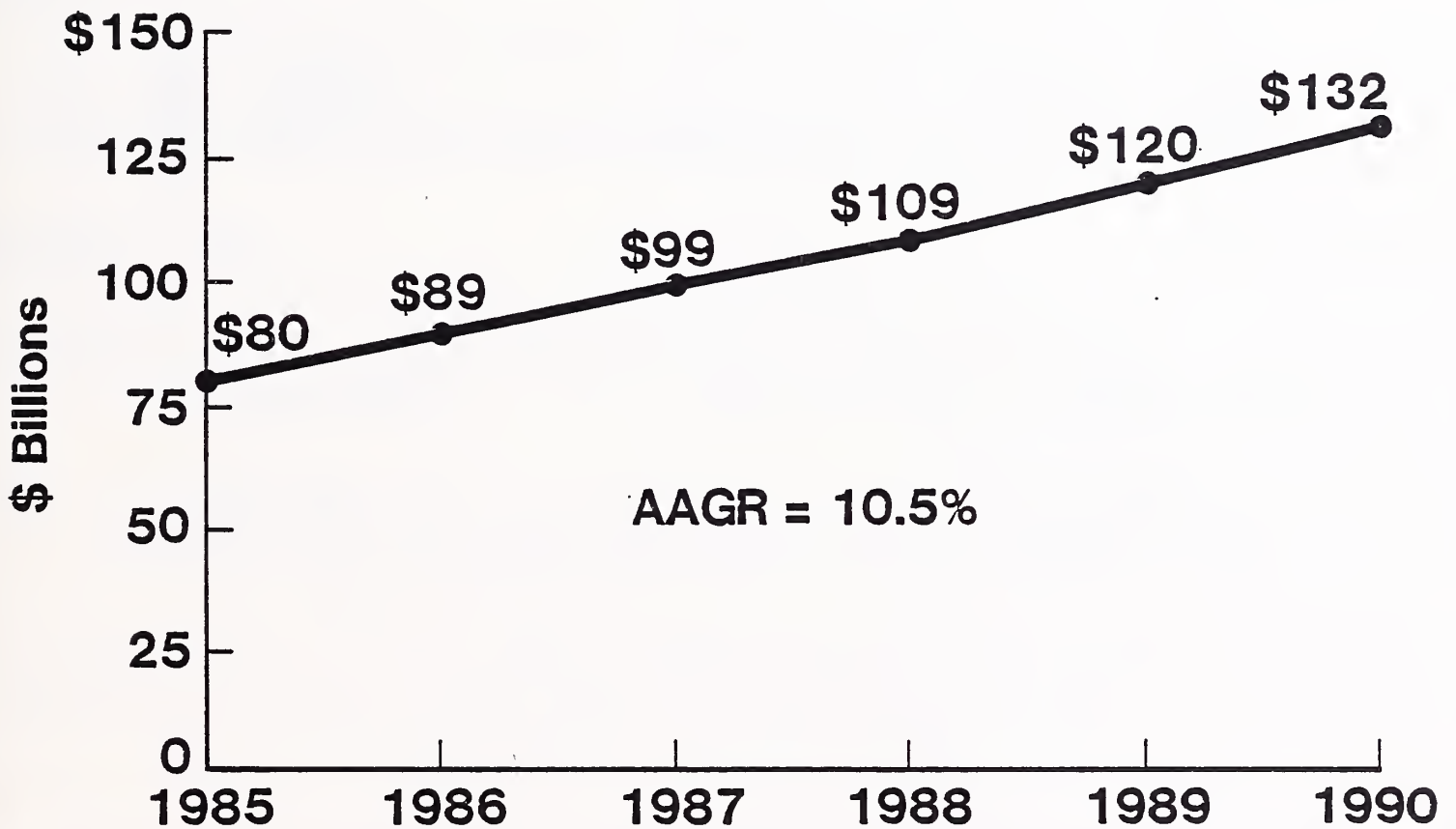
F. TOWARD ADAPTIVE NETWORK SERVICE TECHNOLOGIES

- While networks have often been optimized for voice, data, image, or various protocols, the evolution of network services is toward adaptive technologies.

- It is useful to consider two conflicting, yet complimentary, views of the generic "network" to further understanding of this concept.

  - The utility view sees networks in their most basic form, providing a commodity pathway between two or more points. This telephony-based view obscures the inherent adaptability of the network.

  - The niche view sees the network as fitting specific user needs and applications.

- The challenge to users and vendors is to balance these views, recognizing the multidimensionality of communications technologies, and to identify how the technology can be customized.

- While vendors want to be all things to all people (utility view), users want customized solutions for their specific needs (niche view).

- The networks of the future will be all digital, using a standard interface for a variety of terminal devices. The digital nature of future networks is highly adaptable: digitized voice and digital data will be indistinguishable.

- The Integrated Services Digital Network, when available, promises to provide a universal solution to individual problems.

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EXHIBIT II-6

TOWARD ADAPTIVE
NETWORK TECHNOLOGY
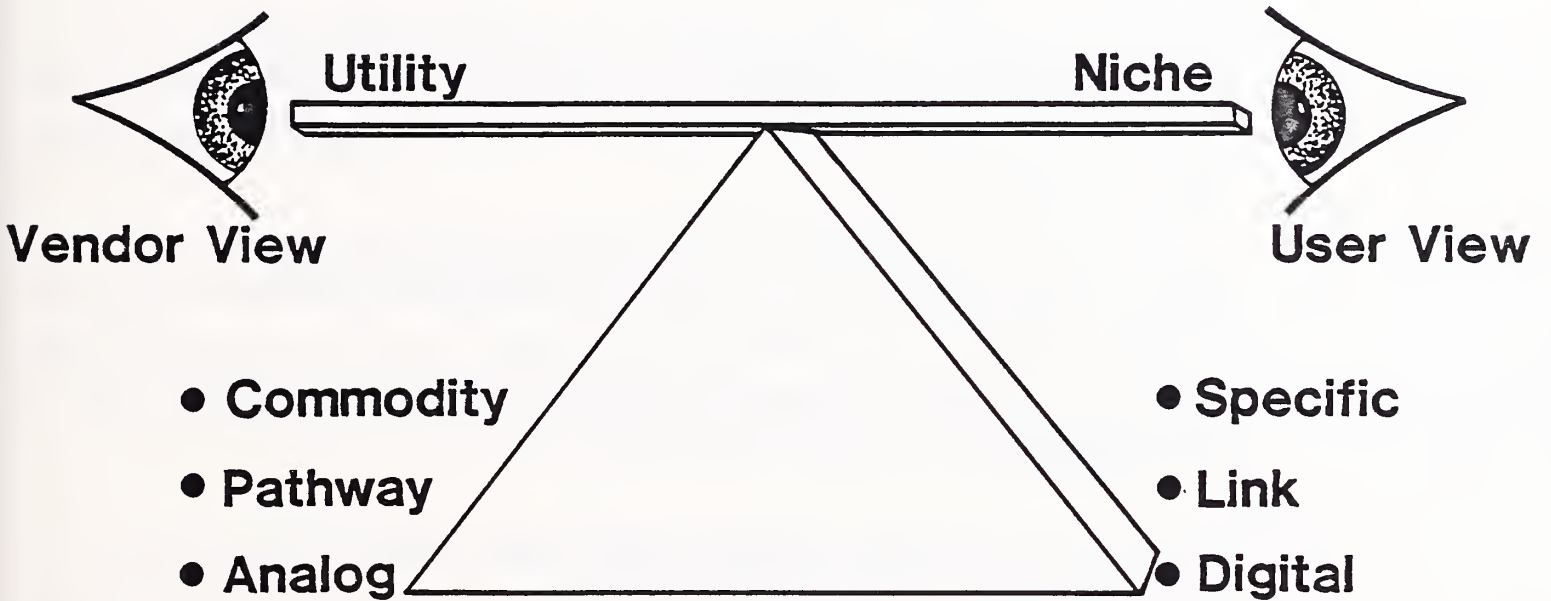
G.   RECOMMENDATIONS TO NETWORK SERVICE USERS

- Users should consider adding technology assessment staff to monitor new developments and make recommendations for piloting new, innovative solutions.

- Users should investigate parallel developments and alternative solutions to problems and avoid the tendency toward the inertia of "comfortable" technologies. To ignore promising trends may mean a loss of competitive advantage and overlooked opportunities.

- Organizationally, the voice and data departments should be merged with cross-discipline training to prepare the way for voice/data integration initiatives in the future.

- Users should evaluate the cost effectiveness of software-defined and virtual private networks as an alternative to private network configurations and develop an organized method of evaluating competitive vendors using a decision matrix.

- ISDN developments should be monitored and management kept informed of both the benefits and risks of ISDN. Use of digital and software-defined networks can provide valuable experience for ISDN. A plan for reusing unneeded equipment when ISDN becomes available should be developed.

- Short-term equipment/service agreements provide flexibility and keep vendors interested in the organization, plus encourage competitive pricing.

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EXHIBIT II-7

RECOMMENDATIONS TO
NETWORK SERVICE USERS

- **Add Technology Assessment Staff; Experiment with Innovations; Merge Voice/Data Departments; Cross-Train**

- **Evaluate Competitive Vendors/Technologies Using a Decision Matrix**

- **Monitor ISDN and Keep Management Informed**

- **Stay Flexible With Short-Term Contracts**

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III NETWORK SERVICES TECHNOLOGY TRENDS

III NETWORK SERVICES TECHNOLOGY TRENDS

- This chapter describes existing and emerging networking technologies, techniques, services, and standards which will have an impact on future network services.

- The chapter is intended as a technology scan to aid telecommunications managers in evaluating technological approaches to networking problems.

A. INTRA-LATA TRENDS

- Intra-LATA services are those provided within a local access and transport area (LATA). The primary service providers are the Bell Operating Companies (BOCs) and independent telephone companies. Together they are called Local Exchange Carriers (LECs).

- Local services are also provided by other carriers and technologies which bypass LEC facilities.

1. BYPASS

- The term "bypass" is defined as replacing LEC facilities for communications between two user premises in the same city or between user premises and the serving office of a long-distance interexchange carrier (IXC).

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- Bypass is most suitable for companies with locally distributed facilities presently linked by leased lines and using high-volume dial-up services. They have often been installed in response to slow service order installation by the LEC.

- Bypass offers users corporate facilities management and cost controls. It may represent replacement of ongoing facilities leasing with a one-time capital expense or use of a service which is not required to levy an access charge.

- Many LECs are offering bypass techniques to mitigate the potential loss of revenue to competitive firms providing various bypass options, and AT&T is planning services to bypass the LECs to connect with their long-distance networks.

2.   LOCAL PACKET SWITCHING NETWORKS

- Value Added Networks (VANs) are most suitable for customers with medium volume data transfer needs throughout a wide area. The VANs provide protocol conversion, meaning incompatible computers can communicate since the data streams are converted to the X.25 standard.

- Several BOCs are planning or are now offering packet switched Local Area Data Transport (LADT) services for low to medium volume data transfers within LATAs. For example:

  - Southern Bell offers Pulselink.

  - Southern New England Telephone Company offers ConnNet within Connecticut.

  - Pacific Bell offers LADT services within the Los Angeles and San Francisco metropolitan areas.

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- LADT costs are lower than VAN services and certainly more economical for local services.

  - New Jersey Bell plans to charge $1 per hour.

  - Southern Bell charges between $0.95 and $1.08 per hour plus $2.20 per month.

  - Southern New England Telephone charges $2.40 per hour.

- VANs also charge more for customers who are remote from a local packet switched node, while LEC prices will be the same anywhere within the service area.

- However, LADT customers will be required to lease local digital lines to packet network nodes (although dial-up access will also be provided) and to buy or lease channel select units (CSUs) and multiplexers both on their premises and at the LEC switching office.

- With some exceptions, LADT services are unavailable for mainframe-to-mainframe links as most will not support Hierarchical Data Link Control (HDLC) or Systems Network Architecture (SNA) connections between IBM mainframes. (Some LECs are planning such services.)

- LADTs can also reduce terminal costs. Due to a common protocol, each terminal can communicate with each host, rather than having separate terminals for each host.

- However, a company with needs to transfer data between incompatible computers may find it more cost-effective to configure a private packet network.

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- VANs do offer virtual private networks, a section of the public network dedicated to a single user.

- The costs of existing data communications need to be compared to the costs of implementing a private packet network and determining if the payback period is attractive.

• LADT services are being proposed for Point of Sale (POS), credit card author- izations, ATM networks, utility remote meter reading, and other applications.

• Interconnection to existing VANs will eventually occur. Pacific Bell, working with other vendors, has prototyped such connections, and Tymnet, working with the Southern New England Telephone Company, has announced inter- connected services, as has ITT World Communications.

• A key advantage to using public VANs, virtual private packet networks, or LADT services is that users can be unconcerned with the added expense of maintenance or network administration.

3. PROJECT VICTORIA

• Pacific Bell has developed a technique to convert a single-voice analog telephone line into a multiplexed, digital, seven channel facility.

- The technology provides two voice and five data transmissions simul- taneously.

- Four data channels operate at 1,200 bps signals and one operates at 9,600 bps.

• The technology is being field tested in Danville (CA), an affluent community near San Francisco.

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- Two hundred homes will participate in the experiment.

- Test participants will have electronic mail via MCI Mail, a community bulletin board, and several on-line data bases.

- Apple Macintoshs will be used.

- Customers will be equipped with a multiplexor supporting connections to two standard RJ-11 phone jacks and five data lines, with the 9,600 bps link-connected to a microcomputer or videotex terminal via a standard RS-232 interface.

• The system offers an open systems architecture in order to stimulate vendor participation and market acceptance. Services will be developed in response to customer demand, and the new technology and services which evolve are expected to become part of services made possible by ISDN.

• Exhibit III-I shows the Project Victoria subscriber-side configuration.

4. NEC's SPECTRUM DIFFUSION COMMUNICATION METHOD

• In what may turn out to be a related development, NEC has simulated data transmission through household wiring.

- The method uses 30 frequencies, operating at up to 9.6 Kbps.

- When transmission characteristics at one frequency degenerate, the transmission is shifted to another.

5. MICROWAVE AND DIGITAL TERMINATION SERVICES

• Microwave is used for both intra- and inter-LATA (long-haul) applications.

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EXHIBIT III-1

PACIFIC BELL'S VICTORIA SYSTEM

Telephone

Modem

Personal
Computer

Fire
Intrusion
Medical
Utilities

Remote
Unit

Single
Telephone
Line

2 Voice/
Analog
Data
Channels

1 Medium-
Speed
Digital
Data
Channel

4 Low-
Speed
Digital Data
Channels

C.
O.
EQUIPMENT

EXCHANGE
SWITCHES
Conversations
Analog Data

PACKET
NETWORKS
Information
Services
Financial
Transactions
Telecommuting

DIRECT LINES
Alarm
Companies
Gas/Water/
Electronic
Hospital/
Medical
Other
Telemetry

a.   Microwave Overview

- Microwave has been the backbone transmission system for long-distance voice networks since the 1950s and has been used since the late 1940s for private communications links by railroads, pipelines, and utilities.

- Despite advances in satellite and fiber optic services, it continues to be a major methodology, with an estimated two-thirds of all long-distance telephone traffic transmitted in this manner.

- Unlike cable-based systems, the microwave right-of-way is free. Although frequencies must be coordinated and licenses secured, links can be quickly established.

- Disadvantages are that microwave is limited to line of sight, requiring repeater stations to account for natural and manmade obstacles as well as the earth's curvature. Environmental conditions can effect efficiency and spectral congestion is found in metropolitan areas.

- AT&T owns most of the long-haul analog microwave networks, which will be upgraded to digital capabilities in anticipation of ISDN. Other large networks are operated by MCI and Western Union.

- Microwave network service directions are coupled with technological advances such as increased channel capacity tied to greater immunity from co-channel interference and the implementation of new multiplexing techniques, spread spectrum technology to add capacity to existing analog systems, and improvements in solid state components.

- Private microwave systems are being established, and local digital microwave services have been authorized by the FCC.

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b.   Digital Termination Service (DTS)

- In 1981, the FCC authorized DTS spectrum in the 10 and 18 gigahertz bands for point-to-multipoint microwave services for business use.

    - Digital Termination Services are common carriers which carry data at speeds ranging up to T-1 (1.544 Mbps) capacity.

    - DTS is also called Digital Electronic Message Service (DEMS).

- DTS services are provided by several common carriers using digital broadcast microwave radios placed on urban area rooftops and small (under one meter) dishes.

- Among those involved are DAMA (Parsippany, NJ), Locate (New York, NY), Tymnet DTS, MCI/SBS (Washington, D.C.), Contemporary Digital Services (New Rochelle, NY), and Digital Termination Service (McLean, VA) which is partially owned by the Southern New England Telephone Company. There are additional localized operations in many metropolitan areas.

- DTS services appear to be searching for a market, and many are seeking relationships with the LECs to provide what would otherwise be called "bypass."

    - The BOCs have found large customers considering bypass due to installation delays and access charges.

    - By providing DTS, the LECs can improve installation time and generate revenues which otherwise would be lost to competitive services.

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6. CENTREX SERVICES

- Centrex is a central office-based service providing many of the features associated with PBXs but obviating the need for customer premise PBX or key equipment.

- The Bell Operating Companies, now free of AT&T which had promoted PBXs, are promoting Centrex, competing with PBX vendors and their own subsidiary equipment sales divisions.

- According to an industry association, the greatest Centrex growth is occurring in locations with under 125 stations. However, many larger users, including government installations, banks, and schools, still use Centrex for city-wide, multiple locations.

    - The BOCs are using special-rate discounts and new services to maintain this larger installation class.

    - This includes rate reductions guaranteed over long contract periods, meaning price stability.

- New features being added include customer premise feature phones and various software offerings. Some of these are controversial as they may fit the category of "enhanced services" which, according to FCC rules, must be offered through separate subsidiaries.

    - However, the FCC has approved most currently offered Centrex features and may approve others.

    - The California Department of Water Resources is beta testing COLAN (Central Office Local Area Network), which is pending regulatory approval. Applications include accounting, spreadsheets, word processing, and data bases.

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- Some of the RBOCs, such as Bell Atlantic, plan to keep Centrex sales within the regulated network services division to prevent conflicts with equipment sales through unregulated subsidiaries.

  - Centrex is seen as a flagship service.

  - An important advantage is Centrex's flexibility to adapt to developing technology.

- According to FCC information, in 1984 there were 5.5 million Centrex lines installed serving some 12,000 businesses, representing 70% of the lines for businesses with more than 1,000 lines. New installations were projected at approximately 500,000 in 1985.

7. CABLE TELEVISION (CATV) VOICE AND DATA SERVICES

- CATV facilities can be used for voice and data services. Since 1983, MCI Communications has run an experimental program called Cablephone.

  - MCI leases space on the cable network and handles calls through its own switching and transmission systems connected to its long-distance network.

  - While originally planned for service in approximately 25 markets, it is only available in eight, including New York, Dallas, and Washington, D.C.

  - Cablephone is targeted to businesses with 24 or more circuits.

- Due to deregulation, major CATV operators are evaluating new service options for their cable installations. Some are already offering institutional data services, typically for banks.

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- Manhattan Cable Company (New York, NY) has the most extensive services, with local data distribution costs far below similar services offered by New York Telephone.

- Cox Cable and Warner-Amex are offering fiber optic loops for institutional data services; however, Cox has withdrawn data services in Omaha (NE) due to low demand and regulatory controversy.

- Only the major CATV companies have extensive experience with complicated telecommunications and computer equipment.

  - The CATV operators' mindset is generally oriented to entertainment and not data or voice communications. Until the market for entertainment services is saturated, new lines of business will not likely be sought.

  - Recent deregulation has eliminated CATV "must carry" provisions requiring coverage of all local signals. This will reduce needs by smaller CATV operators to upgrade facilities to accommodate more local channels and remove impetus to apply surplus bandwidth to unproven ancillary businesses such as bypassing local telco facilities.

  - CATV operators also face investment challenges in wiring newly won franchises and upgrading older systems. Wiring industrial/business areas can be expensive and may not result in ongoing revenues from nonresidential tenants. Data services may not be needed.

- Although INPUT believes that CATV voice and data services are largely technological demonstrations, such services, where offered, are competitive threats to existing network service vendors.

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- However, with the growing availability of fiber optic networks, existing or planned CATV institutional networks may be replaced for metropolitan area applications.

- The intra-LATA methods discussed are shown in Exhibit III-2.

B.   INTER-LATA TRENDS

- Inter-LATA services are those predominantly provided by AT&T Communications, Other Common Carriers (OCCs), and Special Common Carriers (SCCs), jointly called Interchange Carriers (IXCs).

- Services provided range from dial-up long-distance voice services, private lines, and "virtual" private networks (users share the backbone network) to high-capacity links based on various technologies.

1.   800 SERVICES

- Currently, AT&T holds a U.S. monopoly for providing 800 service, also called Inward WATS. In January 1985, a federal court ruled that the company does not need to share its data base or signalling system with the BOCs.

- The BOCs had asked for access to AT&T's 800 data base so they could route such calls for other carriers while their own data bases were being developed. The Department of Justice supported that request.

- More recently, the FCC recommended that a uniform nationwide system for 800 services be allowed and that the IXCs be permitted to enter the market. The agency has asked for comments about how to implement a data base-driven access system which would permit IXCs to market "verbally significant" 800 services, such as "800-CAR-RENT."

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EXHIBIT III-2

INTRA-LATA NETWORK SERVICES

SERVICE	DESCRIPTION	WHO PROVIDES	DIRECTIONS
LADT	Local, Low-Cost Packet Network	LEC/BOC	Interconnection of VANS and LADT Networks (e.g.; SNET/TYMNET)
Project Victoria	Seven Voice/Data Channels	Pacific Bell	Consumer Services Using Existing Wire Plant
DTS/DEMS	Point-to-Multi-Point Digital Microwave Services	Common Carriers	Uncertain Future; Seeking LEC Partners
Centrex	PBX-Type Features	LEC	Added Enhancements
CATV Institutional Services	Voice/Data on CATV Coaxial Plant	CATV Companies	Limited to Major Metropolitan Areas; Fiber Optic Networks Will Supplant

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2.   T-1

- T-1 designates the 1.544 megabits per second digital channels which are used between telephone company central offices.

- Because so much T-1 equipment is used in telephony, it has become a de facto standard for many satellite, fiber optic, and digital radio transmission systems.

- T-1 can support videoconferencing, high-speed digital facsimile, and high speed, high volume data communications with integrated and aggregated voice channels. Twenty-four voice channels fit on a T-1 carrier, although new multiplexing techniques can fit 44.

- AT&T initially offered T-1, called High Capacity Terrestrial Digital Service (HCTDS), in 1983. Later, T-1 was marketed as part of Accunet digital services. T-1 services are now provided by the LECs for local, intra-LATA use, as well as by interexchange carriers.

- Add-on T-1 equipment is sold by manufacturers such as Infotron, NEC, Tautron, Timplex, Amdahl, Avanti, Case, Coastcom, Ericcson, and GTE Lenkurt.

  - Timeplex is working with US Telecom Data Communications Company to market T-1 lines with hardware, providing end-to-end service including network management services. Service can be provided within 30 days.

3.   SWITCHED 56 KBPS SERVICE

- AT&T Communications' Accunet Switched 56 Service was approved in May 1985.

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- This service is an alternative to leased Dataphone Digital Service (DDS) private lines. Since they are used on a switched, usage-sensitive basis, the costs for certain applications can be lower than private links, particularly when volume is insufficient to justify full-time DDS rates.

- Switched 56 Kbps Service allows easy network expansion. The capacity provided supports videoconferencing (using signal compressing codecs), other image applications such as CAD/CAM, and high-speed facsimile exchanges.

- Other applications suitable for Switched 56 Kbps Service include bulk data transfers, use as backup for overloaded periods or service interruptions, use for occasional traffic to remote locations, and use as a replacement for physical transfers of media or paper documents.

- Future applications include dial-up, point-of-sale software delivery, and high quality consumer or theater music and video services.

- The inter-LATA methods discussed are summarized in Exhibit III-3.

4. SATELLITE SERVICE DIRECTIONS

    a. <u>Domestic Satellite Service Directions</u>

        i. <u>Very Small Aperture Terminals (VSAT)</u>

- The trend in satellite services is away from C-band facilities, which share terrestrial microwave frequencies and operate at relatively low power, and toward Ku band implementations.

- VSAT techniques offer an alternative to leased-line, multi-node, dial-up, or private packet networks and to other forms of satellite communications for medium to large, wide area, "thin-route" networks.

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EXHIBIT III-3

INTER-LATA NETWORK SERVICES

SERVICE	DESCRIPTION	WHO PROVIDES	DIRECTIONS
800	Toll-Free Calling	AT&T Monopoly	Coordinated Data Base Allowing IXC Routing
T-1	High-Speed Links at 1.544 MBPS	AT&T, LECs, Others	Integrated Voice, Data, Video Traffic
Switched 56 KBPS	Dial-Up, High-Speed Links between Supporting Cities	AT&T, LECs	Overcoming Different Methods for Inter- and Intra-LATA Services

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- Networks suitable for VSAT applications have many geographically distributed nodes with low data traffic patterns.

- The network is designed to allow remote sites to communicate intermittently with central node processors, although communications between remote nodes is also possible.

- VSAT terminals are under two meter transceiving earth stations.

- The method obviates the need for last-mile connections between user sites and network services such as telephone company central offices.

- Because traffic in VSAT locations is low volume and intermittent, the satellite link can be shared by many users, resulting in low recurring network costs.

- Local weather may affect the channel, with extra power required to "punch through" heavy rainfall. However, some users do not see this as a problem; in fact, the NBC television network uses Ku band exclusively (although larger earth stations) and has been able to distribute programming to affiliates despite hurricanes.

- The up-front capital costs for hardware are relatively high because the technology is new. However, this is changing.

    ii.   Costs of VSAT Services

- The monthly space segment charges for the entire network are between $4,200 and $15,000.

- A user company may use a satellite network service which provides turnkey systems for VSAT applications, managing the network and providing the

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expensive central hub. These vendors include Vitalink and Equatorial Communications.

- Also, AT&T Communications is working with Harris Corporation to develop a VSAT service called Skynet Star Network Service, scheduled to begin in June 1986.

  - Under the agreement, AT&T will market, maintain, and finance user equipment and service the network while Harris provides equipment.

  - RCA's American Communications will supply the space segment.

  - The service will be directed to companies with over 100 remote locations.

  - One way broadcast data and video as well as two-way data communications services will be provided; however, the service reportedly will not be designed for voice only communications.

  - Users will pay between $350-$400 per location monthly, depending on the number of sites.

- Acceptance of VSAT networks is largely dependent on successful implementations by advanced users such as Federal Express, which plans to use the technology to support its ZapMail II facsimile service.

  iii.   Tymnet's Tymstar Service

- The McDonnell Douglas subsidiary offers three optional Ku band networking services:

  - Users may choose usage-sensitive pricing.

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- They may have a fixed transponder allocation representing bulk dedicated services.

- Tymstar will alternately sell a master satellite hub to large users for their own operations.

• The Tymstar service provides multiple protocol support; links to public, private, and international networks; data base access, and multi-media applications (voice, video, fax).

• Transmission capacity of an earthstation is up to 9,600 bps with receive capacity at up to 15 million bps.

b. International Satellite Services

• The monopoly enjoyed by International Telecommunications Satellite Organization (INTELSAT) for private, international satellite service is eroding.

• INTELSAT is a non-profit organization with 110 member nations managing an international satellite network that carries over two-thirds of all international telephone and video transmission.

• It primarily serves as a carrier's carrier, selling services to others rather than directly to users. This multilevel method leads to price markups at each level and has caused criticism on service pricing.

• The U.S. agency represented in INTELSAT is Communications Satellite Corporation (COMSAT), which held exclusive rights to sell INTELSAT pathways to U.S. customers. Some 25 U.S. international carriers access the system.

• In late 1984, President Reagan determined that new, U.S.-based, international satellite services were required for the national interest. Subsequently, the FCC approved proposals for competitive services.

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- Legislation approved in 1985 restricts new entrants to specialized video and digital business services outside the public switched network (i.e., for private use). It also recommended that INTELSAT be granted greater pricing flexibility.

- These actions come in an environment of increasing domestic telecommunications competition which is felt to have provided significant price and service benefits to users.

- The erosion of INTELSAT's monopoly is not without controversy.

    - INTELSAT officials fear new satellite offerings will siphon business from the agency's heaviest routes, resulting in lower subsidies for services to developing nations, and may lead to cutbacks in free satellite time offered under various health and education projects.

    - In approving new competitive international services, the FCC said that new systems would not cause economic problems to INTELSAT.

- INTELSAT is positioning to combat these developments.

    - It is planning to offer capacity for member nation domestic services, a move which may undercut some competitive plans.

    - It is also establishing revised guidelines regarding the economic effects of competitive systems to demonstrate that it will be harmed by new offerings.

- Among the companies planning international satellite services is Pan American Satellite (PanAmSat), affiliated with the Spanish International Network which provides Spanish language television programming throughout the U.S. PanAmSat is planning a Latin American service and has an arrange-

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ment with Cygnus, another company planning international services for European coverage.

c.   Future Satellite Directions

i.   Ka Band - Beyond Ku

- Advanced planners were looking to higher frequencies to fill needs after C-band and Ku band capacity became scarce.

- Until passage of the Gramm-Rudman Bill, NASA had planned to launch the Advanced Communications Technology Satellite (ACTS) in 1989, employing new techniques to reduce message costs, permit rapid switching among many ground stations, and relay traffic to other satellites.

    - The satellite would operate in the 30 gigahertz band.

    - The system was to demonstrate new satellite applications for the marketplace of the late 1990s and beyond.

- Also, in Spring 1984, Lockheed engineers ground tested a large satellite antenna being developed for NASA.

- A number of factors will delay these developments:

    - Federal budget cuts which have forced postponement of the ACTS project.

    - Increasing utilization of existing and planned satellites through reduced orbital spacing.

    - The growing availability of fiber optic capacity.

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- Accordingly, development of satellite technologies beyond Ku band and mobile satellite applications (discussed below) will probably not occur until the 21st century, although an Italian satellite with Ka band capabilities is scheduled for launch within the next few years. It will serve as a research and development vehicle to pave the way for future Ka band development when, and if, the need arises.

ii. Mobile Satellite Service (MSS) Proposals

(a) Overview

- Existing and developing mobile telephone systems are limited in range to the nearest relay station which connects to the public switched telephone network (PSTN).

  - Cellular radio and other mobile systems will be available in an estimated 10% of the U.S. land area.

  - For services in the other 90% of the country, entrepreneurs are looking up to satellites to provide a "switch in the sky" for mobile services.

- Twelve companies are competing for FCC authorization to provide voice and messaging services based on work performed by NASA.

  - Among the more viable are Hughes Communications Mobile Satellite Service, Inc. (El Segundo, CA), Mobile Satellite Corporation (King of Prussia, PA), Omninet (Los Angeles, CA), Skylink (Boulder, CO), McCaw Space Technologies, Inc. (Bellevue, WA), and Atkinson/Transit Communications (Sacramento/Pasadena, CA).

  - Several of these companies are profiled in Chapter IV.

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- NASA's MSAT-X (mobile satellite experimental) program demonstrated mobile communications through satellite repeaters using modified GE mobile radio equipment and the aging ATS (Advanced Technology Satellite) series of communications satellites launched in the 1960s.

- In 1983, NASA proposed an FCC spectrum set aside for system development and for exclusive (i.e., monopoly) mobile satellite use.

  - The space agency plans to enter an agreement with one mobile satellite firm under a barter arrangement, with NASA trading a portion of a shuttle launch in exchange for 15% of the commercial satellite's capacity.

  - NASA will develop the technology for automobile rooftop antennas.

  - Testing would take place over two years, after which time government agencies could contract with the commercial operator for services.

  - Funding would come from the private sector, which would use most of the system's capacity.

- NASA's controversial proposal describes a system which emulates cellular radio.

  - Each geographical cell uses separate spot beams to and from the satellite relay.

  - Subscriber units would work as cellular phones when in range of an urban system and would communicate via satellite otherwise. The user throws a switch for the desired service, similar to an AM/FM selector switch on car radios.

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- Gateway earthstations would collect satellite traffic and connect to the public telephone network via microwave or landline.

• In addition to car telephones, mobile satellite service can provide rural telephony; services for isolated workers such as survey, forestry, or petroleum industry crews; and emergency communications during natural disasters or hijackings.

• Markets for remote and rural telephony services are also evolving in other countries characterized by sparsely populated areas, such as Canada and Mexico, which are actively developing variations on this type of service.

(b)   Controversy and Competition

• The petitioners for MSS frequencies estimate satellite launch in the 1987-1989 timeframe, but this is likely to be delayed. There is skepticism and controversy about mobile satellite services.

• A partnership between Atkinson System Technologies (Sacramento, CA) and Transit Communications (Pasadena, CA) has suggested that voice MSS applications would be spectrally inefficient and economically unfeasible. It is proposing alphanumeric data communications services for fleet operations.

- This service class would be compatible with the Department of Defense's Global Positioning Service (GPS), which will be opened to commercial users.

- Message-oriented MSS coupled to GPS will afford interstate transportation companies with greater fleet operational controls, resulting in productivity increases estimated between 10% and 30% by one promoter, as well as security features.

- Transit Communications is the designer and developer of a pilot program involving Federal Express Corporation, called Mark II, using NASA's ATS-3 satellite and modified mobile terminals from Mobile Data International (Richmond, British Columbia) to test MSS and GPS services.

   - Messages are relayed between the Federal Express Operations Center in Memphis (TN) and delivery vans in remote areas of the country.

   - Pilot program participants other than Federal Express will use micro-computers and a public data network to communicate with their vehicles through the Memphis gateway.

   - Federal Express has an 800 Mhz radio-based digital message and dispatch system in major metropolitan areas connecting delivery vans and foot carriers using hand-held radio terminals; however, frequency congestion and needs for broader coverage are motivating evaluation of MSS.

   iii.   Global Positioning Services

- Being considered along with MSS are proposals for commercial Radiodetermination Satellite Services (RSS). There are competing and complimentary approaches.

- The Department of Defense's (DoD) Global Positioning System is scheduled to be fully operational by 1988.

   - It will consist of 18 satellites in low earth orbits, each broadcasting navigation information.

   - Civilian services will be provided without charge, but the accuracy of GPS codes will be degraded so that location can be estimated only within 100 meters. However, this can be improved through allowed correction techniques.

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- GPS is being evaluated by the Federal Aviation Agency as a possible sole means for civilian air navigation, but signal degradation that can affect flight safety may preclude its use.

- The Atkinson/Transit partnership says GPS can be economically integrated with its proposed alphanumeric messaging service.

- Geostar Corporation (Princeton, NJ) has demonstrated technology using cigarette pack-sized transceivers powered by penlight batteries for positioning within seven meters.

  - Applications include air, land, and marine navigation; fleet control; and emergency services.

  - The Geostar system may also be used for short messages.

  - Each transceiver has a unique identifying code and is addressable.

- Meanwhile, Motorola is promoting equipment called an automatic vehicle location (AVL) system using the U.S. government's LORAN-C marine navigation transmitters.

  - LORAN-C was originally intended for coastal and Great Lakes navigation, but is now being used for light aircraft. It covers approximately 75% of the U.S. land area and more than 90% of the urban population.

  - AVL mobile units have circuitry to interface with existing mobile radio units permitting data communications between fixed-end computers and the mobile unit.

- The AVL system avoids the expense of building and maintaining a backbone network to support the service, and since it uses existing voice channels for

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retransmitting location information, it avoids the associated costs and licensing ramifications of additional mobile radio equipment and channels. However, it does not provide service throughout the U.S.

iv.   Implications for Network Service Users

• Some companies applying for commercial MSS authorizations are pre-selling services and offering price breaks to early signers.

• Prospective users must balance the dangers of committing to excess capacity with the opportunity to gain a competitive position by signing early for sufficient capacity. Of course, this assumes the applicant will be successful.

• MSS system launch and construction will cost between $41 million and $709 million. To recover this investment, a system must run near capacity from start-up. The market is too small for multiple players; a monopoly condition will most likely prevail.

• Exhibit III-4 summarizes these satellite network directions.

C.   HARDWARE, INTERFACE, AND RELATED TRENDS

1.   FASTER MODEMS

• Occasional data communications needs often do not justify the expense of leased lines or private or virtual private networks.

-    Occasional network access through VANs requires connecting through dial-up ports which may support limited speeds.

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EXHIBIT III-4

SATELLITE NETWORK SERVICES DIRECTIONS

SERVICE	WHO PROVIDES	DESCRIPTION	DIRECTIONS
IBS	INTELSAT, Others	Private International Networks	More Providers
VSAT/Ku Band	AT&T, TYMSTAR, VITALINK, EQUATORIAL, Others	Wide Geographic, Thin Routes, Over 100 Sites	Increasing Data and Video Usage
Ka Band	NASA	High Frequency Development Stage Technology	Development Stalled
MOBILSAT	Start-ups	Cellular Fill-in, Messaging	Launch 1987-1989; Monopoly?
GPS/RSS	DoD, GEOSTAR, Motorola/ LORAN-C	Location Finding	Integrated with MOBILSAT?

- Accordingly, direct dial up links between transmitting and receiving sites are often desirable and become more attractive with the introduction of faster modems.

• Modems supporting full duplex 2,400 bps dial-up access are now common; however, in 1984 the V.32 standard was approved by the international standards organization CCITT for full duplex, 9,600 dial-up communications for both synchronous and asynchronous links.

• The costs of high-speed modems limits their acceptance. However, they do represent a competitive technology to network services. Specific applications may have quick pay-back rates when used over dial-up or leased lines compared to network service use.

• INPUT expects modems and other communications equipment such as protocol converters to eventually become computer-integrated options rather than remain as standalone devices.

2. NEW COMMUNICATIONS PROTOCOLS ARE EMERGING

• Two relatively new dial-up, error-correcting, communications protocols are emerging, backed by competing entities.

a. MNP

• The Microcom Networking Protocol (MNP) error-correcting protocol will probably be submitted for certification to the American National Standards Institute and the CCITT.

- Modem manufacturer Microcom took the unique strategy of separating the protocol from its communications software, thus making it machine independent, and offering the protocol to vendors for use in both hardware and software.

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-       A number of network vendors, including IBM, U.S. Telenet, MCI, British Telecom, AT&T, and the European standards committee CEPT (Conference of European Posts and Telephones), are embracing the protocol which is modeled after International Standards Organization (ISO) specifications.

b.   <u>X.PC</u>

- Competing with MNP is X.PC, developed by the Tymnet division of McDonnell Douglas.

    -    X.PC is fully in the public domain, while MNP charges implementers a $2,500 licensing fee for half of the six-level protocol (the other half is now in the public domain).

    -    It is a subset of X.25 packet networking protocol and, with modifications, will support X.32 high-speed, dial-up, synchronous implementation of X.25 communications when supporting equipment becomes available.

    -    However, X.PC does not have a file transport protocol, although to be more competitive with MNP, Tymnet is considering developing this feature or adopting an existing standard such as the X.400 electronic mail standard. Currently, file transfers are accommodated on an application-by-application basis.

    -    MNP also enjoys a larger installed base and will revert to normal asynchronous communications if one modem on the link does not support MNP. This is not possible with X.PC.

- It is expected that MNP will become at least a de facto standard. Use of products incorporating it will alleviate the problem of having to accommodate multiple communications protocols for remote EDI communications.

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- However VANs are not uniformly adopting MNP. Those that have say they will also offer X.PC if users demand it.

- While it is too soon to confirm, both protocols may coexist, requiring VANs to supply ports for each.

- INPUT's survey found users rating the importance of error correction at midpoint, with 75% of the respondents saying that based on their current understanding of the two protocols, they do not have a preference for either. The balance are evenly divided. Several users further volunteered that they "don't care" about these two protocols, some saying they are redundant.

- Error-correcting protocols are more important to users transporting statistical rather than textual information and for high- rather than low-speed data transfers.

    - High quality lines and modems have less need for error correction.

    - Therefore, these protocols are not critical to most users.

- While several modem manufacturers have announced support for one or the other protocol, only a few have implemented it, indicating uncertainty about user demand.

3. THE CORPORATION FOR OPEN SYSTEMS

- In January 1986, the Corporation for Open Systems (COS) was formed by members of the Computer and Communications Industry Association (CCIA) to provide a forum for the development of interoperable, multivendor products and services based on agreed international standards such as OSI, CCITT, ISDN, and others.

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- The formation of COS comes after the National Bureau of Standards said it could no longer support its current level of standard setting and testing work to guarantee open connections between various types of systems.

- By being established by an non-profit, industry-wide group, COS hopes to avoid antitrust implications. It believes its activities are within parameters of the Research and Development Joint Venture law approved in 1985 by Congress and has petitioned for Justice Department approval of its activities.

- Approximately 40 companies are now members of COS. The founders each contributed $325,000 for two years of funding.

- The members include: Amdahl, AT&T, Bell Communications Research, Burroughs, Control Data, Digital Equipment, Harris, Hewlett-Packard, Honeywell, IBM, NCR, National Semiconductor, Northern Telecom, Sperry, Tandem, Telex Computer, Wang Laboratories, and Xerox.

- It is notable and regrettable that as of this writing no users are represented in COS.

- The challenge facing any standards-setting body is to find a balance between standards which are narrow, leading to limited acceptance, and those which are too general and of little use.

- The fact that IBM has joined COS indicates a degree of commitment to open communications systems.

  - However, it is believed IBM will attempt to influence the corporation's work relative to SNA.

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- IBM will also be able to monitor connectivity issues between its de facto standards and products using OSI and CCITT standards.

• To date, OSI standards have been slowly evolving, with only the lower levels of the hierarchy being significantly addressed.

• COS will not be concerned with setting specific communications standards but will focus on testing and certifying vendor implementations of approved specifications from standard-setting bodies, particularly important for inter-organizational communications where multivendor environments exist.

• COS' work will probably encourage new enterprises to develop new products fitting identified communications needs.

4. PBX DIRECTIONS

a. Advanced PBXs

• Any view of network services directions needs to consider advanced generation PBXs.

- These voice/data switches are distributed processors which integrate LANs by design, forming the core for corporate office systems and telecommunications.

- Due to a modular design, advanced PBXs can be easily upgraded for increased capacity.

• Despite vendor claims that advanced PBXs digitize data, the physical switching equipment is analog. Data capabilities are supported by the resident software. Since twisted pair is the primary transmission medium, speed is generally limited to 9,600.

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- INPUT's research finds that approximately half of the respondents questioned have not integrated voice and data communications management functions. Since advanced PBXs can involve both voice and data communications (although such integration is slowly being adopted), there are often political and organizational implications for users.

b.   Computer-to-PBX Interface Alternatives

- Two alternate proposed standards are being proposed for computer to advanced PBX interfaces. These are designed for the coming ISDN environment which will replace modems with digital interfaces.

- The two specifications are:

    - Digital Multiplexed Interface (DMI) proposed by AT&T. DMI is not yet available but will fully match ISDN standards when they are finally determined.

    - Computer to PBX Interface (CPI) was jointly developed by Digital Equipment Corporation and Northern Telecom. Its supporters are focusing on a need for an immediate implementation in preparation for ISDN.

- The goal of both proposed standards is universal acceptance while reducing costs and complexity.

5.   DATA COMPRESSION

- Users are maximizing line usage through several means including data compression; however, the use of the technique is likely to be short term as new technologies and competition reduce line costs.

- Also, there is some reluctance by users to add another piece of equipment requiring additional support and maintenance to the network.

- Data compressors increase line throughput 30%-50% or more without replacing or upgrading modems or Digital Service Units (DSUs).

  - They allow for lower line speeds which are less sensitive to line noise.

  - They often incorporate their own error correction.

  - Combinations of protocols and baud rates can be accommodated.

- Data compression equipment is available from companies such as Chung Telecommunications (Palo Alto, CA), Nokia-Kinex Corporation (Largo, FL), Racal-Vadic (Sunnyvale, CA), and Symplex (Ann Arbor, MI).

- The trend is toward integrated equipment, incorporating statistical multi-plexers as well as algorithm-based compression. Units cost between $800 and $6,000, depending on configuration. Integrated systems with 100 ports are priced at approximately $30,000.

6. VOICE COMPRESSION

- Voice channels, operating at 64 Kbps can be compressed to as low as 2.4 Kbps, leading to cost savings by increasing the utility of available bandwidth.

- Other advantages are that voice compression facilitates encryption and enhances security, especially critical for governmental networks.

- Further, voice compression enhances the ability to integrate voice and data with the attendant benefits of greater overall cost and network controls.

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- Although more bandwidth will become available due to fiber optic networks, several telecommunications techniques such as VSAT and other thin route systems will benefit from compressed voice techniques, primarily due to the need to conserve spectrum and bandwidth.

- Exhibit III-5 summarizes the impact of these hardware and standards directions.

