

TELECOMMUNICATIONS STRATEGIC PLANNING

INPUT

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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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Offices

NORTH AMERICA

Headquarters
1943 Landings Drive
Mountain View, CA
94043
(415) 960-3990
Telex 171407

Detroit
220 East Huron
Suite 209
Ann Arbor, MI 48104
(313) 971-0667

New York
Park 80 Plaza West-1
Saddle Brook, NJ 07662
(201) 368-9471
Telex 134630

Washington, D.C.
11820 Parklawn Drive
Suite 201
Rockville, MD 20852
(301) 231-7350

EUROPE

United Kingdom
INPUT, Ltd.
Airwork House
35 Piccadilly
London, W1V 9PB
England
01-439-8985
Telex 23116

France
La Nacelle
Procédure d'abonnement 1-74
2, rue Campagne Première
75014 Paris
France
322.56.46
Telex 220064 X5533

Italy
PGP Sistema SRL
20127 Milano
Via Soperga 36
Italy
Milan 284-2850
Telex 310352

Sweden
Athena Konsult
P.O. Persson & Co. AB
Box 22114
S-104 22 Stockholm
Sweden
08-52 07 20
Telex 17041

West Germany
NOVOTRON GmbH
Am Elizabethenbrunnen 1
D-6380 Bad Homburg
West Germany
(06172) 44402
Telex 418094

ASIA/AUSTRALIA

Japan
Overseas Data Service
Company, Ltd.
Shugetsu Building
No. 12-7 Kita Aoyama
3-Chome Minato-ku
Tokyo, 107
Japan
(03) 400-7090
Telex 26487

K.K. Ashisuto
Daini-Suzumaru Bldg., 6th Floor
8-1, Nishi Shimbashi
3-Chome Minato-ku
Tokyo, 105, Japan
(03) 437-0654
Telex 781 26196

Singapore
Cyberware Consultants (PTE) Ltd.
2902 Pangkor
Ardmore Park
Singapore 1025
734-8142

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TELECOMMUNICATIONS STRATEGIC PLANNING

ABSTRACT

This report was produced as part of INPUT's Telecommunications Planning Program. It describes strategic methodologies based on significant corporation examples (modified case studies) and telecommunications planning principles; analyzes major technical trends in telecommunications and contains a technology summary, analysis of the impact of the Bell System deregulation, and consequences and results of strategic planning. An executive summary in presentation format is also included.

This report contains 96 pages, including 24 exhibits.

**TELECOMMUNICATIONS
STRATEGIC PLANNING**

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I INTRODUCTION

I INTRODUCTION

- This report is part of INPUT's Telecommunications Planning Program. It is designed to help senior managers and corporate executives assess the opportunities and problems associated with strategic planning of telecommunications. This report:
 - Identifies managers' telecommunications requirements.
 - Analyzes current and projected technology and communications innovations.
 - Analyzes viable examples of strategic planning used in major corporations.
 - Recommends senior management planning methodologies to meet dynamic technological innovations.

A. RATIONALE FOR THE REPORT

- The changing complexion of corporate organizations and the dynamic requirements of the information-related industries (data processing, telecommunications, etc.) has mandated that the personnel responsible for the management of corporate telecommunications resources be persons familiar

with information handling (via data processing) and have a sound basis in telecommunications. These new managers should understand the complexities of a technology that changes over a very short time span.

- Previously, such managers came up from the ranks. Many lacked requisite managerial skills or an appropriate foundation in technology.
- Now, due to the vitality of the telecommunications and data processing industries, it is essential that key managerial staff be adequately trained and properly attuned to the impact of telecommunications and data processing on the parent organization.
- Telecommunications managers must possess knowledge and experience in a multitude of disciplines.
- There is an ongoing and critical need for major corporations to be organized to accommodate and control the growing impact of telecommunications. As telecommunications becomes more completely integrated with data processing functions, it will assume a larger ongoing role within the parent organization. Therefore, advance planning and clear insights are increasingly critical to future organizational structures.
- The cost of telecommunications is becoming a major issue with many medium- to large-sized organizations. It is becoming necessary for middle and senior managers to understand the data communications and teleprocessing commitment to corporate funding and other resources.
- Within many large organizations, the formal telecommunications planning is done, if at all, at fairly low levels in the company hierarchy. The lack of adequately trained personnel leads to inadequate insights regarding the impact of telecommunications on the organization's business functions.

- This report attempts to describe what telecommunications strategies involve and what sorts of technological activities must be taken into consideration when doing strategic planning. Senior managers will then be able to proceed with formal telecommunications planning that will better meet the needs of the organization.

B. SCOPE AND USE

I. SCOPE

- This report focuses on the needs of middle and senior managers, with an emphasis on executive management in large organizations (Fortune 1000-sized companies). Current technology is evaluated and a prognosis of trends is provided.
- Since this is primarily a planning report, much ancillary material in support of the conclusions can be found in the companion INPUT document, Telecommunications Annual Planning Report.
- A number of significant issues are reviewed, and a discussion of the potential impact of these key issues ensues. The following issues have been identified as critical to INPUT's client base:
 - Rewrite of the 1934 Communications Act, divestiture of the Bell operating companies (BOCs), and the creation of separate Bell subsidiaries based on geographical locations.
 - The significance of the migration from analog to digital transmission.
 - The migration of a number of important new transmission technologies including satellites and fiber optics.

- The impact of very large scale integrated circuitry (VLSI) and its increasing use in communications components and complete systems.
- The blurring of the distinction between computer and communications technology and the merging of the two.
- The emergence of the "office of the future" (office automation).
- The impact of the energy shortage and steadily rising energy costs.
- Development of worldwide telecommunications networks and complexes.
- The expanding use of CATV as an adjunct to home communications activities (from a marketing and employment viewpoint).
- Increased availability of FCC networks and value-added networks (VANs).
- Emerging competition for local telephone business.
- Impact of new companies entering the communications field or expanding their telecommunications involvement.

2. USE

- This report provides:

- Guidelines for creating telecommunications planning methodologies and strategies.

- A current, state-of-the-art status report on telecommunications technologies.
 - Planning aids for developing effective telecommunications planning strategies.
 - A look at two different planning approaches by two large corporations, each in a different industry and with a different point of view.
- This report should be of particular interest to the following groups of people:
 - Senior information systems and telecommunications managers.
 - Middle managers and telecommunications end users within existing organizations.
 - Telecommunications planners.
 - Information systems product planners.

C. METHODOLOGY

- Information in this report was gathered from the following sources:
 - More than 30 interviews with senior telecommunications and information systems managers and executive users who either have installed telecommunications within their environment or are planning to install telecommunications-related technologies. The interview questionnaire is contained in Appendix A.

- More than 12 in-depth interviews with organization executives for major companies across the nation. Appendix B contains this questionnaire.
- INPUT's own studies on telecommunications have also contributed to this report.

D. OTHER RELATED INPUT REPORTS

- Interested readers are referred to the following INPUT reports:
 - Telecommunications Annual Report. An analysis of the technology of telecommunications and the impact of change within the industry during the preceding year.
 - Annual Information Systems Planning Report. Evaluates information systems trends and graphically plots critical IS management issues.
 - Impact of Communications Developments on Information Services Vendors. Analyzes changing communications technology and services related to information services activities.
 - Effective Corporate Planning in the Computer Services Industry. Examines the level and extent of corporate, market, industry, and product planning within the computer services industry. Emphasis is on corporate planning efforts.
 - User Communication Networks and Needs. Identifies and evaluates changes in user needs within the communications field, with particular emphasis on network problems and solutions.

- Planning--A Methodology for Protecting Your EDP Investment. A basic planning methodology document emphasizing techniques and approaches rather than technology.

E. REPORT ORGANIZATION

- Chapter II is an executive summary, formatted as a presentation for group discussions and emphasizing the key points of the report.
- Chapter III examines those factors that have an immediate impact on the planning process.
- Chapter IV assesses strategic planning considerations and outlines some basic principles.
- Chapter V analyzes the strategic implications of the technology and presents a synopsis of major trends within the field.
- Chapter VI further analyzes the major functions of the telecommunications industry and identifies future trends, taking into account the financial basis for such projections.
- Chapter VII contains INPUT's recommendations for effective strategic planning of telecommunications.

II EXECUTIVE SUMMARY

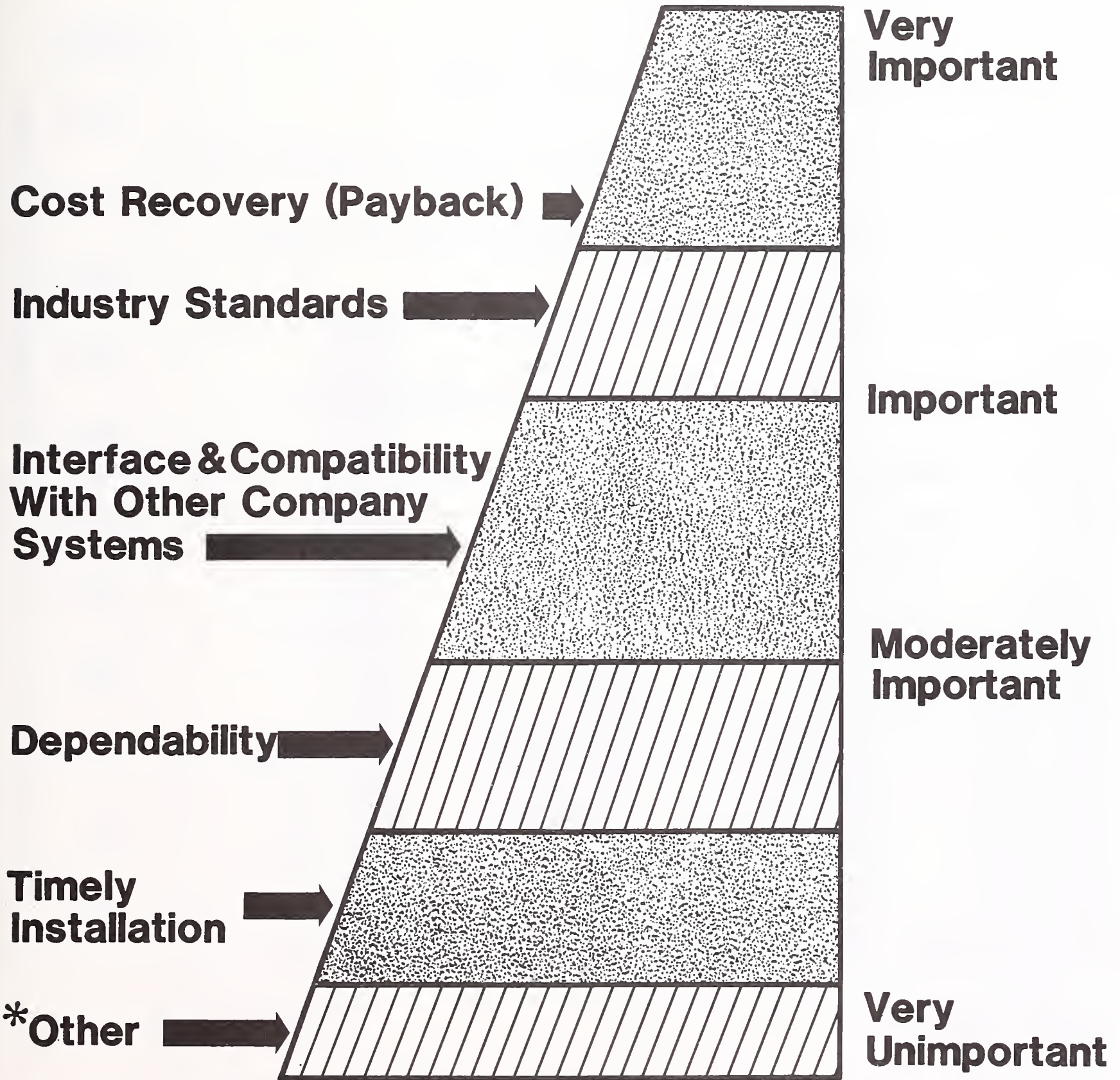
II EXECUTIVE SUMMARY

- This Executive Summary is designed in presentation format to help the busy reader quickly review key research findings. It will also provide an executive presentation, complete with script, to facilitate group communications.
- The key points of the entire report are summarized in Exhibits II-1 through II-8. On the left-hand page facing each exhibit is a script explaining that exhibit's contents.