D.   OTHER NETWORK DIRECTIONS

I.   VIRTUAL PRIVATE/SOFTWARE DEFINED NETWORKS

- New network offerings will provide a combination of public switched and leased line services enhanced with call-processing features for the quick implementation of "virtual" private networks supporting both voice and data.

    - These services will be more widely available in the 1987-1988 time-frame.

    - Such networks can be cost-effective alternatives to fully private networks.

    - They will provide economies of scale since network services are shared.

    - Also, virtual private networks will reduce access line costs, the fees charged for dedicated lines to telephone company central offices, permitting easier economic justification for smaller locations than for regular networks.

    - Virtual Private Networks fit the user need to have control over networks by reducing reliance on the vendor for moves and changes.

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EXHIBIT III-5

HARDWARE AND STANDARDS DIRECTIONS/IMPACT

DIRECTION	IMPACT
Faster Modems	When Costs Moderate, Improves Throughput
Competing Dial-Up, Error-Correcting Protocols	Most Needed for Low-Quality Links
Corporation for Open Systems	Certification of Standards Implementations
Integrated Voice/Data PBX	Data Capabilities Slowly Being Implemented
Competing Computer-to-PBX Interfaces	Interface Standards for ISDN
Data Compression	Not Needed as Link Costs Decrease
Voice Compression	Benefits Thin-Route Communications Methods

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- Among vendors planning these services are:

  - AT&T Communications with the Software Defined Network (SDN).

  - MCI with V-Net and recently with Satellite Business System's Virtual Private Network.

  - U.S. Telecom (now U.S. Sprint and incorporating Isacomm, Inc.) with a service called Virtual Private Networks.

  - Western Union with its announced Software Defined Network Services (SDNS), a dedicated service with proprietary billing software and a wide area service called Optimized WATS.

  - Litel Communications with its planned 1987 service launch.

  - Starnet (owned by Ford Aerospace and Communications) also with a planned 1986 service announcement.

- Local access will be handled with leased private lines. A geographically dispersed corporation's local access points will be connected through the public network but bypassing the local telco for a virtual private network based on current requirements.

  - AT&T will be responsible for links between network access points only.

  - MCI/SBS will offer end-to-end error control.

- As requirements change, the telecommunications manager can reconfigure the network from a micro or a terminal.

- Features will include selected routing, call handling instructions, and address translations allowing a four- to seven-digit calling plan for any network address.

  - Network configuration and features will be chosen from a menu.

  - Call detail reports will be available for network management, design, and departmental chargeback.

- Pricing for virtual private network services has not been finalized. However, an AT&T tariff filing calls for billing based on time of day and distance.

  - There is a monthly recurring charge of $5 per access line grouping and a nonrecurring network implementation charge of $105,000.

  - Special, optional features are charged separately.

- Virtual Private Networks will be most suitable for large companies with:

  - Dispersed natiowide locations. AT&T says the offering will be suitable for over 20 locations.

  - Regular, although sporadic, communications between those locations. AT&T says companies with over 100,000 minutes of monthly traffic will benefit from SDN.

  - Needs for centralized management and network flexibility.

  - The in-house ability to manage and reconfigure a network.

- The primary disadvantages are that users will be dependent on one vendor and will need to manage the complicated, continuing task of network optimization and redesign.

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- Virtual Private Networks are a step toward the Integrated Services Digital Network (ISDN).

    - When implemented, ISDN will support dynamic allocation of bandwidth (DAB) supporting a mix of voice, data, and image communications over the same facilities.

    - ISDN will be directly competitive with Local Area Networks, Value Added Networks, and customer premises PBX switch equipment.

    - ISDN is discussed in greater detail below.

- Users interviewed by INPUT indicate interest in SDN, but some voiced skepticism. They will require proof that SDN works.

    - Some indicated concerns that SDN would not be available in all geographical areas, which would affect their level of interest.

    - Some voiced concerns over SDN's appropriateness for voice and data integration, and indicated preference for routing data traffic over unshared links for security and reliability.

- SDN represents network service vendors opening their internal software network control to users.

2. INTEGRATED SERVICES DIGITAL NETWORK

   a. Background

- Just as the computer business has changed in its technology, applications, and distribution, the communications industry is also changing. The two industries are more interrelated and interdependent than ever before, and they will progress in tandem.

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- This mutuality is perhaps best shown in the developing Integrated Services Digital Network (ISDN), which is evolving from the public switched telephone network (PSTN) and is a step toward what AT&T conceptualizes as the Universal Information Services Network (UISN).

    - ISDN will enable users to pass information at 144 Kbps.

    - The network will support 64 Kbps for data, 64 Kbps for voice, and 16 Kbps for common channel signaling.

    - It will use standard, twisted pair wiring.

- The intent of ISDN is to integrate all communications services in a digital pipeline, universally available from end-to-end.

    - ISDN will enable the LECs, through Centrex, to provide technologically advanced customer services, thus helping to prevent bypass.

    - As the LECs install digital central offices, it is in their interest to extend digital capabilities to customer premises.

    - Regardless of user needs, ISDN will likely be developed by carriers, primarily because of its technological "back office" digital benefits. The extension of these benefits to user applications is, in some ways, an additional opportunity.

- However, developers do need to pay attention to user needs. Without this, the integration scheme may turn out to be a good idea which fails. Only now is consultation with potential users beginning.

INPUT

b.   International Complications

- The International Telegraph and Telephone Consultative Committee's (CCITT) objective is to establish standards for performance, interconnection, and maintenance.

    - The work of the CCITT is complicated since most countries have government-controlled networks.

    - These countries are largely able to dictate to users the communications services offered.

    - Consequently, much of the information on which ISDN standards are based comes from countries which are not compelled to consider market needs before new services are introduced.

- In the era of deregulation, U.S. users are faced with a confusing plethora of network options and suppliers. INPUT's research has found some skepticism regarding ISDN and its ability to meet the needs of telecommunications users.

- INPUT also found that interim standards are being used for field trials which are not completely coordinated, although Bell Communications Research will be coordinating technical information sharing while market research information will remain proprietary.

c.   Survey Results

- Nearly half of the users surveyed report that they are monitoring ISDN developments, while one-third are actively planning to take advantage of its capabilities and several are anticipating ISDN experimentation as early as this year. One-fifth of those surveyed admitted to ignoring ISDN events.

- 66 -

- On average, users expect ISDN to become available to them in the 1989-1991 timeframe, with those in metropolitian areas estimating earlier implementation and those in rural areas not expecting ISDN services anytime soon.

d. Why ISDN?

- Currently, users employ a variety of networks for voice and data requirements, each having different access schemes.

- ISDN, with the telephone network as its core, is intended to ease the problems associated with managing multiple links.

- Users will have a digital pipe and may select a variety of services and bandwidths, as shown in Exhibit III-6.

- One of the primary objectives of ISDN is to inhibit further evolution of separate voice and data networks to take advantage of the economies and reliability of digital transmission, switching, and signalling and to provide users with a universal interface or connection to a universal network.

- Applications for ISDN include telemetry for remote meter reading, energy management, and security functions; interactive applications such as videotex and electronic mail; higher speed applications such as videoconferencing; and beyond to more speculative possibilities.

- It is anticipated that voice will initially constitute the majority of ISDN traffic when it is implemented.

e. ISDN Timetable

- ISDN is expected to evolve over three consecutive phases spanning a decade or more, as shown in Exhibit III-7.

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INPUT

EXHIBIT III-6

CONCEPT ILLUSTRATION OF AN ISDN NETWORK

EXHIBIT III-7

- 69 -
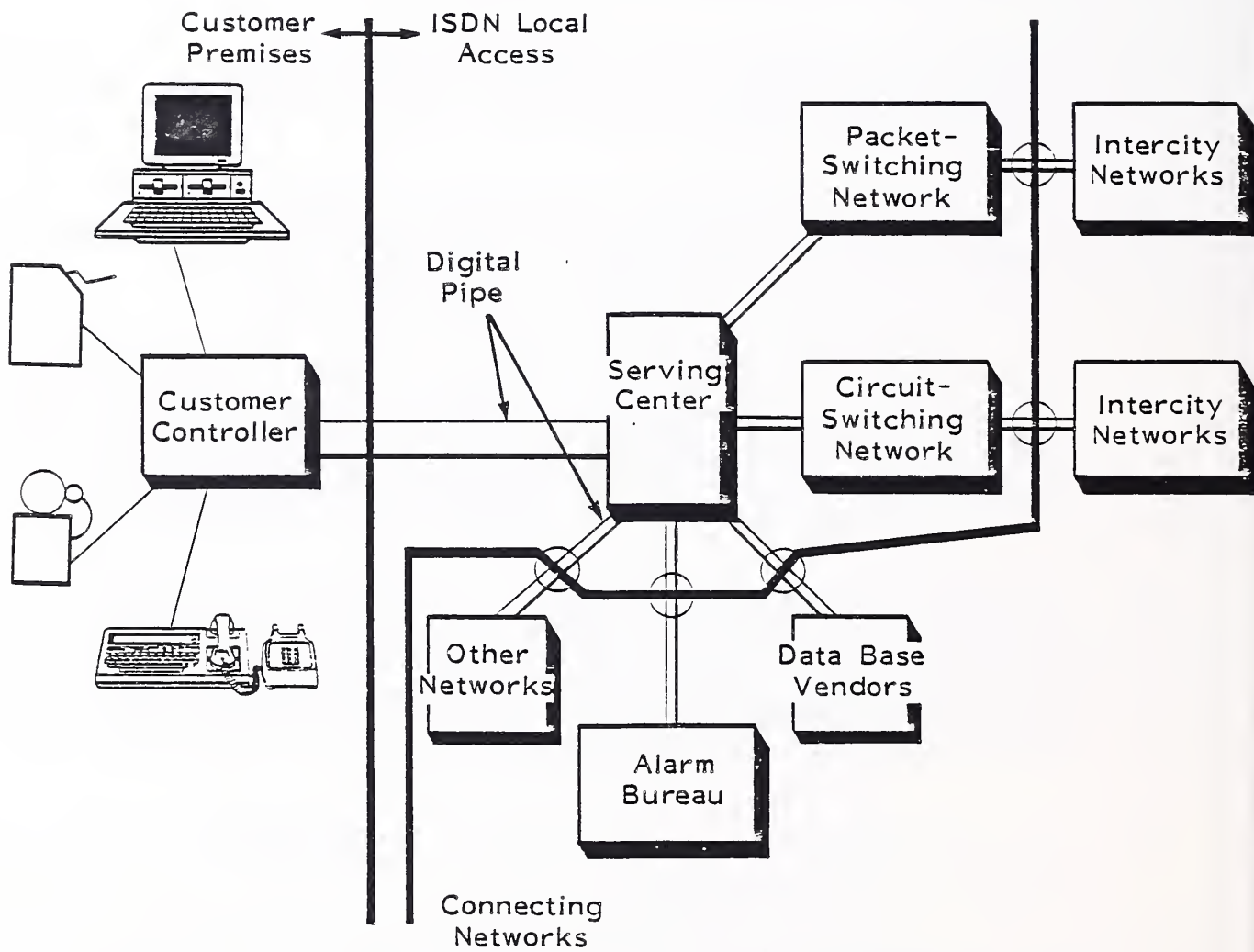
ISDN TIMETABLE

TRANSITION 1983-1987	FIRST GENERATION 1987-1991	SECOND GENERATION 1991 & BEYOND
Pre-ISDN Services, Pilots	Integrated Access	High-Speed Data and Video Capability
Separate Access Facilities - Alternate Voice and Data	CCITT-Standard Equipment Interfaces	Integration of Circuit and Packet Switching
Expanded Digital Capability in Local Loops and Switching Exchanges	Simultaneous Voice and Data at 64 KBPS Expanded Customer Control - D Channel Signaling	New Services Wide Geographic Availability
Increased Use of Common Channel Signaling 64 KBPS Clear-Channel Transmission CCITT ISDN Standards		

INPUT
MSP2

- The transition phase is distinguished by expansion into the PSTN of common channel signalling and digital capability in the local loops and between switching exchanges.

- This phase is characterized by pre-ISDN services such as the Software Defined Network (discussed earlier in this chapter).

- The second generation phase will see a shift toward higher speed data and video capabilities and the integration of circuit and packet switching into a single transport.

    - New services will emerge as suppliers gain a better understanding of the capabilities and benefits of ISDN.

    - New hardware is already being sold in anticipation of the new network environment, although standards for hardware interfaces remain to be standardized and very large-scale integrated circuits (VLSI) are being developed.

    - Existing 56 Kbps transmission lines will ultimately be converted to clear-channel 64 Kbps lines.

    f.   Piloting Now Underway

- Public demonstrations of ISDN's capabilities are being conducted by several LECs, primarily to gather market research.

    - For example, Wisconsin Bell Telephone's preliminary information indicates users want ISDN tailored to specific communications needs.

    - Wisconsin Bell officials indicate research will be focused on targetting customers in order to refine the findings, which will then be used to forumulate product offerings.

- 70 -

- Approximately 12 other field trials are scheduled; however, most do not have firm customers.

g.   Pricing Issues

- Pricing or tariffs for ISDN services is unresolved.

  - Since all transmissions will be digital, there is a question regarding the fairness of charging for all ISDN services equally.

  - While a digital stream is a digital stream, there are differences in what that stream carries.

  - Per bit tarrifs would provide a comparative basis for users to determine which method will be choosen for transmission.

  - However, if tariffs are based on content rather than speed and duration, then artificial demands may result, affecting the inefficient supply of services.

h.   ISDN Services

- Exhibit III-8 depicts a likely scenario for the distributiion of ISDN services.

- The center ring is the PSTN through which most ISDN traffic will be routed.

- The second ring represents the enhanced services providers who will typically use the basic service carriers to transmit value added services to users.

- The third ring incorporates basic service suppliers delivering subscribed information to end users.

INPUT

EXHIBIT III-8

ISDN DISTRIBUTION SERVICES
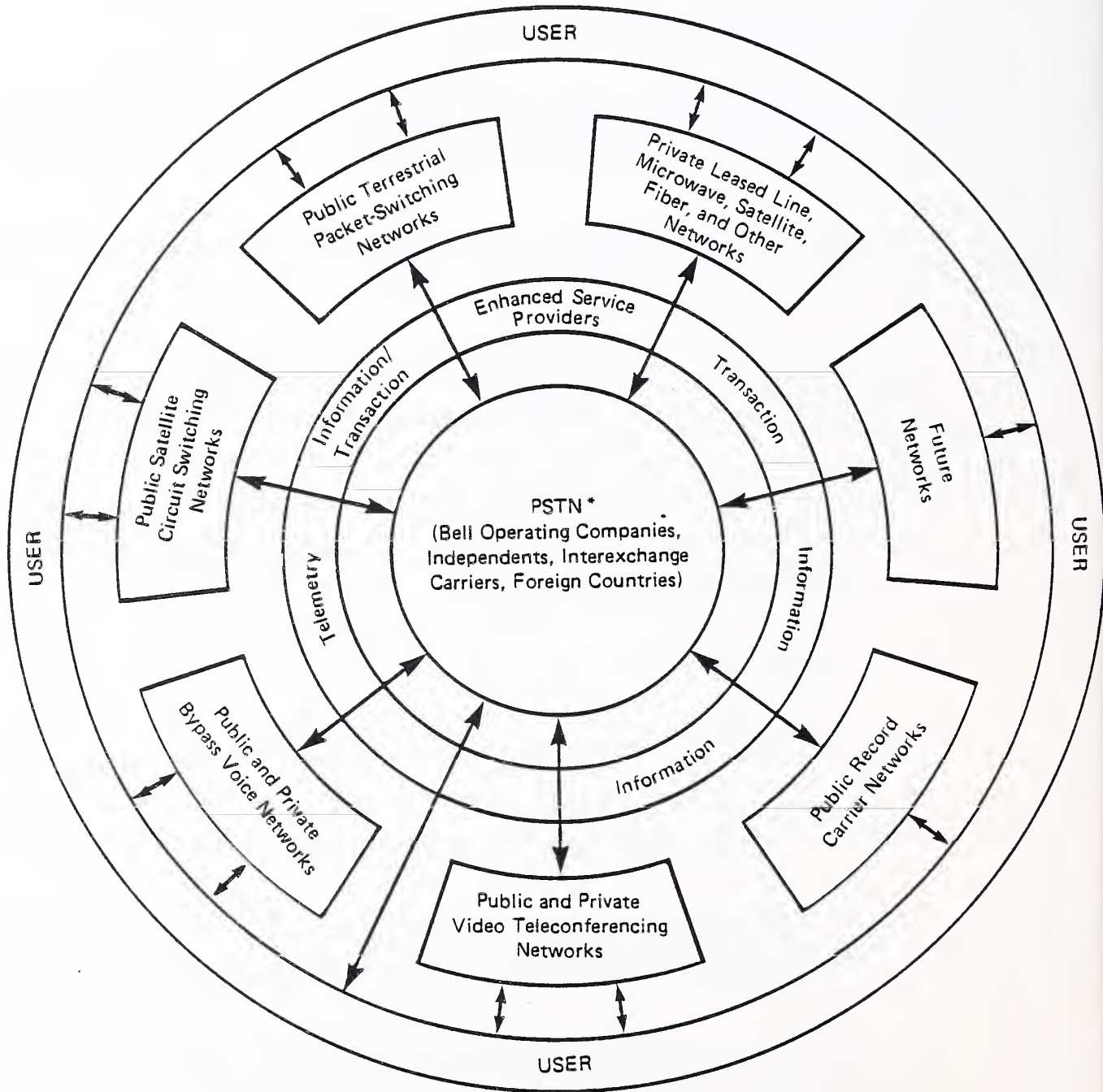
* PSTN = Public Switched Telephone Network

- Finally, the user is shown encompassing the entire ISDN. Users have the purchasing power to determine the viability of all other elements.

   i.   User/Vendor Perspectives

- INPUT's 1985 study <u>Integrated Voice Data Communications</u> found that network service providers, especially telcos, are not only very cognizant of ISDN developments, but are actively incorporating ISDN protocol standards into their service planning activities. This finding was confirmed in the vendor survey conducted for this report.

- The research found that prospective users will be interested in ISDN only if it will reduce communications costs.

- Telecommunications users view ISDN as a new solution to existing problems. If ISDN proves too expensive, then users will find their own solutions in a deregulated and competitive communications market, thereby negating years of standardization work.

- If ISDN is both technologically and economically successful, it will offer a standard for global voice, data, video, and other communications. However, success will require maximum cooperation among industry participants and extensive market research into users' needs.

- ISDN is a relatively new concept and it should be considered as a long-term strategy.

   - ISDN will not immediately become a standard, as the timetable shows.

   - It will initially develop in private networks, with public networks first appearing in major metropolitian areas.

   - ISDN will likely coexist with other network systems.

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INPUT

- One future development which will work to forward its implementation is deterioration in the local loop due to the LECs losing revenue to bypass.

  j. Vendor Strategies/Standards

- Although some vendors, such as IBM, are intent on retaining proprietary standards (i.e., SNA), thus stalling adoption of ISDN standards, state Public Utility Commisssions may allow the LECs to forge ahead with ISDN on their own.

- A key question facing vendors is one of appearances. Most have taken a position on ISDN, although many have not yet begun to put their engineers to work on how it will be implemented. Vendors which have an ISDN position present a "cutting edge" image to their prospective clients, regardless of the immediate importance of that position.

- When ISDN becomes a reality, the impact will be felt by the existing packet networks; ISDN implies universal data, voice, and video communications through the PSTN. The best response may well be a cooption of the technology and continued development of "value added" enhanced services directed toward specific needs.

- Exhibit III-9 summarizes ISDN's directions and issues.

3. FIBER OPTICS (FO)

  a. Overview

- One of the most important directions in network services is the implementation of FO networks for both the long haul and, increasingly, in the local loop.

IN

EXHIBIT III-9

ISDN DIRECTIONS/ISSUES

- **Evolving - Private Nets First**

- **Unsettled Standards**

- **Delays in Pilots (Software)**

- **User Monitoring/Vendor Positioning**

- **Impact on Network Services (X.25)**

INPUT
MSS1 MSP2

- For most users, the dominant problem remains in the final mile of the connection to extend FO's benefits to user locations.

- FO systems can be more effective than satellite systems for high-speed, point-to-point voice and data traffic. Satellite systems remain more efficient for broadcast or multipoint applications.

- Because of its benefits, the risk to vendors hoping to participate in fiber optic networking is a crowded marketplace leading to more capacity than the presently required, with resulting price cuts and financial difficulty.

    - These events are already taking place, with several of the announced FO companies delaying construction or forming partnerships to aggregate resources.

    - A late entry must be carefully considered.

- Users ultimately benefit from the low costs borne of competition, and new applications designed to take advantage of the exponential increase in network capacity made possible by FO will presumedly be found.

- More discussion on a developing network capacity "glut" can be found in Chapter V.

b.   Nontraditional Partners

- Companies with existing real estate rights-of-way have become partners in FO ventures.

- Among the joint ventures are:

    - Lightnet (New Haven, CT), formed by CSX Corporation (a railroad/natural resources company) and Southern New England Telephone (SNET).

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IN

- Fibertrak (Reston, VA), formed by the Sante Fe Southern Pacific and Norfolk Southern railroads. The company has suspended plans for a national network indefinitely due to financial problems.

- Litel Telecommunications, backed by Centel, Alltel, and Pirelli.

- Microtel, formed by ALC Communications, E.F. Hutton, M/A-Com, Centel, and Norfolk Southern Railroad.

- Electra, formed by the Cable and Wireless Company and the Missouri-Kansas-Texas Railroad.

- LDX Net, backed by Kansas City Southern Industries.

- SouthernNet, backed by E.F. Hutton and independent telcos.

- The National Telecommunications Network (Washington, D.C.) is a consortium of seven companies: LDX Net, Litel Telecommunications, Microtel, Inc, Southland Fibernet, SouthernNet, Illinois Consolidated Telephone Company, and Williams Telecommunications.

- The TAT-8 cross-Atlantic undersea FO cable will connect the U.S. to both Great Britian and the European continent. Scheduled for 1988 completion, it will be owned by a consortium led by AT&T and will provide 37,500 phone circuits.

- Submarine Lightwave Cable Company is proposing a trans-Atlantic cable with capacity for 250,000 phone calls or 144 TV signals. Tel-Optik Ltd, partially owned by Britain's Cable & Wireless PLC, is also seeking permission for a similiar facility.

INPUT

- Twenty-two companies, including AT&T, MCI, U.S. Sprint, and Hawaiian Telephone, are joined to construct a Pacific Rim FO network between Japan, Guam, and Hawaii, and most of the same companies will participate in a link between Guam and the Phillipines.

- In late 1985, AT&T filed for tarriff approval for Accunet T45 fiber optic service, initially serving the Northeast, central Texas, and the major metropolitian areas in and near California's Central Valley.

- By multiplexing, the T45 service provided may be subchannelled to operate at less than the 44.736 Mbits per second initially possible. This varies from other vendors' bulk capacity fiber offerings which generally do not provide multiplexing or connecting lightwave equipment.

- The costs of a channel capable of carrying up to 28 multiplexed, T-1 channels will be about the same as 6 T-1 circuits over the same distance.

    - Pricing is based on monthly fixed charges as well as distance-based charges.

    - For example, a single channel running 220 miles will cost $40,000 monthly.

    - Other carriers are only offering long-term leases.

- One potential problem facing this service is the lack of fiber-to-fiber interface standards.

c.   Bulk Capacity versus Switched Services

- Most FO network service companies plan to provide bulk transmission capacity, delivering bundled voice and data packets directly to the customer or to the local telco and requiring users to make arrangements for switching and multiplexing equipment for the "last mile" connection.

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- This provides profitable and operational advantages to the network vendor.

- Unconcerned with end-to-end message routing, bulk fiber optic network providers can achieve profitability by filling their capacity to an estimated 10%-20% level due to low embedded plant costs.

- However, FO firms will face a reluctant market until connections to user premises can complete the advantages the technique offers. Accordingly, most FO firms planned to sell capacity to other carriers.

- Bulk capacity provision will probably continue as the dominant, near term trend. Most large users would prefer to manage the switching functions themselves. However, as smaller users migrate to the technology, demand for complete turnkey services may increase. Vendors failing to provide such services, either themselves or through alliances, may be at a disadvantage.

- Each of the RBOCs, many independent telcos, and most long-distance inter-exchange carriers are installing fiber optic networks, primarily for their own internal needs. However the technology is not limited to long-haul applications.

d. Fiber in the Local Loop

- While there is disagreement about the cost effectiveness of replacing the embedded residential copper plant with more expensive optical fiber in anticipation of future electronic home services, downtown areas of major cities are being "fiberized."

- Also, fiber optics are being installed to protect the LECs from third-party bypass by making available high capacity links for applications which might be considered bypass candidates.

INPUT

- Illinois Bell has installed a high capacity FO cable in downtown Chicago with interface equipment located near individual buildings. Novalink provides services to corporate users, but follows the trend in that it is a bulk transport service; users must arrange their own switching.

- Other metropolitian installations support switching via remote facilities located near user installations, permitting aggregation of traffic which is then transferred to central offices upgraded to support FO digital signals.

e. <u>User Perspectives</u>

- Users interviewed by INPUT indicate they expect fiber optic services to be generally available to them before 1990, with several noting that vendors are proposing new fiber services now and others reporting current usage for T-1.

  - Remotely located users do not expect fiber-based services anytime soon.

  - One user noted that although he anticipates availability within five years, he would not recommend implementation until the technology is proven, estimated at 10 years.

  - Another reported that it was his company's position to take advantage of FO as soon as possible.

f. <u>Fiber Optic Technological Directions</u>

- The development and introduction of long-wavelength lasers coupled to single mode fibers will extend the distance an optical fiber link can run without repeaters.

- Fiber optics are an important factor in the developing Teleports, with such links connecting users to satellite communications facilities which may be some distance from the business center.

- Within the next five years, FO will handle speeds in excess of one gigabit per second for over 30 or more miles without repeaters. Bell Labs scientists have transmitted data at four gigabytes, without error, over a single fiber optic cable for a distance of 117 kilometers without using repeaters.

- The components required for FO networks, detectors, light sources, and spicing/splitting devices will become more reliable and less expensive.

- FO technologies will eventually be found in new optical computers now under development, meaning ultra-high-speed optical data processing using data streams delivered through FO networks.

g.   Analysis

- While many have announced plans, only those who actually build systems will successfully sign customers, although several have attempted to sell services prior to starting construction.

- INPUT believes that consolidation of networks, including fiber optic ones, will be a dominant network services market trend and that regional FO nets will eventually be absorbed into the dominant carriers, often at bargain basement prices, as companies falter.

- Growing recognition of the importance of end-to-end services to users will lead vendors to address this need in order to survive in a competitive environment. The fact that major carriers are now choosing to build their own facilities rather than use capacity on FO networks underscores the importance of attending to user needs.

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INPUT

- Exhibit III-10 summarizes fiber optic network services directions.

4. FM RADIO SCA SERVICES

   a. Background of SCA

- Regulatory changes in the last few years have opened the FM radio station Subsidiary Communications Authority (SCA) spectrum for cost-effective data applications.

- Services are now operational, using the resources of approximately 700 of the nation's 5,000 FM radio stations to distribute data to places which could not economically be reached by private or dial-up lines.

- While some industry participants think direct broadcasting by satellite (DBS) will eventually replace SCA, there are valid reasons for using subcarrier networks in the interim, the most important being low cost and geographical reach.

- Several companies are offering SCA channels throughout the country for data, paging, audio, public displays, and local services. The number of cities served is growing steadily.

   b. Vendor Services

- Among those involved in providing SCA services are:

   - Bonneville Telecommunications (Salt Lake City, UT) which has marketing agreements with both GEISCO and Tymnet for SCA data services coupled to the value added networks for the return loop.

      - Customers can request information via the VANs which is then sent via the SCA network.

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EXHIBIT III-10

FIBER OPTICS DIRECTIONS

- **Consortia/Partners**

- **Shakeout**

- **Bulk Now - Switched Later**

- **Fiberized Local Loop?**

- **Standards/Improvements**

- Bonneville claims to be making a profit using only 1% of its capacity.

- Service is available in approximately 45 markets.

- Bonneville recently introduced a Data Receiver which permits microcomputers to receive FM signals through their RS-232-C ports at speeds up to 19.2 Kbps. The $610 unit combines a receiver, demodulator, and custom microprocessor. Individual units are addressable and can support multiple authorization codes.

- Bonneville, in association with McGraw-Hill, is providing financial and news analysis of the petrochemical industry, and other specialized information is being considered.

- Working with Apple Computer, the company has developed software for the MacIntosh to allow subscribers to access commodity and stock information.

- Start-up Indesys (Mountain View, CA), with backing from ABC Video Enterprises, Epson America, and two venture capital firms, has announced information distribution services using SCA. Among those signed are Avon, BusinessLand, the Christian Science Monitor, and Peat Marwick Mitchell and Company. The company is profiled in Chapter V.

- MultiComm Telecommunications Corporation (formerly part of Mutual Broadcasting, Arlington, VA) has been delivering data and private audio services (i.e., sales motivation messages) to distributors for parent company Amway and is begining services for others, including newsletter distributors.

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- Maxnews Financial Network (Darien, CT) is using MultiComm for distributing financial analysis information.

- American Sports Advisors Inc. and United Press International have formed Telesports Communications (Garden City, NY) to provide sports handicapping information.

- Dow Jones, which once used SCA for financial news distribution, is reportedly evaluating MultiComm for future services.

- MultiComm has leased subcarriers in approximately 80 markets.

- DiversiCom, a division of American Diversified Corporation (Costa Mesa, CA), plans a multichannel information service and has launched nationwide paging and radio messaging services called Cue. DiversiCom's plans may be affected by problems in its savings and loan businesses.

- In early 1986, CBS, Inc. entered a joint partnership in Mainstream Communications Corporation (Salt Lake City, UT) with venture capital firm Mason Best Company for satellite/SCA data transmission services. Mainstream was formed by Bonneville ex-employees.

- Lotus Development Corporation has purchased Dataspeed (San Mateo, CA) which uses SCA for stock market information transmittal to portable receivers in 12 markets.

  - A new service called "Signal" linking financial data to spreadsheets has been introduced.

  - Dataspeed has been renamed Lotus Information Network Corporation.

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INPUT

- Lotus has also entered a marketing arrangement with Equatorial Communications to expand the reach of its financial data services. Lotus will distribute services using Equatorial C-100 satellite earthstations through selected authorized retail dealers in a DBS application.

c.   Pricing SCA

- A full-time 2,400 or 4,800 baud dedicated data circuit to the largest 250 cities is priced at approximately $125,000 per month depending on the supplier being used. Timesharing further reduces costs. There are also monthly charges for leased receivers, which may be purchased with optional printers for under $500.

- For less than full-time needs, national distribution is priced by some vendors at approximately $7.50 per 1,000 characters and a single city may be reached for as little as $0.75. Some of the services charge approximately $50 to deliver a 10,000 character electronic newsletter to 200 cities.

- Start-up Indesys plans to charge between $0.03 and $0.20 per page with most services not carrying monthly minimums. Plug-in boards for IBM or compatible microcomputers are sold for $250, and Epson Smart Printers are priced between $500 and $1,500.

- Pricing is believed flexible in this new area.

d.   Applications

- SCA applications include price and product list distribution, software updates, instant company news (audio or text), electronic mail (i.e., work assignments, product recalls), paging, national fleet dispatching, utility load management, and other simplex telemetry applications. In addition to the examples given above:

- MultiComm is also distributing the New York-based Money Market Report.

- The Rocky Mountain Cancer Data System collects and distributes information to 700 subscribing hospitals.

- Receivers are addressable so data can be sent to a single location, but SCA is more economical for multiple rather than single-point distribution.

- Currently, only simplex transmissions are possible, but return communications can be handled through VANs. Information can be requested and/or verified through this means, while the economies of one-way SCA are used for information dissemination.

- Vendor viability is a factor. The major players are long-time participants in the broadcasting business, but their technical proficiency may vary. Their ability to sell data services to corporate accounts is questionable.

- Integrated services is another factor. For the most economical use of leased SCAs, a combination of electronic publishing/messaging, audio, and paging services provides the efficiencies seen by some as required for success.

- User awareness and education is yet another factor. INPUT found virtually no strategic understanding of SCA capabilities among interviewed telecommunications and IS managers.

- Exhibit III-11 summarizes INPUT's findings on FM-SCA services.

INPUT

EXHIBIT III-11

FM SCA ("SUBCARRIER') DIRECTIONS

- ● **5000 FM Radio Stations with SCA Capabilities**

- ● **DBS Eventually Replaces SCA**

- ● **Participants:**

  - - **Broadcasters (Mutual, CBS, ABC)**

  - - **Others (Lotus, American Diversified)**

- ● **Applications:**

  - - **Messaging**

  - - **Newsletters**

  - - **Audio**

  - - **Software Distribution**

- ● **Directions:**

  - - **Higher Throughput**

  - - **VANS Used for Return Loop**

  - - **Multiple Network Services (i.e.; Paging, Messaging, Newsletters)**

  - - **Niche Services**

5. VERTICAL BLANKING INTERVAL (VBI)

a. Background

- The VBI is the unviewed section of a television signal between frames of the visual image. It has been used for the one-way distribution of the viewdata service called Teletext (not to be confused with Teletex, an electronic mail system).

b. International MarketNet

- The most significant business use of the VBI for data distribution will be the financial services being jointly developed by IBM and Merrill Lynch using the VBI of public broadcasting stations.

    - International MarketNet (Imnet) will deliver financial data to approximately 10,000 Merrill Lynch field offices as well as other brokerage houses.

    - PBS Enterprises, the for-profit subsidiary of the Public Broadcasting Service, is committed to providing coverage in 96% of the U.S. and will lease commercial station VBIs in areas where it cannot secure a carrier.

- PBS has missed one deadline to provide the agreed coverage, with delays in Imnet testing due to layoffs and other financial difficulties at the joint venture.

- There is concern that brokers may be unwilling to link to a system owned and operated, at least partially, by a competititor. Imnet officials believe they will establish reliable and trustworthy services and systems and will overcome any reluctance to use their service.

INPUT

- Further, because it is based on IBM 3270 PC workstations, each agent position's equipment will cost approximately $10,000—more expensive than other services.

- When offered, Imnet will compete with existing and/or planned services using other distribution methods from Quotron (Los Angeles) in partnership with AT&T with the Integrated Financial Information system, Reuters (for European information), Dow Jones (Princeton, NJ), the Oaklahoma Publishing Company (Tulsa, OK), Bunker Ramo Information Systems (Trumbull, CT - purchased by ADP), and CBS (New York).

6. PACKETIZED VOICE

- Packet techniques may offer significant benefits for voice as they do for data.

  - The integration of digital voice with data in a common packet switched system offers potential cost savings through shared switching and transmission media.

  - Channel capacity can be economically used by transmitting voice packets only when speakers are actually talking. This would be similiar to Time Assigned Speech Interweaving (TASI) techniques now used on some long-haul voice links.

  - Digital voice conferencing can be supported since only one conferee uses the channel capacity at a time.

  - Network control becomes more flexible.

  - Security features are enhanced by the digitization of voice and by the packet technique.

- Packet internetworking can be applied to support communications among voice users on different types of networks.

- Enhanced services for users needing access to both voice and data communications can be supported.

- Bell Laboratories has patented a packetized voice and data method which uses T-1 lines. It could become a method which speeds the switching process. The patented technique improves the problem of excessive delay thought to be a major obstacle to packetized voice applications.

- GTE is developing a similiar scheme using burst switching with the objective of using Telenet for voice, and Tymnet is also working on the problem.

- Implementation and the economics of packetized voice switching remain unresolved.

  - Some believe the network capacity glut, discussed further in Chapter V, does not require the bandwidth savings possible, and that voice services competition may prevent profitable market entry.

  - Others believe the benefits of reliable transmission and error correction are sufficient reasons to proceed.

- Packetized voice may have implications for ISDN development as it is more flexible than current ISDN proposals.

- Packetized voice services are currently speculative. If successfully implemented, and assuming the inherent regulatory issues can be resolved, it would open new lines of business for the value added networks based on the integration of voice and data.

INPUT

7. PACKET RADIO

● While not a new technology, packet radio techniques are being evaluated for applications beyond current amateur radio experimentation. The technique uses an X.25 protocol modification called AX.25.

● One of the first applications was the University of Hawaii's Alohanet, linking a Oahu-based computer to satellite systems on other islands.

a. Amateur Experimentation

● Canadian amateurs became involved in packet radio in the late 1970s when the Canadian Department of Communications authorized its use on amateur frequencies.

● A group of U.S. amateurs, many involved in microprocessor hardware development, formed a nonprofit company, Tucson Amateur Packet Radio (TAPR), to develop hardware. Others now involved are Amateur Radio Research and Development (ARRD) and the Radio Amateur Satellite (AMSAT) organizations.

● Packet radio is being developed for local area network links and will use an AMSAT-developed satellite called PACSAT for wide area communications experimentation. Public and private funding, as well as contributions from Tektronix Corporation, are supporting the effort.

b. Commercial Applications

● In addition to hobbyist usage of Packet Bulletin Board Systems through "digipeater" relays, public safety, hospital, forestry, and weather station personnel have experimented with the technique.

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- Interest in commercial applications is spreading, although amateur radio bands are limited to non-commercial use. Mobile satellite service proposals being evaluated by the FCC include packet radio messaging capabilities.

c.   Proposed Public Digital Radio Service

- An equipment manufacturer, the Microperipheral Corporation (Redmond, WA), has submitted a Petition for Rulemaking to the FCC (RM-5241) proposing the establishment of a Public Digital Radio Service (PRDS).

  - As proposed, the PRDS will permit an infinite number of radio local area networks (using radio transmission rather than cables) to inter-connect via a national packet radio network.

  - A single wideband channel would serve as a digital pipeline with addressed packets carrying information.

  - Each user would serve as a node monitoring the transmissions and holding in memory those addressed to that recipient. Messages intended for nearby nodes would be passed on to other nodes and repeated until they reach the intended destination which would confirm delivery.

- As proposed, PDRS users would be prohibited from receiving payment for handling messages to prevent the use of the system for the benefit of common carriers. The proposed service appears designed to provide cost-free computer communications once the equipment is in place.

- Exhibit III-12 summarizes emerging network directions and the characteristics of new services.

- As can be seen from this chapter, there is a wide range of networking options already available, with new types of services being planned.

INPUT

EXHIBIT III-12

EMERGING NETWORK DIRECTIONS

SERVICE	CHARACTERISTICS
Virtual Private/ Software-Defined Networks	Cost-Effective, Shared Network with User Management Features
ISDN	Promises Universal Services, with Bandwidth on Demand
Fiber Optics	High Capacity Links, Currently Offered on a Bulk Basis
FM-SCA	Uses Satellites and FM Radio Station Subcarriers for Broadcast Data Applications
Mobile Sattelite	Depending on FCC Approval of Specific Vendors, Will Offer Cellular-like and Rural Services

- Some networking methods fit specific applications while others are adaptive in that they may be used for a variety of situations.

- Users need to monitor developing technologies and standards to determine if new services offer better solutions to specific problems than current methods.

- The next chapter profiles representative network services vendors as well as some innovative firms promoting leading edge technologies.

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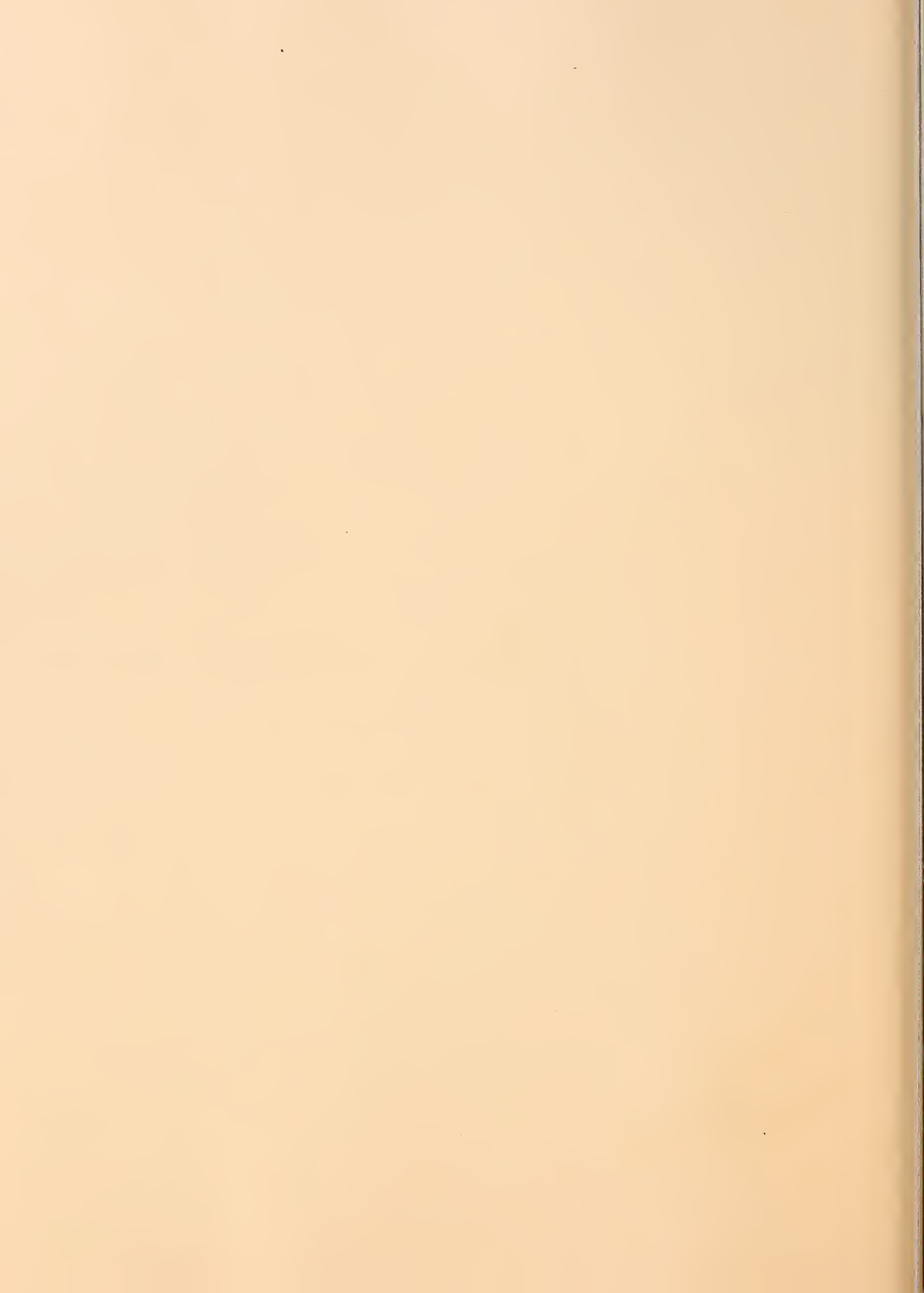
IV VENDOR PROFILES

IV   VENDOR PROFILES

- This chapter profiles representative network services vendors, focusing on nontraditional service vendors, innovative firms, and those firms formed from alliances and mergers.

- The information may be used by users to evaluate vendor viability and innovative solutions.

- Further information about these and other network service firms may be found in INPUT's Company Analysis and Monitoring Service (CAMS). INPUT subscribers may request information on specific companies through the "Hotline" service.

- The vendors are divided into four categories:

    - Traditional and innovative network service vendors.

    - Satellite network service vendors, including mobile satellite companies.

    - Vendors and service firms born from corporate alliances and mergers.

    - Equipment manufacturers involved in network services.

INPUT

A.   TRADITIONAL AND INNOVATIVE NETWORK SERVICE VENDORS

1.   AT&T

    a.   <u>AT&T Communications</u>

- AT&T is the dominant network services vendor and will remain so through the forecast period and beyond.

- The menu of services offered covers a broad range of telecommunications needs. Exhibit IV-1 describes most AT&T services.

- Additionally, the company has introduced the MEGACOM service, designed for users with over 1,000 hours of monthly interstate traffic.

    - MEGACOM will provide savings of between 5%-10% over conventional WATS service.

    - It is attractive to current AT&T users concerned about OCC service quality and wishing to maintain a single vendor for long-distance services.

    - MEGACOM is competitive with MCI's newly introduced Prism service.

- AT&T has been given permission to offer network services coupled to equipment sales for its national accounts. Consolidation of AT&T Communications and AT&T Information Systems is planned by the end of 1986 to support approximately 200 large customers and will follow a September 1985 FCC restriction lifting.