A. COST: THE MOST IMPORTANT FACTOR

- To evaluate a company's overall approach to telecommunications, management must consider both tangible and intangible factors.
- Cost recovery (payback) and industry standards (what others are spending) are the two most important tangible factors.
 - Cost recovery needs to be related to equipment obsolescence. Useful life considerations are important.
 - Industry standards provide a fast and safe means for determining whether the company is spending too much or too little. It is a benchmark for evaluating expenditures.
- Although cost recovery was ranked the most important factor when implementing or modifying a communications systems, most of the other factors are of an intangible nature. They include:
 - Interface and compatibility with other systems.
 - Dependability of equipment and services.
 - Timely installation.
 - Parallel back-up systems, the availability of outside communications links, costs for specialized carrier services (MCI and SPRINT), the effects of dealing with the Bell System divestiture, ease of use, and so on.

COST: THE MOST IMPORTANT FACTOR

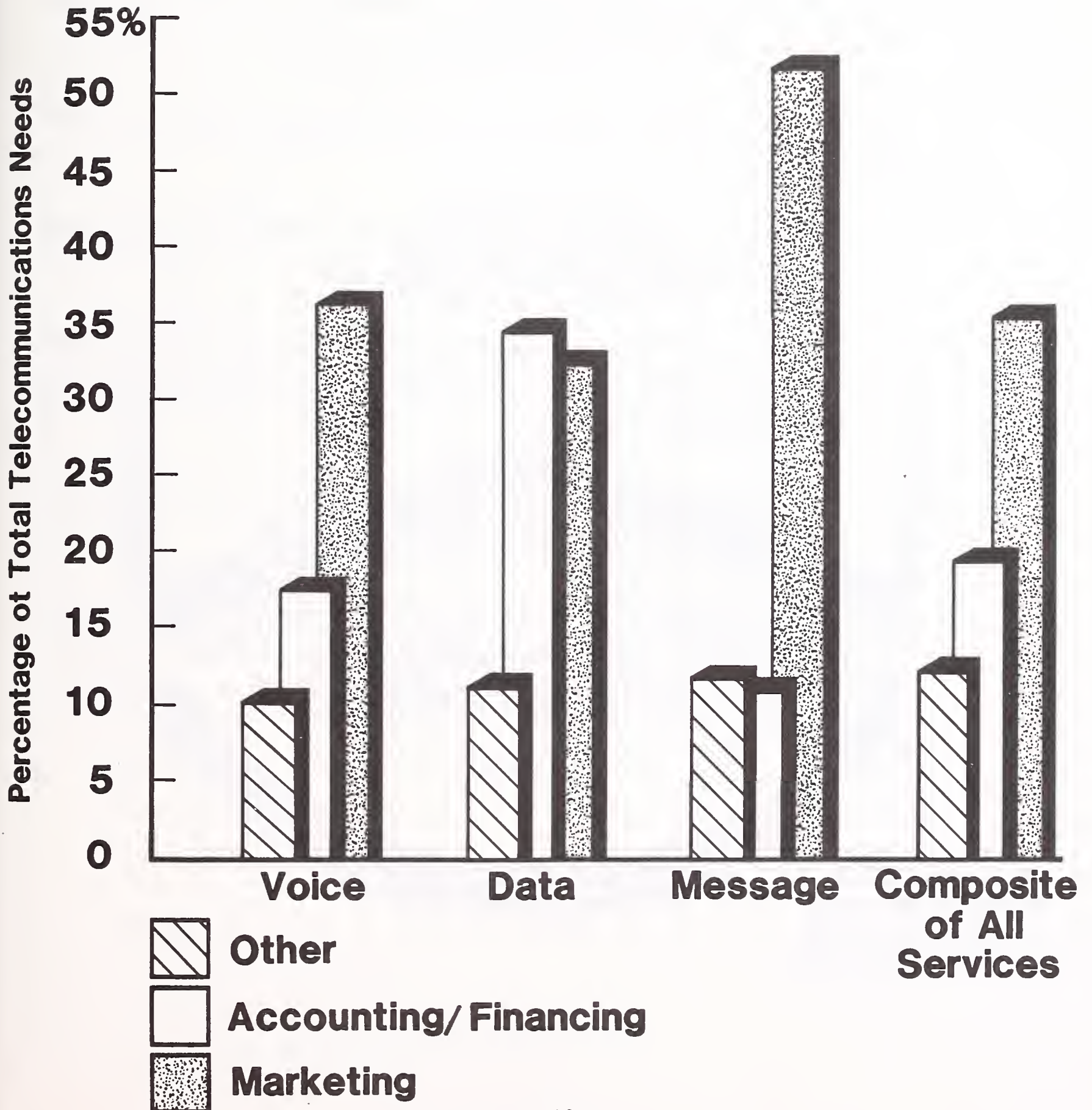


*Parallel Back-up Systems, Cost Relative to What Other Companies Spend, System Security, and Independence from Single Supplier

B. DETERMINING CORPORATE TELECOMMUNICATIONS NEEDS

- Managing a corporate telecommunications function requires the same diligence, dedication, and discipline as any other corporate activity. Regardless of the qualifications and experience of those assigned this task, executive management must determine:
 - How this function should be organized.
 - When, if ever, outside help--consultants--should be employed.
 - Common management mistakes that should be avoided.
 - When cost should be considered secondary to other factors.
 - Who the users are and what their needs consist of.
- Managers may wish to determine the breakdown of users by corporate department (such as accounting or marketing) and correlate this information with the appropriate communications activity (voice, data, message, or composite of all services).