EXHIBIT IV-1

AT&T COMMUNICATIONS

SERVICE	DESCRIPTION
Public Switched Network Services	
AT&T Long Distance	Basic Long Distance Voice Service
AT&T Dial-It 900 Service	Prearranged Recorded Announcement Available on a Direct Dial Basis
AT&T WATS Service	Special Bulk Calling Arrangement for Directly Dialed One-Station-to-Many-Station Toll Calls
Megacom	A Bulk Service Requiring Dedicated Customer Access to Specific AT&T Switches for High-Volume Users
AT&T 800 • Single Number Service • Customized Call Routing Serivce • Variable Call Routing Service	A Toll-Free Service for Inward Calling to a Single Number
Video/Teleconferencing	Two-Way Video Teleconferencing Services
Alliance Teleconferencing Services • Alliance 1000 Service • Alliance 2000 Service Teleconferencing	Up to 59 Party Audio Conferencing Up to 59 Party Analog Graphics
Operator-Handled Services	Provision of Person-to-Person, Collect, Calling Card, and Third-Party Calling As Well As Dialing Assistance

Continued

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EXHIBIT IV-1 (Cont.)

AT&T COMMUNICATIONS

SERVICE	DESCRIPTION
<u>Private Line Services</u>	
SKYNET 1.5 Service	Provides Satellite 1.54 Mbps Channels between Earth Stations
SKYNET Television	Provides Satellite Television Signal Transmission between Earth Stations
SKYNET Audio Service	Provides Satellite Dual 7.5 khz or 15 khz Audio Signals between Two or more Earth Stations
ACCUNET T1.5 Service	Provides Terrestrial 1.5 and 4 Mbps Digital Channels between Two Locations
ACCUNET Reserved T1.5 Service	A Terrestrial-based Digital Network Switching System which Provides for the Simultaneous Two-way Transmission of either 1.544 or 3.0 mbps signals
ACCUNET Packet Service	Provides a Customer-Dedicated Packet Switching System
DATAPHONE Digital Service (A Member of the ACCUNET Family)	Provides Terrestrially-based 2.4, 4.8, 9.6 and 56 kbps Dedicated Digital Two-way Circuits
ACCUNET Switched 56 Service	Not Yet Tariffed. Will Provide a Terrestrial-based Switched 56 Kbps Digital Circuit
"Analog Private Line"	Provides Point-to-point Dedicated Analog Circuits for:
● Telegraph Service	● Low-speed Signalling and Teletypewriter Channels
● Voice Service	● Voice Channels
● Data Service	● Data Transmission to 9.6 kbps
● Wideband Service	● Data Transmission between 19.2 and 230.4 ● kbps
T-45 Fiber Optic Service	Private, Point-to-Point Service to 123 Cities by 1988; Capacity Eventually over 1 Gigabit per second

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b.   The Cancellation of AT&T's Net 1000

- In January 1986, AT&T Communications announced it would withdraw its value added packet switched/remote computing service called Net 1000, effective June 1986. The network was not meeting profit objectives, with 1984 estimated revenues under $3 million and 1985 not showing any improvement as customers left the service.

- There were difficulties in developing NET 1000. It was originally introduced as Advanced Communications Systems in 1978 and was reintroduced in 1983. The original design was modified to rely on existing IBM and DEC computers rather than use Western Electric processors which were delayed in development.

- Primary services available on Net 1000 were morgtage information, an Electronic Data Interchange (EDI) service, and an automotive supply inventory service.

- Net 1000 was directed at a different market than traditional VANS and had broader capabilities. The idea was to provide a comprehensive, compatible network of networks connecting various corporate private networks and supporting any combination of computers.

  - Customers could load data bases and Cobol-like applications written in the C language on network node computers using store and forward services and tying their own processors to the network.

  - Net 1000 was a dual mode intelligent network which overlayed an on-line applications-oriented processing service on a foundation of a transparent network.

- The original perceived need for the combined network and RCS service was not cost-effective for many users; for others, it was not needed.

INPUT

- AT&T will remain active in the VAN market.

  - Barring unforeseen events, it will maintain EDI presence through a relationship with Control Data's Redinet which uses Accunet and other facilities.

  - In April 1986, AT&T Information Systems announced it was opening its private packet switched network to others in support of a new point-of-sale network called AT&T Transaction Services or T-Services.

    - T-Services provide customer network control, protocol conversion, and preprocessing for POS network vendors, off-loading the customer's host computers.

    - Access is available in 90 locations throughout the U.S.

    - CoreStates Financial Corportion, the holding company of the Philadelphia National Bank, is using T-Services for a POS system being constructed for the Sun Refining Company.

    - T-Service charges are based on start-up fees, monthly charges, and usage fees, although specific rates were not immediately published.

- When permitted, AT&T may offer processing services similiar to those earlier provided through NET 1000 directly via its other network offerings.

2. AUTOMATIC DATA PROCESSING, INC. (ADP)

- ADP (Roseland, NJ) was formed in 1949 as Automatic Payrolls, Inc with the name changed in 1960.

IN

- Since the early 1960s, ADP has had an active acquisition program to diversify from its primary business of providing payroll services, which still provide a major share of its revenue.

- The company has diversified into RCS, banking, finance, brokerage, on-line data bases, collision estimating for the insurance industry, and services to automotive dealers.

- The company has over 150,000 customers and approximately 17,500 employees.

- ADP's Network Financial and Communications Service group provides remote and on-site distributed processing and the Autonet international VAN, which was started in 1982 to provide access to processing clients and others.

    - Autonet is available in over 300 cities, including approximately 50 countries, through IRCs gateways.

    - Autonet supports the AutoMail E-mail system.

- INPUT estimates that approximately 9% of the company's revenue of over $1 billion is derived from network services.

3. COMPUSERVE INCORPORATED

   a. Background

- CompuServe, (Columbus, OH) formed in 1969, was wholly acquired by H&R Block, Inc. in 1980.

- Offered services include electronic mail, data bases, shopping services, airline ticket reservations (via TWA's PARS system), and financial services including economic analysis, discount securities trading, home banking, and international funds transfer for overseas credit union members.

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INPUT

- Services are oriented to both consumer and commercial accounts.

- CompuServe entered the point-of-sale information market in an agreement with VISA to provide computerized support for retail credit authorization and verification of charge card sales. Similiar agreements were signed with other private credit issuers.

- The EasyPlex (consumer) and Infoplex (business) electronic mail services and MCIMail were linked in early 1986 in the first U.S. connection between E-mail systems.

    - Revenue from cross-network messaging will be shared based on a usage formula.

    - Infoplex is used by approximately 150 Fortune 1000 companies.

    - Initially, only electronic delivery is supported, with hard copy/mixed mode options to be added later.

- CompuServe's Network Services is a VAN available to corporations, government agencies, and financial institutions with access in over 200 cities and internationally via IRC gateways from 196 countries. Additional access is possible through other VANs.

- CompuServe has approximately 750 employees.

b. Financials

- Fiscal 1985 year revenues totaled nearly $69 million, an increase of 33% from the previous year with nearly $8 million in profits.

- Approximately half of its revenues are from remote computing services.

- Communications services accounts for approximately $7 million in annual revenues, with the balance from data base access and other services.

• Revenues for the third quarter ending January 31, 1986 were $21.5 million, an increase of nearly 22% from the same period a year earlier. Revenues for the nine month period increased 26% to $62.4 million.

• Meanwhile parent company H&R Block reported third quarter losses of nearly $7 million, with three month revenues of $90.1 million, an increase of 36.5% from the previous year. The net loss for the year was reported at nearly $12.9 million.

c.   Directions

• CompuServe is moving away from computing services by forming private networks providing business customers with access to specialized data bases.

• The company has established a goal of increasing the current subscriber base of approximately 270,000 to one million within three years by adding additional services, using new marketing strategies, entering joint ventures with other companies, and adding business subscribers.

• Additional products being considered will fill niches similiar to the weather forecasts service currently offered to private pilots and possibly will include graphic videotex services.

• Sales are expected to rise 30% in 1986.

INPUT

- Owner H&R Block recently rejected an offer by a former company official to buy CompuServe. While the parent company has experienced losses at least for the last two years, its subsidiary is returning a respectable, and needed, profit.

4.   COMPUTER SCIENCES CORPORATION (CSC)

   a.   Background

- CSC (El Segundo, CA), founded in 1959, is the largest independent professional services company in the industry, providing systems engineering and development, communications engineering, facilities management, and processing/network services to government and commercial clients.

- CSC entered the VAN network services market in August 1983 with INFONET, which is part of the company's Information Network Services Group.

- INFONET currently serves approximately 400 international cities with links in 19 nations through dedicated lines and with an additional 70 countries served via IRC connections. The international profile is strengthed by CSC's commitment to local support in major industrialized nations.

- The group has been repositioned into three major areas:

   - Value added communications, with the network uncoupled from the company's host processors, allowing VAN services to be sold separately, with enhanced electronic mail (NOTICE) capabilities.

   - Professional services, with major activity with AT&T and others.

   - Remote and distributed data processing using the company's IBM service.

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- NOTICE, an electronic mail service, can link messages to a data base and provide form processing, information file transfer, and microcomputer-based electronic mail as well as Telex access.

b. **Strategy**

- The company targets large multinational and multilocation organizations, including Fortune 1,000 companies, the communications, distribution, and manufacturing industries, and federal and state agencies.

- The company is focusing its host computer services on the federal government and growth markets in certain industries for remote processing and for nationally available, industry-specific applications. Examples include:

    - On-line inventory control.

    - Administrative information and software distribution between a software vendor's domestic headquarters and international offices.

    - Support of the U.S. Army's worldwide recruitment activities.

- Further, its professional services in facilities management, system development, and integration are being leveraged in both domestic and international markets.

c. **Profitability**

- The company reported 1985 revenues for the Information Network Services Group of $92 million, down from 1984's figure on continuing operations of $95.2 million.

- The Information Network Services Group's 1985 revenues were divided among the federal government (40%), commercial accounts (43%), international customers (12%), and state/local governments (5%).

INPUT

- Historically, profit margins on INFONET that were very high through 1981 dropped as demands for timesharing eroded, leading to a loss in fiscal 1984, but rose to break even in 1985 with an estimated profit margin of 3%.

- The company has established a 10%-12% profit margin goal for the group, with growth on the order of 15%. The plan is to accomplish this through cost containment measures, successful marketing of new products and services, consolidation of equipment and facilities, and group function restructuring.

  d.   Analysis

- The communications capability of INFONET to serve markets for high-speed data transmission, enhanced electronic mail, and information transfer as well as providing industry-specific processing services in growth markets is impressive.

- Its international profile serves well to differentiate its services, enhanced by CSC representatives versed in local languages, customs, and procedures in many landed countries.

- CSC's niche strategies in various industries and governmental markets and the leveraging of its expertise into professional services bode well for the company as a whole.

5.   DAMA TELECOMMUNICATIONS CORPORATION

- Privately held DAMA (Parsippany, NJ) is a specialized common carrier providing DTS and other services called DamaNet.

- The company was formed in 1982 and was formerly known as ICOM, Inc. DAMA acquired the International Harvester Transet network in 1984. It has approximately 100 employees.

- In late 1985, minicomputer manufacturer Data General (DG) acquired an interest in DAMA for an undisclosed amount (estimated at $2 million) with an option to buy all of it. It is believed the two companies will form a joint venture to offer integrated communications products and services.

- DamaNet services currently include:

  - National Voice Network, a WATS-type service with six second incremental billing and flat rate calling between major cities.

  - The corporate Voice Network requiring dedicated access lines in two switching cities, designed for high volume applications, supporting speed dialing, specialized billing, and low-speed data.

  - Digital Data Link supports point-to-point dedicated digital communications over fiber optic and microwave links.

  - Integrated Voice/Data Network is designed for intracompany voice, data, and image networking with services to be provided in 50 metropolitian areas. For data communications, speed and bandwidth are assigned on user demand, using a proprietary processor interface attached to a customer's PBX equipment.

- DAMA targets companies in the largest cities with multiple locations and over 200 employees, a high volume of communications between them, and spending of over $4,000 per location.

- Its approach is to provide flexible solutions, offering several transmission vehicles (fiber, microwave, institutional CATV networks, satellites) to fit customer needs.

INPUT

- As of March 1986, the company had approximately six customers, including Dow Jones & Company and the Cigna Corporation.

6. GENERAL ELECTRIC INFORMATION SERVICES COMPANY (GEISCO)

    a. Background

- GEISCO (Rockville, MD), established in 1984, is a division of General Electric. It provides the Mark*Net VAN, available in over 750 cities world-wide with 600 access points in the U.S., representing the world's largest commercial teleprocessing network.

- The electronic mail service is called Quik-Comm, with WPXchange and a storage and retrieval capability linked to the E-mail service, featuring word processing and document translations between incompatible equipment.

    b. Financials

- In 1984, the company spent $20 million upgrading equipment, with another $8 million spent in 1985.

- As did many information service companies, GEISCO experienced difficulties during 1985, resulting in staff cutbacks.

    -   The company announced the cutbacks were part of a restructuring leading to a tighter business focus.

    -   Company officials acknowledge that network-based services are contributing only 10% to the business, but they have established a 1986 goal of increasing that to 20%.

c. Strategies

- GEISCO's plan is to leverage the worldwide network presence and to focus on cross-industry applications, including EDI, business logistics, and international trade.

- It is also targeting vertical markets including banks, transportation, health care, and discrete manufacturers.

- EDI services are provided through EDI Express, and Trade Express supports international trading.

- GEISCO's network is used to provide access to a variety of processing services including its national clearinghouse for health care insurance claims, financial institution automated clearinghouse services, payment systems, and computer conferencing.

- In 1985, the company announced the GEnie consumer information service for microcomputer users, with low-cost hourly rates, access to bulletin boards, software libraries, electronic newsletters, and games. INPUT believes GEnie has signed approximately 8,000 subscribers as of March 1986.

- In 1986, the company added support for 3270 SNA/SDLC protocols, in addition to existing synchronous and bisynchronous service, through Mark*Net to the company's IBM-oriented Mark 3000 RCS services.

- GEISCO's philosophy is that the company will not enter any business where they cannot achieve a dominant or near dominant position. Rather than solely providing basic network services, such as electronic mail, GEISCO is positioning to leverage its data transmission, remote processing, and industry-specific applications in targeted markets.

INPUT

7. GLOBENET

- This entreprenural Chicago firm, working with its partner the Satellite Broadcast Network (also in Chicago), has announced a satellite communications service which it says will support fast and accurate data transmission.

- Globenet also plans an internetworking service, supporting communications across VANs.

- The first service will use both Ku band satellite and packet switching technolgies to send traffic to remote sites at 9,600 bps. An earth station management module will route return data via a packet switching network, resulting in a 25%-30% cost savings when compared to conventional telephone charges and more than a 50% savings in satellite transmission charges.

- The system uses the 90-10 principle of transmission, with 90% of the data transmitted over the network via satellite in a point-to-multipoint mode and the returning 10% transmitted via a packet switching network.

- Globenet's partner, SBN, recently announced an agreement with AgriData Resources to bring financial data and agricultural videotex information services to farmers using receive-only satellite earth stations. IBM has also entered into an agreement with AgriData (see IBM profile, below).

- This type of service is competitive with VSAT techniques and systems such as that provided by General Electric Information Services and Bonneville Telecommunications which uses the combined resources of Bonneville's FM-SCA network and GEISCO's VAN.

- Applications include the distribution of data to branch offices simultaneously with return communications via Globenet's VAN, Tymnet, or GTE Telenet.

- The system is priced at $3,500.

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8.   GRAPHIC SCANNING CORPORATION

    a.   Background

-   Graphic Scanning Corporation (Teaneck, NJ), formed in 1968, is involved in several communications services.

    -    For example, it has had cellular radio, paging, mobile telephone, telephone answering services, cable television, and direct broadcasting by satellite (DBS) interests as well as manufacturing operations.

    -    The subsidiary corporation, Graphnet Inc., provides data communications and messaging services via the Graphnet VAN.

-   Graphnet began in 1975 with switched and store and forward facsimile services. The network was optimized for this application.

    -    The service base has been expanded to other types of traffic.

    -    The Graphnet VAN offers real-time and store and forward services.

-   The Freedom Network is a global packet switching service for messaging, supporting communications among a variety of equipment domestically and to telex devices internationally.

    -    Freedom Forward is a store and forward service supporting the E-mail Freedom Express service.

    -    Freedom Express provides electronic, courier, and telephone voice delivery, as well as mailboxing. Mail Manager supports high volume, time-insensitive services.

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INPUT

- The company also supports telegram service, and messages can be telephoned by subscribers to a service operator using a Freedom Network Gold Card for account billing.

- Graphnet has approximately 230 local access points.

● In addition to certain direct overseas connections for telex and leased line services, other international links use ITT World Communications and RCA Global Communications facilities. For a time, these two companies agreed to use Graphnet's domestic networks for some of overseas-originated traffic directed to U.S. destinations.

● The parent firm employs approximately 950 people.

b.   Financials

● Approximately 18% of Graphic Scanning's stock is owned by the company President Barry Yampol, who resigned in early May 1986.

● The company has had increasing revenues, but also losses for the past three fiscal years.

- As of September 30, 1985, it had a retained earnings deficit of $50 million.

- The company recorded a loss of $11.9 million in the year ended June 30, 1985, despite its divestiture of cellular radio operations resulting in a $22.6 million income.

- It had a net loss of $11.6 million for the six months ended December 31, 1985, compared with a net loss of $14.3 million the previous year.

- Selected financial information is shown below, in millions:

	1983	1984	1985
Total Revenue	$107,400.4	$124,483.9	$155,573.1
Total Expenses	127,846.3	148,631.4	168,388.6
Net Income	-20,325.4	-25,285.5	-11,907.5

- Graphic Scanning has not held an annual meeting since August 1983, although one was scheduled for May 15, 1986 after a shareholder's legal action.

c.   Recent Events

- The company's recent history has been controversial.

  - In January 1984, the company had a dispute with the FCC over radio paging service applications.

    - The company was accused of using four smaller companies, operated by friends of Graphic's president as fronts to win more licenses from the agency than it could on its own.

    - This placed the company's cellular radio applications also in jeopardy.

  - In February 1986, citing losses and regulatory troubles, Graphic announced its intention to sell off many of its assets, with some to be purchased by Chairman Barry Yampol, who would then leave the company.

  - Graphic also said in SEC filings that it guaranteed several company executives substantial severance payments if the company is acquired or its businesses sold.

INPUT

- The sale of certain assets was to finance expansion into new areas. The company said the sales would benefit shareholders, who would need to approve them.

- Shortly after these plans were announced, a shareholder group announced a proxy battle to remove the company's board.

  - The shareholders group holds approximately 13% of the company.

  - In SEC filings it said it opposes any agreement to sell assets to the company's chairman, saying it was illegal and unfair to other stockholders.

  - A federal lawsuit was filed to prevent company officials from what was called an illegal scheme to systematically "strip" the company of certain assets and to order that an annual meeting be held to elect new directors. That meeting was scheduled for after publication of this report.

  - Prior to that meeting, and as this report was being finalized, President and Chairman Barry Yampol retired, and a new acting Chief Executive Officer and a new executive committee were named. Further, new financial advisors were assigned.

d.   Analysis

- Graphic Scanning is a diversified company with interests spanning data, record, and personal communications as well as cable television and speculative multi-point distribution services for pay television.

- It has attempted innovations such as providing a service bureau for telex customers who call and dictate messages for transmission using a credit

IN

card. However, its marketing has been marred with poor follow-up and correction sheets on pricing, leading to user confusion.

- The plan to sell assets to company officials and to provide "golden parachutes" to others should they lose their jobs has generated concern from some well organized stockholders. The late annoucement of the president's retirement and other changes at Graphic indicates the controversy is moving toward resolution, but remaining issues needed to be addressed at a scheduled stock-holders meeting. The timing may be critical.

  - If the ultimately approved plan is inherently a good one, delays may affect the success of any new entities which are formed from the parts of the company.

  - If the plan is a bad one, continued publicity may lead to a loss in revenue and customers who are concerned with service degradation or even cancellation.

9. GTE TELENET COMMUNICATIONS CORPORATION

- GTE Telenet (Reston, VA) is part of the parent company's Communications services operating group.

- The first to use packet switching technology for public communications, the network was originally established in 1972 by Bolt, Beranek and Newman, Inc. (Cambridge, MA), and the Telenet Communications Corporation began publicly offered services in 1975. It was acquired by GTE in 1979.

- Telenet is the largest VAN by revenues, with access in approximately 370 cities and direct connections in 11 nations. Access through other facilities is possible in an additional 57 nations.

INPUT

- With the merger with United Telecommunication's Uninet VAN (discussed below in Section D), the resulting VAN, U.S. Telenet, will provide additional access and strengthen the carrier's market dominance.

- The company also provides dedicated private networks for government agencies, multinational corporations, and foreign governments.

- Telenet provides access to Telemail E-mail services, with hard copy options and direct connections to Telecom Canada's Envoy, the first link between electronic mail systems.

- Telenet also supports the Medical Information Network in association with the American Medical Association (further discussed in Chapter V) and the Phycom pharmaceutical products data base developed by Fisher-Stevens, Inc.

- Other applications are the Financial Information Network, Micro-Fone II credit transaction services for which GTE provides terminals, and PC SUNet for downloading software to IBM and compatibles.

- GTE Telenet supports SDLC/3270 access in addition to asynchronous terminals.

10. INDESYS, INC.

- This Mountain View (CA) firm was formed in 1985 by three former executives of home computer manufacturer Atari who were working with software publisher Activision to develop a method of electronically distributing computer games via broadcaster's FM-SCA ("subcarrier") channels.

- With the disintegration of the home computer market, the participants involved Pittsburg (PA) venture capitalist Henry Hillman and modified the original plan to provide information, rather than software, distribution services.

- Other investors brought in were:

  - ABC Video Enterprises, which will initially provide subcarriers on ABC owned and operated radio stations, and its satellite distribution network.

  - Epson America, which will provide printers and a corporate sales force.

  - Venture capital firm Singacom of Singapore to provide entree into Far East markets and manufacturers.

- The company has developed proprietary distribution technologies requiring two FM subcarriers supporting transmission speeds of 38.4 KBps. A plug-in board is sold for IBM personal computers and compatibles, and an Epson "Smart Printer" attachment can be used to print out information as received without a computer.

- Testing is being conducted in the San Francisco area, with services scheduled for availability in other major markets beginning in June 1986.

- Fifteen accounts have been signed including Avon, BusinessLand, Merrill Lynch, Monsanto, Peat Marwick, and the Christian Science Monitor.

- Most accounts will use the service for internal messaging, although the Christian Science Monitor is planning to deliver electronically a condensed version of the newspaper, with simple graphics, to executives. Avon is planning to distribute price lists and sales messages to its network of district managers who typically work out of their homes.

- Unlike other participants in FM-subcarrier network services, Indesys feels it can be successful distributing messages rather than financial information, a market considered crowded with firms such as Quotron and Telerate which use leased lines, and Lotus Information Network which uses FM-SCA.

INPUT

- Indesys' transmissions are priced at approximately $0.15 per page with most services requiring no monthly minimums. A number of options are available including one-hour, four-hour, and overnight delivery.

- Indesys feels it is more credible than its competitors given the association with ABC and with Epson, which will sell Indesys' distribution services to the targetted Fortune 500 accounts along with printers and microcomputers.

11. ITT CORPORATION

a. ITT Corporation - Overview

- ITT's involvement in network services spans international record carrier services, long-distance, and electronic mail.

- For 1985, ITT reported income from continuing operations of $287 million after a $160 million charge for restructuring, with net earnings totalling $294 million after accounting for gains on disposal of operations and losses from discontinued operations.

- As a whole, highly diversified ITT announced expected increasing profits from continuing operations in 1986.

- ITT is restructuring its company to focus on telecommunications and financial services.

- ITT faces problems in several telecommunications areas. For example, it recently abandoned an effort to sell a central office switch in the U.S. and discontinued facsimile services.

b.   ITT Dialcom, Inc.

- Until early 1986, when it was acquired by British Telecom, Dialcom (Silver Spring, MD) was a unit of the ITT Corporation. More information about the purchase can be found below, in Section C.

- Dialcom has 1,200 U.S. customers with electronic mail services provided to approximately 100,000 users. Some of its revenues come from international software licensing.

- The company was founded in 1970 to provide general purpose timesharing in the Washington, D.C. area. Since 1975, it has shifted its emphasis to office systems and extended its services to other areas in the U.S., Canada, and overseas. It was purchased by ITT in 1982, as a unit of ITT's Communications Operations and Information Services (ITT-COINS) Group.

- ITT Dialcom offers a family of electronic business communications services and provides RCS, facilities management, professional services, and applications software. Its Global Mail software has been licensed to several PTTs.

- Dialcom's 1985 revenues were $18.9, but the company has never been profitable.

- In addition to electronic mail, ITT provides computer conferencing, private bulletin boards, electronic publishing, calendaring, forms processing, news and information data bases, and management/support tools, with computer-based messaging providing the basis for other communications applications.

- Access is provided through other VANs and 800 numbers, with the Dialnet dial-in network available in New York and Washington, D.C.

- Services called Netlink and Gateway connect subscribers to any other computer system accessible via a public data network.

INPUT

c.   ITT World Communications

- This unit of ITT provides IRC services, private lines, telex, store and forward, bridging services between business systems and telex or leased lines, Datel dial-up data links, E-mail, and the now discontinued facsimile services.

- In April 1986, a plan to link Southern New England Telephone's state-wide packet network (ConnNet) with ITT World Communications networks was announced.

d.   U.S. Transmission Systems

- This unit is a subsidiary of ITT-COINS, providing discount long-distance, WATS, and private line services. The unit is believed for sale.

e.   Analysis

- ITT stopped making significant investments in its domestic telecommunications businesses several years ago.

- Its long-distance services are in a very competitive marketplace, and the company probably does not have the capital necessary to support marketing or physical network expansion. The customer lists and perhaps the facilities themselves will likely be sold, assuming a buyer can be found.

- Saying it will focus on telecommunications markets, the sale of Dialcom is somewhat confusing. Perhaps the price was right, or perhaps ITT hopes to benefit from future alliances with British Telecom.

12. LOCAL AREA TELECOMMUNICATIONS, INC. (LOCATE)

- This New York firm specializes in creating DTS networks and was one of the first involved in the field.

- With operations in 20 cities, it is the most successful vendor configuring such networks for links between and among brokerages, investment bankers, and their major customers in the New York City area.

- LOCATE also provides DTS links to long-haul microwave and fiber optic carriers, using the facilities of Qwest Microwave and Cable & Wireless in the New York area for connections to Chicago and the West Coast.

- The primary targeted market is large Fortune 500 firms requiring between four and eight T-1 capacity links for connections between distributed company locations.

13. MCI COMMUNICATIONS CORPORATION (MCI)

- MCI (Washington, D.C.) was partially acquired by IBM in 1985, as described below in Section D.

- The company began as Microwave Communications, Inc. to provide short-haul communications links. These short-haul links became longer, and, overcoming AT&T's monopoly along the way, the company became the most successful IXC, operating its own microwave, fiber optic, and satellite network.

- The company claims over three million customers and revenues approaching $3 billion.

- MCI plans to be completely digital by 1990 and has been heavily investing to upgrade its facilities.

INPUT

- The company, through its subsidiaries, provides various domestic and international services including voice, data, record, personal communications, and E-mail services.

- Services are provided to match, or better, similiar offerings from AT&T such as WATS-type bulk services. MCI's Data Transport is a private packet network offering, and V-Net is a virtual private network for voice services.

- MCI plans to increase the types of services offered, adding T-1 services and following through on SBS' recent contract to buy VSAT terminals.

- The company acquired Western Union International from Xerox in 1982, and it is now a subsidiary of MCI International, providing private lines and international record carriage.

- The challenges facing MCI are:

  - Service quality perceptions, particularly critical for winning corporate voice and data business (its move to an all-digital network should resolve this issue).

  - Maintaining competitive prices while facing higher costs from marketing and required plant upgrades.

  - Making the SBS unit profitable.

- The relationship with IBM will strengthen its profile, and the company will benefit from joint marketing which was announced after earlier claims that there were no plans to do so.

14. MCDONNELL DOUGLAS INFORMATION SYSTEMS GROUP/TYMNET

a.   Background

- The Information Systems Group (ISG) was created in April 1984, consolidating three McDonnell Douglas divisions and the newly acquired Tymshare, Inc. subsidiary (with the Tymnet VAN).

- Tymnet was formed due to demand for network services from clients of Tymshare. It is the second largest VAN, with GTE's Telenet holding market dominance (strengthened by GTE's acquisition of U.S. Telecom's Uninet.)

- The major portion of Tymnet is now called McDonnell Douglas Network Systems Company, although EDI and vertical industry services form their own companies within the group, using group facilities and services as appropriate.

- The group provides services to vertical and horizontal businesses through focused operating groups and also sells products and services to other ISG companies.

- The acquisition of Tymshare was completed in March 1984, with an aggregate cost of approximately $312.7 million.

- Tymnet serves approximately 50 countries and over 500 U.S. cities. International access is supported via international record carriers, including FTCC which is now principally owned by McDonnell Douglas, and through telex links.

- Among services provided are:

    -    Check verification services.

    -    Credit card authorizations.

INPUT

- Electronic Data Interchange.

- VAN services for a variety of applications and customers.

- Tymnet also supports the OnTyme family of E-mail services, electronic data interchange, asynch, bisynch, and SDLC (3270) protocol access, and the X.PC error-correcting protocol, with conversions offered as part of the value added service.

b. Financials

- Prior to its acquisition and the 1985 blending of Tymshare's operations into various ISG operating group companies, Tymshare had revenues of nearly $300 million and 1983 net losses of $1.6 million.

- INPUT estimates that ISG's 1984 noncaptive revenues from network services totalled $35 million, representing approximately 4% of total noncaptive revenues, estimated at $888 million.

- As a whole, ISG is believed to have suffered losses amounting to slightly over $100 million in fiscal year 1985. In response, the group closed a manufacturing operation, named new executives, and laid off workers as part of a reorganization move designed to strengthen the company's marketing and to make the group more profitable.

c. Strategies

- Tymnet has announced an agreement with the Southern New England Telephone company to provide access to its long-haul network from the LEC's intra-LATA packet network called ConnNet.

- Tymnet DTS, Inc., a subsidiary of the Network Systems Company, provides DTS services in several cities.

- The Tymstar satellite network is a new service using four-foot diameter earthstations, with transmit capacity up to 96 kbps and receiving capacity at T-1 rates. Each earth station communicates with a master hub earth station. More detail about the Tymstar service can be found in Chapter III.

15. TRT TELECOMMUNICATIONS

- TRT, originally called Tropical Radio and Telegraph Company, was formed 80 years ago to provide communications for the United Fruit Company in Latin America.

- In 1985, the company was purchased for $56 million from the renamed United Brands Company by UNC Resources, a precision manufacturing, natural resources, and services firm in Virginia.

    - In 1985, UNC spent $165 million buying aerospace and telecommunications operations.

    - The company is reportedly planning additional acquisitions.

- TRT had fiscal year 1985 revenues of $122.2 million.

- Services provided include:

    - High-speed data and packet switching services.

    - Broadband digital satellite transmission services.

    - Telex.

    - Recently introduced international voice services.

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- UNC purchased TRT due to its strengths in management, marketing and service, their service profile in international services, and their focus on business-to-business telecommunications.

- TRT recently won approval from the FCC for an application by its partly owned (43%) International Satellite Inc. (ISI) to operate two communications satellites for high-speed data and video IBS-type services between the United States and Western Europe.

    - The proposed services, to include messaging, fax, and videoconferencing, come after the international satellite service monopoly of Intelsat was removed, as discussed in Chapter III.

    - TRT shares ownership of ISI with Satellite Syndicated Systems Inc. and Kansas City Southern Industries Inc.

- ISI's system, which is expected to be operational by mid-1986, will operate in the Ku band, using VSAT earth stations.

16. WESTERN UNION (WU)

    a. <u>Service Profile</u>

- Western Union (Upper Saddle River, NJ), through subsidiary corporations, offers a wide range of networking services.

    - The satellite network includes four Westar satellites.

    - There is a transcontinental microwave system.

    - WU operates local transmission lines in major cities.

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- WU owns half of Airfone, which provides telephone services from airliners.

- Most of its services come through Western Union Telegraph Company, which is being merged into the holding company, and the electronic mail subsidiary. They include:

  - TWX and Worldwide Telex.

  - EasyLink Electronic mail service.

  - Special systems and services for voice, data, graphics, and broadcasting, as well as money transfer service, Mailgram, Telegram, and Cablegram services. Electronic mail services include volume mailing of computer-originated messages.

  - Long-distance services, formerly called Metrophone.

  - A voice mail resale business using Voice Mail International (Santa Clara, CA) services.

- The Government Systems Division provides Safelink, a packet switched network for interactive timesharing and transactions with encryption features for government agencies.

- Infocom services supports intracompany private messaging.

  b.   Financial Problems

- The pioneering company is facing significant challenges including administrative and organizational problems which have developed over its long history.

- Western Union posted a $370 loss for 1985, primarily because of a write down on certain transmission and switching equipment.

- It is expected to post a $15.3 million loss for the first quarter of 1986, based on the poor performance of recent ventures such as cellular radio, Easylink, and Airfone.

- Its external auditors have qualified the 1984 and 1985 financial reports due to uncertainty over the availability of financing to meet debt obligations.

- WU's telex business is becoming less profitable, with the number of leased telex lines decreasing to 90,000 in 1985, a drop of 25,000.

• As a result of these problems, the company has reduced its workforce by one-fifth, renegotiated new union contracts, and reorganized its structure, and has been selling certain assets, and will continue to do so, while focusing its efforts on its core business as a record carrier, electronic mail service vendor, and provider of private data networks.

• It is also hoping to raise $20 million through the sale of new debentures.

- Western Union Corporation, a holding company formed in the early 1970s to allow WU to diversify into unregulated areas, is being merged with the primary subsidiary, Western Union Telegraph Company, subject to shareholders' approval.

- The company has sold or contracted to sell assets valued at over $200 million.

. The company sold mobile telephone manufacturer E.F. Johnson.

- Western Union's half interest in Airfone, Inc. which provides pay telephone services on commercial aircraft under an experimental FCC licence may be sold.

- The company may seek joint ventures in its satellite transmission and long-distance telephone services.

- It has sold its Government Systems unit to Continental Telecom's American Satellite Company for $155 million. The unit provides federal agencies with data communications. WU will provide maintenance and administrative services after the sale is finalized.

- The French conglomerate, Thomson-CSF, has reportedly expressed interest in purchasing part of Western Union.

- The company has seen erosion in its customer base for private data networks due to increasing charges by the local telephone companies for leased lines. WU is trying to move this traffic to its packet switched data network and is seeking to upgrade its current telex customers to electronic mail services.

c.   Analysis

- WU's problems are unfortunate. Second only to AT&T, it is the company most responsible for the historic development of telecommunications. Its name may be its greatest asset, but its organizational development leaves something to be desired. The company has been characterized by high turnover in the executive ranks and an unwieldy organizational structure.

- Its attempts to diversify are to be applauded, with forays into cellular telephony, direct broadcasting by satellite, and its highly promoted (and expensively advertised) EasyLink electronic mail service. WU may have overextended but it probably could not anticipate the difficulties it has faced.

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- Sympathetic bankers, expert financial consulting, reorganization of both its priorities and its structure, and recognition of market realities are the key factors in rescuing the company from becoming little more than a shell of its former self.

B.   SATELLITE NETWORK SERVICE VENDORS

- This section focuses on mobile, domestic satellite, and international satellite service providers.

1.   AMERICAN SATELLITE COMPANY (ASC)

a.   Background

- ASC has been operational since 1974, providing voice, data, and image services through owned and leased satellite capacity and a network of 170 earth stations.

- The company was formerly a partnership between Fairchild Industries and Continental Telecom, Inc. (Contel), but is now wholly owned by Contel.

- The company has approximately 450 accounts in industry and government, including Abbott Laboratories, Federal Express, USA Today, Sears Communications, and several government agencies.

- Its areas of emphasis are:

  - International services using Intelsat's satellite system.

  - Ku band VSAT and transportable equipment services.

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- Videoconferencing.

- High-speed data networks.

b. <u>Financials</u>

- The company estimates that 55% of its traffic is voice, 40% data, and 5% video services.

- Annual revenues of this private firm have shown consistent annual increases of 40%, and the company has been profitable for several years. It has secured a $350 million line of credit from a banking syndicate to finance growth through 1994 and is planning continued network expansion.

2. FINANCIAL SATELLITE CORPORATION (FINSAT)

- FINSAT has received authority to become the sixth and final licensee to build an international satellite system after the Intelsat monopoly was removed.

- FINSAT plans a three satellite system (including one ground spare) covering both the Atlantic and Pacific ocean regions, and claims it will be the only network provider to internally link both-oceanic networks.

- The other licensees for international satellite services include:

    - International Satellite, Inc.

    - Orion Satellite Corporation.

    - A tentative partnership of Pan American Satellite Corporation and Cygnus Satellite.

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-   RCA American Communications, which gave up its authority in 1985, claiming there was an insufficient demand for services.

3.   EQUATORIAL COMMUNICATIONS

a.   Background

-   Equatorial (Mountain View, CA) provides private satellite networks to large corporations.

-   The company claims to offer savings of 30%-40% over conventional, multi-dropped leased lines, with lower error rates than voice grade lines.

-   In 1985, Equatorial announced expansion of its one-way packet switched satellite network to two-way services, using four-foot transceiving dishes.

    -   The service is designed for private data networks hubbed with large central computing sites and a hundred or more remote sites.

    -   The system is primarily intended for transaction and data collection applications such as financial, process monitoring and control, point-of-sale, and field office administration.

    -   One-way services are used for information distribution, including financial market data.

    -   Network capacity is sold in increments of 9.6 kbps, with data reception possible at up to 19.2 Kbps.

    -   Support is provided for SDLC, Bysync, PARS F, and specialized process control protocols, as well as asynchronous protocols.

    -   Spread sprectrum C-band technologies are used.

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- In addition to providing packet switched satellite services, the company manufactures micro earth stations. It supplies satellite capacity on its 16 transponders on the Westar IV and Galaxy III satellites and supports the networks through its control center.

- The company has over 1,000 earth station installations in 36 states and has sold over 30,000 micro earth stations.

b.   Financials

- Fiscal year 1985 revenues increased by 47% to $56.1 million, with net income of $1.8 million. This represents a decline from the previous year's income of $5.7 million on revenues of $38.3 million.

c.   Strategies

- Among Equatorial's users are insurance agents and claims offices, consumer finance offices, banks for ATM applications, utilities needing process control applications, and news and financial data base distributors.

- Clients include the National Weather Service (for distribution of weather maps), Hughes Communications Galaxy, Inc., Reuters, Ltd., United Press International, Farmers Insurance Group, Lotus Development Corporation (for the Signal financial market information service), the Comtrend Division of ADP, Inc., Telerate Systems, Inc., Dow Jones & Company, and the New York Stock Exchange.

- The company has entered agent agreements in Australia, Canada, and the Pacific Basin, and was granted FCC authority for transborder services to Mexico, Canada, and several Caribbean nations.

INPUT

- In 1985, Martin Marietta Corporation purchased a 24% equity position in the company for approximately $50 million.

4. MOBILE SATELLITE CORPORATION

- Mobile Satellite Corporation (King of Prussia, PA), organized by former staffers at General Electric Corporation's research facility, plans to launch the first of two satellites in 1987 for one- and two-way radio communications between air, ground, and water-based mobile stations.

- Voice, data, navagational aid, and international air traffic control applications are projected services.

- Mobilesat is one of three companies petitioning to have frequencies reallocated from land mobile reserve channels for satellite services. Gateway earth stations would connect mobile customers to the public telephone network and with cellular radio common cariers and others.

5. OMNINET CORPORATION

- Applying to the FCC for frequency allocations for new satellite communications, Omninet (Los Angeles, CA) was formed in August 1984 by former NASA (National Aeronautical and Space Adminstration) and Jet Propulsion Laboratory staff who were involved in a NASA-conceived land mobile satellite systems concept from inception.

- The company claims to be "the leading candidate for FCC frequency allocations permitting operation of geostationary satellite communications systems."

- Omninet was formed to provide a variety of voice and data communications services to several end-user markets. The primary market is the transmission of data from remote areas by companies requiring instantaneous communica-

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tions, such as the oil and gas industries, emergency, police, fire, rescue, and medical data services.

- Rural telephony, or telephone service to thinly populated areas is the second focus.

- A third focus is mobile cellular service. Omninet proposes to provide coverage in areas not served by terrestrial-based cellular radio systems.

- Applications include dispatch for nationwide trucking fleets. The technology will also allow dispatchers to know where their vehicles are located.

- A fourth service envisioned is nationwide paging, restricted to "thin route" and rural areas since current spacecraft cannot generate sufficient power to reach pagers inside buildings.

- All Omninet services require favorable review by the FCC on frequency allocations. It is competing with several other proposed services of a similar nature.

6. PRIVATE SATELLITE NETWORK (PSN)

- Formed in late 1983, PSN (New York, NY) is the first direct broadcast satellite (DBS) network, targeting business and institutions for its services. It uses Ku band satellite services exclusively.

- The company's chairman is former U.S. Treasury Secretary G. William Miller.

- The company provides full services, including programming such as live interactive presentations, public access (allowing company account executives to participate in a conference from any company location), and decentralization (allowing local rooms to conduct a teleconference rather than being limited to company headquarters origination).

INPUT

- PSN is one of several companies with differing technologies vying to sell video communications for the business market.

7. SKYLINK CORPORATION

- Similiar to the proposals of Mobile Satellite Corporation and Omninet, Skylink (Boulder, CO) would use satellites as "mega-repeaters" to relay land mobile dispatch, rural fixed/mobile telephone, and low-speed data transmission in the U.S.

    - Applications are for transportation and law enforcement use, remote industrial process control, environmental monitoring, rural area emergency communications, and telex/teletype services.

    - The system would be compatible with cellular radio systems.

- Skylink plans to use very small, portable, mobile, and fixed earth stations. Each of two or three satellites could serve up to 100,000 two-five pound "personal satellite phones" using technology similiar to specialized mobile radio (SMR) trunking configurations.

- The first phase calls for two beam coverage of North America and, later, a third generation satellite using multi-spot beam techniques for frequency reuse in a cellular radio frequency emulation.

- This third phase would be implemented when the personal satellite phones are in volume production and a predictable market is growing.

- The company proposes shared ownership of the satellites with Telesat Canada. A first generation satellite system (assuming favorable FCC action) would be operational in 1987 at a cost of $120 million.

- Skylink's business plan is a phased one, designed to keep the risks of this new service low.

8. VITALINK COMMUNICATIONS CORPORATION

a. Background

- This Mountain View (CA) company provides private data networks via C- and Ku band satellite, designing, manufacturing, and servicing all equipment components including on-premise earth stations, turnkey video conferencing units, satellite transmission, and network maintenance.

- It has installed private digital satellite transmission systems for Dow Jones, Electronic Data Systems, Rockwell International, Tandem Computer Corporation, General Electric Information Services Company, United Press International, Time, Inc., the University of California, and others.

- The company claims capabilities to serve current user needs with systems which are easily modified to support future intelligent workstation-oriented communications.

b. Strategies

- Vitalink's strategy is to provide links between local area networks (LANs) and the intelligent workstations on those LANS, primarily using satellite techniques supplemented when appropriate with terrestrial facilities. Ethernet/IEEE 802.3 and DecNET standards are supported.

- In June 1984, Vitalink announced a plan to offer a satellite-based wide area network under a partnership with Hewlett-Packard to link users HP "3000" computer systems and also a similiar agreement with Prime Computer Company. INPUT believes these capabilities are used very little.

INPUT

- An agreement was signed in 1984 with Uniden Corporation of America for the development of advanced satellite digital earthstation equipment and workstations for data network transmissions.

- Vitalink has an agreement with AT&T-Communications to jointly market SkyNet Digital Services using C-band satellites.

- A joint development and marketing program with Digital Equipment Corporation, signed in October 1984, supports Vitalink's hardware/software bridge called TransLAN to transparently connect local area networks via satellites and/or terrestrial lines.

- Vitalink has a fully owned subsidiary, Vitalink International Communications, Inc., chartered to add international capabilities to the private networks the company now provides large corporations.

- Vitalink has leased transponder space from AT&T Communications on Comstar D3 after the launch failure of Westar VI and has additional transponders on AT&T's Telstar 302. It had earlier shared transponders on Westar satellites with Equatorial Communications.

c.   Financials

- Vitalink is privately held. Western Union owns 20%, with Gevenco, General Electric's venture capital arm, and the venture capital firms of Hillman Company and Kleiner, Perkins, Caufield and Byers also partners, the latter holding the largest block of shares.

- Vitalink claims a 40% annual growth rate, with approximately 15% of its revenues derived from network services and the balance from hardware and support services. The company has approximately 130 employees.

- Exhibit IV-2 shows mainstream network service vendors and their offerings.