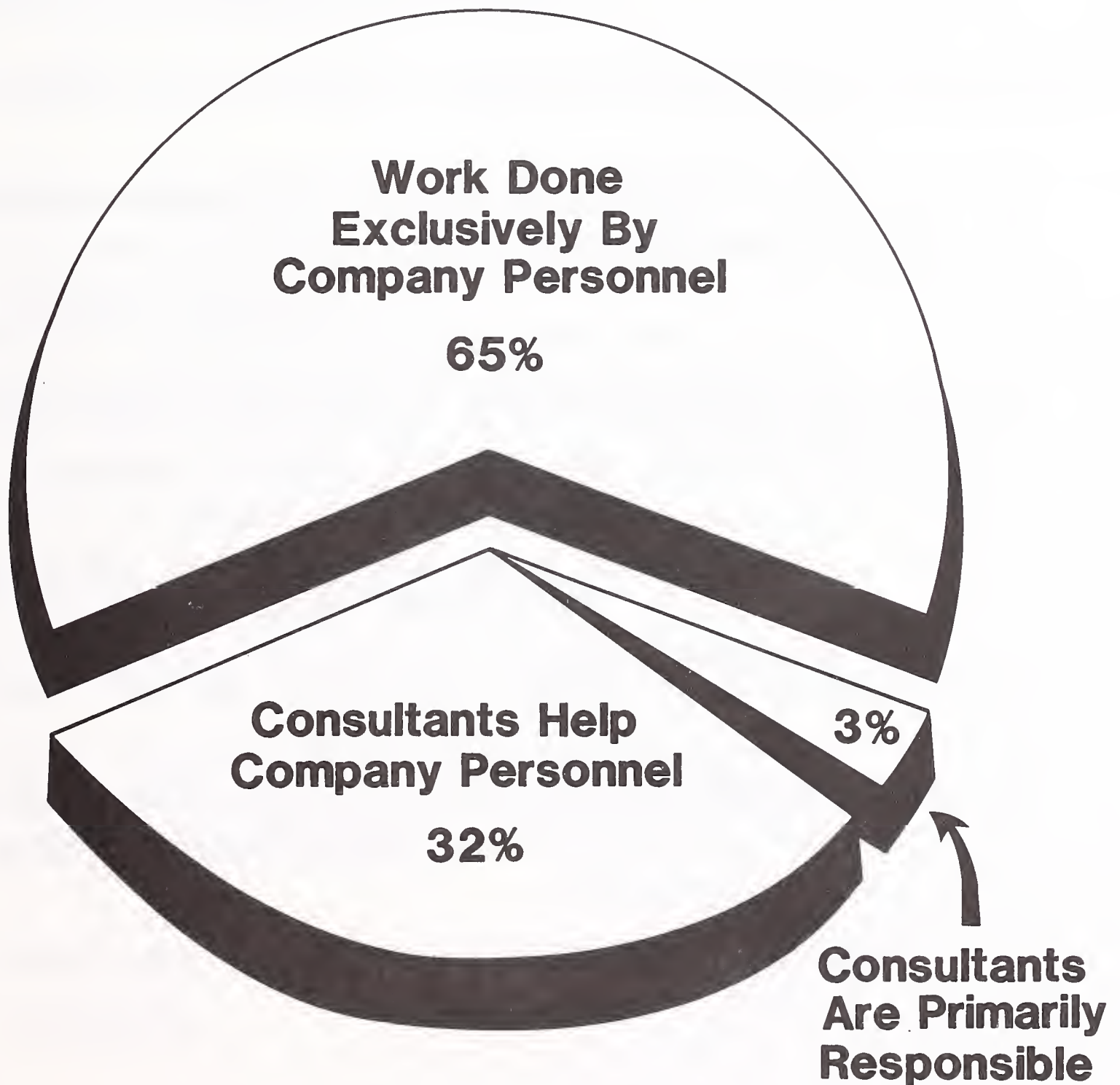
DETERMINING CORPORATE TELECOMMUNICATIONS NEEDS



C. THE ROLE OF THE CONSULTANT

- Most corporate telecommunications activities are managed by company personnel. Some companies contract with outside consultants for special projects, whereas a few use consultants to manage their overall programs. A company handling its own communications requirements improves control, develops a well-coordinated program, and administers decision making consistent with management style and corporate philosophy.
- This does not mean that consultants should not be hired. They are, in fact, valuable resources.
 - Consultants' exposure to the workings of different companies can sometimes help minimize problem-solving time.
 - It may be desirable to have a consultant handle much of the time-consuming vendor interface during evaluation and acquisition phases of the planning process.
 - Consultants can help eliminate or reduce a portion of the internal management telecommunications overhead costs.
 - Consultants can assist in the buying process by commanding superior buying power, owing to their numerous different accounts. It is necessary, of course, to be wary of consultants pushing their pet products or services.

THE ROLE OF THE CONSULTANT



D. TO CENTRALIZE OR TO DECENTRALIZE?

- Companies that handle their own telecommunications requirements in a centralized environment gain several advantages:
 - Potential for improved control.
 - More effective, coordinated telecommunications.
 - Decision making consistent with management style and corporate philosophy.
- The complexities of management in dynamic, growth-oriented companies may dictate organizational decentralization.
 - Decentralization results in dilution of management responsibilities, thus making control easier (particularly for operating divisions and subsidiaries).
 - In a decentralized organization, reduced executive control may put too much responsibility in the hands of marginally capable managers. Executives may rely too heavily on others to evaluate day-to-day problems and solutions.
 - The operating divisions of many broadly decentralized companies are frequently unaware of each other's activities. Decentralization, then, may lead to costly purchases and redundancy of telecommunications systems and services.

TO CENTRALIZE OR TO DECENTRALIZE?

- **Highly Centralized Divisions**

- **Leads to Efficient Interdivisional Communications**
- **Fewer Managers Held Accountable for Successful Operations, thus Contributing to Greater Control**
- **Results in the Most Cost-Effective Equipment Acquisitions, Since Efforts Are Not Duplicated**

- **Highly Decentralized Divisions**

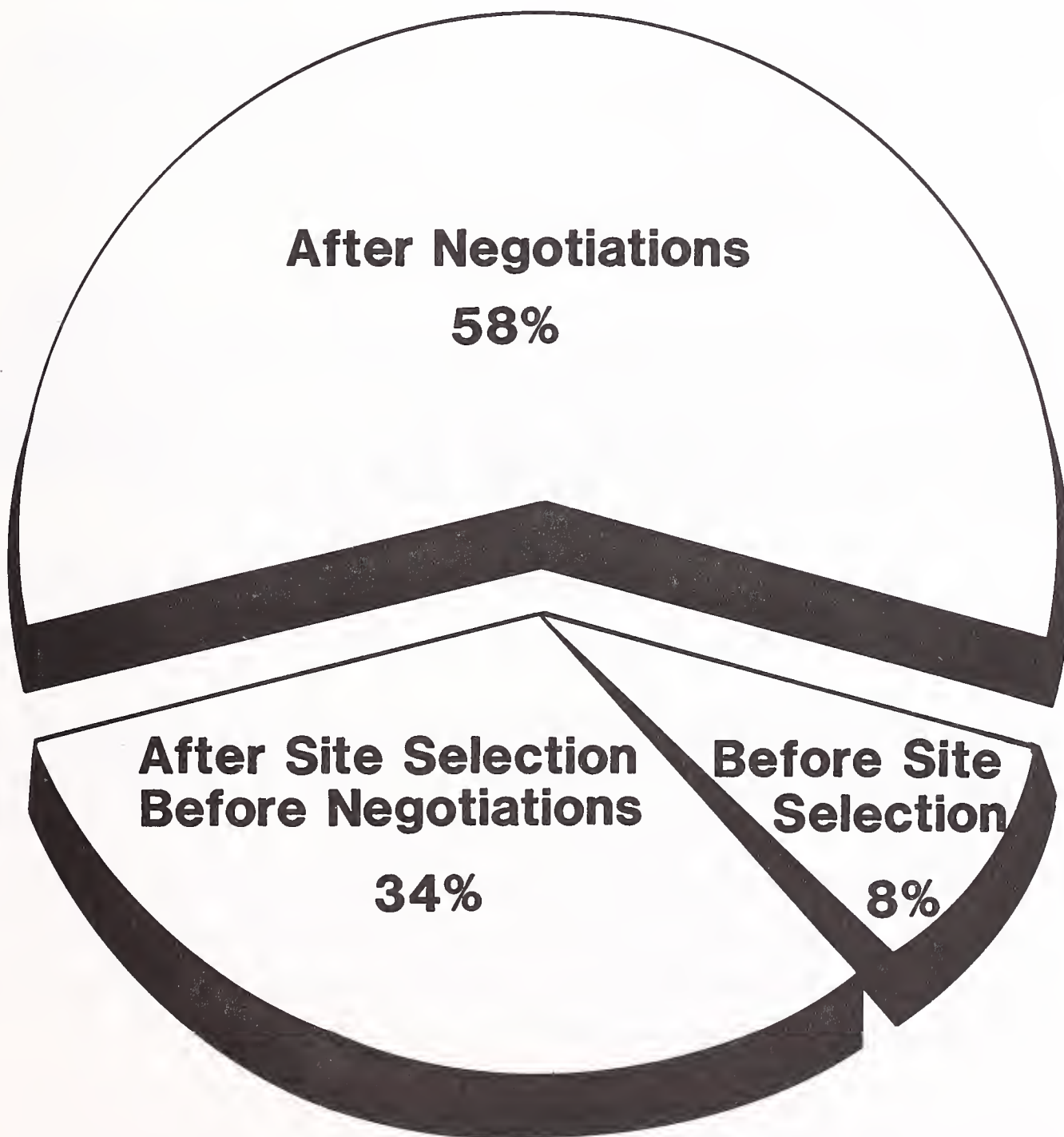
- **Each Division Unaware of the Others' Efforts**
- **Leads to Costly Purchases and Redundancy of Systems and Services**
- **Generally, Indicative of a Poorly Organized Company**

E. INVOLVING TELECOMMUNICATIONS IN THE PLANNING PROCESS

- In poorly organized companies, telecommunications is not given its rightful place within the organization because executive management either undervalues its importance or finds it difficult to communicate with technical personnel.
- Communications functions may be excluded from key management decisions because corporate management hasn't yet realized the magnitude of their contribution.
- In a number of companies, telecommunications is specifically excluded from the planning process; in others, it is included only at a very advanced stage of planning. Over forty-two percent of the companies polled did not include the telecommunications function in their early planning process.
- Managers were asked to describe when telecommunications was brought into the planning process for a new physical plant, or in relocating an existing one.
 - In most cases, telecommunications was not involved until after negotiations had begun for the proposed new plant.
 - In only a very small percentage of companies was telecommunications involved before the site was selected.
- Involving telecommunications at late stages of planning makes it difficult to acquire the proper hardware or to have it installed in a timely fashion.