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EXHIBIT IV-2

MAINSTREAM NETWORK SERVICE VENDORS

Carrier	Public Telephone Service	Leased Line	E-Mail	Packet Service	Telex and Telegraph	Private Telephone Switching	Satellite Services
ADP AUTONET		X	X	X	X		
American Satellite		X				X	X
AT&T	X	X	X	X	X	X	X
CompuServe		X	X	X			
COMSAT							X
DAMA				X		X	X
Equatorial				X			X
FTCC		X	X		X		
GEISCO		X	X	X			
Graphic Scanning/ Graphnet			X	X	X		
GTE SPACENET							X
IBM Information Network			X	X			
ITT Domestic			X		X		
ITT World			X		X	X	X
McDonnell Douglas/ Tymnet		X	X	X			X
MCI/SBS	X	X	X	X	X	X	X
RCA American		X	X			X	X
RCA Cyclix*		X		X			X
RCA Global		X	X	X	X		
TRT		X	X	X	X		
US SPRINT**	X	X					
US TELENET**		X	X	X	X		
US Transmission Systems (ITT)	X	X					
Vitalink							X
Western Union	X	X	X	X	X	X	X
Worldnet			X		X		

*RCA Cyclix and GEISCO will merge.

**US SPRINT formed by merger of GTE SPRINT and US TELECOM; US TELENET formed from GTE TELENET and US TELECOM's UNINET.

INPUT
MSP2

C.   VENTURES BORN OF ALLIANCES, MERGERS, AND PARTNERING

- The network services market has been characterized recently by various forms of alliances. This section reports and analyzes several events to help clarify them as an aid to users facing vendor selection decisions which these events may affect.

1.   ELECTRONIC DATA SYSTEMS, INC. (EDS)

   a.   Background

- EDS, formed in 1962, is the leading services company providing facilities management processing for insurance, government funded health insurance, and the banking idnsutry.

- EDS is the first company to offer complete, integrated automation implementation and project/facilities management after a system is built.

- The company historically has had brisk acquisition activity, primarily processing services but also in turnkey system vendors.

- Access to EDS' facilities is through an internally developed nationwide telecommunications network called EDS-NET. One division uses Tymnet and 800 dial-in services.

   b.   Financials

- EDS had fiscal year 1984 revenues of $947.5 million, with noncaptive revenues accounting for $866.6 million of that. An estimated 94% of its noncaptive revenues were derived from processing services, 5% from professional services, and 1% from turnkey systems.

c.   The GM Acquisition

- In October 1984, General Motors acquired the company and its subsidiaries for approximately $2.5 billion.

- The purpose of the acquisition was twofold:

  - To provide GM with the expertise needed to fully automate its processing, manufacturing, and comunications.

  - To provide a vehicle for diversification into information services.

d.   EDS' Role in Network Services

- The company is included in this report because it has the capability and the opportunity to tackle large-scale private network projects which will impact incumbent network services vendors.

- It also the capabilitity to enter the network services business itself, either by reselling capacity on its own or GM's network (as an automaker's network) or by offering network services separately.

- The network being developed by EDS for its parent will connect GM's telephones and computers, those of its suppliers, and perhaps even dealerships into an integrated network capable of carrying voice, data, CAD/CAE graphics, and video conferencing at a lower cost and with greater functionality than previously possible.

  - The vision is that a customer could custom order a car with the parts being ordered from suppliers through an automated inventory management and order processing system--an application of Electronic Data Interchange.

INPUT

-    It is a massive project, one fitting EDS' capabilities and requiring its high quality, motivated staff's expertise to successfully implement.

-    This highly visible experience can, and undoubtedly will, be leveraged into similiar projects for large users, even on a global scale.

● In the period since the takeover, EDS has expanded its staff nearly threefold.

e.   Analysis

● EDS is a special company serving as both a model and a threat to network services vendors as well as professional services, processing services, and turnkey system vendors.

● The opportunities before it for large-scale domestic and international computing and communications projects and for being a network/processing services vendor may mean that competitive firms will have fewer opportunities to pursue.

● EDS' growth has been impressive, its reputation the envy of others, and its alliances creating a formidible synergy of capabilities.

2.   BRITISH TELECOM/ITT DIALCOM, INC.

● In March 1986, British Telecommunications (BT) PLC signed a letter of intent to buy ITT Dialcom (Silver Spring, MD). Terms were not disclosed.

● This is the recently privatized company's first purchase of a U.S. firm.

-    The purchase comes after negotiations for joint venture operations.

-    The motivation is to open the U.S. market, which accounts for a third of the world's telecommunications products and services market, to the British company.

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- BT recently began satellite transmission services in the U.S. and is reportedly seeking to acquire or partner with a U.S. long-distance carrier.

- The venture risks losing U.S. government business due to the new foreign ownership of the company.

- British Telecom is said to be prepared to heavily invest in Dialcom in order to make it successful.

- There is also speculation that British Telecom may be considering the purchase of Tymnet from McDonnell Douglas.

3. GTE SPRINT/U.S. TELECOM

- In January 1986, GTE, owner of Sprint (Burlingame, CA) since 1983, announced it would merge the number three interexchange carrier with U.S. Telecom (Kansas City, MO) to form a new company called U.S. Sprint.

- Also included in the merger would be the data networks of the two companies (Telenet and Uninet, to be called U.S. Telenet).

    - GTE's Spacenet and its voice mail messaging service would continue separate operations under GTE ownership.

    - Telenet will initially be the backbone data network with Uninet serving as a feeder network.

- Sprint was formerly owned by Southern Pacific, a railroad company which used its rights of way to create the network. The merger (along with a joint switching equipment venture with Siemens of West Germany) will result in a $1.3 billion charge against GTE's fourth quarter (1985) earnings.

INPUT

- Sprint has absorbed some $2.8 billion since its purchase (including purchase price) in trying to become profitable, but it never has shown a profit. Operating losses have amounted to approximately $100 million per quarter.

- Both Sprint and U.S. Telecom were unprofitable, but the combined economies of scale plus the merging of customer lists provide certain benefits including the ability to sell advanced communications services based on the combined capabilities of the two networks.

- The alliance's timing is not favorable. By the time the partnership is finalized, most telephone customers will have selected a long-distance carrier through the equal access balloting process.

- The venture comes after capacity sharing arrangements specifically covering fiber optic routes. The two carriers have approximately 7,000 miles of fiber optic, with plans for an additional 14,200 miles. Officials claim the carrier will be the first with an all-digital network.

  - The combined company will have 2.2 million customers, solidifying U.S. Sprint's third place in the IXC market.

  - GTE's voice network is reportedly mostly analog, while U.S. Telecom's is based primarily on fiber optics and digital switches.

  - U.S. Telecom's software defined network, called Virtual Private Network, represents a new telecommunications direction and has approximately 60 customers.

4. GTE TELENET/CONSORTIUM COMMUNICATIONS INTERNATIONAL (CCI)

- GTE Telenet has agreed in principle to acquire 60% of CCI, which is a subsidiary of the British firm Air Call, Plc. The purchase will cost over $16 million. CCI had 1984 profits of $1.17 million on sales of $14.21 million.

IN

- CCI is a specialized carrier offering international, high-speed, voice grade record service. The major portion of traffic carried is telex. Special features include store and forward, use of numeric codes replacing telex codes, and broadcast message capabilities.

- GTE plans to expand the company's U.S. data transmission capabilities as well as add VAN services such as E-mail.

5. IBM/MCI/SBS

- MCI acquired Satellite Business Systems in 1985 in a complex arrangement which included IBM's purchase of 18% of MCI's outstanding stock.

- SBS had been a partnership of IBM, Comsat, and Aetna Insurance, but Comsat first sold its interests to its partners and Aetna was bought out by IBM in 1985.

- MCI, the second largest IXC, has added approximately 200,000 SBS business customers to its list, plus acquired satellite technologies. SBS was planning to offer private networks based on VSAT technology.

- MCI also announced plans to jointly market products and services with IBM.

- SBS has been losing a reported $10 million monthly. As part of the acquisition, IBM is assuming SBS's accumulated $400 million in debts, meaning MCI can concentrate on attempting to make the unit profitable without the hinderance of a burdensome debt.

INPUT

6. MCDONNELL DOUGLAS NETWORK SYSTEMS COMPANY (TYMNET)/
   SOUTHERN NEW ENGLAND TELEPHONE COMPANY

- In a first arrangement of this type, Tymnet will interconnect its national X.25 packet switched network with SNET's ConnNet local packet service, providing network transparency to users.

- The service will be jointly promoted by the two companies.

- The advantage to Tymnet is that it will not need to purchase local access service from SNET. Customers can access the statewide or national network via a single number.

- This interconnection is important because the divested BOCs are prevented from offering inter-LATA (Local Access Transport Area) services. The success of this type of venture hinges on the availability of needed customer applications coupled to the network services.

- Also, such arrangements increase the number of cities in which network services are available, an important factor to users with needs for wide geographical coverage.

- In April 1986, a link between ConnNet and ITT World Communications was announced, providing access to the domestic and international networks of that carrier.

7. GE/RCA

- The merger of these two conglomerates brings together several network services. How they will be joined to reduce redundancy while building syner-gistically remains to be seen.

- Prior to the merger, General Electronic Information Services had been reorganized twice in as many years.

  - It has been placing more attention on networking services while deemphasizing remote computer services.

  - GEISCO offerings include EDI Express, electronic mail, GEnie on-line data base services directed to computer hobbyists, general VAN services, and electronic software distribution.

- RCA Communications provides IRC, VAN, voice, electronic mail, and satellite services through RCA Cylix, RCA American, and RCA Global Communications. The three units have been coordinating their activities.

- The new company, by its very size and with its collective technical expertise, is well positioned to provide a full range of competitive network services.

8. GENERAL ELECTRIC INFORMATION SERVICES COMPANY (GEISCO)/NEC

- As with domestic communications, the international arena has examples of strategic partnering.

- In mid-1985, GEISCO entered a distribution agreement with Nippon Electric Company (NEC) for the delivery of GEISCO's teleprocessing services to Japanese businesses using NEC's value added network.

- In addition to the distribution agreement, the two companies are forming a joint venture called C&C International Ltd., to provide marketing and technical support to the VAN/teleprocessing venture and to develop other cooperative agreements.

- NEC's new VAN called NEC-NET will be interconnected with GE's international network, allowing NEC to use its Japanese VAN to distribute international teleprocessing services.

INPUT

- The venture fits GEISCO's vertical market strategy and attempts to sign in strategic alliances.

- GEISCO applications include order entry, cash management, and electronic mail services using the Mark III and Mark3000 services.

9. ALLNET/LEXITEL

- The December 1985 merger of Allnet Communications Services (Chicago) and Lexitel (Dearborn, MI) creates the fourth largest IXC. The new company is called ALC.

- Both companies began in 1980 as long-distance resellers, later adding their own transmission facilities.

- ALC claims to own or control under long-term leases approximately half of its network, with a goal of similiar control over 85% of its facilities by the end of 1986.

- Lexitel was reportedly profitable at the time of the merger, focusing its efforts on marketing in the Midwest to business accounts. Allnet has been unprofitable, marketing services nationally to both corporate and residential accounts.

    - Allnet reported losses of $23.2 million on revenues of $72 million in the last quarter of 1985, prior to the merger.

        . This compared to losses of $32 million on $74.5 million in revenues for the same period a year earlier. Four million dollars of the loss is attributed to changes in accounting and a write-down from disposal of part of the business.

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- Lexitel posted earnings of $2.8 million on revenues of $127.2 for all of 1984, compared to a $5.3 million loss in 1984. Lexitel improved its revenues nearly 90%.

- Corporate accounts have generated the majority of Lexitel's revenue, and ALC will therefore focus on such business.

- However ALC must add various services such as private lines to its discount long-distance and WATS-like services to be more appealing to businesses, and must improve its network capacity to make offering such services feasible.

- Also, unlike other IXCs, ALC does not currently plan a virtual private network offering.

10. PACIFIC TELESIS GROUP (PACTEL)/COMMUNICATIONS INDUSTRIES, INC.

- PacTel, a regional Bell holding company, is planning to merge/purchase Communications Industries, which is involved in paging, cellular radio, and equipment manufacturing. The plan is subject to government approval and the sale of certain CI manufacturing businesses. As a RBOC, Pactel is not permitted to manufacture.

11. OTHERS

- Other joint ventures and acquisitions include:

    - The National Telecommunications Network, a consortium of regional fiber optic network builders, discussed in Chapter II.

    - Control Data's Redinet Intercorporate Business Transaction System for electronic data interchange services is being jointly sold with AT&T, using AT&T Communications' family of data transport services, including the Accunet packet network.

INPUT

- AT&T is working with EDS, the new subsidiary of General Motors, in a joint venture to sell private data networks.

- Citicorp has announced plans to purchase Quotron Systems, a leading financial information delivery company.

- Martin Marietta has purchased 24% of Equatorial Communications (profiled above) and will jointly sell satellite networks.

- Data General has purchased part of DAMA Telecommunications and has a marketing agreement with Equatorial Communications, as described earlier in this chapter.

12. ANALYSIS: MORE CONSOLIDATION COMING

- INPUT expects additional network consolidations, joint marketing agreements, and mergers throughout the forecast period. Candidates may include:

  - MCI and CompuServe, which have announced an interconnection agreement for electronic mail services.

  - The long-distance carriers owned separately by ITT and Ford Aerospace may be purchased by other carriers in order to build critical market share.

  - The smaller VANs, such as Computer Sciences Corporation's Infonet and Graphic Scanning's GraphNet, may be merged into other VANs or joined in strategic alliances with other vendors.

  - IBM may seek to strengthen its networking profile by adding another company, possibly an LEC, to its portfolio to compliment the long-distance and data services provided by MCI/SBS. A speculative scenario on this possibility is included in Chapter VII.

IN

- In addition to the market forces requiring such partnering, antitrust implications may be further liberalized.

    - Two cabinet level committees have recommended granting presidental authority to extempt companies found injured from Department of Justice antitrust reviews by import competition.

    - The Reagan administration reportedly will seek liberalized laws easing contraints on future mergers to help U.S. companies restructure and better compete with foreign companies.

13. TYPES OF ALLIANCES

- Several types of alliances may be observed from the above examples:

    - Mergers of network services firms. An example is GTE Sprint and U.S. Telecom.

    - Diversification by non-IS firms. Examples include General Motors/EDS and McDonnell Douglas/Tymnet.

    - Financial Services Alliances. Examples include banks, such as Citicorp, and brokerages, such as Merrill Lynch, buying companies or entering alliances with network service firms to sell financial information and/or trading services.

    - Consortia formed by utilities and railroads to use existing rights-of-way to develop fiber optic or other types of networks. Examples include CSX working with SNET in Lightnet, and the rails involved in Fibertrak.

INPUT

- In addition to these four types are cooperative research and development alliances, ventures in providing shared tenant services, joint ventures and alliances serving as preludes to formal acquisitions, and alliances formed in response to other alliances, such as the RCA-Citicorp-Nynex videotex venture which was in response to a similiar CBS-IBM-Chemical Bank venture.

- The various types of alliances are shown in Exhibit IV-3.

D. EQUIPMENT MANUFACTURERS' NETWORK SERVICES

- Several information equipment manufacturers have entered the network services market, some on a limited basis, others with more comprehensive offerings.

- The motivations for providing such services include the desire to offer complete information services, including hardware, software, and networking, and to diversify into higher growth, albeit competitive, areas.

- This section provides examples of successful and unsuccesful ventures into network services by hardware companies.

I. DATA GENERAL

- Minicomputer vendor Data General (DG) has purchased a minority interest, with an option to buy the entire company, in DAMA Telecommunications Corporation, which provides intercity data networks and DTS services.

- DG also has a marketing agreement with Equatorial Communications to sell integrated satellite network/hardware/software products. The companies plan to develop joint proposals for point-to-multipoint data and interactive networks, allowing DG users to bypass LECs and IXC facilities.

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EXHIBIT IV-3

TYPES OF NETWORK SERVICE ALLIANCES

TYPE	EXAMPLE
Merger of Network Services	GTE Sprint/U.S. Telecom
Diversification of Non-IS Firms	GM/EDS; McDonnell Douglas/Tymnet
Financial Service Alliances	Citicorp/Videotex; Merrill Lynch/IBM
Consortia	National Telecommunications Network

INPUT
MSP2

- The acquisition, partnership, and earlier purchase of about 30% of United Technologies' research and development operations are part of DG's long-range strategy of increasing involvement in integrated voice and data telecommunications technology, and come at a time of declining growth.

2. DIGITAL EQUIPMENT CORPORATION (DEC)

- DEC offers several network services, primarily focused on local area networks. However, the Enhanced Application Network Services, part of the company's Service Bureau, provides access to the DEC network.

    - This supports services combining terminals or micros, customer host processors, and DEC host processors for an integrated application delivered nationwide.

    - The network provides customers with product information and allows hardware and software evaluation, peak load processing, and other incremental computer resources for special customer needs.

- Services are accessed locally and delivered remotely from the company's computer services centers.

- Exhibit IV-4 shows DEC's worldwide network.

3. IBM AND THE INFORMATION NETWORK (IN)

    a. Overview

- Since IS is largely an IBM world, understanding the company's intentions and directions in network services is important to users planning network implementations.

EXHIBIT IV-4

DEC'S WORLDWIDE NETWORK
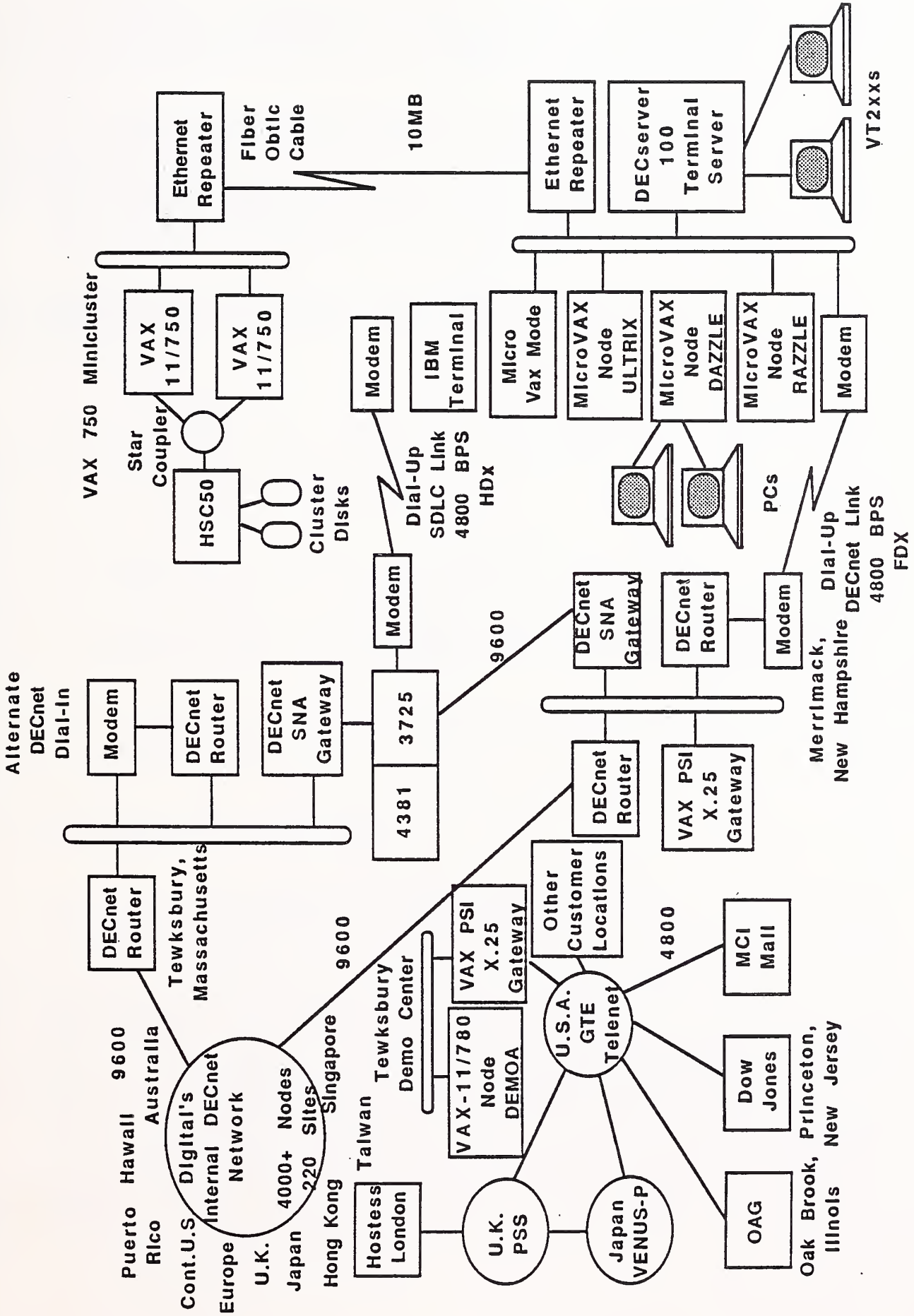
- IBM has historically focused on products but is recognizing user needs to link to multiple host processors.

- IBM has identified the general development of communications software as a top priority but needs to overcome the past piecemeal development and enhancements made to its family of products.

- The company has increased its programming staff and will work to continue enhancements to systems network architecture (SNA) to serve decentralized needs.

    - It is estimated there are more than 20,000 computers running under SNA.

    - SNA is a mainframe oriented, master-slave hierarchy.

- Enhancements center around APPC (Advanced Program to Program Communications) and the subset LU 6.2.

    - APPC is peer-to-peer oriented.

    - It supports cooperative processing between distributed machines.

b.   Integration Capabilities Need Improvement

- A key to IBM's networking success will be its ability to integrate communications with hardware, as is the apparent plan with the acquisition of Rolm.

- Integration will likely be the direction observed with IBM's partial acquisition of MCI and the blending of SBS' service with MCI's.

    - Although IBM initially said joint marketing with MCI was not planned, INPUT notes that IBM was given approval to jointly market SBS

IN

services with its own products several years ago, resulting in approximately 20 major accounts for SBS' long-distance services.

- Accordingly, similiar activity with MCI is expected.

● With regards to IBM's integration activity, several users note that IBM has not been completely successful in these initiatives.

● Another factor will be the integration of communications with applications.

- While IBM officials profess to support national and international standards, open architectures, and connectivity between multiple vendors, it will undoubtedly continue SNA support as well as support any emerging OSI standards.

- IBM's Document Interchange Architecture/Document Control Architecture (DIA/DCA) standard is an incompatible alternative to the X.400 standard being promoted for electronic mail and document transfers.

- Further, IBM does not appear to have plans for T-l or Software Defined Network interfaces.

c. IBM and Network Services

● IBM's growing involvement in networks is dependent on the continuing absence of strict antitrust laws which could adversly affect the company.

● IBM's reputation for service and support and its account control advantage will be potent tools in providing network services as it jointly markets hardware and communications services with others in its constellation. However, the company will need to improve its ability to combine voice, data, and image by providing professional services to firms needing such implementations.

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INPUT

- While AT&T may now be the dominant network service provider by default, many feel IBM will be more of a factor, but that larger users' network environments will remain inhabited by several carriers due to needs and desires for redundancy, networks tied to specific applications, and the need to avoid dependence on one vendor, regardless of the vendor's strength.

- IBM may be preparing a satellite network offering.

  - As of April 1986, IBM Research and Development Inc. has received authority for 15 earth stations.

  - IBM has retained one existing satellite from SBS and will keep two others, which are FCC authorized, now being built.

  - Although the company says the earth stations are for a private, experimental data transmission project, FCC sources note that a request to delete the private network limitation would be routinely granted.

- IBM's presence in networking is felt on the hardware side, with many respondents using IBM modems, front-end processors, and communications software. On the networking side, IBM operates the Information Network.

i. IBM's Information Network

- The Information Network was developed in Europe as a remote computing service. In 1982, it was transferred to the U.S. as an independent business unit (IBU) within IBM, offering SNA networking and remote processing services.

- Two services are supported:

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- Network Services, for linking a customer's mainframes and terminals in a managed network environment.

- Information Exchange which provides store and forward and other value added services.

• IN hosts Ad/TRACs (Advanced Transaction Rearrange and Conversion System), developed by Advanced Technology Systems (Norcross, GA), within IN's Information Exchange store and forward services for EDI applications, although the cost effectiveness of using Ad/TRACs is not attractive. Rather, IBM expects customers to handle EDI conversions within their own environments.

• Communications protocol conversions are handled on the network (rather than on IN's central processors), where bisynch or asynch protocols are converted from and to the backbone network's SNA protocol.

ii. Other Applications

• IN's Insurance Communications Service was selected by the Insurance Research Institute (IRR) to perform protocol conversions for up to 70 types of terminals and processors of independent insurance agents and corporate underwriters and also to provide message switching and processing at volume discounts.

- The resulting Insurance Value Added Network Service (IVANS), operated by a separate company established by IRR, uses IBM's service supplemented with customized facilities and supervisory and support services.

- Independent insurance agents can directly access a carrier's computers.

INPUT

- Approximately 35 insurance company host computers are connected to IVANS, serving over 3,000 independent agents.

- In late 1985, IBM began a relationship with AgriData Resources, Inc. (Milwaukee, WI) which provides agricultural data bases and related services to manufacturers, vendors, bankers, commodity traders, and government agencies. IBM is providing long-term loans to privately held AgriData with warrants to buy up to 14% of the company.

- Other customers of the Information Network are telephone companies and large corporations linking their IBM facilities through the SNA network.

d. Analysis

- As noted, IBM has taken steps toward greater communications capabilities (the purchase of Rolm and part of MCI are representative of this), and the company is agressively pursuing VAN opportunities. However, IN has some limitations for its potential customers.

   - IN appears unfocused and expensive to use.

   - It appears directed at large, dedicated IBM users, permitting use of applications such as program development languages, office systems, decision support, and graphics.

   - The synchronous nature of the backbone network is more suited to mainframe-to-mainframe communications than micro-to-host communications.

- On the plus side, IN can serve to expedit pre-installation testing and planning for ordered large-scale equipment and software, thus serving to increase sales.

- IN was upgraded with new computer center facilities added in 1985, and other measures designed to improve large users' abilities to connect their SNA networks use network-based applications to link with other customers.

- Earlier, IN was available in only a few cities representing a majority of its large mainframe customer installations, but now dial-up access is possible in over 100 cities.

- IN also connects to Telenet for off-net access. Rather than further extend the network geographically, this type of third-party approach, or using the facilities of partly owned MCI, is the probable future direction of any Information Network expansion.

- The company is quite capable of meeting demands for network services from its customers and is well positioned to enter any number of vertical markets.

- Company representatives indicate the networks business doubled in 1985, and an access charge price cut is scheduled for August 1986 to further encourage usage.

- INPUT estimates 1985 total revenues for the Information Network at $60 million, with network services contributing under $10 million, representing a small portion of the overall VAN market, and indicating a disappointing performance to date.

4. WANG LABORATORIES

    a. Background and Network Services

- The office automation company offers products supporting local and wide area networking. It partly owns one PBX and is doing joint development work with another PBX manufacturer.

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- Wang owns a subsidiary called Wang Communications, Inc. (Arlington, VA), which is a specialized common carrier.

  - In late 1985, it was given permission by the California PUC to provide intra-LATA services in Los Angeles and San Francisco.

  - Wang Communications also has networks in the Boston, Philadelphia, and Chicago areas which extend across state lines.

  - The company provides T-1 and higher capacity facilities using a combination of microwave, fiber optics, lightwave, and coaxial cables. Wang provides direct access to the transmission service via these methods, engineered to customer specifications.

  - Primarily intended for data, the facilities may also be used for bulk voice services. By connecting with an IXC, users could bypass the LECs.

- In June 1985, Wang formed another wholly owned subsidiary, Wang Information Services Corporation (WISC), in a strategy designed to leverage the company's technology and to create an additional revenue source.

- The company has set an agressive revenue goal of $100 million for the subsidiary by the end of fiscal 1986.

  - WISC will offer advanced but easily used information services which do not require heavy user investment.

  - Its initial offerings are nationally available voice mailbox services based on the DVX Digital Voice Exchange product and an electronic mail service with new portable terminals provided to subscribers.

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- WISC will also support telecommunications switching, data base services, Wang office networks, and a shared tenant services (STS) joint venture with GEISCO and a real estate firm.

• WISC will eventually operate as an RCS with accounting and scientific applications running on Wang and IBM systems, using the company's proprietary and internal WangPac packet switching network.

  - WangPac was developed with help from Bolt, Beranek and Newman.

  - The expansion plans for WangPac call for 60 packet switching processors, supporting 56 Kbps channels and approximately 20,000 terminals.

• Other network service related developments at Wang include:

  - The acquisition of customer lists and other assets from AVCO Computer Services to serve small businesses.

  - The formation of a Communications Marketing Division to coordinate OEM hardware sales to RBOCs, LECs, and interconnect companies.

  - An agreement to develop communications software for banks.

  - The acquisition of Walsh Greenwood Company's assets in a subsidiary providing financial market data and analysis information to brokers and traders via telephone lines.

  - A 1985 joint development agreement with Control Data to link Wang systems to CDC's Business Information Services timesharing network. CDC resells Wang machines with bundled communications software.

  - A 1984 joint marketing agreement with GEISCO which will modify its software access methods to provide users of Wang's Professional Computers with dial-up access to GEISCO's VAN and E-mail services.

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b.　Financials

- After disappointed earnings leading to layoffs and a short manufacturing suspension, Wang Laboratories has been showing signs of recovery, with profits of $21.7 million posted on an 11% revenue increase for the second quarter of 1985, ending December 31.

c.　Strategies/Analysis

- The multiple telecommunications initiatives of this billion dollar company is in recognition of the importance of networking, but the prospects for an E-mail and voice mail service bureau are questionable given competition in these fields, the developing voice mail capabilities of corporate PBX equipment, and the possibility of such services coming from the LECs in the future.

- The financial information system appears to be a strategic afterthought and competes with others, including market leader Quotron Systems.

- Further, Wang's entry into networking services at this time given the crowded marketplace is also questionable; however, the office systems company faces few alternatives beyond its core business.

- Permission to offer intra-LATA services in California is an important revenue opportunity which expands the subsidiary's market in the West.

- As can be seen from this chapter, there are a wide variety of network vendors offering a correspondingly wide variety of services.

- The next chapter examines many of the factors affecting this market, including user and application trends.

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V MARKET FACTORS, USER TRENDS, AND FORECASTS

V   MARKET FACTORS, USER TRENDS, AND FORECASTS

- This chapter presents INPUT's analysis of market and applications trends, the results of the primary research regarding user concerns, a discussion of regulatory issues, and an analysis of selected industry segments.

A.   USER VIEWS, CONCERNS, AND TRENDS

I.   VIEWS OF CORPORATE TELECOMMUNICATIONS

- The costs of a corporate telecommunications network has been viewed by user management as a necessary expense; however, this perception is rapidly changing. Increasingly, the corporate network is seen as a contributor to corporate profitability, and the telecommunications manager has taken a role among those responsible for finding new, innovative ways to show profits.

- This emerging view takes two forms:

    - The network aids the smooth functioning of the corporation by facilitating communications.

    - The network may serve as a contributor to the corporation's bottom line in its own right.

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- This section highlights some of the findings relevant to telecommunications and network services in INPUT's 1985 <u>Information Systems Planning Report</u> and in an earlier report, <u>Telecommunications Strategic Planning</u>. Additional comments have been added.

- The referenced report was based on 150 interviews in 10 industry segments. The information here pertains across all researched industries.

a. Management Perceptions of the Network

- INPUT's research indicates that management believes IS and the network have some impact on the performance and competitive stance of the company, but that the greatest role of the information systems department remains to reduce product and service costs.

b. Who Reports to Whom?

i. Voice and Data Departments Are Coming Together

- Over the last two years, additional responsibilities have been given to IS due to data and voice communications complexity.

- In over half of the cases reviewed, both the voice and data communications sides of the house report to information systems.

  - This means that in the balance of cases, voice communications reports somewhere else in the corporate hierarchy.

  - INPUT believes this hinders the common development of the corporate network.

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ii.   Decentralization Trends

- Other research by INPUT has found continuing trends toward decentralization. This can affect network managers in several ways:

  - The possibility of multivendor environments increases, creating interface and coordination problems.

  - Company-wide implementations require all affected departments to sign-off on specifications.

c.   The Network Contributes

- Managers are coming to believe that the network can be a competitive tool. The most obvious example is Automatic Teller Machine (ATM) networks in banking, used to leverage other services to expand the customer base.

- Other corporate networks are being used to shift the customer service burden onto customers for applications such as order entry and order tracking; i.e., electronic data interchange applications.

d.   Voice/Data Integration

- Voice data integration has piqued the interest of all interviewed. The need to control communications costs is a high priority, but most respondents are skeptical about the technology's ability to merge voice and data economically.

- Increasing demands on IS to provide communications support have relegated action on voice/data integration issues to the data gathering stage. Most respondents do not believe such integration will be a viable alternative until the 1990s.

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- This finding is perhaps surprising given the availability and sales of advanced digital PBX equipment supporting integrated voice/data networks, the replacement rate of obsolete analog switches, and the logic of shared facilities (switches and wiring).

e.   Local Area Networks (LANs)

- Those interviewed have few LAN installations. It appears that LANs are still viewed as experimental due to the lack of standards and unrealized need. Most interviewed feel they will eventually implement LANs, but only after IBM's intentions are fully known and understood.

- Network service offerings designed to interlink corporate LANs are therefore anticipating this potential.

f.   Involving Telecommunications in Planning

- In poorly organized companies, telecommunications is not given its rightful place within the organization because executives either undervalue its importance or have difficulty communicating with technical personnel.

- In an earlier survey, INPUT found that telecommunications is not included in the early planning processes.

- For example, in the case of planning for a new physical plan, or in relocating an existing one, in over half the cases telecommunications was not involved until after negotiations for the new facility had begun.

g.   Lack of Telecommunications Policy

- INPUT found that most companies lack a comprehensive telecommunications policy, attributable to the exclusion of communications personnel from executive decisionmaking.

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- This results in excessive expenditures for obsolete equipment, leased equipment with different expiration periods inhibiting attempts to upgrade or purchase new systems, substantial penalities for lease cancellations, and underutiliztion or overpayment of consultants due to a lack of a unifying policy.

- In some cases (particularly with overseas operations), facilities may be located in areas where needed telecommunications services cannot be provided.

- This points to opportunities for network service vendors to influence corporate telecom policies or to capitalize on the lack of one.

- Exhibit V-1 highlights corporate views of the network

2. THE CHALLENGES FACING TELECOM MANAGERS

- The dynamic telecommunications environment presents major challenges to users. The combined effects of divestiture, deregulation, and technological advances coupled to market competition means more options for service and equipment, more needs to stay current, and career risks for those making the wrong decisions.

- Wise decisions come from informed analysis, but with today's constant change and complexity, staying informed is a non-trivial task. Not only must the manager stay current on service offerings, pricing changes, and new techniques and technologies, he must be concerned with vendor viability, long-range planning, and the overall corporate strategic plan.

- Investing in the corporate network requires more than a financial analysis to determine return on investment. It requires perspective on the company and the environment in which it competes. Unfortunately, the strategic view is sometimes lost in the press of daily matters.

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EXHIBIT V-1

VIEWS OF THE NETWORK

- Network mostly exists to control costs.

- Growing recognition of potential to contribute.

- Voice/Data integration not yet viable.

- Most lack telecom policies.

- While telecom managers have been largely excluded from strategic decision-making, indications are this is being corrected. Management is recognizing the value of telecommunications. Communications managers are becoming more skilled in technology, but more importantly, more involved in business matters.

3. USER OBSERVED TRENDS

- The convergence of telecommunications and information processing will continue, with more user organizations melding two separate organizations to benefit from centralized control and enhanced coordination, fault isolation, and joint management.

- Conversion from analog to digital technologies will proceed to benefit from faster circuits with greater reliability, availability, and serviceability.

- Increasing acceptance of intelligent, communicating workstations (i.e., micro-computers), and implementation of micro-mainframe applications both locally (within a corporate building) and remotely will lead to increasing bandwidth demands.

- New applications, particularly graphics and video, also lead to increasing bandwidth demands.

- Evolution toward ISDN will simplify users' network attachments and stimulate demand for integrated communications services of all types--voice, data, graphics, image, and video. The key question remains "when."

- The trend toward internetworking, now shown with several VANs accessible through others (particularly for international applications), will continue.

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- Implementation of X.400 standards for electronic mail will facilitate inter-networking leading to universal data communications just as the public switched telephone network provides universal telephone service.

- Increasing demands, particularly from larger users, to be able to configure, manage, and administer their own networks, reducing reliance on vendors and benefitting from cost control/reduction and improved turnaround will lead to more private and virtual private networks at the expense of other network services.

- Further installation of fiber optic networks, ultimately becoming the backbone for many long-haul services but also supporting locally distributed facilities, will lead to decreasing per unit costs and new networking applications.

4.   WHAT SMALL USERS WANT

- Small companies, unable to cope with the wide range of options, services, features, and pricing schedules, are searching for simplicity.

- They would like to see the "old" Ma Bell return to handle all of their tele-communications needs, but they recognize this is not likely.

- Instead, smaller companies prefer to deal with one or two vendors providing them with end-to-end services, managing the facilities, and pricing them fairly.

- Small users want the right network for the application at hand at the right price.

- The ideal would be an adaptation of least-cost routing for their specific voice and data needs, a system which would use its own judgement to dispassion-ately evaluate competitive services, and available applications presenting a

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few options in a clearly understood menu, allowing a choice with confidence in the results.

5.   WHAT LARGE USERS WANT

● Large users with greater capabilities in managing, configuring, and monitoring networks generally favor competition which offers the benefits of price and technological competition.

● They want to completely control network configurations, but they don't want the process to be excessively difficult.

● They are willing to select and install equipment, but when it comes to the network itself, they want to order bandwidth on demand. Software defined networks, configured through microcomputers or terminals, offer this capability.

● Beyond traditional cable-based networks, large users want technologies which fit the application at hand, providing a balanced combination of economy, service quality, network availability, reliability, response time, and freedom from errors.

● They appear willing to experiment with innovative applications and network services but are often unaware of techniques which fall outside the mainstream of their experience.

6.   USER CONCERNS

● Exhibit V-2 shows the average ratings of user's concerns with regards to network services.

    - Costs received the highest ratings, with the related concern of access charges close behind. Other highly rated concerns were vendor viability and standards for interconnection.

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EXHIBIT   V-2

USER CONCERNS

Horizontal bar chart titled "USER CONCERNS" with values rated on a scale from 1 (NO CONCERN) to 5 (GREAT CONCERN):

- Access Charges: 4.3
- Network Mergers: 3.0
- BOCs Computing with AT&T: 2.9
- Vendor Viability: 4.5
- Standards for Interconnection: 4.5
- Regulatory Agencies: 3.6
- Cost: 4.9

X-axis: 1 — NO CONCERN ... 5 — GREAT CONCERN

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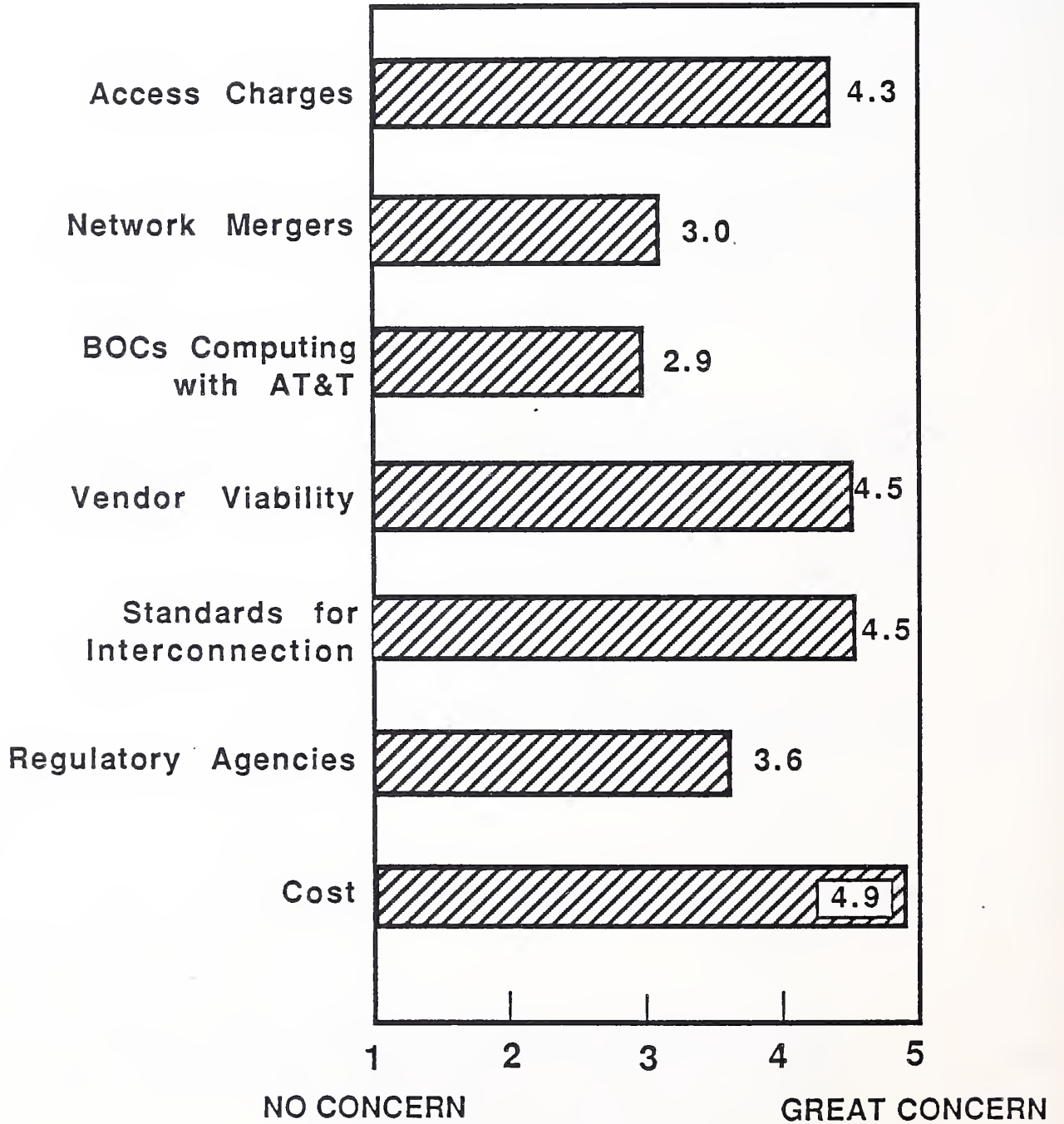
- The high rating given standards for interconnection points to growing awareness of the need to interconnect dissimiliar machines over networks.

- Network mergers were rated at midrange. This becomes a concern if the merger affects service and network flexibility.

  - Several larger users expressed concerns that network mergers might reverse the directions initiated with divestiture, returning network services to a monopolistic situation and reducing the positive effects of competition on prices, technological advances, and innovation.

  - Smaller users, however, were more favorably inclined toward mergers which work to reduce the complexity of multiple choices.

- Similiarly, concerns over the BOCs competing with AT&T were rated at midrange. Again, larger users benefit from more competition while smaller users seek one-stop solutions.

7. PRIVATE VERSUS PUBLIC NETWORK SERVICES DIRECTIONS

- Users interviewed by INPUT show movement toward increasing private network configurations and interest in quasi or "virtual" private network offerings at the expense of other network services. Exhibit V-3 shows how interview respondents see their current networks configured and how they will look in 1991.

- Comments from respondents fit the observed pattern of IS in corporate America. The primary reasons given for the reported changes were cost related. Representative comments include:

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EXHIBIT V-3

CORPORATE NETWORK USE

User Views
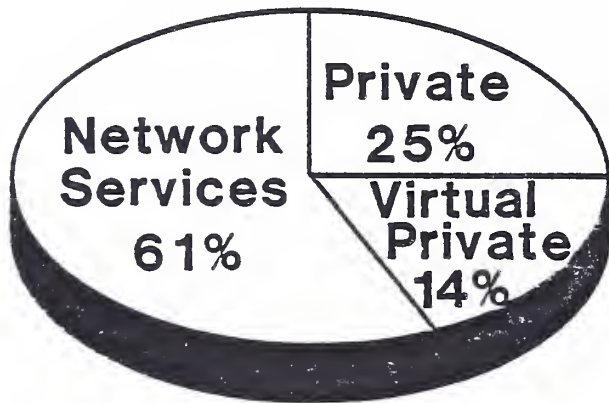
1986
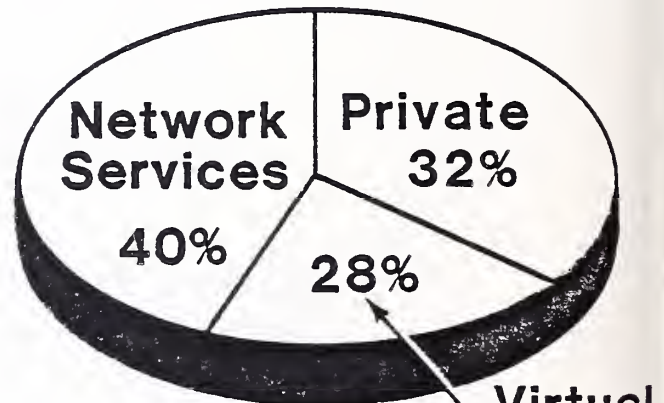
1991

- "It's economics. We would rather pay by time used rather than pay monthly charges."

- "We are implementing a digital T-1 backbone network with compressed voice, piggybacking data to reduce costs."

- "It's part of a technological migration due to the availability of software defined networks and toward ISDN."

- "We see a change in the price differentials between networks and naturally we'll go where we can achieve economies."

- To summarize, the reasons given for the movement toward virtual/software defined networks and private networks are:

  - Desire for more control. Many users found service delays for the installation and maintenance of links unacceptable and felt that new technologies can be more quickly implemented on private and virtual networks.

  - Cost control. Users feel private and virtual networks offer better long-range control and protection from tariff changes.

  - Security. Private networks are seen as more secure than those using public facilities.

  - Compatibility. Since network services are not uniformly available, a private network offers the advantage of system-wide compatibility and connectivity.

- To address these concerns, network service vendors are offering new and revised services which meld private network features with public backbone

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networks using switch partitioning and software controls. These services provide a growing list of features and customer control to users.

- Using public or semi-public ("virtual" private) network services offer these benefits:

    - Ease of management and maintenance. This is handled by the vendor, although some services provide for user control through terminals connected to network processors for reconfigurations.

    - Low risk from customer-owned equipment obsolescence since the vendor presumedly maintains a state-of-the-technology network.

    - Usage sensitive pricing. Users are not faced with the inefficiencies caused by unused capacity if an SDN is used.

- While the trend is toward increasing private and virtual private network configurations, public network services will continue to be used, resulting in a mixed environment. For example, field offices which frequently move, or occasional data flows from remote locations will be most economical through public networks.

8. CONNECTING REMOTE OFFICES

- Users were asked to identify the methods they currently use to connect their headquarters office to remote facilities. As Exhibit V-4 shows, 80% are using WATS lines, with hybrid networks combining private and leased lines being used by nearly half.

- Of the 20% reporting usage of satellite links, users are nearly evenly split between managing the central hub earth station themselves and using the vendor's services and central hub.

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EXHIBIT V-4

REMOTE OFFICE LINKS

WATS	79%
Hybrid Networks	44%
Tandem Networks	25%
VANs	23%
Microwave	21%
Satellite	20%
- **Vendor Managed Hub**	53%
- **User Managed Hub**	47%

Note: Totals over 100% due to multiple links.

9. CURRENT AND PLANNED BYPASS ACTIVITIES

- Users were asked if they are currently doing anything fitting the accepted definition of "bypass," using alternative facilities to go around an LEC central office for communications.

    - Approximately one-fourth reported bypass systems, with leased lines, microwave systems, and fiber optics nearly evenly represented.

    - Over half the respondents reported plans to implement bypasses within the next two years. Of these, nearly half reported evaluating microwave, with fiber optics closely behind.

    - These results are shown in Exhibit V-5.

10. FEW USERS RESELL EXCESS CAPACITY

- INPUT was unable to identify any companies in the research sample which resold private network capacity to others. However two such cases were found in the literature search.

- Kodak began reselling capacity on its private network in 1984, using AT&T long-distance lines. However, after a short time, the company abandoned this project citing volatility in line charges making it difficult to guarantee rates to its customers.

- More successful in resale was Schneider National, a Wisconsin common carrier trucking company. When the FCC lifted long-distance resale restrictions, rather than sign with an alternative long-distance carrier, the company decided to start a subsidiary communications company to resell its excess private network capacity.

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EXHIBIT V-5

BYPASS DIRECTIONS

Now Using Bypass		**23%**
● **Leased Lines**	**58%**	
● **Microwave**	**53%**	
● **Fiber Optics**	**47%**	
Planning to Bypass		**55%**
Evaluating:		
● **Microwave**	**48%**	
● **Fiber Optics**	**43%**	
● **Leased Lines**	**33%**	
● **Satellite**	**15%**	

Note: Totals over 100% due to multiple responses.

- Schneider subsequently purchased two large central office-type telephone switches for both its own use and to support resale operations. The company provides call accounting services, compares its bills against AT&T's, and guarentees a lower rate. Its services are sold by telephone equipment vendors in the state.

11. SHARED NETWORKS

- The best examples of shared networks are found in the embryonic shared tenant services (STS) industry and in teleports. Shared ATM networks in banking are discussed below in Section K-1.

    a.   Shared Tenant Services

- STS enterprises are being developed largely because of industry deregulation, which allows new companies to enter the market.

- These enterprises are typically real estate developers, often joined by office system, telecommunications, and building control vendors.

- By becoming telecommunications vendors themselves, STS developers hope to cut tenant costs, receive revenue from services provided, and improve the perceived value of their properties.

- While it is estimated that STS services are offered, or being planned, for nearly 200 developments, a low percentage (under one-third) of current tenants are making use of the available shared services. Some tenants are large enough to implement their own systems, often leading to lower expenses than if they used the shared services.

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b.   Teleports

- Teleports may have similiar problems. Constructed near business centers, Teleports offer shared business services plus microwave links and satellite network gateways for video conferencing, international communications, and high-speed applications.

- The New York Teleport, located on Staten Island, has installed fiber optic links to Manhattan and elsewhere in the metropolitian area to carry traffic to the Teleport's satellite uplinks, to offices located in the associated business park, and between offices in the city.

c.   Analysis

- Communications technologies are changing so rapidly that needs for services identified when teleports and shared tenant buildings were originally planned may be met through other means.

- The focus of STS and teleports on satellite communications will likely be reevaluated in light of fiber optic network developments.

- Satellite services are most attractive for broadcast applications such as videoconferencing and to transmit data to a large number of distributed destinations.

- Both STS and teleports may be effective solutions for smaller companies which typically do not have the resources to install their own communications systems or field offices of larger companies which, because they often move, will benefit from the offered services.

- The shared facilities and shared costs must be lower than those associated with installing company owned or leased facilities.

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B.   REGULATORY TRENDS

● This section covers the actions stemming from AT&T's voluntary divestiture of its operating companies as well as regulatory trends on federal and state levels affecting the Regional Holding Companies (RHCs) and the Bell Operating Companies (BOCs), as well as independent telcos and other common carriers.

● These actions, and future events, will impact network users options. Understanding the dynamic forces at work is a necessary component of advanced network planning.

I.   FEDERAL REGULATIONS

● The challenge for regulatory agencies is to deregulate while preserving and enhancing competition which, it is presumed, leads to more product options, lower prices, better service, and improved information access for customers.

● Some industry participants do not feel these benefits are yet being realized due to the failure of policy makers to consider, on a timely basis, the rapidly changing telecommunications market. Indeed, keeping up with the industry is a difficult task.

● Remaining restrictions are viewed by some (particularly the BOCs) as preventing the free enterprise competitive system from benefitting customers.

● In fact, the monopoly is being eroded through bypass techniques such as microwave.

- The FCC, in a series of rulings, has indicated the intention to overule state PUCs trying to prevent larger private users from bypassing local telcos.

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- The BOCs and independent telcos are concerned, saying they are required to serve both large and small users, while competing bypassers target lucrative, high-volume business users.

● The BOCs, through unregulated, separate subsidiaries, are seeking waivers to enter new markets, often outside their geographical areas.

● The thrust of the FCC's Computer Inquiry III is to lift structural separation restrictions from the Bell regional holding companies.

● While there is yet no agreement on how to prevent anticompetitive activities, the options being considered are "non-structural" safeguards such as accounting controls, network and customer information disclosure, and equal access for alternative carriers.

2. STATE REGULATIONS

● In a January 1986 address to a telecommunications industry association, the FCC chairman proposed that state public utility commissions relax their rules to permit the local telcos to enter new businesses. In exchange for this new freedom, the monopoly protections now enjoyed would be removed.

● INPUT feels that since PUCs are subject to political pressures, for the most part they will not favor actions which may put local services at risk.

● Nevertheless, it is worth noting that several PUCs have favorably responded to deregulation petitions by the BOCs and that changes in state laws have had similiar results.

- For example, Illinois law now permits a regulated carrier to declare a service as "competitive" when another company offers the same type of service.

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- Illinois Bell has taken advantage of this by offering the Integrated Information Network which can be tailored to customer needs for both voice and data. Service is available up to 56 Kbps through digital central offices.

- In several states (Idaho and Vermont as well as Illinois), other legislation is being introduced to deregulate all categories of telephone service. The trade-off offered by BOCs is a period of price stability for basic telephone service.

- The BOCs, through their subsidiaries, are in new businesses; Exhibit V-6 lists some examples. While only some of these are directly related to network services, the list is indicative of the range and scope of services now provided by the BOCs in the competitive marketplace.

- The future will see the BOCs more actively involved in electronic services to the home (videotex, home banking, and possibly cable television). Initially, they will manage the services of others by providing communications channels.

- Subsidiary operations, forced to stand alone without reliance on profits from regulated activities, is one approach; however, merging these activities with ongoing business activities is beneficial since it reduces marketing costs and improves coordination. In reality, it represents a return to one-stop communications shopping.

- However, the price is to allow others to enter the local service business. This may be unacceptable; the BOCs would undoubtedly prefer to maintain this monopoly. Regardless, the monopoly is eroding. The BOCs want to compete on fair ground and will lobby for that privilege.

INI.

EXHIBIT V-6

EXAMPLES OF NEW BOC BUSINESS

Bypass Equipment

Interconnect Telephone Equipment

Computer/Office System Retailing

Software Development

Publishing

Personal Communications (i.e. paging, cellular and traditional mobile services)

Computer Maintenance

Shared Tenant Services

Real Estate

Financial Services

Seminars, Technical Education

Domestic/International Consulting

Engineering/Construction Management

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- To competing vendors, the threat and reality of integrated communications marketing is formidable. These vendors can be a powerful political constituency and will not be silent.

- To the BOCs, the diversification/integration effort, while understandable from a business sense, may cause managerial and organizational problems which cannot be ignored.

C.   VENDOR TRENDS

1.   MERGERS, ACQUISITIONS, AND STRATEGIC PARTNERING

- As noted in Chapter III, the network services market has been marked with a number of significant joinings. The largest, discussed in detail in that chapter, included:

    - McDonnell Douglas and Tymshare/Tymnet.

    - GE and RCA.

    - IBM and MCI.

    - U.S. Telecom and GTE Sprint.

- INPUT expects such consolidations to continue through 1990 and beyond.

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2.   VANs

   a.   Background

- VANs are essentially resellers, buying high-speed capacity and parcelling it out to lower volume users, albeit with "value added" features such as protocol/code/speed conversions and error detection/correction.

- Because of the capital expenses involved, it has taken several years for some of the VANs to reach profitability, and others have never been profitable.

- VANs which were developed by large remote computing services were often more successful than "pure" network services since they had current processing customers who gained from the benefits of less expensive links with added features. The network efficiently replaced tape shipments, dial-up access, or leased lines.

   b.   Problems

- VAN usage has experienced historic rapid growth due to deregulation and the importance of data communications. But there are problems, and long term, perhaps critical, ones.

   -   The market is categorized by extreme competition, with the various services being viewed as commodities.

   -   This has led to extreme price competition and low profit margins. While VANs require few personnel to maintain operations, the capital expenses are significant.

   -   Competition from planned LEC intra-LATA packet networks may be substantial.

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- Many companies are developing their own internal packet networks or using "virtual" private networks.

c.   Trends

- Several trends may be anticipated:

    - Strategic partnering, as shown in the agreement between Tymnet and Southern New England Telephone to expand local service availability through connections with the LEC's intra-LATA packet network, providing gateways to the national network. This is an alternative to additional VAN points-of-presence.

    - Network mergers, as shown with the pending mergers of GTE's Telenet and U.S. Telecom's UNINET, and with GEISCO's Mark-Net and RCA's Cyclix.

    - Niche strategies, as shown by McDonnell Douglas creating subsidiary corporations and groups to target specific industries and applications using the company's VAN as the delivery and communications vehicle.

- Established VANs, competing for the same customers, have evolved strategies away from generalized services by providing conversions and applications designed for use by niche markets. These applications often incorporate users' micros and larger machines into the service mix. INPUT will examine these services in a forthcoming report on distributed processing services.

d.   VAN Positioning

- Generally, the opportunities for VANS lie in servicing various industry "communities of interest," building the critical mass necessary for profitability. For example:

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- VANs can be used to interconnect a company's local area networks in several locations.

- Several of the major VANs, working with their processing·services, are providing Electronic Data Interchange to electronically handle the "paperwork" of purchasing and distribution. These applications are usually targeted to specific industries.

- Several VANs are providing industry-specific on-line data bases, in addition to providing communications links to commercial OLDBs.

- Other services added to VANs include electronic mail and telex; voice services may be offered in the future.

e. Creative Pricing

- Two VANs have introduced creative pricing schedules for computer hobbyist services which may also be useful to corporate users.

    i. GTE Telenet's PC Pursuit

- For a flat rate of $25 a month, GTE Telenet allows unlimited access to micro-computer hobbyists during off peak hours. The network automatically disconnects after one hour of use.

- PC Pursuit is designed for microcomputer-to-microcomputer connections, supporting real-time communications, file sharing, or bulletin board access.

- Companies could also presumedly use this service for bulk transfers after hours.

- The service is designed to generate revenue from underused capacity during off-hours.

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ii. GEISCO's GEnie

- GEnie is the General Electric Network for Information Exchange which became operational in October 1985. It provides consumer information services for $5 an hour during non-prime times.

- Users can access a variety of entertainment, information, and software exchanges including bulletin boards, special interest groups, electronic mail, newsletters, conferencing, shopping, and travel services.

- This service compares to existing hobbyist-oriented services such as The Source, CompuServe, and Delphi as well as with regional computer bulletin boards.

- GEnie represents an attempt to utilize unused capacity in off-peak hours; however, INPUT feels the service will be a limited opportunity for the vendor due to a late entry and limited features.

f. Traffic/Revenue Growth and Profitability

- The average annual growth rate for U.S. value added network revenue is expected to be approximately 28%.

  - More than half of that will be due to increasing usage, and the other portion due to price increases.

  - Revenue growth will be slower than traffic volume because of intense price competition.

- It is important to note that revenue growth does not necessarily mean profitability. Associated with developing new business are capital and marketing expenses. Uncontrolled growth can negatively impact a company's ability to make money.

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- As Exhibit V-7 shows, INPUT projects value added networks will become a $1.3 billion market in 1990.

g.   The Opportunity in Private Networks

- A large number of users indicated they are considering virtual private networks for its cost benefits coupled with the user management and configuration features offered.

- Hardware vendors are putting pressure on VANs with equipment for cost-effective private networks.   While primarily benefitting large companies, smaller companies may gradually find private networks cost-effective.

- This trend toward private networks does offer VANs opportunities in applying their expertise toward developing customer installations and providing facilities management services.

- The major threat in the long term will be ISDN, as discussed in Chapter III.

D.   A NETWORK CAPACITY GLUT?

- In the late 1970s, demand for satellite channels to distribute cable television programming was high and large corporations were adding to their long-haul networks with satellite links.

- Many user organizations overestimated their requirements or purposely ordered excess capacity with resale intentions.   Cable television expansion slowed, and alternative long-haul methods became available.   Further, demand forecasts for data communications failed to materialize as scheduled.

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EXHIBIT V-7

VALUE ADDED NETWORK FORECAST
Processing/Network Services
(User Expenditures)

AAGR: 28%

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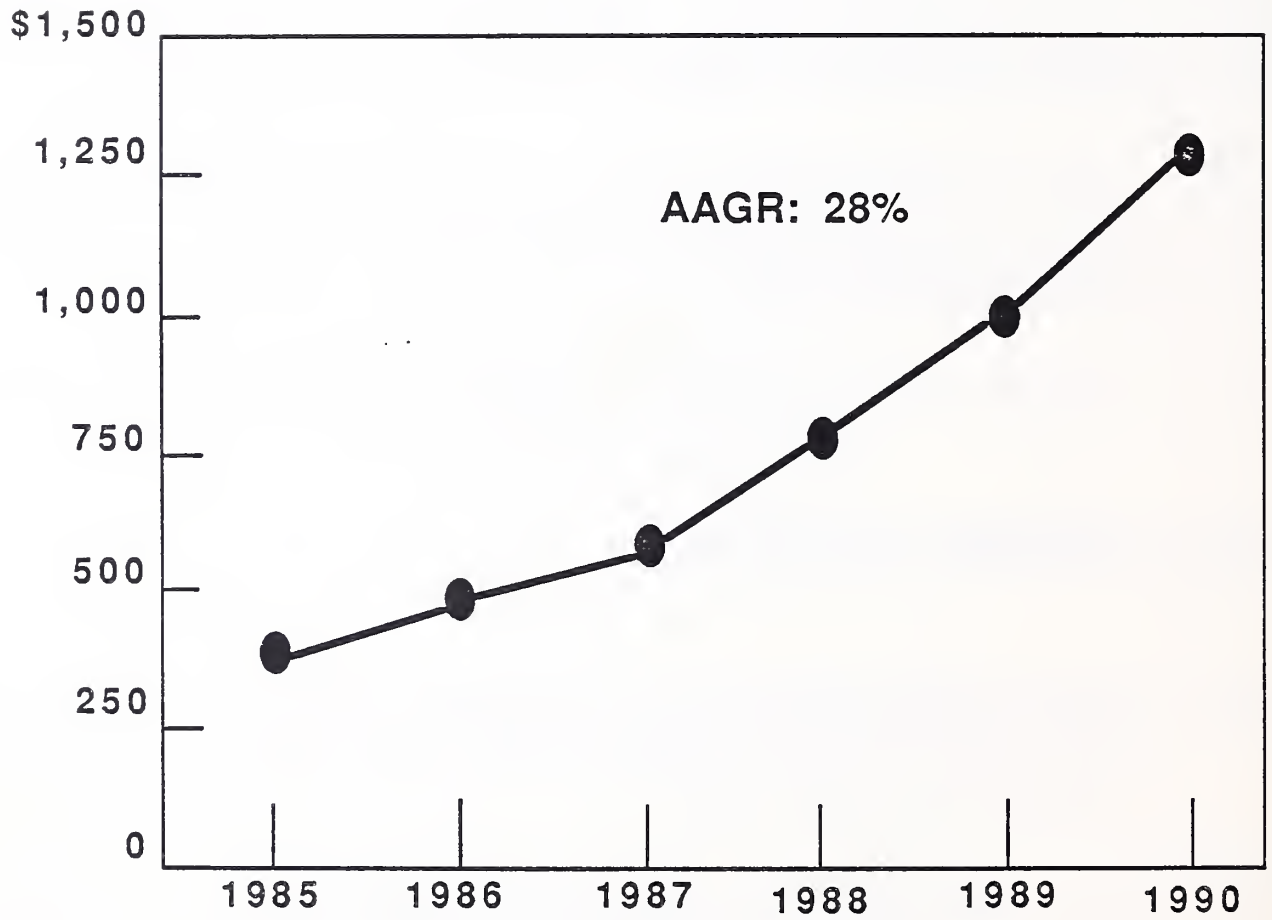
- The result was restructured business plans for satellite vendors making adjustments between their projections and actual demand, and the same course of events may be happening in the fiber optic segment.

- Growing network capacity, particularly in satellite and fiber optic systems, will lead to price competition and more aggressive marketing.

- However, growing capacity and the associated reduction in transmission costs will presumedly encourage new applications. This will be led by lowering barriers to entry, as has been the case with OLDBs, and in long-distance resale markets.

- Two central questions need to be addressed:

  - Will the network services vendors seek ways to fill the pipelines becoming available or will needed innovations come from others?

  - Is the assumption that the pipeline needs to be filled valid?

- In the first case, applications will come from both network vendors and others. AT&T is involved in videotex, for example, working both on its own and with partners.

- Regarding the second question, at least in the case of bulk capacity fiber optic networks, the breakeven point could be as low as 10%-20%, meaning the impetus to find new uses may not be great. Rather, the natural progression in traffic growth will ultimately use much, if not all, installed capacity, eventually triggering network rebuilds and upgrades.

- New applications include those currently emerging, such as videotex, networked CAD/CAM, and other graphic and image applications (scientific, engineering, and medical), and point-of-sale/credit card authorization systems.

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- Speculative applications remain to be developed in areas such as dial-up consumer and business services and intelligent home applications. New and emerging applications requiring additional network capacity are described in Chapter VII.

E.   APPLICATION TRENDS

1.   VOICE REMAINS DOMINANT, DATA GROWING

- INPUT's research finds that on average, users believe voice traffic currently accounts for three-fourths of their network use while data traffic is one-fifth. Image applications, including graphics, video, and facsimile applications, on average currently contributes 5%.

- These proportions will change in the future with increasing data (nearly double) and a slight (1%) increase in image. Exhibit V-8 shows these findings.

- Within the image category, video shows the largest growth (nearly four-fold); however, users rated the importance of video conferencing, now and in the future, fairly low. As a percentage of traffic, video conferencing remains minimal. Facsimile shows a decline, while both usage and the importance of graphics increases.

- Exhibit V-9 shows current and projected user estimates for image traffic.

- Users were asked to give reasons for the change in proportions between the three modes. Representative comments were:

    - "More employees will have terminals and there will be more on-line applications, leading to more data traffic."

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EXHIBIT V-8

CORPORATE NETWORK PROPORTIONS

User Estimates

Image 5%
Data 20%
Voice 75%

1986

Image 6%
Data 37%
Voice 57%

1991

EXHIBIT V-9
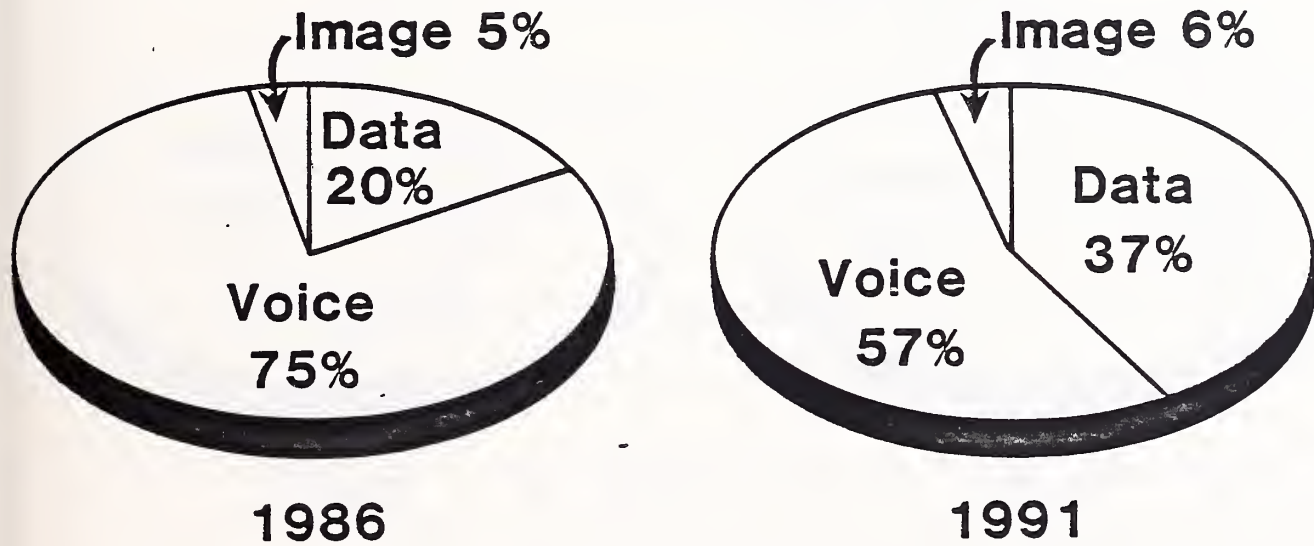
CORPORATE NETWORKS'
IMAGE ELEMENTS CHANGING

User Estimates

INP
44 MS!
MSP2
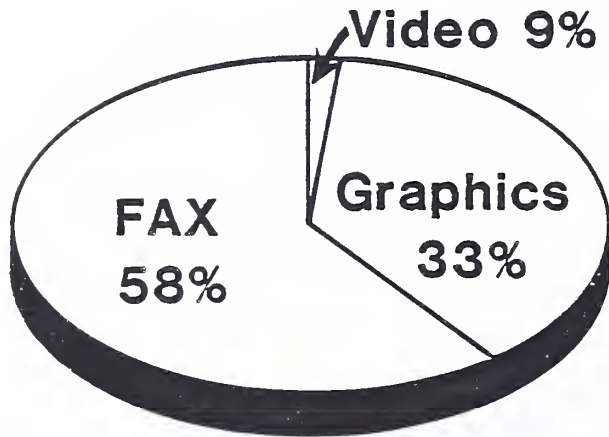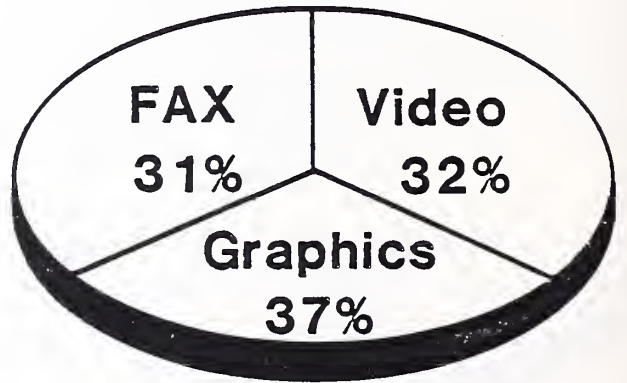
- "Data will become the vehicle for transmission of text and graphics, and we expect more demands."

- "Information that was formerly passed verbally is now written. Also, there is greater appreciation of the value of data and the ability to share it quickly."

- "We will have more file transfers between remote CPUs, and more communications between office systems at our subsidiaries."

- "Image is picking up quite a bit. We expect it to increase due to the availaility of technology supporting applications."

- "We see growing appreciation of the economies of video conferencing."

2. LONG-DISTANCE TRENDS

- Currently, AT&T is estimated to hold approximately 85% of the long-distance market.

- Attempts by the Bell Operating Companies to offer long-distance services were turned back in mid-1984 until such time as they lose their monopoly in local telephone services. According to the U.S. Justice Department, this is unlikely to occur for at least 10 years.

- It is generally accepted that the survival of the national IXCs will require attaining a 6%-8% share, meaning erosion of AT&T's share and a need for mergers by smaller companies to achieve this critical mass.

- The number of companies receiving Carrier Identification Codes (CTCs) issued by Bell Communications research reached 188 in 1985.

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- Despite the large number of companies participating, the long-distance market is showing signs of consolidation.

- As the local access charges levied the IXCs approach parity with those charged AT&T for local network connections, profit margins will be further narrowed.

  - Further consolidation will result.

  - It is likely that by the end of the forecast period, the market will be an oligopoly: a few companies providing long-distance services but the actions of any impacting the others in significant ways.

- Niche exploitation will remain.

  - Some of the IXCs will continue to focus their marketing efforts on large long-distance users for bulk services.

  - Creative pricing plans (for example, satellite communications rates based solely on time rather than distance) may show success.

  - Companies will need to add value to their long-distance offerings in order to differentiate their services.

- Creative marketing, using distinct marketing channels, may evolve. Credit card holders are now offering services charged to their accounts. An example is American Express' Expressphone using MCI facilities.

- The future may see demographic, ethnic, social, or even political market segmentation. For example:

  - A company may market long-distance service between the U.S. and France through a French-American social affinity group.

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- Senior citizens may sign up through the American Association of Retired Persons.

- Hispanics may be targeted through Spanish-language media.

- Parallels to these speculative visions can be found: Asian Yellow Pages Directory and Silver Pages directed at senior citizens are published in several sections of the country.

3. ON-LINE DATA BASES

a. Usage

- Users project that the importance of accessing commercial On-Line Data Bases (OLDB) will increase 20% in the next two years. INPUT's user expenditure forecasts for OLDB services by market segment are shown in Exhibit V-10.

- Among the factors leading to this growth are growing recognition of the value of information and micro-based software which eases the search process. Growth in data base use presages growth in packet networks which are used as the delivery mode.

b. A Trend in OLDB: Front-End Software and Services

- OLDB search structures can be complicated, often requiring specialized training.

- One trend in OLDB is the development of both user purchased software which serves as a front-end to the data base, facilitating the search process, and third-party bureaus which perform this function on-line.

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EXHIBIT V-10

ON-LINE DATA BASE SERVICES USER EXPENDITURE FORECAST
BY MARKET SEGMENT, 1985-1990

SEGMENTATION	$ Millions			AAGR 1985-1990 (Percent)
	1985	1986	1990	
Industry-Specific				
Discrete Manufacturing	$221	$281	$676	25%
Process Manufacturing	65	92	245	30
Transportation	68	79	147	17
Utilities	21	24	46	17
Telecommunications	134	170	409	25
Distribution	189	235	564	24
Banking and Finance	346	429	1,031	24
Insurance	54	69	165	25
Medical	23	27	50	17
Education	21	24	45	16
Services	230	323	863	30
Federal Government	23	29	69	25
State and Local Government	7	9	22	26
Other Industry-Specific	52	65	155	24
Subtotal	$1,454	$1,856	$4,487	25%
Cross Industry				
Securities	154	195	528	28
Credit	237	301	751	26
Text/Bibliography	82	98	210	21
News	154	191	452	24
Economic/Other	95	111	211	17
Subtotal	$722	$896	$2,152	24%
Grand Total	$2,176	$2,752	$6,639	25%

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- EasyNet, from Telebase Systems (Narberth, PA) is currently the sole independent provider of such a service.

  - Accessing the system via a toll-free number, a user responds to a series of questions from which the system designs a search strategy.

  - A flat fee is charged to a credit card number entered upon log-in.

- Dialog Information Services (Palo Alto, CA) has introduced the Dialog Business Connection, a premimum priced, menu-based system which will search all available data bases for requested information based on keywords.

- BRS (Latham, New York) is providing a similiar service option called "Brkthru."

c.   CD-ROM Will Impact OLDB

- Several companies are now publishing data bases on floppy discs.

  - Isys (Acton, MA) provides financial information, and Corporate Technology Information Services, Inc. (Wellesley Hills, MA) offers a data base of information on both public and private high technology firms.

  - One disadvantage of this method is the need for periodic updates, and often the dedication of a hard-disk microcomputer to house and access information.

- OLDB and VAN services which provide access to them will eventually be impacted by the developing Compact Disk Read Only Memory (CD-ROM) and related optical disk systems.

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- Reference materials, now only manageable in OLDB or in unwieldy paper or micrographic formats, will be economically available on easily managed optical systems.

  - The present centralized data bases will become more decentralized with local storage, reducing communications, and access costs.

  - Users will benefit from more casual and complete searching without being concerned that the "clock is ticking," and that charges are being accumulated.

  - The ease of disk reproduction suggests mass marketing of directories, catalogs, archives, and other relatively static references for the corporate library and for users.

- Despite this technology, dial-up information services will still be used, but primarily to access recent materials and by those needing only occasional data base searches.

- Several information providers are publishing CD-ROM data bases. Examples include:

  - Information Access Corporation (Belmont, CA) with its InfoTrac bibliographic reference covering many business publications and major newspapers.

  - National Decision Systems provides Infomark with marketing and demographic information designed for market researchers and planners.

  - Several technical data bases as well as an electronic encyclopedia are also available on CD-ROMs.

- Further information about CD-ROM and related technologies can be found in INPUT's report <u>Impact of Upcoming Optical Memory Systems.</u>

- Chapter VIII contains a scenario projecting the effects of CD-ROM on OLDB and network service vendors.

4. ELECTRONIC MAIL (E-mail)

a. <u>Survey Findings</u>

- INPUT's user research finds a definite pattern toward increasing use of electronic mail.

b. <u>E-mail Directions</u>

- Electronic mail is currently limited because there are different systems and services with different command structures. This inherent incompatibility will be less of a problem within a few years as X.400 standards are implemented.

- The near term will also see further integration of services, such as voice mail and textual electronic mail merging. For example, on Digital Equipment Corporation's All-in-One integrated office system, DecTalk reads electronic messages aloud over the telephone or through a workstation speaker.

- Voice-to-text is a more difficult undertaking. IBM and Wang are working on voice command typewriters with E-mail implications. Speech Systems Incorporated (Tarzana, CA) claims to have a lead in continous voice-to-text processing and is now offering developmental and original equipment manufacturer products.

- E-mail acceptance will continue led by growing appreciation of its benefits and also by implementation of the X.400 standard leading to universal E-mail communications capabilities.

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INPUT

- X.400 will standardize the interfaces between different E-mail systems and allow full integration of media (voice, for voice mail, graphics, text, and eventually image) into one basic information distribution system.

- The purely electronic, as opposed to mixed mode, usage of E-mail (which prepares and mails a hard copy of the message) will particularly benefit from standardization.

- Most of the value added networks have electronic mail services limited to electronic delivery. However, the E-mail services of Western Union (EasyLink) and MCI (MCI Mail) can be accessed via several VANs and do provide hard copy delivery options.

- McDonnell Douglas' Tymnet has entered into an agreement with Telentry Systems Inc. (Stamford, CT) to resell the latter's proprietary document transmission service.

  - Tymnet will provide transmission capacity on its international packet network.

  - Telentry will provide the means for point-to-point communications between word processors and personal computers regardless of compatibility.

  - The service, which enhances Tymnet's OnTyme E-mail, is directed at a perceived need for inexpensive ways to exchange documents between different devices in fully translated, electronically editable, and retransmittable form.

  - Applications include proposals, regulatory filings, and legal briefs which may be prepared on one word processor, but need to be reviewed and finalized using the formatting provided by another system.

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- Future E-mail offerings by the BOCs and a new service from AT&T will serve to encourage usage and may seriously impact third-party service pricing. The success of E-mail in consumer markets is dependent on videotex acceptance and, more importantly, a home computer market resurgence.

c.   Teletex

- Teletex, not to be confused with Teletext, which describes the one way distribution of viewdata via television signals, is being promoted as a replacement for telex, yet it maintains compatibility with the mature, global, telex network.

- Teletex was introduced in 1981 by the West German Post, Telephone and Telegraph (PTT) agency called Bundespost.

- It links word processors and other intelligent terminals via the PSTN or through public data networks.

- Teletex service is available in several European countries, Canada, and on a limited basis in the U.S.

- Internal forecasts by the Bundespost were overly optimistic. They assumed that lower communications charges and low fees would encourage migration from telex to teletex.

- Several reasons appear responsible for the slow growth of the service:

    -    Terminals are still more expensive than telex, especially used ones.

    -    Even though transmission costs are lower due to higher speeds, service charges in the U.S. are also higher than the fees charged in Europe.

INPUT

- The trend is away from dedicated messaging terminals to multifunctional workstations.

- Telex is embedded, with an estimated two million user organizations worldwide.

- International acceptance of the teletex standard has been another problem.

- INPUT estimates there are approximately 12,500 teletex users worldwide and fewer than 1,000 U.S. users.

- Replacements for telex terminals will most likely be teletex terminals or teletex-compatible workstations. Replaced telex machines will find an aftermarket, impeding somewhat the universality of teletex.

d. Facsimile (FAX)

- Facsimile usage in the U.S. is lower than in other countries, such as Japan, where the language has graphic characteristics.

- An extensive advertising campaign by Federal Express has triggered FAX equipment manufacturers to agressively market digital, high-speed, intelligent machines in a "coattail" marketing approach.

- Federal Express' Zapmail Service has lost a reported $200 million since introduction in 1984, and installation of Zapmail machines at customer premises was temporarily halted in March 1986, ostensibly to allow technical hardware improvements and installation of VSAT satellite dishes (using the Ku band) to replace leased lines.

- Historically, it is interesting to note that Graphic Scanning's Graphnet was originally designed for facsimile transmission and was later reconfigured to support other traffic.

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- Software has been introduced which allows microcomputers to communicate with Group III digital fax machines through dial-up lines. Similiarly, properly equipped microcomputers can receive and display images received from digital fax machines. This is known as "softfax" as opposed to hardcopy.

- INPUT feels that FAX will remain useful as a convenience but will find significant applications only in visually-oriented businesses, such as advertising agencies, architect offices, fashion design studios, and similiar settings.

- Niche usage for signature verification will also continue, although increasingly, digitizing optical scanning techniques coupled to high resolution monitors and plotters will replace FAX systems.

  e.   <u>Voice Store and Forward (VSF)</u>

- A verbal form of electronic mail, VSF (also called voice mail) can be accomplished on advanced PBXs, either with add-on equipment or integrated into the switch.

- Service bureaus have been established by Voice Mail International, GTE, Wang, and independent companies, often in association with telephone answering services.

- Eventually, pending resolution of regulatory questions, the LECs will offer VSF as an enhanced service or as part of Centrex services to businesses.

5.   VIDEOTEX

- Videotex is distinguished from other forms of on-line data base applications by its graphic features and easy user interface. Videotex was developed in Europe with the intention of increasing network traffic, especially during off-peak hours.

INPUT

- The primary business application for videotex includes internal use for economical information distribution, external services graphically describing electronic components for manufacturers (Videolog of Norwalk, CT), and an AT&T-managed service for real estate agents (Monmouth County, NJ). However, this real estate service has been cancelled due to financial and software problems.

- Efforts are continuing to develop general consumer videotex, but disappointing results have led to the discontinuation of the three which had been offered. The reasons include:

  - No government backing. In Europe, videotex was developed with help from the governmental post, telephone, and telegraph companies (PTTs). In France, terminals are provided to replace telephone directories with an on-line directory while other fee-based information services are provided.

  - As originally introduced, videotex required special and relatively expensive terminals which could be used for the service. U.S. videotex services failed to recognize the importance of the micro.

  - Competing for would-be videotex subscribers are the information utilities such as CompuServe and the Source, as well as localized computer bulletin boards.

  - The technology itself is also a factor behind slow acceptance of the new media. Although the situation is being improved, videotex can be somewhat frustrating due to slow screen drawing and refresh cycles.

- Low subscription rates has led Times Mirror to discontinue its Gateway service, provided in affluent Orange County (CA).

IN

- The company had losses estimated between $20-$30 million.

- The system attracted fewer than 2,000 subscribers since November 1984.

- Reasons given for the poor showing include customer difficulty in understanding the service and dependence on a dedicated videotex terminal rather than including microcomputer users.

- Similiarly, the Knight-Ridder South Florida Viewtron service, which was available nationally and did support microcomputers as terminals, abandoned its operation after a $50 million investment. It claimed approximately 20,000 subscribers.

- The potential may still exist for a consumer-oriented service, as several large corporations have recognized. However, it is interesting to note that alliances have been formed to share the risks of videotex development. Examples include:

  - IBM, Sears, and CBS in Trintex.

  - AT&T, Time, Inc., and two banks in Covidea. Rather than focusing solely on the informational aspects of videotex, Covidea will target transaction-based applications.

- INPUT feels a dramatic move is necessary to make U.S. consumer videotex more than a promising service which has fallen behind projections and that meaningful consumer acceptance will not occur until the mid-1990s, if then.

- One scenario calls for adapting the French strategy of distributing free terminals to replace published telephone directories, with fee-based services offered through the system.

INPUT

6.   MICRO-TO-MAINFRAME AND NETWORK SERVICES

- In a 1985 series of studies, 130 users were asked to identify the types of communications linkages which are used for various micro-mainframe connections. They were also asked to rate the importance of various connections.

- Exhibit V-11 shows link usage.

- It was not surprising to find that LANs, leased lines, dial-up access, and direct links are those most favored for micro-mainframe connections.

  - LANs and leased lines drop approximately 10 percentage points when the same micro is used to link to multiple mainframes.

  - The generally lower ratings for this multiple connection suggests a lower priority, which was confirmed by the 2.1 rating (out of 5) given this configuration elsewhere in the survey.

- LANs are favored for micro-micro links, and dial-up access is the most favored method to connect a company's micros to another company's mainframe or micros.

- WATS lines and public data networks received very low ratings, suggesting two things:

  - Internal linkages are unsuitable for WATS or public data networks.

  - The specific connections (e.g., connecting micros to another company's micros) will be infrequent, negating any cost benefits.

- The survey findings indicates that the need to communicate outside the corporate environment (i.e., to public data bases as well as other corporations) was seen as less important than communicating internally.

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EXHIBIT V-11

MICRO-TO-MAINFRAME CONFIGURATION AND
EXTERNAL COMMUNICATIONS

CONFIGURATION	RATING*	LINKAGE MODE RESPONDENT PERCENTAGES
Micro-to-Company Mainframe	3.5	20.6% · 30.5% · 1.3% · 23.0% · 2.2% · 22.4%
Same Micro-to-Multiple Brand Mainframes	2.1	17.2% · 30.5% · 1.3% · 26.5% · 2% · 22.5%
Micro-to-Micro, Same Company	2.6	44.4% · 19.2% · 2% · 20.3% · 1% · 13.1%
Micro-to Another Company's Mainframe	2.0	6.8% · 20.2% · 2.2% · 56.2% · 1.2% · 13.4%
Micro to Another Company's Micros	1.5	8.6% · 14.8% · 3.7% · 54.4% · 3.7% · 14.8%
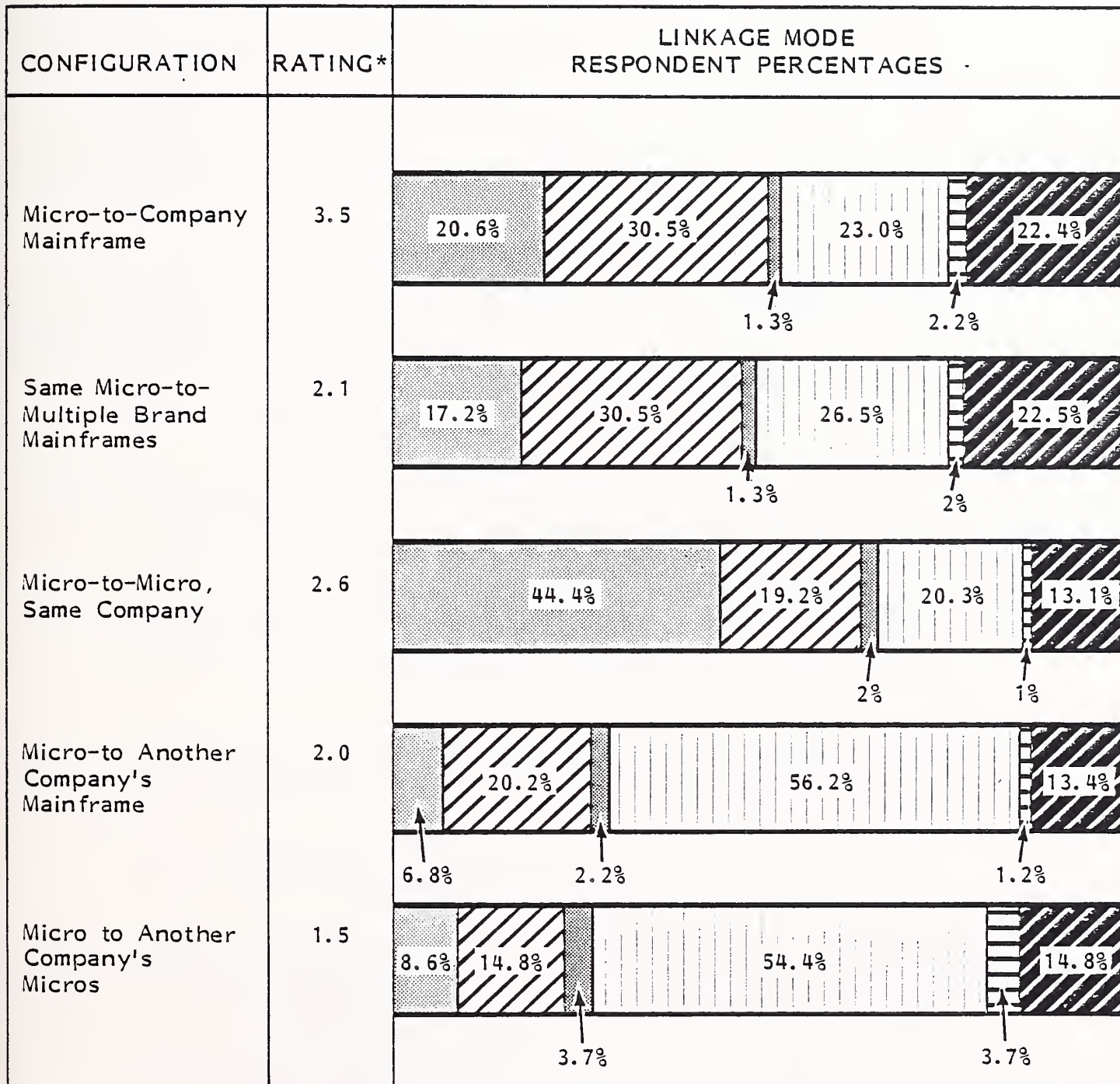
Legend: ☐ LAN   ▨ Leased Line   ▨ WATS   ☐ Dial   ☰ Data Net   ▨ Other†

*Average Rating, with 5 Being "Highest Importance".