INVOLVING TELECOMMUNICATIONS IN THE PLANNING PROCESS

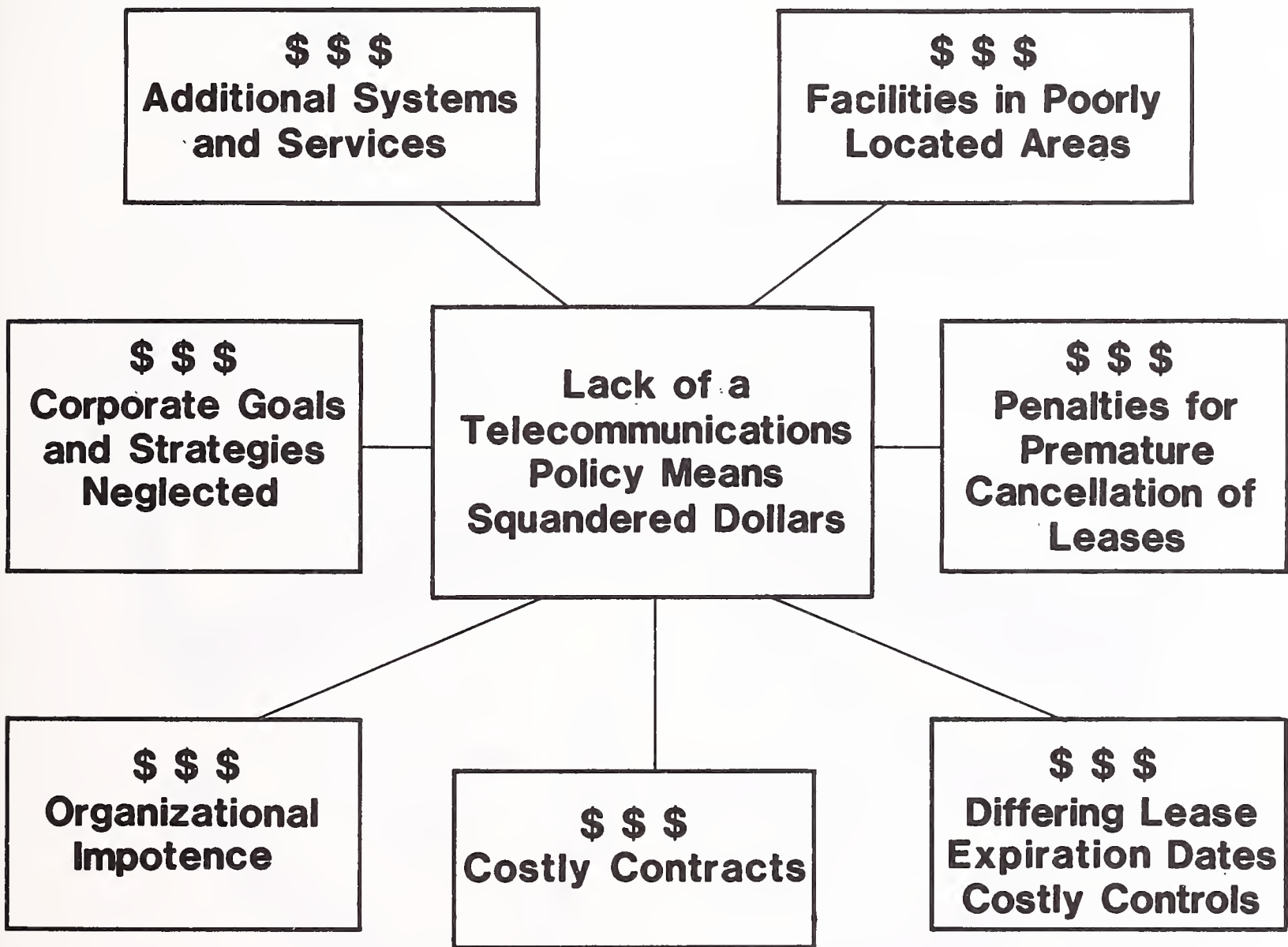
When do those responsible for communications usually get involved in company plans to establish a new facility or relocate an existing facility?



F. THE LACK OF A TELECOMMUNICATIONS POLICY

- Within most companies, corporate management does not intentionally set out to stifle the telecommunications function. Yet, by excluding communications personnel from the executive decision-making process, the lack of a well-reasoned telecommunications policy results.
 - Managers end up arranging for additional systems and services in a state of crisis. In such circumstances, no allowances are made for corporate goals and strategies.
 - This results in excessive expenditures and organizational impotence.
- The lack of a sound telecommunications policy means that the company is bound by costly contract clauses.
 - The company has to pay for obsolete equipment.
 - Every piece of leased equipment has a different expiration period, inhibiting attempts to upgrade or purchase new systems.
 - Substantial penalties are incurred for canceling leases prematurely or by acquiring them on a unit-by-unit basis as existing contracts expire.
- In addition, the company will underutilize or overpay consultants, owing to the lack of a unifying policy.
- Because the company lacks a telecommunications policy, its facilities may be located in areas that cannot provide the telecommunications services needed to conduct everyday business. This is a particularly sensitive issue when overseas operations are involved.