†Other = Direct Links, through Controller, etc.

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7. ELECTRONIC DATA INTERCHANGE (EDI)

- INPUT analyzed EDI for a 1985 Market Analysis and Planning Service (MAPS) report and projected an average annual growth rate of approximately 100% through 1990.

  a. EDI Defined

- EDI is the electronic exchange of business information between companies in a structured application.

- It is used by companies to exchange electronic versions of standard business forms such as purchase orders, invoices, shipping bills of lading, and other documents otherwise prepared on computers, printed, and then mailed.

- With EDI, a company's computers exchange information with a trading partner's computers, even though they may be using incompatible systems and different document/data formats.

- INPUT's projected EDI growth is based on the method's benefits and the complexities of modern trading relationships.

- EDI's benefits include reduced costs in document preparation, faster turn-around, fewer errors since information is not rekeyed, time/space transparency, and the ability to integrate EDI data with existing applications such as inventory control, materials resource planning, and forecasting.

- While exchanges directly between two companies are being done now, complex business transactions often make managing such links difficult. For example, the auto industry buys components from approximately 35,000 small suppliers.

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- Accordingly, third-party EDI services are offered by Value Added Networks (VANs) with their processing affiliates and by several smaller remote computer services (RCS) which do not generally operate their own networks.

b.   EDI Growth/Costs

- As shown in Exhibit V-12, INPUT projects the EDI market will grow by approximately 100% per year to become a $1.15 billion market in 1990, representing a significant contribution to network services growth, as well as processing, software, and professional services.

- Transaction volume will grow at a slightly higher rate, as shown in Exhibit V-13, but as use increases and the effects of competition come into play, per-transaction costs will drop.

c.   EDI Service Vendors

- Vendors currently offering EDI services are McDonnell Douglas Electronic Data Interchange Company, General Electric Information Services Company (GEISCO), and IBM's Information Network. RCS vendors providing EDI services are Control Data Corporation, Informatics General, TranSettlements, RailInc., and SCM Kleinschmidt.

- AT&T Information Systems' Net 1000 did support EDI but the network has been discontinued.

d.   Associations Taking a Leading Role

- Industry associations are taking an important role in establishing and gaining acceptance of EDI standards.

- The leading advocate for EDI is the Transportation Data Coordinating Committee which has been centrally involved in educating potential users and

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EXHIBIT V-12

EDI MARKET GROWTH
1985-1990

INPU
MPIE MSI
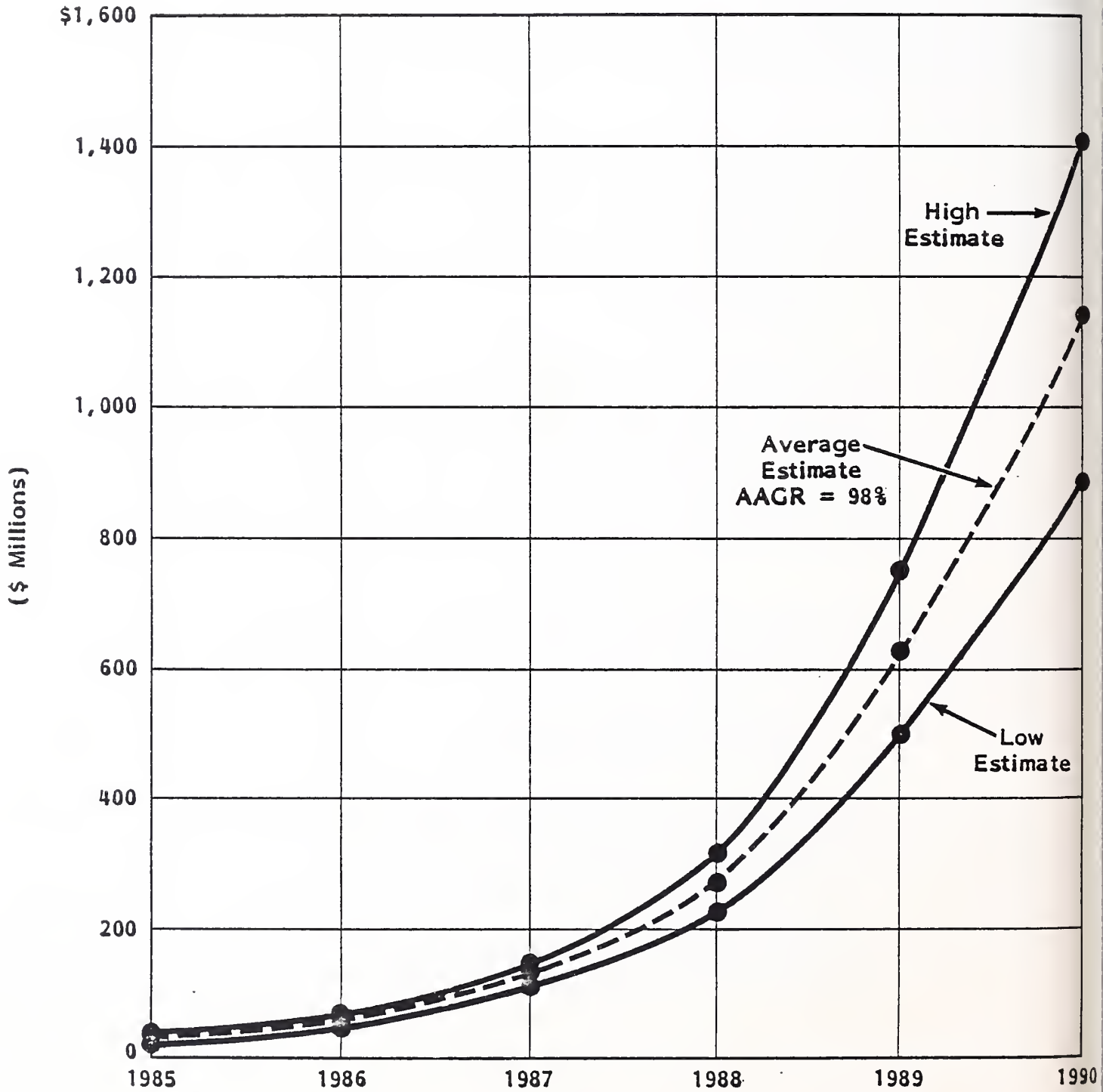
EXHIBIT V-13

EDI TRANSACTION GROWTH
1985-1990

INPUT
MPIE MSP2
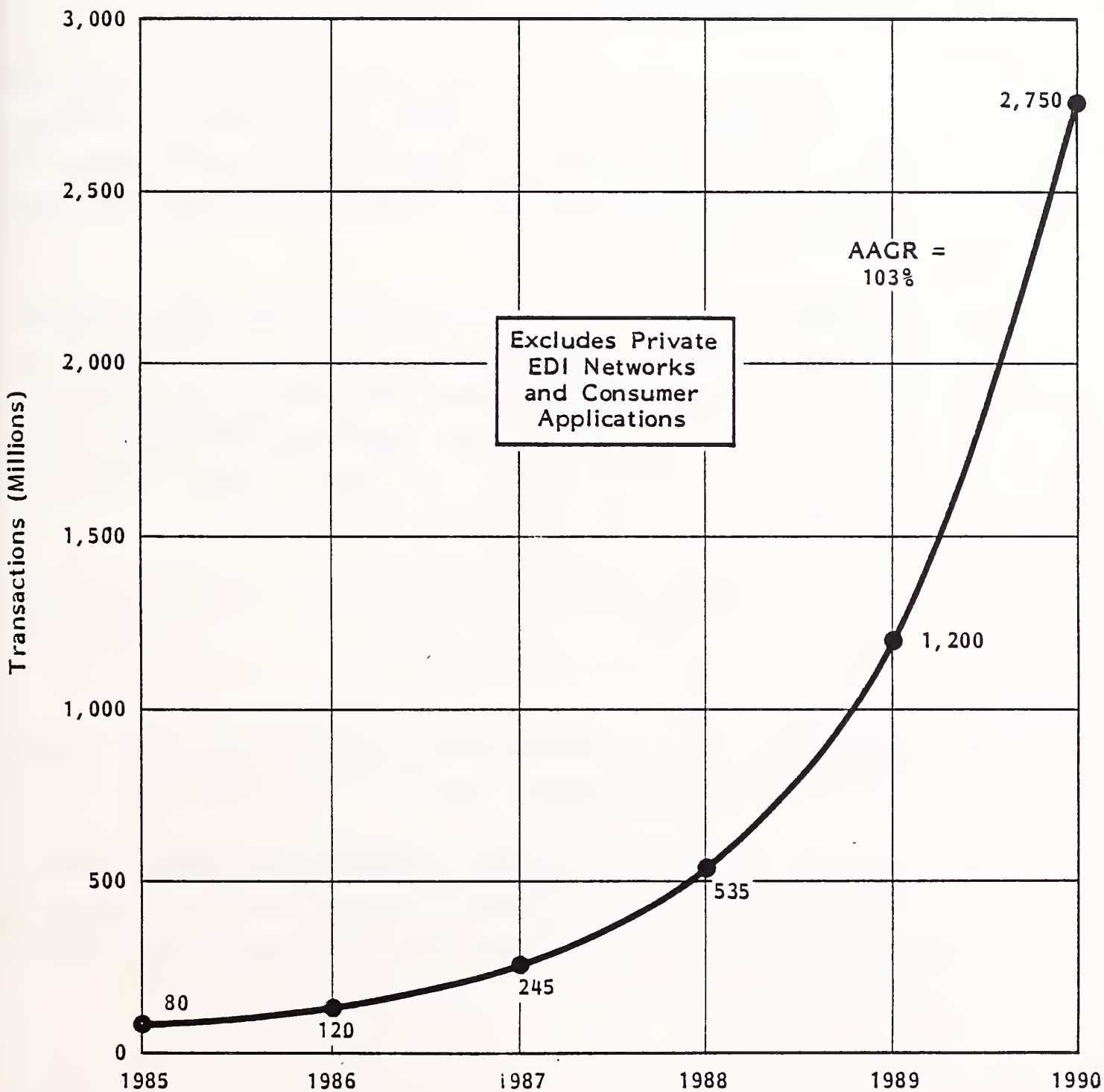
assisting the development of EDI standards called X.12 by the American National Standards Institute.

- Also involved are trade organizations representing the automotive, paper, office products, aluminum, steel, grocery, warehousing, and chemical industries.

8.   VIDEO/TELECONFERENCING

- Users estimate the importance of videoconferencing will nearly double in the next two years, but nevertheless, they rated the importance of the technique low, both for now and in the future. This may be a reflection of telecommunications and IS managers' priorities rather than end users' in marketing, training, and management.

- Although growth has been slower than expected due to high cost (even relative to travel) and because business people like to travel, INPUT's research found the technique being adopted at a faster rate by small companies, with larger companies expanding their applications. One respondent said, "We'll do more, assuming I can get people to listen to me," suggesting end-user education is still needed.

- Lower costs are the most critical factor in videoconferencing growth; some vendors feel the market is a narrow one which may be saturated at current prices.

- An important trend in videoconferencing is the use of Ku band satellite services and small earth stations.

- Secondary trends are the introduction of less expensive conferencing stations, desk-top microcomputers with slow-scan or "freeze-frame" video capabilities, and the introduction of Datapoint's Minx full motion system, primarily for internal use.

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INF

- Additionally, private television networks are being established for the one-way delivery of sales training and product information. Several computer retail chains have implemented such networks.

- Transmission costs for full motion video conferencing on 56 Kbps lines are now approximately $100 per hour, a substantial drop from the $800 per hour found as recently as 18 months ago. Such pricing should fuel increasing use of the technique.

- In audio conferencing, AT&T has introduced the Alliance Service. By dialing a special "700" number, users can set up their own voice conference calls with over 50 international locations. Charges are itemized on the monthly AT&T bill.

- INPUT feels that slow-scan videoconferencing will have limited acceptance in business, but there is the potential for a hobbyist fad, much like computer bulletin boards and citizens band radio. A scenario regarding this possibility can be found in Chapter VII.

- Further, audiographic conferencing appears to be increasing, with applications such as distributed manufacturing offices sharing and discussing design specifications and more routinely for document revisions.

- Also, computer conferencing in which participants contribute to a conference record at convenient times is now being offered by network service vendors in association with software developers such as Network Technologies International Inc. (Ann Arbor, MI).

9. TRADITIONAL BUSINESS APPLICATIONS

- Users were asked to rate the importance of various business applications, accessed through networks, both now and in the future.

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- Exhibit V-14 shows the changes in applications importance.

    - Distributed data processing, electronic mail, electronic data inter-change, connecting office systems, and graphics importance was estimated to increase over 50%, according to users.

    - Video conferencing also improved its rating, but still remains an unimportant application in the view of most respondents.

    - Electronic delivery of software improved its rating but only to mid-range.

        . Many respondents saw this as shared applications within the company for site licensed products, while others saw increasing delivery of fixes, patches, and updates occurring.

        . A few companies in information services reported current or planned use of network services to electronically distribute software to customers or to international and remote field sales offices.

- Little or no improvement in importance was reported for timesharing, remote job entry, inventory, or financial applications.

10. PERSONAL COMMUNICATIONS

    a. Paging

- Attempts to develop a broader consumer market for paging services were not successful but did generate more business interest in the messaging technique.

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EXHIBIT V-14

CHANGES IN APPLICATION IMPORTANCE

PERCENT
CHANGE

Application	Now	2 Years from Now	Percent Change
Video Conferencing	1.2	2.2	90%
Electronic Mail	2.3	3.7	60%
Micro-Mainframe	2.5	4.1	60%
Connecting Office Systems	2.4	3.7	56%
Graphics	2.3	3.4	53%
Software Teledelivery	1.8	2.8	52%
EDI	2.1	3.1	49%
DDP	2.4	3.6	47%
Own Data Base	2.9	4.1	40%

User Rating

☐ Now   ▨ 2 Years from Now

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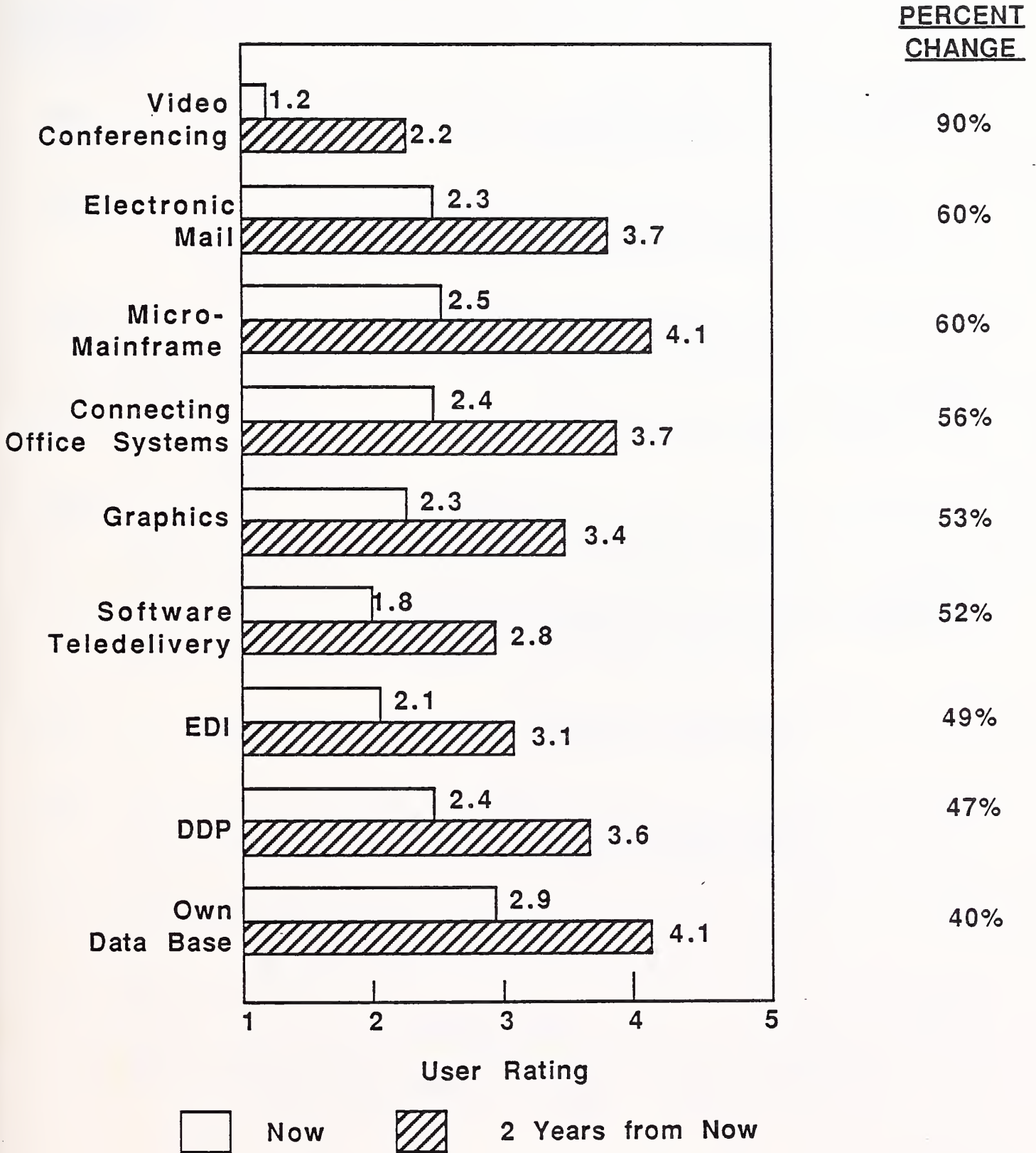
EXHIBIT V-14 (Cont.)

CHANGES IN APPLICATION IMPORTANCE

PERCENT CHANGE

Application	Now	2 Years from Now	Percent Change
Decision Support	2.1	3.0	40%
Order Entry	2.9	3.9	34%
Personnel	3.1	3.9	24%
Commercial Data Bases	2.4	2.9	21%
Financial	3.0	3.6	20%
Inventory	3.2	3.8	17%
RJE	2.7	2.8	4%
Timesharing	2.8	2.9	3%

User Rating

☐ Now   ▨ 2 Years from Now

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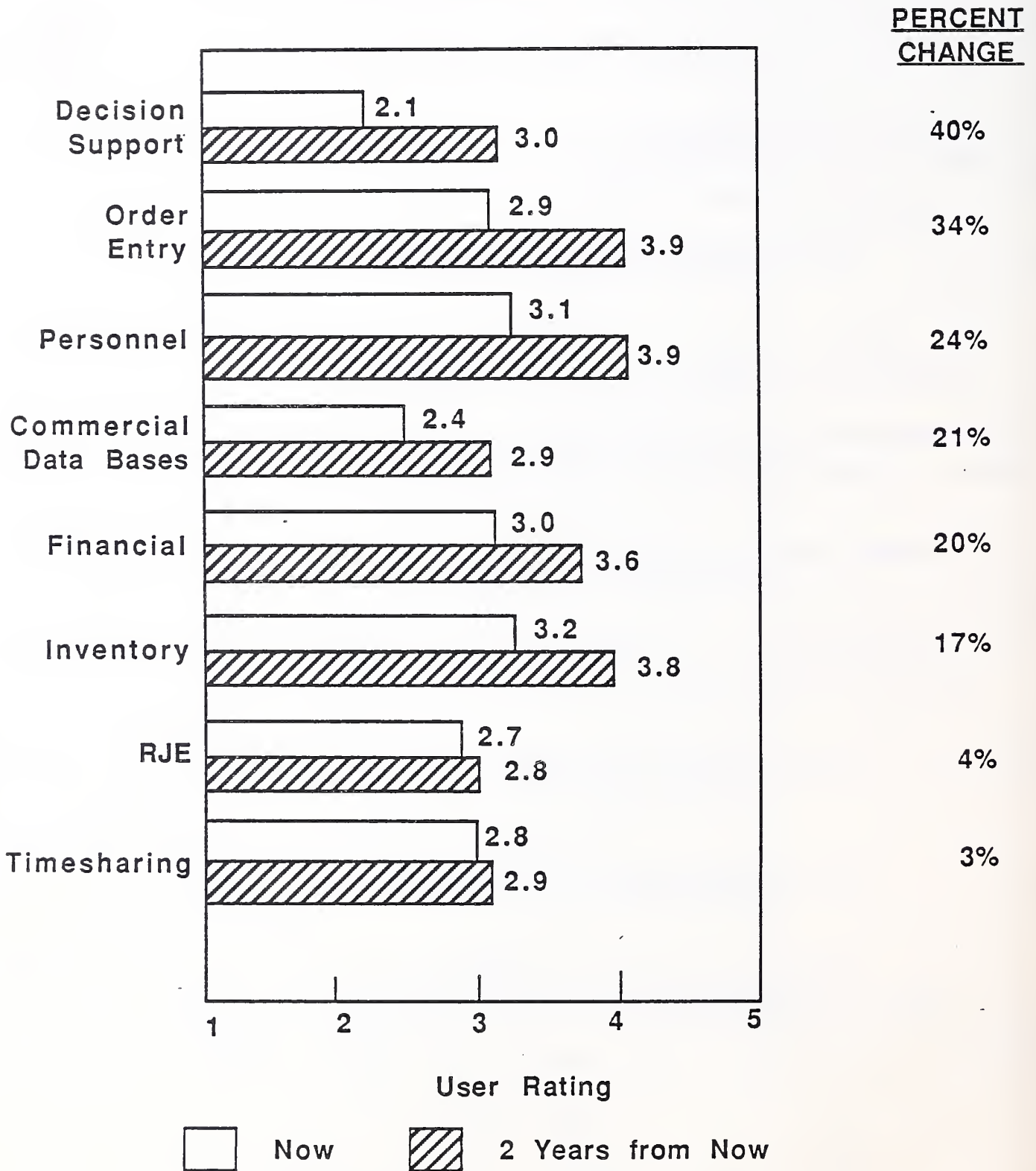
- Pagers are now available with alpha-numeric displays and with the capability of delivering short voice messages.

- The U.S. Justice Department has recommended approval for Ameritech and Bell Atlantic to provide inter-LATA paging services with certain restrictions:

  - Affiliated paging operations must lease interexchange connections from carriers not affiliated with the two RBOCS.

  - The operating companies must provide links to all non-affiliated services and cannot price discriminate between their affiliates and others for access.

- AT&T's paging operations are being sold to A Beeper Company, a national paging company.

b.   Portable Teletex

- Portable teletex, an adapation of display paging systems, is being used to distribute financial information to small, hand-held terminals. Companies involved include Lotus Information Network Company (San Mateo, CA - formerly Dataspeed) and Telemet America (Alexandria, VA).

c.   Field Service Messaging

- IBM, working with Motorola, has developed a national messaging service using 800 MHz frequencies, designed for use by the IBM field service personnel. Service is available in approximately 300 cities, serving 1,000 base stations and approximately 20,000 portable terminals.

- IBM earlier planned to sell excess capacity to others for field service applications but has abandoned those plans. However, Motorola is conducting tests of the Data Radio Network to evaluate market demand for such a service.

INPUT

d.   Cellular Telephone

- Cellular telephone is an improvement on mobile telephone service, offering higher capacity and allowing more simultaneous users through frequency sharing techniques.

    i.   Industry Overview

- After nearly two decades of development, cellular telephone is authorized and becoming operational in over 100 U.S. cities.

- Aside from automobiles, cellular telephone are being installed in commuter buses, ferries, taxi cabs, and rental cars.   Cellular-related services are available on some airplanes (AirPhone - see below) and railroads (RailPhone).

- In each market, cellular services will be provided by two companies: wireline (a local telephone company subsidiary) and non-wireline carriers. Cellular subsidiaries of LECs must have separate operations under divestiture.

    ii.   Roaming

- A roamer is a mobile station communicating with a land station other than the one with which it is normally associated. Outside the home system, a cellular mobile station is not registered. Arrangements must be made for service.

- To be fully effective, cellular roaming may require a processing clearing-house.   This would validate a roamer's credit rating, centralize billing or provide credit card processing, arrange for inter-licensee toll settlements to divide payments among service providers, and handle billing errors.

- Such clearinghouses are being planned with Cellular Business Systems (Chicago, IL), Auxton Computer Enterprises (Maitland, FL), and Cincinnati Bell Information Systems, Inc. joining to offer roaming services.

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iii. Long-Distance Services

- For long-distance cellular service, the trend is toward direct connections between cellular operators and long-distance carriers.

    - Currently, long-distance calls are switched twice before linking with the long-distance network, often affecting the quality of the connection.

    - Direct connect adds network efficiency and includes billing agreements between the operator and the long-distance network.

iv. Mobile Data Applications

- Cellular radio channels can be used for mobile data communications.

- Typical applications include the proverbial travelling salesman checking inventory, product availability, shipping dates, price changes, or electronic mail. Field personnel can access account histories, verify warrantees, order parts, and generate on-site billing. Custom formats can be configured for quick information entry.

- Communicating mobile computer terminals, though not using cellular frequencies, are available to police departments, transportation, delivery, and other service industries.

- While many of the new "notebook" personal computers have built-in modems and some (such as the Grid Compass) have a handset making it a "smart" telephone, it's not hard to imagine future notebooks incorporating cellular radio circuitry. In fact, some of the briefcase cellular telephones coming to market leave space for a notebook computer.

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- Throughput and response times of mobile data terminals have improved with new signaling methods permitting speeds of 4,800 bps, new data detection methods, overlapping "rolling buffers" for store and forwarding while receiving, and frequency reuse schemes.

    v.   Value Added Cellular Services

- In addition to customer calling features such as call forwarding, other features are being offered by or through cellular radio operators which represent opportunities to network and information service vendors.

- NYNEX Mobile Communications is prohibited from directly offering information services to customers under the terms of the Modified Final Judgement. However, it has entred marketing agreements with information service vendors to provide three value added services to customers.

    - Voice Quote is a stock market information service.

    - Computerized Answering Service is a voice mailbox service.

    - Live Answering Service provides a secretarial service to answer calls, schedule appointments, take dictation, do word processing, and handle correspondence.

- With the exception of Voice Quote, which is currently offered free of charge, the others carry premium but competitive prices to enhance the value of the cellular service.

- Mobile communications offers clear benefits in service industries. Federal Express has a system for route management and dispatch, keeping the "absolutely, positively" document delivery system running smoothly. Company vehicles and couriers making rounds in high-rise office buildings are in constant communication and operate at a high level of efficiency.

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vi. Airfone

- Airfone, a company founded by Jack Goeken, one of the founders of MCI Communications, has been providing telephone service from commercial airliners for several years, under a temporary operating authority which has been extended through 1987.

    - Airfone uses unassigned spectrum in the 800 Mhz band.

    - Western Union owns 50% of the company.

- Originally, two Airfone terminals were installed on the bulkheads of participating carrier planes. Callers inserted a credit card to activate the system which links with the public switched network through serving stations distributed across the country.

- The company now plans to install phones in the backrests of seats making Airfone service accessible to more passengers.

- Despite the possibility of losing access to the frequencies now used, other spectrum may be allocated for air to ground radio telephone services.

- In the United Kingdom, a consortium of British Telecom, Racal-Decca Advanced Development, and British Airways is conducting tests for a similar service, but using communications satellites to relay calls from airliners to ground networks. Airfone uses links to terrestrial ground stations which afford smaller range.

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vii.   The Cellular Market

- Cellular radio systems are now operational in over 110 cities.

- According to the Cellular Telecommunications Industry Association, by the end of 1985 there were approximately 340,000 cellular telephone users (revised upward from earlier estimates), with user expenditures of $306 million.

- While overall growth has been slower than expected, in some areas projections have been exceeded, leading to service problems and accelerated cell site installation.

- As Exhibit V-15 shows, it is expected that by 1990, there will be approximately 1.25 million cellular radio users.

11.   VOICE RESPONSE/SPEECH SYNTHESIS NETWORK APPLICATIONS

- Voice recognition and speech response technologies are being used in several network service applications.

- A newly formed AT&T subsidiary is marketing interactive speech processing systems.   AT&T Conversant Systems facilitates human-to-computer communications. Approximately 6,000 words are recognized, and the system responds using speech synthesis.

- Successful applications include financial information, medical records access, field service dispatch, and aural access to textual electronic mail. GTE is incorporating this capability at its Telemessenger voice mail service bureaus, as does AT&T's electronic mail product.

- By transferring routine calling functions from human/human to human/machine dialogues, personnel cost savings are realized and network traffic can be increased.

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EXHIBIT V-15

CELLULAR RADIO GROWTH USERS
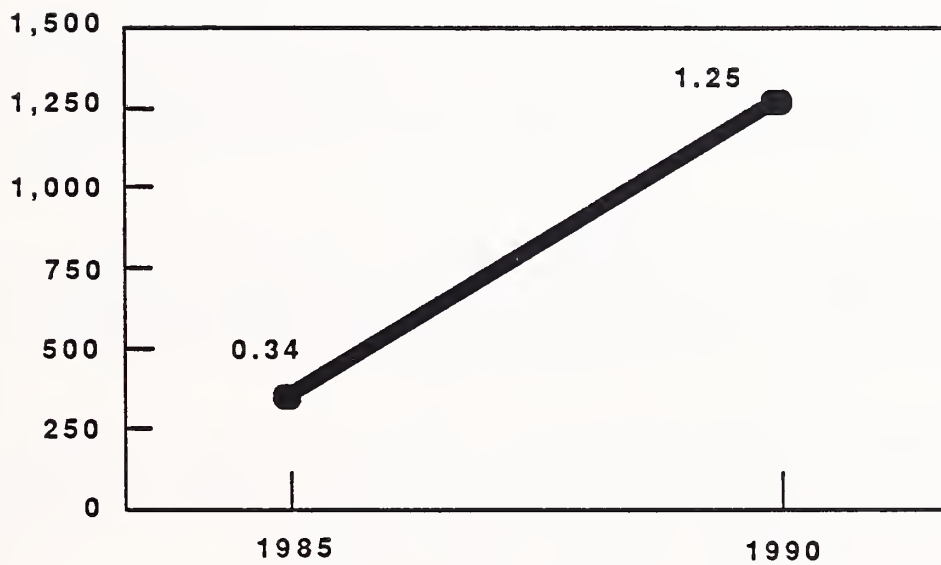
INPUT
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- Major computer and telecommunications companies are in experimental and evaluation modes and more options and services will appear within the next few years. INPUT expects adaptation of the technology to network applications in order processing and messaging, point-of-sales, and security services.

12. TELEMARKETING

- The growth in both inbound and outbound telemarketing provides an important source of traffic for voice carriers. International telemarketing applications are now being introduced.

- Automation in telemarketing not only leads to greater agent productivity and enhanced customer service, but by incorporating automatic dialers, specialized workstations can generate more traffic than manual methods.

- An industry study found that in-house telemarketing accounts for 83% of telemarketing activity, with the balance provided by service bureaus. Of the total, only 4% is fully automated, although 42% are partially automated.

- By 1990, the study finds that today's count of 481,000 telemarketing stations will increase to nearly 800,000, with in-house telemarketing automation growing at a 50% rate in the coming year alone.

- While the industry will grow, external services will account for only 5% of telemarketing activity.

- The growth in automated telemarketing not only suggests increasing voice traffic (with discount carriers benefiting), but indicates greater demand for specialized on-line data bases providing call lists and links to electronic mail for the rapid dispatch of sales materials.

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INI

- Sophisticated systems exist for determining agent and line productivity. Eventually, enhanced network service applications for such functions directed at smaller operations may be developed.

13. OTHER APPLICATIONS

- INPUT asked telecommunications managers to rate the importance of receiving software electronically in their environments for installation, updates, and patches.

    - While the importance of software teledelivery is currently fairly low, users project an over 50% increase within two years.

    - Several users report using this method to distribute software between corporate offices.

    - Many respondents saw this as shared applications within the company for site licensed products, while others saw increasing delivery of fixes, patches, and updates occurring.

- General Electric Informations Services (Geisco) offers Quick*Ware, an electronic software ordering and delivery service.

    - The Quick*Ware service is accessed by an IBM PC or compatible to order microcomputer software for the IBM PC/XT and other popular micros.

    - GE intends to offer 500-2,000 software packages at competitive prices in this manner.

- GTE Telenet supports PC SUNet for downloading corporate software, updates, or site-licensed software to IBM and compatible microcomputers.

INPUT

F. NETWORK FEATURES DESIRED

1. VAN INTERNETWORKING

a. Current Status

- Companies tend to predominantly use one VAN. Inter-company communications are therefore limited to companies on the same service.

- An alternative is to have multiple vendor arrangements, but this may require maintaining several equipment and software settings to accommodate communications on different services.

- Depending on volume, it may also require multiple dedicated lines to a single network node.

    - Many VANs do have gateways to international packet networks (using X.75 standards) or to International Record Carriers (IRCs).

    - IBM's Information Network provides for access via Telenet for "off-net" locations.

    - McDonnell Douglas' Tymnet, ITT's World Communications, and Southern New England Telephone's statewide packet network called ConnNet are being interconnected, and other similiar arrangements are expected as intra-LATA packet network services from the LECs are introduced.

    - MCI Mail and Compuserve are linked permitting mail exchanges between subscribers. The protocol supports transparent interconnection.

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- However, there are currently few other examples of domestic inter-networking exchanges.

b. A Useful Network Feature

- Several users interviewed by INPUT indicated interest in internetworking, the ability to use one primary network service vendor through which connections may be made to applications or services provided by other vendors.

- Globenet (Chicago, IL), a new network services vendor, has identified this niche for its services.

  - Globenet intends to provide for interchange between value added networks, handling protocol and communications conversions, allowing a subscriber to one VAN to access applications on another or to communicate with a trading partner on another VAN.

  - This approach reduces networks to a common denominator and facilitates communications across industry groups.

- INPUT's EDI study found users feeling that internetwork exchanges will be required if VANs hope to provide full, "universal" service to customers; otherwise, other methods such as private networks will be used, at least for EDI applications.

- There is inherently little reason why data communications should not eventually become as universal as the public switched telephone network (PSTN).

  - One party should be able to reach another regardless of different transmission vendors being used.

  - The public telephone network is an appropriate analogy; a General Telephone customer can call a Pacific Bell customer, for example.

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- VANs, particularly the smaller ones, may enter internetwork exchange agreements, perhaps as a prelude to network mergers.

- INPUT believes the philosophy of universal telephone service will eventually apply to packet switched networks, initially to electronic mail services and later to data communications as a whole.

  - This is the intent of the developing Integrated Services Digital Network (ISDN) and X.400 standards in E-mail which are now being adopted.

  - While ISDN is being is being demonstrated, full implementation will probably not occur until the 1990s or later. ISDN is discussed in Chapter III.

2. SYSTEMS NETWORK ARCHITECTURE (SNA)

- Users were asked to rate the importance of a network service supporting SNA. Not surprisingly, those with IBM mainframes rated SNA support highly. On average, SNA support rated high mid-range.

3. BISYNCHRONOUS SUPPORT

- Users rated the importance of bisynchronous protocols at mid-range. Although it would remain necessary, many said the importance of the protocol will decline in the future.

4. OUTCALL

- A network which will automatically call a company's computer when it has a transmission for the company was rated on average at low mid-range by all users.

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5. PROTOCOL CONVERSION

- Users rated networks providing protocol conversion services fairly high, with the highest demand for asynchronous and bisynchronous to SNA conversions and with several requiring conversion to Sperry protocols.

6. ERROR CORRECTION

- Error correction was rated at midpoint in INPUT's user survey. As reported in Chapter III, users had no preference for either of the two new, competing microcomputer error-correcting protocols called MNP and X.PC.

- Exhibit V-16 shows user ratings for several network features.

7. USER NEEDS FOR SUPPORT

- Users contract with network service vendors in part to isolate them from the network management, control, and repair functions.

- However, since many large corporations use a mixture of network services and private networks, support responsibilities can be confusing.

    a. Maintenance, Installation, and Software Support

- A 1985 INPUT study, User Service Requirements: Telecommunications, surveyed over 150 IS and telecommunications managers and planners. While looking at the broad definition of "telecommunications," the study provides some valuable perspectives to both network service users and vendors.

- Network users were found to rely heavily on vendors for hardware mainte-nance (78%) and installation (71%), 45% relied on vendors for software support, and only 24% reported receiving network planning from the vendors. Two conclusions were drawn:

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EXHIBIT V-16

NETWORK SERVICES FEATURE RATINGS
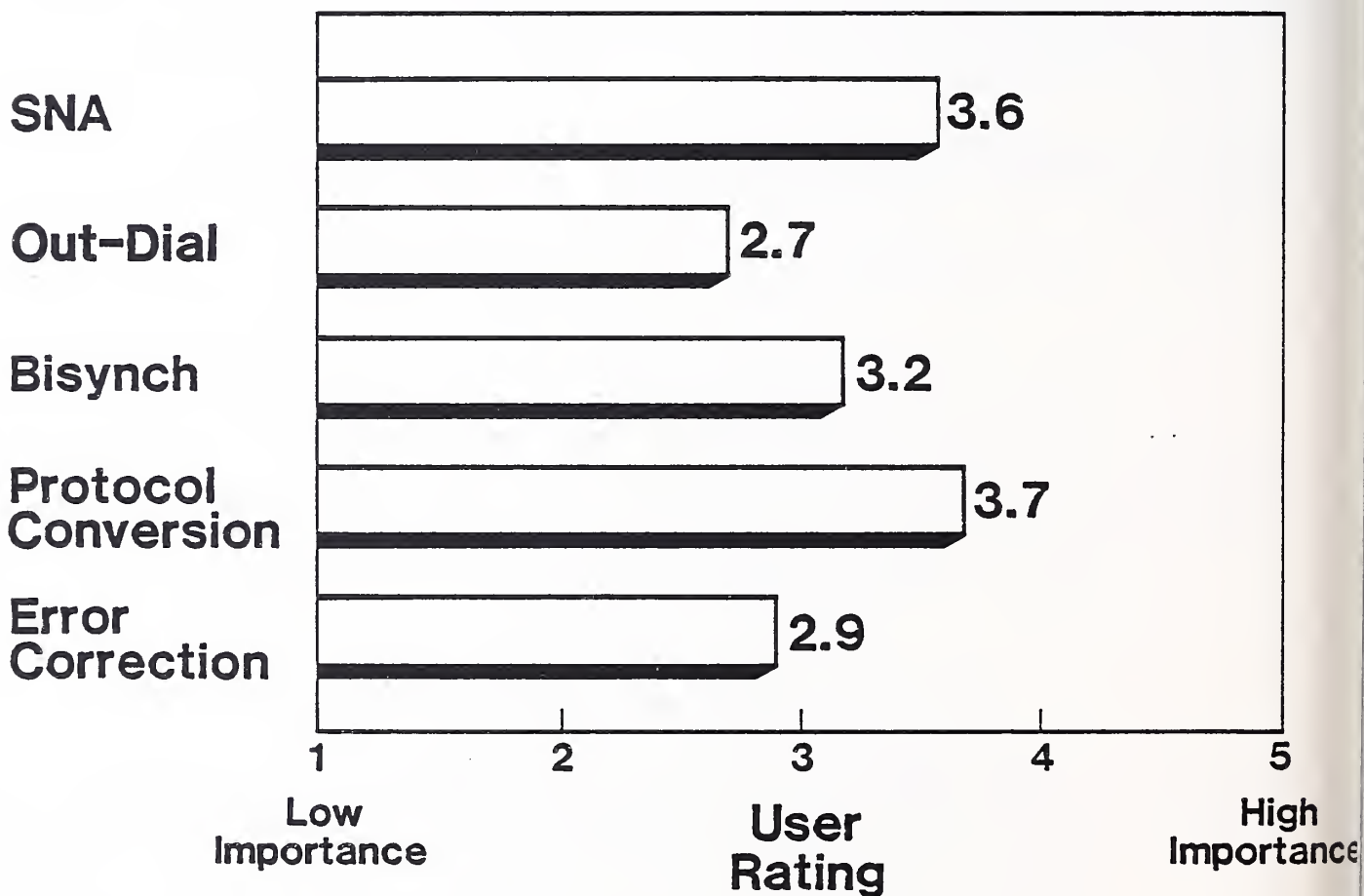
- Users, frustrated with the quality and quantity of vendor support, have taken over software and network planning support themselves.

- Although third-party involvement in each area appears limited, these areas do represent virtually untapped markets.

● The results of this survey are shown in Exhibit V-17.

b.   Hardware/Software Integration Assistance

● In the survey of approximately 100 users conducted for the current report, users rated their expectations from network service vendors for assistance in integrating their hardware and/or software.

- Approximately half expected their vendor to provide assistance in hardware integration.

- Software integration help was expected by approximately one-third.

c.   Service Interruptions

● Exhibit V-18 shows the average number of system interuptions, divided into acceptable and unacceptable categories, determined in the 1985 report.

● The interruptions discussed were attributable to hardware, software, or the links themselves.

● As a result of dissatisfaction, many large users have developed and now maintain their own network service and support organizations. As users rely on their networks more and as networks grow in complexity, network support vendors and the network service vendors themselves need to improve their support offerings.

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EXHIBIT V-17

SUPPORT SERVICE DISTRIBUTION
NETWORK

Hardware Maintenance: 33%, 78%, 5%

Software Support: 64%, 45%, 3%

Installation: 47%, 71%, 3%

Network Planning: 86%, 24%, 0%

Percent of Support

- In-House
- Manufacturer or Vendor
- Third-Party

Note: Answers will exceed 100% due to
multiple responses by individual users.

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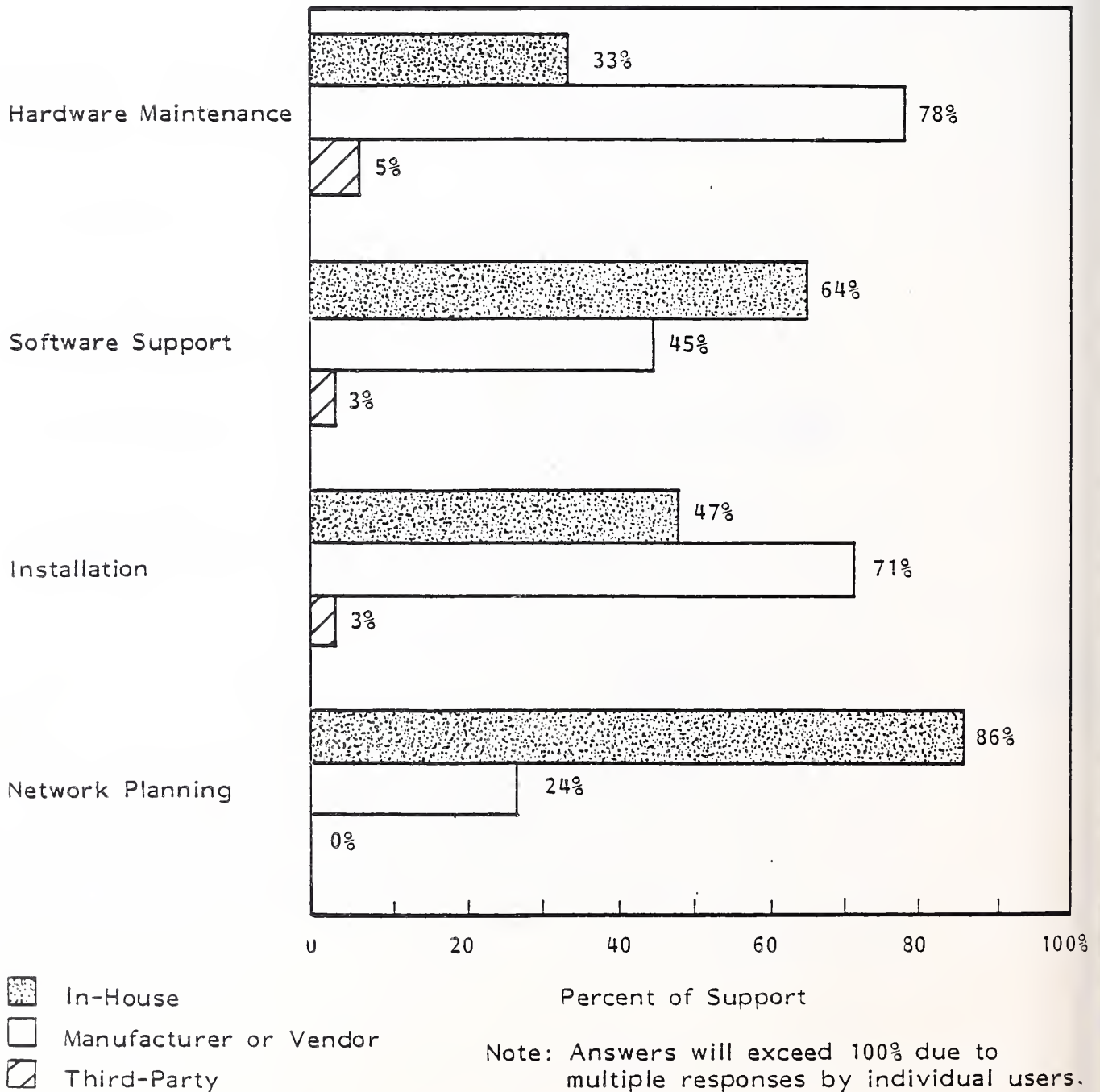
EXHIBIT V-18

AVERAGE NUMBER OF SYSTEM INTERRUPTIONS RECEIVED

NETWORK

(Per Month)

Acceptable   Unacceptable

Number of Interruptions per Month

- 241 -
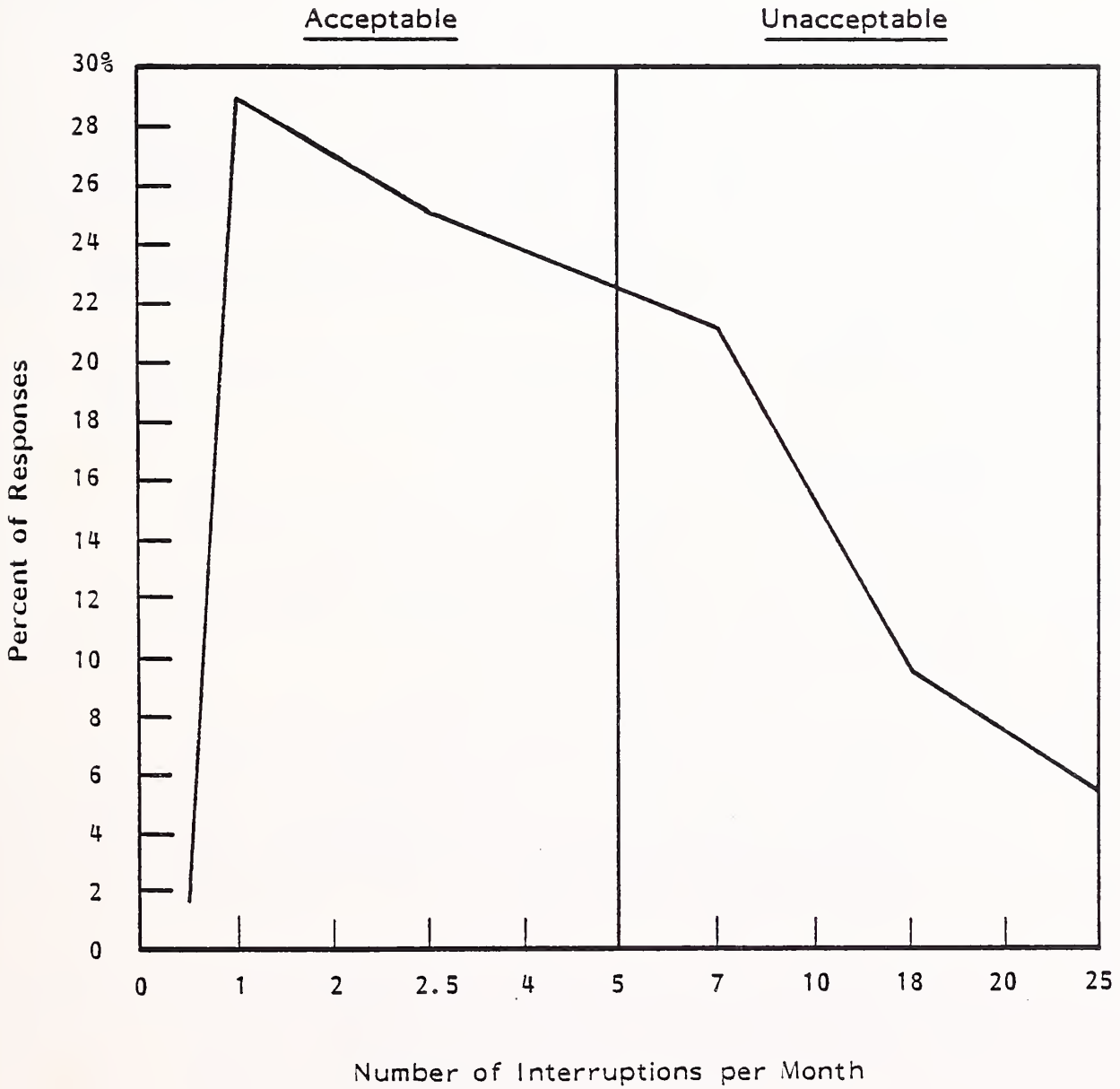
- The complexities of corporate networks has led to several third-party vendors providing remote diagnostics and network monitoring. Additionally, PacTel Spectrum (Walnut Creek, CA - a subsidiary of Pacific Telesis) will isolate network problems and coordinate vendor repairs.

- One way to reduce support problems is to reduce the number of vendors represented; another is to increase preventative maintenance.

- In instances where users feel vendor supplied support personnel are inadequately skilled or too slow to respond, they should consider specifying required levels of service in contractual negotiations.

- The multivendor environment keeps vendors on their toes since they are competing with each other. However, it can lead to finger pointing when problems occur. Such situations will benefit from a service which remotely diagnoses network problems and monitors performance to isolate problems before they occur.

G.   PRICE STABILITY

- Users were asked if they expect their expenses for network services to increase, decrease, or remain constant.

    - Most users anticipate that their domestic network service costs will increase an average of 12.5% during the next two years, driven by inflation, access fees, increasing use, and the effects of working in a highly regulated environment.

    - A minority of users anticipate the effects of competition to lower unit costs, especially for long-distance use.

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- Users planning to shift traffic to private or virtual private networks expect their expenses for network services to decrease due to this change.

- Several users indicated that they expect the costs of bandwidth for international services to decline as more efficient services are introduced and as competition in international networking works to lower prices.

H.   USE OF CONSULTANTS

- Users were asked to rate the likelihood they would use an independent consultant or the consulting services of a network services vendor, and to rate their self-reliance for network planning.

- Exhibit V-19 shows the average responses. Most users are highly self-reliant.

- Some comments from those rating the use of an independent consultant highly were:

    - "We have limited resources internally. Also, our objectivity in the view of our multiple divisions is important. I would use an outsider to show that I was not building a power base."

    - "There are services being offered which are technically not strong enough. We need a consultant to guide us around potential pitfalls."

    - "You don't have finger-pointing if you use a single source of information."

    - "In this dynamic and volatile industry, you need currency of information. They have the ability to bring their vast experience to us. Plus they are an unbiased source of help."

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EXHIBIT V-19

USE OF CONSULTANTS

©1986 by INPUT. Reproduction Prohibited.
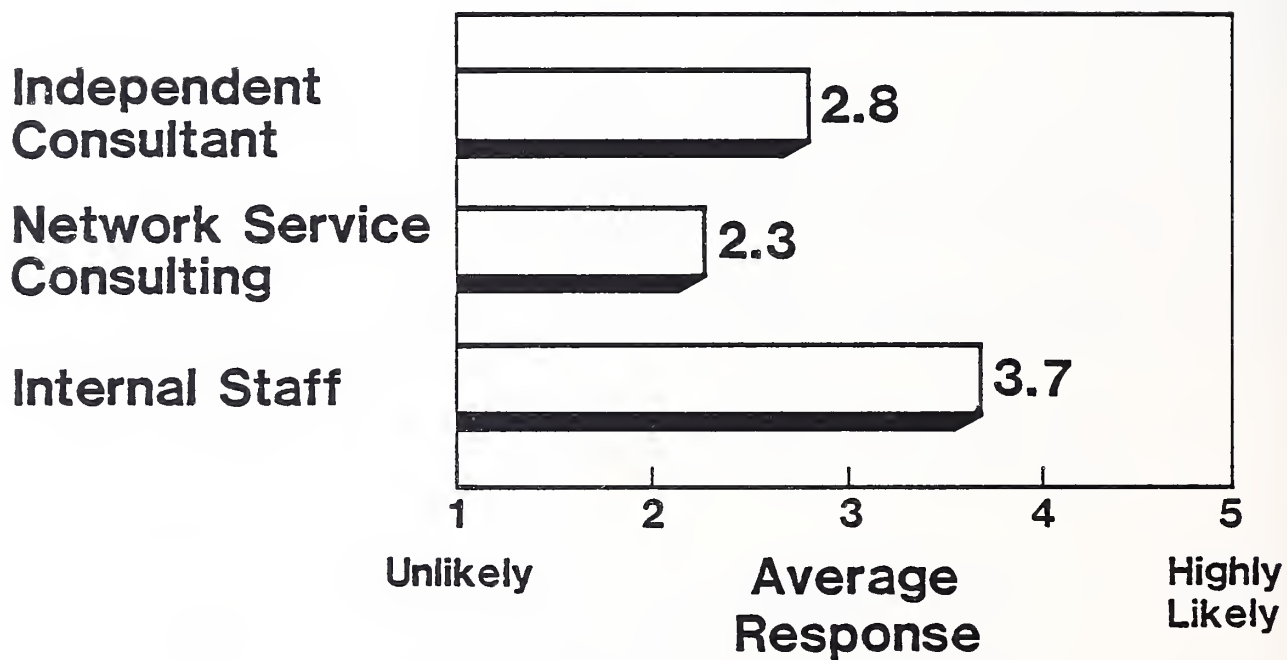
- Users rating their use of outside consultants low typically felt they had the internal expertise necessary.

- The inclination to use vendor consulting services was rated below the other alternatives. Typical comments were:

  - "Their objectivity is in question. We wouldn't get a comprehensive view of the facilities available. Besides, we don't like to have our eggs in one basket."

  - "I don't trust them. I don't think a lot of them know what they're doing."

- However, some of those giving favorable ratings to vendor consulting said:

  - "If you're already using a vendor, it makes sense to use his other services."

  - "A vendor will do extra work to get the customer's business, and usually such services are free. Frankly, we expect this service from them."

  - "I would only use them to verify our internal decisions and impressions after the decision is made."

I.   INCLINATION TO CHANGE

- Users were asked to rate the liklihood that they would change their current network services vendor.

- Unlike a 1982 INPUT study, <u>Market Opportunities in Network Services,</u> the current survey found a low inclination to shift suppliers, with an average rating of 1.9 given, with "5" representing highly likely.

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- The major factors which would lead users to change vendors was lower costs. Others factors mentioned were bandwidth, access to new places, and a loss of support from their current vendor.

- Users will evaluate vendors based on cost, service quality, performance, vendor viability, and track record.

J.   INTERNATIONAL TELECOMMUNICATIONS

- The international communications market is estimated at nearly $3 billion. This section presents INPUT's survey results, but focuses on governmental findings.

1.   INPUT'S RESEARCH

- INPUT's research found users estimating a small percentage of traffic now going offshore, with increases projected. The primary reasons given were support of overseas offices and interdependence between firms and their trading partners.

  - On average, users with any international communications estimated 7% of their traffic to be international.

  - This was expected to increase to approximately 11% in two years, representing a 50% increase.

  - Users with no international traffic tended to be small businesses or educational and health institutions.

- Respresentative comments included:

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- "We belong to a foreign company, and our product line relationships are getting closer."

- "Coordinating phone calls across international time zones is a real problem. Electronic mail is more efficient."

- "Some of our greatest market opportunities are overseas, and we've formed partnerships with European companies."

- "We have more international suppliers than we did before. We're becoming more of a global company."

- "We've had a change in focus toward more international marketing, and the economic strength of the U.S. dollar is largely behind this."

2. U.S. COMMERCE DEPARTMENT FINDINGS

- A survey of over 100 firms performed on behalf of the U.S. Commerce Department's National Telecommunications and Information Administration (NTIA) projects a 20%-30% increase in international telecommunications service demand between 1986 and 1990. The salient findings are reported here along with INPUT's analysis.

- Growth is forecast in international message services, wideband circuits, telex alternatives, and Intelsat Business Service (IBS). Limited or no growth is projected for alternate voice/data circuits or telex.

a. International Voice/Messaging Demand

- The survey projected a 16% average annual growth rate in the use of international message services. Most of the growth is expected among medium-sized user firms. The largest users on average expected growth of just under 35% over the next five years.

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- Nearly 80% of all users interviewed expected international messaging to increase while under 6% expect use to decrease and 15% expect use to stay at the same level. Fifty-four percent of those sampled say they probably will be using discount services for international messaging (typically voice) by 1990, and an additional 33% said they would consider using discount offerings.

b. International Voice/Data Circuit Demand Trends

- The study found that there will be slowing demand for alternate voice/data (AVD) circuits due to:

    - The utilization of wideband circuits.

    - International dataphone availability.

    - Discounted switched voice services.

    - Virtual private network services.

- The survey projects an annual growth rate of 6.5% for AVD circuits, down from the 14% annual growth found between 1980 and 1984. Heavy use of wideband circuits could result in growth as low as 4.5% for AVD circuits.

c. Wideband Circuit Demands

- Nine percent of those sampled identified their present wideband needs as accounting for 28 circuits operating at 50-56 Kbps, representing 70% of the existing commercial market. Fifty-eight percent of those sampled said they would have wideband requirements by 1990. Eighty-eight percent of these are in the highest spending categories.

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d.   International Satellite Network Service Demand

- The survey notes active interest in INTELSAT Business Service (IBS),
  NTELSAT's new digital voice/data/video offering (discussed in Chapter III).

- Nearly half of the largest users indicate they probably will use IBS by 1990,
  while about 20% of the medium-sized users say they will.

- The survey found little interest among users in leasing or buying transponders
  on international satellites, indicating a continuing market for network
  services as opposed to high capacity links and user reluctance to risk such
  investment given the coming development of transoceanic fiber optic links.

e.   International Virtual Private Networks

- Assuming availability, nearly 40% of the sample said they would use virtual
  leased international circuits, and a similiar number indicated they would
  "possibly" use them.

f.   International Electronic Mail Demand

- Ninety percent of those sampled say they will use electronic mail by 1990 for
  international communications.

- The survey predicts a possible decrease in international telex use. Currently,
  only 10% of the sample does not use telex growing to 23% in 1990.

g.   International Packet Switching Service Demands

- Nearly 80% percent indicated probable or possible requirements for packet
  switching services by 1990, with strongest interest among largest categories
  for internal, private packet networks.

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3. INTERNATIONAL RECORD CARRIERS

- IRCs have exclusive licenses for carrying telex traffic ("records") and have been limited by regulation to message and leased private lines.

- Until 1982, Western Union had the monopoly on domestic links for international traffic while the international portion travelled via one of the five IRCs. Western Union International, which handled the offshore portion of the communications, was divested (and is now owned by MCI). However, Western Union is now free to compete internationally, and the other IRCs may use any domestic link desired.

- The five IRCs are FTC Communications (recently purchased by McDonnell Douglass), ITT World Commuications, RCA Global Communications, TRT, and Western Union International (now part of MCI International).

- Due to a growth rate estimated under 5% in the record carrying business, the IRCs have expanded their involvement to provide several enhanced services.

    a. What IRCs Provide

- In addition to record traffic, leased lines, and dial-up DATEL services (digital data), several enhanced services are now available.

- IRCs provide leased lines for private networks which interface to foreign telex networks. Discount telex services have emerged taking advantage of these services, in a manner similiar to long-distance resellers.

- Leased circuits begin with a U.S. domestic carrier and terminate at a user site connected to the post, telephone, and telegraph company (PTT) providing the link in the landed country.

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- Telex/TWX, two versions of the classic electronic mail methods have now been enhanced with computer messaging switching for large volume requirements and store and forward which allows high speed batch transmissions.

- Packet switching services are provided with interconnections to in country VANs and to telex networks.

- Costs are driven primarily by negotiations between the IRCs and PTTs. Since the PTTs are predominantly monopolies, there are no competitive pressures on pricing.

b. Diversification of Services

- Previously limited to record communications and leased lines, the IRCs are now carrying voice and high speed data. Further, the IRCs are no longer limited to international traffic; they can, and many are, providing domestic services as well.

c. Changing Directions of Foreign PTTs

- The changing attitudes of PTTs is affecting "landing rights" and relationships with carriers.

- The governments supervising foreign PTTs are evaluating their own directions. Just as AT&T went through changes, so is Japan's NTT and British Telecom. Other PTTs are watching developments, with European countries most interested in privatization of PTTs and/or opening their telecommunications markets to competition.

- There has been added complexities for the PTTs with regard to approving landing rights for international carriers, which is impeding expansion.

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- The expansion of services as well as growing user demands will lead to increasing use of international record carriers. However, competition will mean that the "IRC" label may need to be retired as the differences between these entities, their competitors, and their parents become less clear.

- Just as in the case of domestic communications, users are faced with several alternatives for international traffic.

  - They have a choice, and smaller users are less prepared to face the confusion caused by choices than larger companies with fully staffed telecom departments.

  - Larger companies benefit more from the diversity offered.

- Further confusing matters is the fact that international carriers are seeking to differentiate from other vendors to be perceived as providing more than a commodity service.

- The observed direction however is toward flexible, end-to-end rather than specialized, solely international network services. By providing the widest range of services meeting unique user needs, market participants hope to develop market share.

K.   INDUSTRY TRENDS

- This section provides background and trends in several representative industries. It is provided for users to verify their perceptions of their own industries and to identify trends in others which may suggest approaches to network services.

- Several industries contain examples of companies which have leveraged their own internal experience and networks into services which are offered others.

I.   BANKING AND FINANCIAL SERVICES

   a.   <u>Overview</u>

- INPUT has conducted several research projects on the information systems needs in this segment.

- Several banks have entered the business, building on the products and services developed for internal use, and third-party vendors are also providing services.

- Examples include services for:

   - Credit/debit cards.

   - Check authorizations.

   - Loans.

   - Shared and proprietary ATM networks.

   - Point-of-sale networks.

   - Cash management services.

   - Automated clearinghouses.

   - Consumer/business electronic banking.

   - Electronic trading.

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- Data base information including market quotations, financial news, and credit bureau information.

b. Electronic Transaction Growth

- INPUT has found that electronic transaction growth is substantial, with over 20 billion electronic transactions processed in 1985, growing annually to over 65 billion within the next decade.

- While creation of new electronic transaction networks is on the wane, significant network consolidation is seen through the 1990s.

- Development and control of electronic financial information networks is key to delivering financial services to both the wholesale and retail marketplaces in the coming decade. The control and cost effectivenesss of electronic delivery is a necessary condition for financial institution survival, much less expansion.

- Exhibit V-20 shows the growth forecast in electronic payment volume.

  - Accelerated growth is expected over the next five years, with the volume more than doubling for an 19% annual growth rate.

  - With national networks in place, electronic payment transactions will steadily increase to 65 billion annually, an 8% AAGR over the forecast period.

  - Transaction growth will be greatest for automatic teller machine transactions, with a 15% increase over the next decade.

  - Point-of-sale transactions will more than triple for an annual growth rate of 13% over the ten-year period.

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EXHIBIT V-20

FORECAST OF U.S. ELECTRONIC PAYMENTS, 1983-2000

Legend:
- Home Banking Terminals
- Point-of-Sale Terminals
- Automated Teller Machines
- Automated Clearinghouse
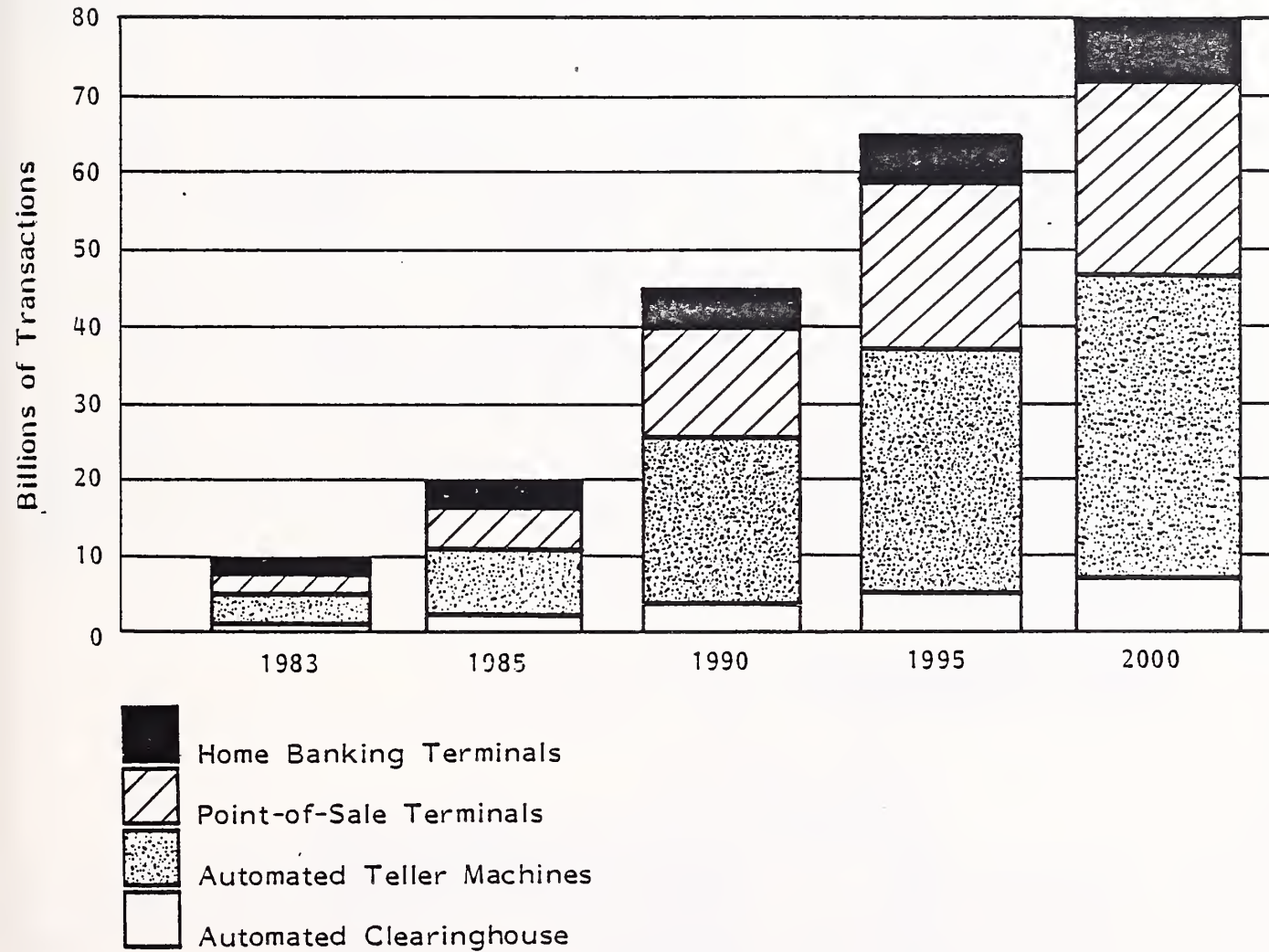
Source: Federal Reserve Board (FRB), American Bankers Association (ABA).

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WBAN MSP2

c. Shared Financial Networks

- The three components of a shared consumer financial transaction network are shown in Exhibit V-21.

    - For a proprietary bank ATM network, the bank component contains the ATM and, as necessary, the switch.

    - In shared ATM networks, the ATM may be in either the retail or bank enviornment, with the switch either in the bank or with a third-party vendor.

    - Because of their location in the retail environment, POS terminals are primarily attached to shared financial transaction networks.

    - The switch components are primarily part of third-party network vendors such as VISA, MasterCard, Sears, or Tymshare/Tymnet.

- There are approximately 100 proprietary and shared ATM networks operating in local and regional areas, with less than a dozen having national presence. The trend is toward shared networks to support the economic viability of expensive terminals.

d. Other Financial Services Networks

    i. Mortgage Networks

- National networks for electronic mortgage information and processing are seen as a new financial information service which can rapidly match consumer and loan broker needs with mortgage funds availabiity.

- Involved vendors include ShelterNet (First Boston Capital Group), Loan Express (Planning Research Corporation), Realtors National Mortgage Access (National Association of Realtors), and Loan Link (TRW).

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EXHIBIT V-21

SHARED FINANCIAL TRANSACTION NETWORK COMPONENTS

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WBAN MSP2
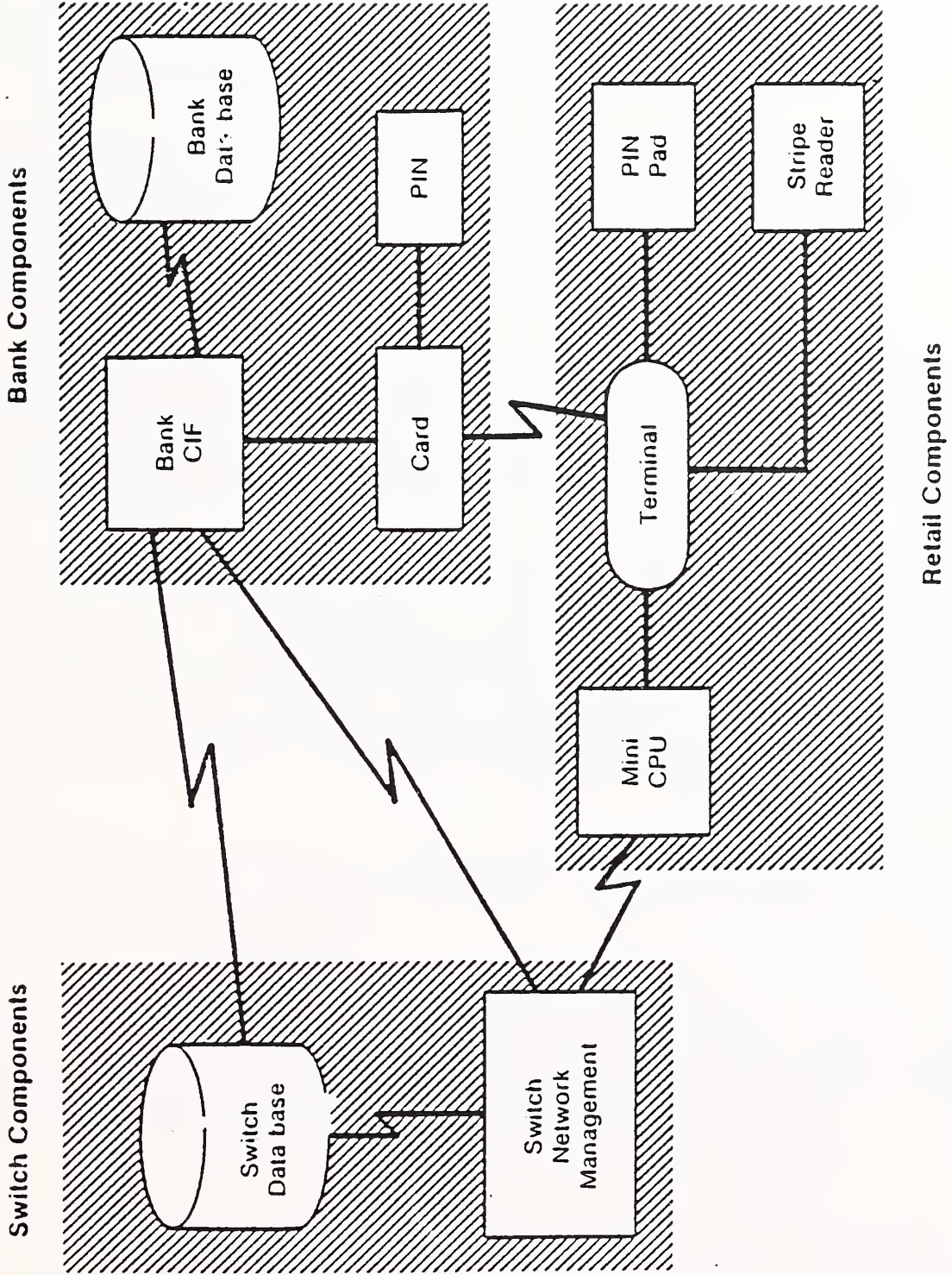
- This market will expand on a national basis, facilitating the packaging and sale of mortgages into the secondary market.

    ii.   Securities Trading Networks

- Electronics security trading is an advancing area.

- Discount brokerages are interconnecting to private investors and investment groups with micro-based security analysis, portfolio management, and buying and selling order placement and execution.

- The trend is toward international, 24-hour trading capabilities.

    - The growth of personal computer use to do financial market research and to trade stocks will boost demand for off-hour trading.

    - Evidence of demand currently exists. Asian and European investors do local market trading in U.S. stocks when U.S. markets are closed.

    - There are also foreign security trading boards operating while U.S. markets are closed.

- Initially, off-hours trading will be done by experienced traders and investors working at home.

    e.   Technological Issues

- The technology to provide substantial benefits for low-cost product delivery exists; however, there are many technology issues left to be understood such as:

    - The danger of data distribution without control.

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- IBM's domination in controlling technological advances.

- The use of optical memory systems for check truncation and other static data bases.

- The effective use of pattern recognition systems.

- Security issues are a key concern. Validation of the message originator and authentication of the message itself coupled with adequate encryption is seen as the only viable way to secure electronic transaction networks in the wholesale environment.

- "Smart cards," while possibly offering to handle additional financial and other information services, will not become economically viable during the forecast period because complete security requires on-line operations.

f. Value Added Network Financial Services Forecast

- The banking and financial institution groups account for more expenditures on information services than any other industry group. Member institutions spend a larger share of their total IS budget on information services than most groups.

- Exhibit V-22 shows INPUT's forecast for banking and financial industry expenditures for VAN services.

- As financial electronic networks spread into the consumer market, VAN delivery of these services will approach half a billion dollars by 1990. Shared ATM and POS network services are "where the action is."

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EXHIBIT V-22

FORECAST OF USER EXPENDITURES FOR VALUE ADDED NETWORK
SERVICES FOR THE BANKING AND FINANCE INDUSTRY, 1985-1990

MARKET SECTOR	USER EXPENDITURES ($ Millions)			AAGR 1985-1990 (Percent)
	1985	1986	1990	
Commercial Banks	$30	$100	$300	30%
Other Financial Institututions	50	55	150	25
Total	$80	$155	$450	28%

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g.   Vendor Opportunities

• There are several opportunities for vendors. Financial institutions are willing to jointly fund or partner large projects such as network development.

• Because many participants will not want to align with potential competitors, opportunities for network service vendors to offer third-party selections exist and will prosper.

• On-line data base services opportunities exist for selling to banks and partnering with them.

    - Consumer credit reporting is already the largest on-line data base market in this segment, yet it has great potential remaining.

    - Financial institutions need competitive information and therefore will need more access to marketing and demographic data bases.

    - Meanwhile, check, credit, and securities data bases will continue to expand.

• Industry competition is also creating demand for decision support systems beyond those used in the corporate environment.

    - In the personal services area, brokers, retailers, and nonbank financial groups will require financial data and services to support customer needs.

    - Products included will be portfolio analysis systems, market analysis systems, and others.

• EDI services to handle the transfer between participants and the payment system will grow rapidly, in part due to the accelerating growth of Automated

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Clearinghouse (ACH) transaction volume, and the emergence of common standards for ACH and EDI.

- Hardware and other vendors will need partners and subcontractors to provide compelete solutions, and this creates opportunities for small and highly-specialized vendors, particularly for emerging, sophisticated, and multidisciplinary solutions.

- Readers requiring more information are directed to INPUT's studies <u>Banking and Financial Services: The Next Decade</u> and <u>Check Guarantee/Credit Authorization Processing</u>.

h. <u>Financial Institutions Are Partnering with Vendors</u>

- EDI implementations handling funds transfers between participants and the payment system will grow rapidly, in part due to the accelerating growth of Automated Clearinghouse (ACH) transaction volume and the emergence of common standards for ACH and EDI.

- Readers requiring more information on the industry are directed to INPUT's studies <u>Banking and Financial Services: The Next Decade</u>, and <u>Check Guarantee/Credit Authorization Processing</u>.

2. TRANSPORTATION INDUSTRY

- The transportation industry is subsegmented into motor, rail, air, and ocean carriers.

- The rail and trucking industries have experienced slowing business, partially as a result of general economic softness. Income and tonnage fell sharply in 1985.

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- Deregulation is causing rapid obsolescence of existing systems. To remain viable in the new environment, transporation firms are placing increasing emphasis on computerized, networked systems to improve their competitive edge.

- Over 90% of the transportation companies surveyed expect their IS budgets to increase with an average growth rate of 9%.

- The rails generally develop industry applications internally but look to vendors for assistance in extending information systems capabilities to encompass intermodal distribution. The development of such systems requires network services due to the number of participants.

a.   Railroads

- Railways have launched cost cutting programs, reducing employment.

- The rail sector is highly concentrated in a few large organizations, with 98% of rail ton-mileage and 92% of railroad employment accounted for by 32 of the largest railroad carriers (those with revenues over $50 million).

- Deregulation has allowed rails to acquire motor carriers regardless of whether they provide auxiliary or supplemental service, as was previously required.

- Rails can make rate changes more easily, and rate and service contracts with shippers are now allowed.

- Rails are emerging as transportation conglomerates. Eleven of the largest have trucking affiliates and three others own trucks as part of rail piggyback services.

- Railways were one of the first industries to use EDI technologies, discussed elsewhere in this chapter.

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- Individual companies have access to the technology due to their size relative to other industries.

- Every major rail company has extensive computer and communications facilities, and has excess capacity, able to handle the needs of companies outside the industry.

● The railroad industry is an interesting network services participant in its own right for several reasons.

- Its rights-of-way are being used for telecommunications networks, including microwave and fiber optic systems, for both internal use.

- Its own internal messaging has grown from a reported 4,500 to nearly 100,000 daily since 1980.

● An estimated 80%-90% of railroad waybills are handled electronically, while other documentation statistics are lower. Most of this traffic is intra-company.

b. Trucking

● The trucking sector is the most fragmented in the transportation industry. Its thousands of firms vary from single owner/operator shops to nationwide, long-haul carriers.

● Trucking sector revenue growth has been eroded by competition in a newly deregulated environment.

- Price cutting competition is greatest between unionized and nonunion carriers.

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- Many unionized carriers have established nonunion subsidiaries to compete for "less than truckload" business.

- This creates needs for complex billing, tracing, and detail operations. When linked to EDI applications, these operations create needed efficiencies.

● Trucking companies have been slow to adapt to electronic methods, due to financial constraints and a lack of computerization. Those that have are claiming competitive advantages. New, less expensive computer systems are paving the way for various applications.

c. Ocean Shipping

● Most of the paperwork in this industry emanates between shippers and forwarders.

● Shippers have not been aggressive advocates for information systems such as EDI, but carriers are beginning to recognize that the benefits are worth pursuing.

● Many shipping companies provide on-line services for rate quotes, freight bills, manifests, trace shipments, and billing. Some support data analyses for management reports.

d. Innovation in the Transportation Industry

● Large trucking firms are using point-of-sales (POS) terminal information to provide data for expense tracking as well as geographical tracking of their vehicles.

- When a trucker refuels using an approved credit card, not only are expenses charged against the master account, but location information is sent to the firm's processors.

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INPUT

- Messages can be sent to the trucker through the POS network as well.

- Mobilsat and Geographical Positioning Services are being considered by some in the industry to assist computation of state highway taxes as well as to provide truck location information and emergency messaging.

3. BROADCASTING

- Broadcasters are a heavy user of network services, especially in support of special events programming, news coverage, and syndication. Many operate private networks for the distribution of programming.

   a. Microwave

- Prior to divestiture, broadcasters primarily relied on AT&T and GTE to provide microwave facilities to relay remote live news, sports, and entertainment programming.

- Since divestiture, the BOCs, which now have responsibility for local circuits, have often demonstrated poor response time and a lack of experience and the expertise needed for such services. There has sometimes been confusion about responsibility for a single transmission path which crosses the jurisdictional boundaries of several telcos.

- New common carriers have been formed to install and maintain both permanent and mobile microwave links and provide services to broadcasters. Among these are Microwave Mobile Systems (Huntington Beach, CA), Midwestern Relay (Milwaukee, WI), Telehop (Fresno, CA), Marcus Telecommunications (Bethel, CT), Telecam (Golden, CO), and Communications Technology Management (McLean, VA).

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- Additionally, satellite transmission firms are providing ancillary terrestrial microwave transmission in competition with telcos. Examples are Wold Communications (Los Angeles, CA), Netcom (San Francisco, CA), Bonneville Telecommunications (Salt Lake City, UT), Western Union (Upper Saddle Brook, NJ), and RCA (Princeton, NJ).

- These vendors vary in capabilities from extremely localized operations to worldwide coverage.

- The effects of competition have been lower prices and improved services. In several major cities, permanent microwave paths have been installed to connect major news and sports origination sites with satellite and landline transmission facilities, permitting the rapid formation of ad hoc local, regional, and national networks.

- The drive to use such facilities include cost savings and the competitive advantages of, and audience expectation for, live broadcasts.

b.   Looking for Alternatives

- The National Association of Broadcasters reports that many members are seeking alternatives for programming distribution due to the increasing costs of private lines.

- Most of the major radio and TV networks are now using, or at least exploring, satellite delivery modes.

c.   Cable Television Directions

- Chapter II reported on the use of CATV facilities for voice services and institutional data networks.

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- CATV has been promoted as opening the doors for many new consumer services; however, it appears that past demonstrations of enhanced "home of the future" services such as interactive programming, electronic shopping, and data base access have been de-emphasised by the CATV industry. For example, the highly publicized Columbus (OH) CUBE service operates at a much reduced activity level.

- Pay-per-view (PPV) services are likewise becoming less of an opportunity due to inexpensive Video Cassette Recorders (VCRs) and the rise of neighborhood movie rental outlets.

- However, some still see opportunities for pay events unique to CATV, and methods supporting impulse ordering of special programs are being tried using the telephone keypad as an input device and addressable subscriber decoder.

- The idea behind these directions is that demand for popular rental videotapes will be high, but the supply low, creating a temporary opportunity for PPV programs.

- With the possible exception of major markets, INPUT feels such services will face difficult times in generating the needed volume of subscriber interest to make the marketing effort cost-effective, resulting in little opprotunity for network service vendors.

L.   GOVERNMENT MARKET SECTOR FACTORS

1.   STATE/LOCAL GOVERNMENTS

- State governments represent promising, sizeable markets for network service vendors. State agency telecom personnel are facing the same confusion caused by recent telecom industry events as have their commercial brethern,

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but they have been slower to respond in implementing solutions for a variety of reasons.

a. California Is Representative

- INPUT conducted a study of the information systems/services in California. While in some ways, the state is more advanced than others, the situation in California is believed representative.

    - The California Office of Information Technology (OIT) is a coordinating and consulting agency which is not chartered to exercise control over agency plans.

    - The General Services Administration (GSA) Office of Telecommunications is responsible for managing, installing, and maintaining all state telecom facilities.

    - GSA and OIT share responsibility for policy development and oversight.

b. State Networks

- The state of California operates three microwave systems.

    - One is managed by the GSA and is used mostly for data. It was originally planned as the backbone of the state communications system. According to a state commissioned report, this network operates at under 40% of capacity, primarily because of a pricing policy under which some users subsidize others.

    - The state university system operates its own microwave network for video, data, and audio, hubbed at one of the university campuses. The University of California was planning another digital system for use by the U.C. library system.

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- A separate data network is maintained by the Department of Motor Vehicles.

- CalTrans, the state transportation and highway agency, was studying pulling out of the state data network to save money by contracting with the private sector.

• Despite excess capacity in the existing state-wide systems, independent links have been established by many departments.

   - Data centers and major data communications users have developed their own networks over the years in lieu of any accepted common facility.

   - According to a published study, a common data communications facility would probably not be broadly accepted unless departments and data centers are visibly involved in the planning process.

   - According to another study, the state's microwave systems command 86% of the GSA's Office of Telecommunications' personnel budget. An OIT Strategic Telecom Report suggested the possibility of a third-party operating the state network.

• A voice network called ATSS is leased by GSA from Pacific Telephone. Data lines called ATSS/DS are provided, not by contract, but under an "understanding" between the state and Pacific Telephone.

   c. Planning and Legislative Initiatives

• OIT has indicated work toward a backbone digital network and establishment of a network management center; however, this has not gone beyond the discussion stages.

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- On the voice side, the state appears to be maintaining its Centrex ties, discouraging use of PBX switches.

- A consultant's report concluded the state is not contemporary with major corporations or other states in its telecom management.

  - The consultant found the state has not developed the organizational management systems necessary, resulting in missed opportunities to reduce costs.

  - The report recommends reorganizing existing telecom activities into a new department, or minimally, consolidating the Office of Telecom and Office of Information Technology.

- Proposed legislation has called for the creation of a Department of Telecommunications and Information Resource Management to oversee, recommend, and implement state policy and participate in technology development for state use. Opinions vary on this proposal's chances for success as it would eliminate currently existing offices which provide these functions.

- Another bill called for the creation of a California Telecommunications Advisory Commission to advise the Governor and Legislature about changes in the marketplace, to help minimize public expenditures, and to provide public/consumer education.

  d.   Trends

- The information systems trends in California mirror those in other states.

  - There have been directives for automation to achieve efficiency; however, INPUT found that state agency directors tend to support the status quo.

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- There is direction toward outside services to reduce costs and to open state business to the private sector. Another intention is to reduce reliance on state personnel who are difficult to keep due to salary levels below commercial sector salaries.

- According to surveys done by the National Association for State Information Systems, there is also a trend toward more control of telecommunications and the creation of more networks, a trend away from equipment leasing, and a lessening concern over lack of money to implement projects.

- In general, while the states lack developmental methodologies, state data processing budgets have increased 20%, in many cases catching up from earlier economic difficulties. Also, contractual services for telecom services and system design are the top externally contracted services.

- Many states maintain master plans for information systems; in California, this "plan" consists of files containing agency three-year plans which are centrally reviewed.

2. FEDERAL GOVERNMENT NETWORK SERVICES DIRECTIONS

a. Overview

- Federal telecommunications activities are shaped both by the procurement activities of the various agencies and by a variety of regulatory, policy, and standards influences.

    - Most federal agencies are both direct buyers and users of network services.

    - Several agencies serve primarily as buyers or resuppliers of telecommunications resources for other agencies.

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- Other agencies influence the market through regulation, policy, and standards activities.

- Additionally, the market is subject to external pressures since network access extends outside the government and across international boundaries. These pressures are exerted by internal standard setting bodies, industry organizations, and PTT authorities in foreign countries.

b. Market Size

- INPUT estimates that the overall federal government telecommunications market through 1990 will show an increase from $2.6 billion in 1985 to $3.9 billion.

- Most federal telecommunications procurement is concentrated in network services, but significant growth trends are shown in hardware and professional services.

- As Exhibit V-23 shows, leased telecommunications service accounts for $2.25 billion of the overall market, growing to $3.33 billion in 1990.

- Some agencies will experience higher growth rates than others. For example, the Treasury Department will increasingly use telecommunications to support the tax system's redesign and electronic tax processing initiatives.

- Although all federal agencies buy some commercial network services directly, annual procurement by the Department of Defense and the General Services Adminstration (GSA) exceeds that of the other agencies combined.

- Some programs are in a questionable status due to budget reduction mandates and questions about the suitability of the proposed FTS 2000 network (discussed below) for meeting agency needs.

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EXHIBIT V-23

FEDERAL TELECOMMUNICATIONS MARKET, 1985-1990

$ Billions

Professional Services

Hardware

Leased Telecommunications

Note: Dollars rounded to the nearest $10 million.