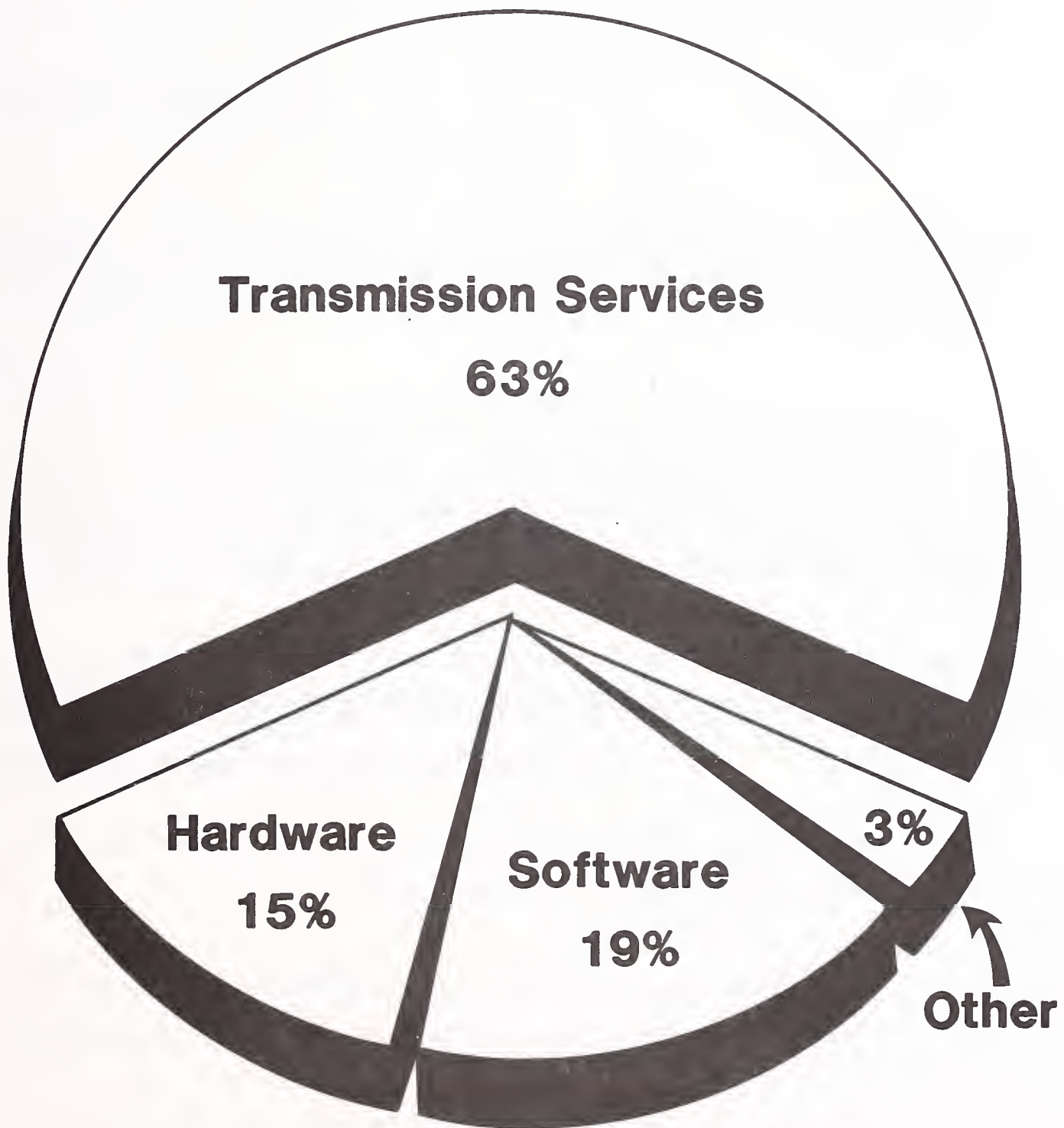
THE LACK OF A TELECOMMUNICATIONS POLICY



G. PROBLEMS FOR TELECOMMUNICATIONS SERVICES

- Users have categorized telecommunications problems into several functional areas:
 - Transmission services problems.
 - Hardware problems
 - Software problems
 - Uncategorized problems.
- Software problems are the second most frequent type problem to occur.
- Transmission-related problems, consuming the bulk of the telecommunications asset base, also are the most severe and most difficult problems to solve.
- Uncategorized problems may include purely planning functions or items beyond the control of the company or its divisions, e.g., late delivery of supplies and equipment.

PROBLEMS FOR TELECOMMUNICATIONS SERVICES (By Functional Area)



Percentage = Frequency with Which such Problems Occur

H. SOME MISTAKES TO AVOID

- The "status quo syndrome," in which those responsible for telecommunications either resist change or are slow to accept change, is a common mistake of management. Companies that do not change their telecommunications approach as business volume increases will cause their overall efficiency and effectiveness to suffer.
- Costly and careless conversions often result in the acquisition of more equipment and services than the company needs. The company should first consider how to better use existing systems and services. Managers should ask themselves if the proposed system is necessary and justifiable on a cost basis. In addition, remember that being first to obtain new items generally causes problems.
- Concealed costing is a result of either burying expenses in divisional budgets or allocating expenses inconsistently and indiscriminately. Concealed costs make it difficult to monitor current telecommunications use and to project future requirements.
- Companies that anticipate imminent systems and/or organizational changes but do not prepare for these events in a timely fashion are guilty of passive planning.
 - Information systems managers and telecommunications managers should communicate with each other.
 - Managers should anticipate problems when systems or facilities are relocated; problems that surface later may prove catastrophic.
 - Ignoring or postponing the planning process may prove foolish and extremely costly.

SOME MISTAKES TO AVOID

- **Responsible Telecommunications Managers or Executives Who Are Resistant or Slow to Accept Change**
- **Costly and Careless Conversions, Which Result in Acquiring More Equipment and Service Than Required**
- **Concealed Costs, in Which Expenses Are Buried or Inconsistently and Indiscriminately Allocated**
- **Passive Planning, or Not Preparing for Imminent Changes in Timely Fashion**

III FACTORS INFLUENCING THE PLANNING PROCESS

III FACTORS INFLUENCING THE PLANNING PROCESS

- In the telephone and telecommunications business, the legal restraints of government action have a profound effect, not only on the company, but on the industry as a whole.

A. DIVESTITURE

- A number of changes resulting from actions by the courts and the Federal Communications Commission (FCC) have affected users. The industry was restructured January 1, 1984.
- Within the telephone industry, maintenance, engineering, and network control services have been separated, and new costs are associated with each.
- Exchange and interexchange services are now and will continue to be regulated.
- Nondiscriminatory access arrangements are being imposed on telephone companies, allowing other common carriers to have "equal access."
- Local exchange and intra-LATA (Local Access and Transport Area) service rates will vary to an increasing degree, depending on jurisdiction.

B. DEREGULATION

- Prior to 1984, long distance subsidized local "basic" exchange service by approximately 40%.
- Decisions by the FCC during the past 25 years have encouraged competition.
- Bypass of AT&T long lines and local exchange carrier facilities began to threaten the long-term health of the telephone industry.
- The Department of Justice withdrew a long-standing antitrust suit against AT&T in December, 1982, after both parties agreed on a divestiture plan to separate Bell operating companies (BOCs) from the parent organization.
- The FCC issued an access charge order to be implemented January 1, 1984. This order imposes various user access charges that will flow to the exchange carriers in lieu of toll subsidies.
- Congressional actions and response to FCC orders, however, threaten the access charge ruling.

C. TELECOMMUNICATIONS CONSIDERATIONS

- Responsibility for voice and data communications continues to be fragmented.
- Cost effectiveness of internal telecommunications networks have been elevated to business unit management consciousness. Certain business divisions are frequently in disagreement in the application of technology.