Overall AAGR 8%
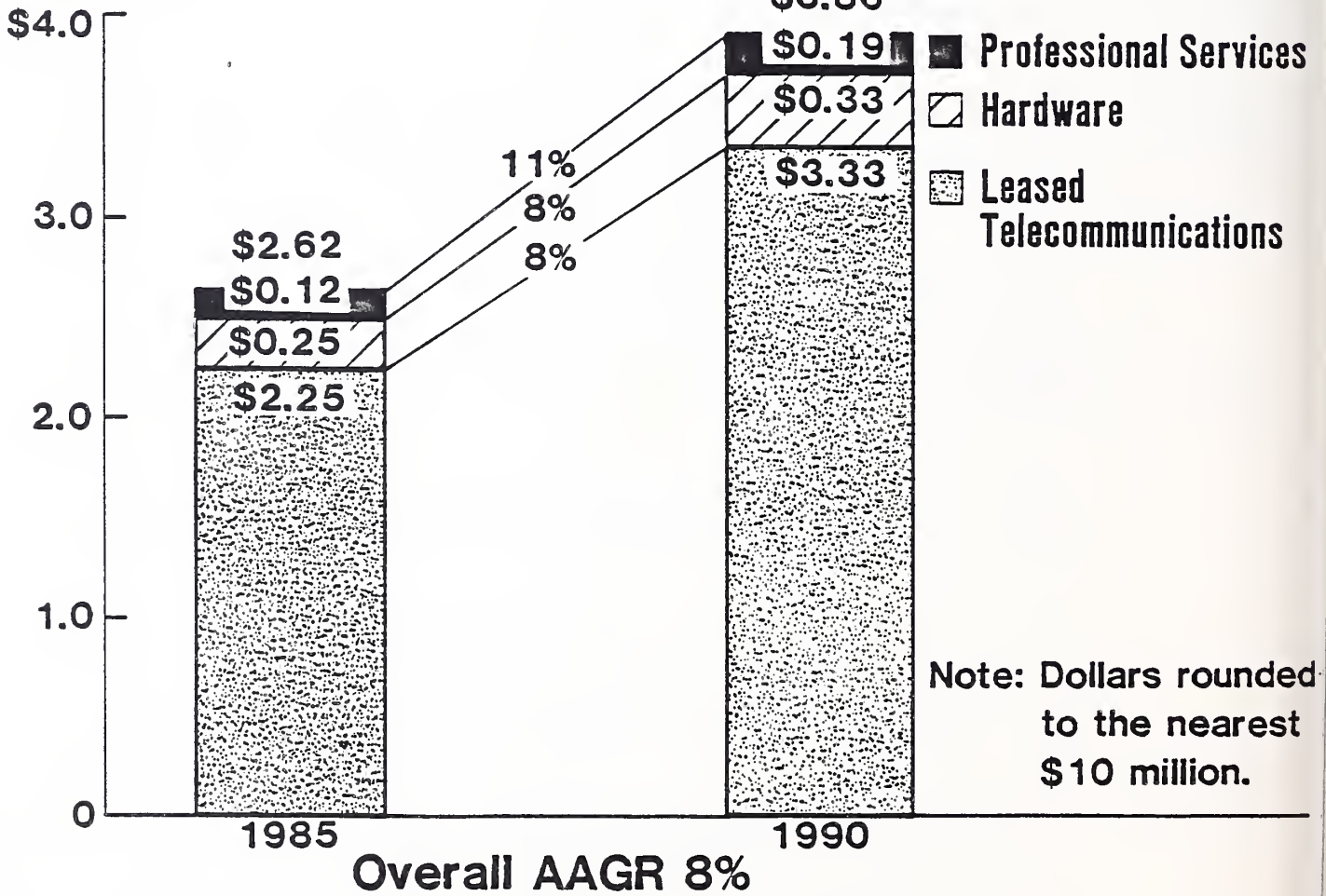
- While individual agencies may acquire new telecommunications services, new and replacement network acquisitions by Defense and GSA are most prominent.

- Defense and GSA networks may be used to satisfy individual agency requirements and reduce direct spending by the agencies for commercial network services.

c. FTS 2000 and WITS

- FTS 2000 is seen as a replacement of the current federal telecommunications system through a single contract with a primary services vendor.

  - In contrast to previous GSA circuit acquisition strategies, GSA has devised the FTS 2000 procurement strictly as a services acquisition.

  - GSA estimates the contract value of these services between $400 and $450 million annually.

- FTS 2000 is understood in several different ways:

  - As an inter-city network.

  - An inter-city network including switching equipment.

  - As all federal telecommunications services provided by GSA.

- Confusion on these various interpretations persists both inside and outside the government.

- The draft request for proposal (RFP) for FTS-2000 was issued in September 1985. It calls for a ten-year contract, but the contractor is given no guarantee of system use after the first three years.

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- A second draft RFP will be issued in 1986, and full implemenation of the network may slip well into the 1990s.

- The Washington Interagency Telecommunications System (WITS) program is conceptually similiar to FTS 2000, but targets federal agency requirements in the Washington, D.C. metropolitan area.

- WITS is to replace now existing federal services, primarily based on Centrex services, with an integrated voice/data network.

    d.   Technical Trends

- With the variety of emerging telecommunications technologies, most federal agencies have adopted a "wait and see" attitude, preferring to see network service vendors assume the risks associated with new technology.

- Defense and other agencies with geographically-dispersed or campus-type facilities are moving more rapidly than others in implementing satellite, microwave, fiber optic, and teleconferencing facilities.

- Federal agenecies are also growing more concerned with telecommunications security and are requiring end-to-end encryption even for systems handling non-sensitive information.

    e.   Network Services Usage

- Despite divestiture and increasing market competition, AT&T remains the dominant carrier for federal agencies.

- Aside from providing local voice services, the RBOCs will not be a significant force in this market during the next few years. The continued constraints of structural separation in most cases will prevent them from bidding major federal procurements which require both basic and enhanced network services.

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- Several specialized network services companies outside the old Bell organization have had increasing success in the federal market.

- INPUT believes that traditional value added network vendors will be hard pressed to expand their current share of the market.

    - VAN vendors probably will retain existing business due to the long-term nature of existing contracts.

    - The distinction between VANs and common carriers is becoming blurred as the traditional long-haul communications carriers add features previously only available from VANs.

    - Federal networks will offer services obviating the need for VAN services in many cases.

- The window of opportunity for smaller telecommunications companies will close quickly due to a single supplier approach dictated for FTS 2000 and the increasing preference shown by federal agencies for a systems integration approach, locking out smaller companies who do not have close ties to established primary vendors in this market.

- For a fuller discussion of federal telecommunications plans, including a detailed analysis of individual agency requirements, readers are referred to INPUT's current report Federal Communications Market, 1986-1990.

- The next chapter contains case studies describing user approaches to communications problems and their resolution through network services.

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VI CASE STUDIES

VI CASE STUDIES

- This chapter contains case studies to describe user approaches to network services. The cases reveal unique solutions to specific problems and in one instance describe how a company decided to abandon its plan to develop a commercial network service application.

A. AN ELECTRONICS COMPANY

- An electronics components manufacturer with manufacturing and sales offices maintained internationally sees increasing reliance on private networks and virtual private networks at the expense of other network services, but acknowledges sensitivity to what services may specifically be offered.

- For communications with sales offices, which frequently relocate, virtual private network use will increase because of the ability to repath data, with the vendor coordinating moves and changes.

- There is also interest in the Software Defined Network, with the user handling reconfiguration by accessing the network via a terminal or a micro, but there is skepticism whether recently announced services will perform as advertised.

- Another option being evaluated for links to remote sales offices are VSAT techniques using Ku band frequencies due to their perceived efficiency.

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- For overseas communications, an IBS satellite service is being considered for one major location because of the cost effectiveness this new service offers.

    - Currently, an international record carrier is used for traffic to a Far East manufacturing site.

    - Traffic at 56 Kbps is routed over LEC digital data service facilities to an international record carrier coordination point where the data is then sent via satellite to the PTT which handles connection to the plant.

- The telecom manager of this company says he is monitoring ISDN events and is implementing systems which will not preclude rolling into ISDN technologies which are not expected to be available until the end of the 1980s, if then.

- Network services are evaluated using the traditional criteria of geographical reach, cost relative to the application, reliability, vendor viability, and other factors.

B. A COMPANY PLANS TO DEVELOP AND SELL AN EDI SERVICE

1. THE PLAN

- A natural resources company established a New Products and Marketing Group, with one of its tasks being the evaluation, development, and marketing of Electronic Data Interchange services within and outside its industry.

- After preliminary market research and advice from the Transporation and Data Coordinating Committee, a leading advocate for EDI, group members

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determined that development costs were manageable and justifiable based on internal needs alone.

- The transportation group of the company had independently investigated EDI but concluded it was too soon for implementation since EDI standards had not yet stabilized.

- The New Products and Marketing Group decided to proceed, using TDCC software as a starting point but without currently involving the transportation group.

- As the plan evolved, it called for developed software to be sold to other companies who would then contract independently for network services to handle implementation of an EDI system, while the company itself would implement a system for use with its suppliers and subsidiaries.

- Initial marketing plans called for selling the proposed service to other companies, including customers and suppliers, in various industries, then extending the marketing effort to utilize the experience of the company field staff for sales within the industry.

- Some problems needed to be resolved as the task force continued to refine its plans. It conducted an evaluation of VAN and RCS EDI offerings, collecting service descriptions and pricing information.

- After this competitive analysis, the company determined that EDI services would be best provided by the large network services companies now participating rather than an independent firm and that the planned software would be in competition with products from other firms.

- Accordingly, the EDI network plan was abandoned.

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2.   ANALYSIS

● Members of the EDI task force at this company are to be credited.

    - First, they envisioned a service and a software package which was needed internally as filling a broader need.

    - Second, they did research to determine market demand and potential competition for the planned product/service.

● While other firms may have plowed ahead despite apparent obstacles, this company had the foresight to acknowledge the plan as a good idea, but one which was unworkable in a broader sense considering market realities.

● While the networking issues were never fully addressed, indications are the approach saw third-party rather than private networks as the delivery mode. This would have allowed a wider community of potential users to access the system, a wise strategy considering the numbers of potential participants representing various industry groups, while a private network would have provided limited, and more costly, accessibility.

C.   AN INNOVATIVE PUBLISHER

● Dow Jones & Company is one of the most innovative information services companies, open to experimentation and exploration of technological solutions to problems.

    - In 1962 the company used microwave to transmit full page facsimile images between a composing room and a printing plant.

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-   It now uses its own satellite transponders to support national publication of the <u>Wall Street Journal</u> and <u>Barrons.</u>

-   It first used FM SCA to distribute audio financial news in a system called Dow Alert using specially developed DowRadio II receivers equipped with cassette recorders. However, it abandoned this experiment to move the audiotex news service to an adaptation of voice mail for telephone delivery.

    .   Users punch touch tone commands to access desired information.

    .   The audiotex news service is resold by Charles Schwab, a discount brokerage.

●   While still using the value added networks for access to its on-line data base, the Dow Jones News and Information Retrieval (DJNIR) service, the company has developed DowNet, a public data network to provide simplified subscriber access.

    -   DowNet, available in four metropolitian areas, is strictly for DJNIR access.

    -   It was developed to provide more reliable access and faster response time in congested areas.

●   The company is investigating the use of DowNet for corporate networks.

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D.   A MANUFACTURER CUTS COSTS

- Facing increasing losses, corporate management mandated all departments of this firm to find ways of reducing costs.

- The telecommunications manager and staff evaluated their options and determined that AT&T's new Software Defined Network would allow a reduction in support staff and lead to other savings.

- The company successfully switched over to SDN and was able to sell its network test equipment and the fully amortized switch. It also cut the network management staff by depending on AT&T to handle network maintenance.

- The company is still able to do its own network design, routing, and expansion planning, and is still able to generate departmental billing for chargebacks due to the features of SDN.

- Additionally, because SDN will be widely available, the company will be able to add almost 100 additional locations to the network, offices which formerly were too isolated from the private network to be connected and which therefore incurred more expenses for dial-up services than will now be the case.

- Because SDN charges for actual use, there is no built-in, but unused, capacity on the new network.

- While aware that tariff rates may change in the future, the telecom manager feels that new offerings from other carriers will allow it to investigate alternatives should charges become too high, but also recognizes that competition will work to moderate price changes.

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E.   A FARM COOPERATIVE LOOKS TO SATELLITE SERVICES

- A farm cooperative which manufacturers and provides agricultural products to a larger number of farmers needed to reduce costs of leased private lines between its central data processing operations and remote offices.

- After evaluating its options, it determined that leased lines could be eliminated through a satellite-based network service provider.

- Approximately 100 VSAT terminals were placed, satellite time was secured, and a private link was used between the data center and the master hub earth station maintained by the vendor.

- Under the terms of the rental/purchase contract, monthly charges were predictable and manageable and could be applied to the equipment purchase price.

    - Installation charges were $1,200 per location.

    - Monthly fees of under $300 per site covered the network, hardware, operations, and maintenance, compared with a $400 charge for leased lines previously.

- In addition to cost savings and improved reliability, the cooperative gained from a one-stop solution to its networking problems with a flexible system which could easily be upgraded or reconfigured.

- Exhibit VI-1 summarizes the motivations, strategies, and approaches taken in these case studies.

- The final chapter in this report presents INPUT's recommendations to network services users and summarizes the study's findings.

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EXHIBIT VI-1

CASE STUDY SUMMARY

CASE	MOTIVATION	APPROACH	RESULTS
Electronics Company	Links to Frequently Moved Remote Offices	Considering Virtual Private/Software Defined Network Services	Evaluating Options with ISDN Considerations; Now Using IRC for Overseas Link
Planning for EDI	To Sell EDI Service/ Software	Formed Task Force to Evaluate Opportunities, Risks, and Required Steps	Abandoned Plan after Competitive Analysis Showed Unacceptable Risks
Innovative Publisher	Using Technology for Strategic Advantage	Experimentation with a Variety of Network Services; Own Network for Customer Data Base Access in Congested Areas	Some Failed Experiments, but Many Successes Improving Value of Information Services to Customers
Manufacturer	Required to Cut Costs	Early User of Software Defined Network	Reduced Support Staff and Leased Line Costs; Added Locations to Network
Farm Cooperative	Reduced Leased Line Costs, Improved Reliability	VSAT Network Serivces	Lowered Monthly Charges 25%, Applied Fees to Equipment Purchase; Gained Network Reliability

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VII CONCLUSIONS AND RECOMMENDATIONS

VII CONCLUSIONS AND RECOMMENDATIONS

- This chapter presents INPUT's recommendations to network services users and summarizes the study.

A. USER RECOMMENDATIONS

1. ORGANIZATIONAL ISSUES

- Consider adding to the organization technology assessment staff responsible for monitoring new developments and making recommendations for piloting new technology.

- Evaluate the cost effectiveness and desirability of user-managed, reconfigurable services such as software-defined and virtual private networks.

- Merge voice and data departments into a single IS department.

  - While data and voice equipment may be maintained separately, the physical links may be used in a unified way now in preparation for further levels of integration in the future.

  - At some point, initiate pilot projects for integrated applications.

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- Train the voice group and the data group in each other's disciplines.

- Use a task force or focus groups to identify future applications for integrated systems.

2. ISDN RECOMMENDATIONS

- Monitor ISDN developments and piloting experiences, keeping management informed of the benefits and risks of ISDN.

- Use experience with digital technologies and SDN-type services to prepare for ISDN.

- Create a plan for reusing present or newly installed equipment elsewhere in the organization when (and if) ISDN capabilities are offered.

3. VENDOR SELECTION CRITERIA

- Maintain flexibility in vendor relations by entering short-term equipment/service leasing agreements. This keeps the interest of other vendors who may have suitable offerings in the future and provides competitive pricing and other benefits to the organization.

- Understand vendor directions toward ISDN implementation and standards and require that ISDN capabilities can be retrofitted to capital equipment with long life cycles.

- Evaluate the options for using a private network versus a public network service, giving primary attention to economic factors involved.

  - Conduct a self-appraisal regarding your ability to manage a private network.

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- Investigate options for third-party services who will help you maintain the network, diagnose problems, and coordinate servicing.

- Use the matrix in Exhibit VII-1 to rate and compare competitive vendor services. In addition to cost comparisons in volume discounts, other factors to be considered include:

  - Flexibility of the network. Can it be reconfigured quickly? Is additional bandwidth available on demand?

  - User mangement features. Are management statistics, on-line help, or other desired features available?

  - Clarity of billing. Is it easy to understand and monitor charges? Can departmental bill-back codes be used?

  - Reliability. What is the vendor's reputation and his guarantees regarding error rates, mean time between failures, lost data, and related factors?

  - Geographic availability. Are network points of presence located near your network destinations, such as major trading partners or field offices? Evaluate the costs of connecting through dial and leased lines, and for dial backup.

  - Interfaces and protocols. Is SNA compatibility available? What protocol conversions are provided?

  - Internetworking. Can you link through the network to others to access desirable applications, data bases, or users on other networks?

  - Applicability of method of application. Are broadcast rather than point-to-point communications dominant? If so, does the method fit the need?

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EXHIBIT VII-1

NETWORK VENDORS SELECTION MATRIX

Vendor A. \ Vendor B. (Comparison)	Flexibility	User Management Features	Bill Clarity	Geographic Availability	Interfaces and Protocols	Internetworking	Applicability to Application	Applications	Numeric Value	Weighting Factors
Flexibility										
User Management Features										
Bill Clarity										
Geographic Availability										
Interfaces and Protocols										
Internetworking										
Applicability to Application										
Applications										

- Working down column "A", enter numeric value for preference of "A" over "B".

- Add numeric values across columns and enter in appropriate column.

- Average numbers to get weighting factor.

- Apply weighting factor against features of present system and all feasible alternatives.

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- Applications available. What programs, software, and services are accessible through the network—timesharing, EDI, E-mail, graphics?

- Once a vendor is chosen, consider a limited trial period to validate the choice and have backup plans if a change is required.

4. EXPERIMENT

- Do not be afraid to try something new. Fight the tendency to look in one direction and only consider traditional solutions.

- Investigate parallel developments and alternative solutions; to ignore promising trends can mean a loss of competitive advantage, overlooked opportunities, and missed efficiencies. Granted, it is a constant chore to take into account all the variables, but recognize that evaluating new technologies often requires new criteria.

- New technologies will offer new applications and will generate new options. For example, if you have a digital PBX used only for voice, identify pilot projects to test its data capabilities.

- Use low-risk projects to experiment with new technologies. Work with vendors and volunteer to serve as a beta site. The ability to see the future is limited, and the best course of action is to learn through experience.

B.   CONCLUDING REMARKS

- The network services market is a complex one, with an array of techniques and technologies available to users, creating a challenge in selecting the most appropriate method.

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- The split between data, voice, and image will almost become immaterial as voice and image become increasingly digitized.

- A least-cost routing method seems to be required.

  - Users essentially attempt to find the least expensive pathway when evaluating competitive network services, but also factor the applicability of the technique to the specific application.

  - For example, is information being broadcast to multiple locations or is it being routed from one point to another?

- The first tier of network service vendors will likely establish and maintain their market shares, often with several types of techniques represented in their product mix, while the second tier will provide specialized niche services, building expertise within various industry segments.

- It is recognized but rarely acknowledged that the choice of vendors is often arbitrary when services, applications, and vendor reputation are nearly equal. In these cases, the skill of the sales team in interpersonal relations often becomes the deciding factor; thus, human communications forms the underpinnings of the technological communications environment.

- There are other factors to be considered, including users not fully understanding the wide range of technologies available. This undersores the importance of user organizations to train and cross-train their staffers in processing and telecommunications.

- Use of innovative techniques and growing network capacity may lead to new applications which were previously only speculation, and technologies designed for one application may be more suitable for others.

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- We are reminded that originally the telephone was intended to distribute music and the radio was for the distribution of messages.

- While radio in several of its forms is used as originally intended, music and information broadcasting is the greatest use.

- The one dominant direction identified in this study of network services is that things are changing and will likely continue to change. How users and vendors respond to those changes, both short and long term, will largely determine their success.

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APPENDIX A: DEFINITIONS OF RELEVANT TERMS

APPENDIX A: DEFINITIONS OF RELEVANT TERMS

- <u>Access Charge</u> - The FCC mandated fee charged users of a telephone company's services, designed to offset non-traffic sensitive costs incurred by local telephone companies. Also called Customer Access Line Charge (CALC).

- ATM - Automated Teller Machine.

- AX.25 - A packet radio protocol/interface, similiar to X.25.

- BOC - Bell Operating Company.

- Bypass - Refers to the use of one of several technologies (such as microwave) to avoid using, and paying for, local telephone company facilities.

- CATV - Originally Community Antenna Television, now refers more broadly to Cable Television which includes satellite delivered and local programming in addition to retransmission of off-air signals. May use plant facilities to provide other services such as data transmission or voice.

- CD-ROM - An optically-encoded "read only memory" disk with high capacity, similiar to compact disks holding music, but generally containing data.

- Centrex - Special telephone features such as conferencing and call fowarding provided by the telephone company's central office equipment.

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- Codec - For coder/decoder, a device which converts between digital and analog video channels and compresses bandwidth for transmission. Typically used in videoconferencing.

- COS - The Corporation for Open Systems. Most leading information service vendors are members. Will certify compliance with standards.

- CCITT - The International Consultative Committee on Telephone and Telegraph, a U.N. chartered standards-setting agency, part of the International Telecommunications Union.

- CPI - Computer-to-PBX Interface, designed in anticipation of ISDN, replacing modems with digital interfaces.

- DAB - Dynamic Allocation of Bandwidth. The throughput of a communications link is automatically reconfigured depending on current need.

- DBS - Direct broadcasting by satellite.

- DEMS - Digital Electronic Message Service (see DTS).

- Digital Termination Services (DTS) - Usually refers to a digital microwave system for line-of-sight, point-multipoint communications. Also called DEMS.

- Divestiture - The action, stemming from antitrust lawsuits by the Department of Justice, which led to the break-up of AT&T and its previously owned local operating companies

- DMI - Digital Multiplexed Interface, an alternative to CPI (see above) for PBX-to-computer interfaces. Proposed by AT&T.

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- Electronic Mail ("E-mail") - The use of telecommunications to distribute messages between individuals. May be a computer-based message system (CBMS), facsimile (FAX), or voice store and forward (voice mail). Also see "mixed mode electronic mail."

- EDI - Electronic Data Interchange. The computer-to-computer exchange, usually through a third-party network/processing service, of electronic business documents. The computers may have different protocols and the documents may be in different formats.

- Equal Access - The requirement that the same quality of lines must be offered, at the same price, to the interexchange carriers that are offered AT&T for long-distance connections.

- FAX or Facsimile - An image transfer, like a communicating photo copy machine.

- FM SCA - A transmission medium which uses the Subsidiary Communications Authority "sidebands" of FM radio broadcast stations, usually in conjunction with satellite delivery to the radio station.

- Fiber Optics - A transmission medium which uses lightwaves.

- GPS - Global Positioning Services.

- IBS - International Business Services, a satellite-supported offering.

- Inter-LATA - Communications within designated areas called LATAs (see definition below).

- Intra-LATA - Communications between LATAs.

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- IRC - International Record Carrier, providing records and leased line service both domestically and internationally, due to deregulation.

- ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image, using a standard interface and twisted pair wiring.

- IXC - Interexchange Carrier: a long-distance provider. Sometimes called Other Common Carrier (OCC).

- LADT - Local Area Data Transport. Data communications provided by the BOCs within local access transport areas (LATA).

- LATA - Local Access and Transport Area, where communications are handled by the local telco.

- LCR - Least Cost Routing. A feature on advanced PBXs and tandem networks which routes a call via the lowest priced facility available at the time of the call.

- LEC - Local Exchange Carrier. A Bell Operating Company (BOC) or an independent telephone company which provides intra-LATA services.

- Local Loop - The connection between a customer's premises and the LEC central office.

- Mixed Mode Electronic Mail - The use of the post office or a courier service to deliver messages prepared electronically, routed to the service for printing, insertion in an envelope, and final delivery.

- MHS - Message Handling System, an electronic mail standard.

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- MNP - Microcom Networking Protocol, an error-correcting protocol developed by modem manufacturer Microcom.

- Mobilsat - Mobile Satellite. Proposed systems for voice communications and messaging to and from mobile units through satellites.

- MSS - Mobile Satellite Systems.

- On-Line Data Base (OLDB) - Data bases available for interactive access through vendor or common carrier networks.

- OCC - Other Common Carrier. A long-distance telephone service provider other than AT&T. An alternative description of an interexchange carrier (IXC).

- Pay-Per-View (PPV) - An entertainment offering provided by cable television services which bills customers a fee based on individually ordered special event programs.

- Personal Videophone Conferencing (PVC) - INPUT's coined phrase for video transmission using microprocessor-based systems with video cameras transmitting images over standard phone lines.

- Portable Teletext - The one-way delivery of information or messages to hand-held, addressable, and sometimes programmable terminals adapted from display paging technology. Usually uses FM-SCA frequencies.

- PBX - Private Branch Exchange, a customer premises telephone switch.

- PRDS - Public Digital Radio Service. A proposal for a packet radio-based data communications system.

- PSTN - Public Switched Telephone Network.

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- RBOC - Regional Bell Operating Company, one of seven holding companies coordinating the activities of the BOCs.

- RCS - Remote Computing Service.

- Resale - The practice of selling excess or bulk purchased network capacity.

- Reseller - A marketing organization which buys long-distance capacity for others at wholesale rates, selling services at retail but discounted prices and profitting on the difference.

- Roamer - A cellular radio term describing a user requiring service outside the user's "home" system.

- SNA - Systems Network Architecture. An IBM standard for mainframe computer communications.

- Software Defined Network - A private network which uses public network facilities and which is configurable on an as needed basis by the user. Also see virtual private network.

- Tandem Network - Describes a private network of PBXs coordinated with larger ("tandem") switches.

- T-1 - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices, and now used for microwave, satellite, fiber optics, or other bypass applications.

- Tandem Switch - A central customer premises telephone switch which works jointly (in tandem) with PBXs at company locations.

- Telco - Telephone Company.

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- Teleconferencing - An electronic meeting method. May be audio, audio-graphic, video, freeze-frame video, or computer conferencing.

- Teledelivery - The electronic distribution of software.

- Telenomads - INPUT's definition for a mobile workforce using mobile satellite and/or cellular radio for communications.

- Teletex - An electronic mail system, proposed to replace Telex.

- Telex - A record communications service between teletypewriters (TTY), now often using store and forwarding techniques.

- UISN - Universal Information Services Network. AT&T's concept for public network services resulting from ISDN.

- Value Added Network (VAN) - A carrier which augments netwwork trans-mission with computerized (often packet) switching and other features such as store and forwarding, multiple terminal access, error detection and correc-tion, and host computer interfacing.

- Vertical Blanking Interval (VBI) - Space on a television signal which can be used to distribute data without interfering with the broadcast.

- Voice Mail - A technique which digitally records voice messages, holding them in a voice "mailbox" for later retrieval.

- VSF - Voice store and forward-voice mail.

- Videotex - An information distribution system characterized by displayed graphics and an easy user interface.

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- VSAT - Very Small Aperature Terminal. A small satellite dish system, usually using Ku band frequencies.

- Virtual Private Network - A portion of a public network dedicated to a single user.

- WATS - Wide Area Telephone Service, also called outbound 800 service. A bulk rate, discounted long-distance service.

- X.PC - An error-correcting protocol for microcomputers developed by Tymnet.

- X.25 - The interface standard for packet switched networks.

- X.75 - The interface standard for connection between packet switched networks.

- X.400 - The electronic mail standards established by the CCITT.

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APPENDIX B: USER QUESTIONNAIRE

My name is _____.   I'm with INPUT in Mountain View,
California. We're a management planning firm and we're working
on a report regarding network services. I'd appreciate your
perspectives and I think you'll find the discussion interesting.
In return for your cooperation, I'd be happy to send you a copy
of the executive summary of the report for your personal use.
The interview should take about 15-20 minutes. Is now a good
time?

First, I would like to discuss definitions.

A PRIVATE NETWORK would be one which is completely managed by
your company. It consists of equipment such as tandem switches
and bulk capacity linkages which are owned or leased by you over
a long term.

NETWORK SERVICES is defined as the use of a public switched or
packet network, or other method such as satellite or microwave
links. It may be dial up, or you may have dedicated access lines
to a network serving office. Generally, the communications
equipment attached to the network is provided by the service.
The key points, however, are that your company pays by the hour
and/or amount of traffic and that the network is managed by the
vendor.

A VIRTUAL PRIVATE NETWORK is somewhere in-between. It is your
company's use of a portion of the public network, and you have
the capability to reconfigure and otherwise manage the network
yourself through a terminal. We're including Software Defined
Networks in this definition.

1. FIRST, do you agree with these definitions?
[IF NOT, HOW WOULD YOU CHANGE THESE DEFINITIONS?]

2. Which of these types of networks do you currently use, and
based on both voice and data traffic, by what proportions? Let's
measure data traffic in the equivalent of voice line holding time.

(a)PRIVATE NETWORK   (b)NETWORK SERVICES   (c)VIRTUAL PRIVATE NET

_____ %   _____ %   _____ %

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3. How would these proportions CHANGE over the next TWO YEARS?

(a)PRIVATE NETWORK   (b)NETWORK SERVICES   (c)VIRTUAL PRIVATE NET

_____%   _____%   _____%

4. How would they CHANGE in the NEXT FIVE YEARS?   .

(a)PRIVATE NETWORK   (b)NETWORK SERVICES   (c)VIRTUAL PRIVATE NET

_____%   _____%   _____%

5.   What are the reasons behind these estimated changes?

6. Next, I need to know something about the proportions of your
data, voice and image traffic. Again, the measure is voice line
equivalent holding time. Could you estimate how these three
elements (data, voice, image)are currently split for ALL
communications, both internal and external? We have three
subcategories for image: video, graphics and facsimile.

(a)Voice   (b)Data   (c)Video   (d)Graphics   (e)Facsimile

____%   ____%   ____%   ____%   ____%
(should add to 100%)

7. Could I ask you to peer into the old crystal ball and estimate
what those proportions will be in five years?

(a)Voice   (b)Data   (c)Video   (d)Graphics   (e)Facsimile

____%   ____%   ____%   ____%   ____%
(should add to 100%)

f. Why do you see these ratios changing?   .

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8. Could you provide me with information on your annual
expenditures for third-party network services, in other words,
the fees you pay to companies that manage the network for you?
[If not, could you refer me to someone who can?]
$_____per year (1985) REF:

_____

9.. And would it be possible to estimate the proportions of this
annual expenditure which can be allocated to the types of .
communications:

(a)Voice   (b)Data   (c)Video   (d)Graphics   (e)Facsimile

____%   ____%   ____%   ____%   ____%
(should add to 100%)

10. Let's look in the crystal ball again. Could you estimate how
your network services expenses paid to network services vendors
will CHANGE over the next TWO YEARS? Would they go up, come down
or remain the same? And by what percentage?

(a)up_____%   (b)down_____%   (c)same

11. Why do you see this change [or why will it remain the same]?

12.(a) Are you currently doing anything which fits under the
definition of BYPASS, in other words, going around the local
telephone company to link WITH A NETWORK SERVICES point of
presense or serving office? (BY) Y/N

(b.) [If yes, ask:] Are you currently using any of these
techniques:

(bi.)Leased line(s) to a network office (L) Y/N

        (biA.)At what speed do these lines operate? Sp=_____

(bii.)Microwave link (s) to a network office (MW) Y/N

        (biiA.)What type (s): 23 ghz? 10 ghz? other? Type:_____

(biii)Fiber Optic link (s) to a network office. (FO) Y/N

(biv)Other method such as lightwave?   Oth = _____
        (bivA.) What speed: _____

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INPUT
MSP2

13. Now, I would like to get some information on your plans in the future. In the next TWO years, are you planning to implement any [other] bypass method to link to a NETWORK SERVICES CENTRAL OFFICE? Y/N

If YES: What method[s] are being evaluated?

TWO YEARS

a. Leased (L)   Y/N

b. Microwave (MW)   Y/N

c. Fiber Optic (FO)   Y/N

d. Other: _____

14. Next, are you using any of the following to connect your headquarters offices to remote offices?

a. Value Added Network (VAN) Y/N

b. WATS (WA) Y/N

c. A Tandem Switched Network (TA) Y/N

d. Hybrid network combining dedicated lines and the public network (HY) Y/N

e. Microwave (MW)   Y/N

f. Satellite network (SA)   Y/N   IF "Y" THEN:

    f1. Using a third party to manage the central hub? (3Pty) Y/N

    f2. Managing the central hub yourself? (SE) Y/N

g. An INTERNATIONAL RECORD CARRIER (Y/N)

h. Other: _____

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15. Next, I'm going to read you a list of some applications tied to the use of network services, and ask if your company USES THIRD PARTY NETWORK SERVICES for these applications. I would also like to get a sense of the importance of these applications, now and in the future. We'll be using the 1-5 scale with 5 being very important. Some applications may overlap others.

So, the first question is, "is the application tied to the network," and then, could you give me your impressions of how important each is NOW, and how important do you think it will be in TWO YEARS.

	net svces?	rank now	2 yrs
a. TIMESHARING a mainframe computer, either your own or a computer service (TS)	| |	1 2 3 4 5	1 2 3 4 5
b. REMOTE JOB ENTRY (RJE)	| |	1 2 3 4 5	1 2 3 4 5
c. DATABASE ACCESS (DB)			
c1. commercial databases	| |	1 2 3 4 5	1 2 3 4 5
c2. your own databases	| |	1 2 3 4 5	1 2 3 4 5
d. DISTRIBUTED DATA PROCESSING (DDP)	| |	1 2 3 4 5	1 2 3 4 5
e. MICRO-TO-MAINFRAME links (MM)	| |	1 2 3 4 5	1 2 3 4 5
f. CONNECTING OFFICE SYSTEMS in various locations (OS)	| |	1 2 3 4 5	1 2 3 4 5
g. ELECTRONIC MAIL (EM)	| |	1 2 3 4 5	1 2 3 4 5
h. ORDER ENTRY/INQUIRY (OR)	| |	1 2 3 4 5	1 2 3 4 5
i. INVENTORY CONTROL (INV)	| |	1 2 3 4 5	1 2 3 4 5
j. Electronic Data Interchange [DEFINE IF NECESSARY: EDI is when you exchange electronic documents, such as purchase orders, with another company. It may require converting or translating to a standard format.] (EDI)	| |	1 2 3 4 5	1 2 3 4 5
k. FINANCIAL APPLICATIONS (FIN)	| |	1 2 3 4 5	1 2 3 4 5
l. DECISION SUPPORT SYSTEMS (DSS)	| |	1 2 3 4 5	1 2 3 4 5
m. PERSONNEL (PER)	| |	1 2 3 4 5	1 2 3 4 5
n. VIDEO CONFERENCING (VC)	| |	1 2 3 4 5	1 2 3 5
o. GRAPHICS FOR CAD/CAM (GR)	| |	1 2 3 4 5	1 2 3 4 5
p. ELECTRONIC DELIVERY OF SOFTWARE(TELD)	| |	1 2 3 4 5	1 2 3 4 5

q. OTHER APPLICATIONS:_____

INPUT
MSP2

16. Of those applications you are NOT using, do you have any
plans to implement them within the next two years? If yes, WHICH?

17. a. Could you estimate the PERCENTAGE of your voice and data
traffic which presently goes OVERSEAS?_____%

b. Do you see INTERNATIONAL TRAFFIC INCREASING, DECREASING OR
REMAINING THE SAME over the NEXT FIVE YEARS?   more   less   same

c. What percentage will it be in 5 years?_____%

d. Why will this change?

18. a. When, if ever, do you think your company may start using
optical disc storage?

1986   1987   1988   1989   1990   1991   1992 or later   d/k

 b. How do you think this technology will effect your on line
data base usage and your network usage?

19. Next, I'd like to know what you expect from third party
network services companies. For example, what percentage of
availability do you require for:

a. Voice Services (V):   _____%

b. Data Services (D):   _____%

20. And could you tell me what you are ACTUALLY GETTING now in
terms of availability for:

a. Voice Services (V):   _____%

b. Data Services (D):   _____%

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MSP2

21. Do you expect a network services vendor to provide you with help in INTEGRATING your communications EQUIPMENT with the network provided by a third-party? Y/N

22. How about help in INTEGRATING your communications SOFTWARE with the network provided by a third-party? Y/N

23. How important, on a scale of 1-5 with 5 being very important, is it for your to have a network which supports:

a. OUTDIAL, in other words, the network will call your computers when and if it has something for you. 1 2 3 4 5

b. SNA   1 2 3 4 5

c. BISYNCH 1 2 3 4 5   ci. How important will this be in 2 years?

d. PROTOCOL CONVERSION   1 2 3 4 5
                (di.)   WHICH PROTOCOLS? _____
_____

e. How about ERROR CORRECTION for microcomputers, such as X.PC or MNP protocols? 1 2 3 4 5

24. Based on what you now know, of the two MICROCOMPUTER ERROR-CORRECTING PROTOCOLS, WHICH are you more inclined to use:

        (a) MNP_____ (b) X.PC _____ (c) Don't Know _____

Thank you. I have just a few more questions. Your help is very much appreciated.

25. I'm going to read you a short list of issues we think telecommunications managers, like yourself, may be concerned about. Could you indicate how great a concern each is on a scale of 1-5, with 5 being "a great concern." The first is:

a. Access Charges: 1 2 3 4 5

b. Network mergers: 1 2 3 4 5

c. BOCs competing with AT&T: 1 2 3 4 5

d. Vendor Viability: 1 2 3 4 5

e. Standards for Interconnection 1 2 3 4 5

f. Regulatory Agencies   1 2 3 4 5

Are there any other concerns you can identify?

g. _____   1 2 3 4 5

h. _____   1 2 3 4 5

INPUT
MSP2

26.   I would like to quickly check your awareness of two things.
Basically, I would like to know how much you know from a
strategic standpoint, in other words with regards to what they
can do: We are using the 1-5 scale, with 5 being "I know quite a
bit about that."

a. FM SCA·   1 2 3 4 5

b.   Electronic Data Interchange   1 2 3 4 5

27a. On a scale of 1-5, with 5 being highly likely, how likely is
it you would call on the services of an INDEPENDENT OUTSIDE
TELECOMMUNICATIONS CONSULTANT to assist you in planning for your
network service needs? 1   2   3   4   5   b. Why that rating?

28a. And how likely is it that you would use the consulting
services of a network services VENDOR to assist you?
1   2   3   4   5   b. Why that rating?

29.   So you would rate your RELIANCE ON YOUR STAFF EXCLUSIVELY
for network planning at what level?   1 2 3 4 5.

30a. As you may know, network services are being provided by
companies other than the traditional vendors. An example would be
the insurance industry setting up an industry-specific network,
along with special applications. In your industry, are you aware
of companies that are doing this? Y/N [b. if yes: Which ones?]

31a. On our scale of 1-5, with 5 being highly likely, how
inclined would you be to use the services of a non-traditional
network services company? 1   2   3   4   5

b. What are the factors influencing this rating?

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32. Could you identify any special or industry-specific needs you would like to see offered by any network services company?

33a. One our scale of 1-5, with 5 being "highly likely", how likely would it be that you would CHANGE the company you now use for network services?   1   2   3   4   5

b.   And what would be some of the FACTORS involved in such a change? ·

34. What, if anything, are you doing to prepare for the coming development of ISDN - the Integrated Services Digital Network.

 Are you: (a.) staying INFORMED and monitoring developments
                                                                    (I)

          (b.) actively PLANNING to take advantage of ISDN
          capabilities?   (P)

          (c.) Not doing very much at all?   (N)

35. a. When do you see the INTEGRATED SERVICES DIGITAL NETWORK (ISDN) becoming available to you?

1986   1987   1988   1989 · 1990   1991   1992 or later

NEVER
 b. WHY that estimate?

36. a. When do you see fiber optic networks becoming available to you?

1986   1937   1988   1939   1990   1991   1992 or later

NEVER
 b. WHY that estimate?

37. Is there anything else you would like to see addressed in a report about network services, directed to telecommunications managers, like youself?

That concludes our interview. I want to thank you for being so generous with your time. The executive summary of the report should be out in about 6-8 weeks. Once again, thank you.

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APPENDIX C: VENDOR QUESTIONNAIRE

NETWORK SERVICES
VENDOR QUESTIONNAIRE

INPUT is preparing a report on Network Services Directions. We'd appreciate your perspectives. In exchange for your cooperation, we'll send you the executive summary of the completed report for your personal use.

1. Could you estimate the proportions of data, voice and image traffic passing through your netwworks. The measure is voice line equivalent holding time. Also, for image, we'd like to split it between video, graphics and facsimile.

(a) Voice   (b) Data   (c)Video   (d)Graphics (e) Fax

_____   _____ _____ _____ _____

2. Could you estimate wwhat those proportions will be in five years?

(a) Voice   (b) Data   (c)Video   (d)Graphics (e) Fax

_____   _____ _____ _____ _____

3. Could you estimate how charges for network services will change within the next two years? Will they go up, come don or stay about the same?

(a) up_____% (b) down_____%   (c) same_____

4. Why will this occur?

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INPUT
MSP2

5. Next, I'm going to read you a list of applications tied to the use of network services. I would also like to get a sense of the importance of these applications, now and within two years. We'll be using the 1-5 scale with 5 being very important. Some applications may overlap others.

So, the question asks for your impressions of how important each is NOW, and how important do you think it will be in TWO YEARS.

	rank	now	2 yrs
a. TIMESHARING (TS)	| |	1 2 3 4 5	1 2 3 4 5
b. REMOTE JOB ENTRY (RJE)	| |	1 2 3 4 5	1 2 3 4 5
c. DATABASE ACCESS (DB)			
c1.commercial databases	| |	1 2 3 4 5	1 2 3 4 5
c2.corporate databases	| |	1 2 3 4 5	1 2 3 4 5
d. DISTRIBUTED DATA PROCESSING (DDP)	| |	1 2 3 4 5	1 2 3 4 5
e. MICRO-TO-MAINFRAME links (MM)	| |	1 2 3 4 5	1 2 3 4 5
f. CONNECTING OFFICE SYSTEMS in various locations (OS)	| |	1 2 3 4 5	1 2 3 4 5
g. ELECTRONIC MAIL (EM)	| |	1 2 3 4 5	1 2 3 4 5
h. ORDER ENTRY/INQUIRY (OR)	| |	1 2 3 4 5	1 2 3 4 5
i. INVENTORY CONTROL (INV)	| |	1 2 3 4 5	1 2 3 4 5
j. Electronic Data Interchange (EDI)	| |	1 2 3 4 5	1 2 3 4 5
k. FINANCIAL APPLICATIONS (FIN)	| |	1 2 3 4 5	1 2 3 4 5
l. DECISION SUPPORT SYSTEMS (DSS)	| |	1 2 3 4 5	1 2 3 4 5
m. PERSONNEL (PER)	| |	1 2 3 4 5	1 2 3 4 5
n. VIDEO CONFERENCING (VC)	| |	1 2 3 4 5	1 2 3 4 5
o. GRAPHICS FOR CAD/CAM (GR)	| |	1 2 3 4 5	1 2 3 4 5
p. ELECTRONIC DELIVERY OF SOFTWARE(TELD)	| |	1 2 3 4 5	1 2 3 4 5
o. OTHER APPLICATIONS:_____			

_____

6. a. Could you estimate the PERCENTAGE of your voice and data
traffic which presently goes OVERSEAS?_____%

b. Do you see INTERNATIONAL TRAFFIC INCREASING, DECREASING OR
REMAINING THE SAME over the NEXT FIVE YEARS? more   less   same

c. By what percentage will it change?_____%

d. Why will this change?

7. How important, on a scale of 1-5 with 5 being very
important, is it for users to have a network which supports:

a. OUTDIAL, in other words, the network will call a clients computers
when and if it has something for them. 1 2 3 4 5

b. SNA   1 2 3 4 5

c. BISYNCH 1 2 3 4 5
        ci. How important will this be in 2 years? 1 2 3 4 5

d. PROTOCOL CONVERSION   1 2 3 4 5
              (di.)   WHICH PROTOCOLS? _____
_____

e. How about ERROR CORRECTION for microcomputers, such as X.PC or
MNP protocols? 1 2 3 4 5

8. I'm going to read you a short list of concerns. Could you
indicate how great a concern each is on a scale of 1-5, with 5
being "a great concern." The first is:

a. Network mergers: 1   2   3   4   5

b. BOCs competing with AT&T: 1   2   3   4   5

c. BOCs competing with you: 1   2   3   4   5

d. IBM competing with you: 1   2   3   4   5

e. Standards for Interconnection 1   2   3   4   5

f. Regulatory Agencies   1   2   3   4   5

Are there any other concerns you can identify?

g. _____   1   2   3   4   5

h. _____   1   2   3   4   5

INPUT
MSP2

8. What is your position on ISDN?

9. When do you see the INTEGRATED SERVICES DIGITAL NETWORK
(ISDN) becoming available?

1986   1987   1988   1989   1990   1991   1992 or later

NEVER
 b. WHY that estimate?

10. What do you think the impact of ISDN will be on your
business?

11. What do you think the impact of Fiber Optic Networks will be on
your business?

12.a. Could you tell me how long after the introduction of network
services your company became profitable in this area?

b. What are some of the factors impacting profitability?

INPUT
MSP2

13. How important, on the scale of 1-5, with 5 being very important, are the following factors in driving the use of network services:

a. Applications Available   1   2   3   4   5

b. International Communications   1   2   3   4   5

c. Microcomputers   1   2   3   4   5

d. Your marketing efforts   1   2   3   4   5

e. Other factors_____   1   2   3   4   5

f. Other factors_____   1   2   3   4   5

14. How would you rate the following factors as impacting the reduction in use of network services?

a. Costs   1   2   3   4   5

b. Private network growth   1   2   3   4   5

c. User demands for control   1   2   3   4   5

15. Could you rate your company's attitudes on internetworking, in other words, connecting your network to another in the following areas:

a. Connections to other public networks.   1   2   3   4   5

b. Connections to private corporate networks.   1   2   3   4   5

c. Connections to international networks,
   including IRCs.   1   2   3   4   5

Why these ratings?

16. How likely do you think the following will become important factors in the network services business within the next five years, again on the 1-5 scale.

a. Packetized Voice Services   1   2   3   4   5

b. Electronic Software Distribution   1   2   3   4   5

c. VSAT satellite services   1   2   3   4   5

INPUT

17. What do you see as your company's competitive advantages which makes you the best choice for users?

Thank you

INPU
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