- The phased evolutionary integration of voice, data, and office automation is considered possible and is compatible with telecommunication industry direction. However, incompatible synchronous and asynchronous data networks and terminal equipment are currently installed within many companies.

D. SWITCHING

- Intelligence embedded in evolving digital switches will diminish the need for public network hierarchy, resulting in greater flexibility for interexchange carriers.
- Burst-switching technology now emerging will allow the combination of switched data, voice, and video within ten years.
- Time division multiplexing arrangement (TDMA) on-board satellite switching will be available after 20-30 GHz has been implemented (about 1990). Earth stations will drop in price to about \$500, will expand in capability, and will shrink to two feet or less.
- Analog-to-digital conversion technology will become more widely available, spurring use of digital trunking and accelerating the move to fully integrated voice/data networks. (Voice in digital format = data.)
- Small office key systems and PBXs will be fabricated on a chip within ten years, encouraging a high degree of distributed switching function by floor, office, or community.
- Improvements in silence detection, coupled with voice and data in digital format, will result in circuit efficiencies, providing more economies from integration.

E. TRANSMISSION

- VLSI digital signal compression will encourage more efficient use of bandwidth.
- Digital transmission accuracy will improve to an error rate of 10^{-9} .
- Pulse code modulated (PCM) speech at 64,000 bps is gradually being replaced by 32,000 bps, greatly increasing capacity of transmission resources.
- Satellite direct broadcasting will become economically competitive with cable television (CATV).
- Fiber optics, cellular radio, digital transmission service (DTS), and satellite are becoming economically and technically viable bypass alternatives.
- Large users may lower unit transmission costs by the use of T-1 carrier transmission facilities. T-1 carrier is defined as a 1.544 Mbps transmission speed.

F. CUSTOMER PREMISE EQUIPMENT

- Conversion to digital telephones in business will be slow.
- Executive terminal operation will become greatly simplified and made user friendly through the use of speech interpolation and touch commands.

G. SERVICES

- Voice mail will continue to expand through the mid-1980s as unit costs decline.
- Video teleconferencing will become more economically attractive as compression techniques lower transmission costs.
- If due weight and consideration are not given to the influence of these factors, the telecommunications function will not prove viable. Management, then, cannot expect the company to survive the ensuing obsolescence and its attendant effects on corporate growth.
- Thus, prudence dictates that careful analysis of each of the points enumerated above be conducted, and that the influence of each of these points on the organization's business activities be carefully weighed before instituting a telecommunication's plan or strategy.

IV STRATEGIC PLANNING: SOME EXAMPLES

IV STRATEGIC PLANNING: SOME EXAMPLES

- The two following examples illustrate the planning process in real world situations. The first example shows the initial planning of a major computer manufacturer; the second exemplifies the more comprehensive and sophisticated approach of a major telecommunications conglomerate.
- Each example represents a different methodology and perspective in the planning process. Together they give the reader an indication of what may be involved in developing a complex strategic telecommunication plan and how each type of approach is implemented.
- This information is presented without analysis so that readers can decide which technique is applicable to their situation and environment. Thus, readers can selectively use what is most applicable to their needs.
- Although this section involves "learning by example," the content (if not the approach) may be of considerable importance to any telecommunications planner and contains many items that planning managers should take into consideration in helping to guide their efforts.

A. PLAN I: MAJOR COMPUTER CORPORATION

- This step-by-step approach for defining business planning requirements is used by a major computer manufacturer, the majority of whose divisions operate as separate entities, each responsible for its own profit-and-loss statement. A typical division does its telecommunications planning as outlined here.
 - Gain executive commitment. A top executive sponsor and other executives must make a commitment to the study. A team leader is then selected to work full-time on the study and direct the team's activities.
 - Prepare for the study. Information about the company and data communications support should be gathered before the study begins.
 - Start the study. The study starts with a review meeting to give the team an overall understanding of the current and planned data support.
 - Define business process. The business processes are listed and described, and those that are key to the success of the business are identified.
 - Group definite telecommunications resources and needs into logically related classes. These are then related to the business processes in order to define the communications architecture. They are then related to present capabilities to assist in the development of a migration plan.
 - Analyze current telecommunications systems support. The currently existing organizations, business processes, information systems, and data files are analyzed to identify voids and redundancies to help clarify the responsibilities, and to further the understanding of the business processes.

- Determine the executive perspective. Executive interviews, an integral part of the top-down approach, validate the work done by the team; determine the objectives, problems, information needs, and their value; and gain executive rapport and involvement.
- Define findings and conclusions. The business problems identified and developed during the fact-gathering and executive interview stages are now analyzed and related to the business processes. The results provide the basis for setting subsystem priorities and developing recommendations.
- Define information architecture. The future information system and its data are structured.
- Determine architecture priorities. The team determines which data communications subsystems should be developed first.
- Review information resource management. The purpose of information resource management is to establish a controlled environment in which communications architecture can be developed and implemented and can operate efficiently and effectively.
- Develop recommendations and the action plan. The action plan brings together the architectural priorities and the telecommunications systems management recommendations to identify specific resources, schedules, and interactions of the projects.
- Report results. The final report is drawn up to obtain executive management commitment and involvement for implementing recommendations from the study.

- The steps described in the approach sequence lead to some important conclusions summarized here. Note that each activity can be carried out to varying degrees; none, however, can be omitted.
 - Management acceptance of telecommunications as a corporate resource is an absolute requirement.
 - Management needs to incorporate telecommunications into its corporate strategic policies. This is a critical factor.
 - System planning must support forecast business needs. It must not stand alone if it is to succeed.
 - In terms of the planning process, telecommunications must be planned from the top down and must involve the highest levels of executives.
 - Creative planning requires input from those who do the day-to-day business tasks: clerks, semi-professional personnel, administrators, etc.

- When using top-down analysis as part of the overall planning function, certain critical questions need to be addressed if the plan is to succeed. These questions can be summarized as follows:
 - Is telecommunications being developed in an integrated way across divisional, departmental, or functional lines?
 - Is it consistent and accurate across functional units within the organization?
 - Is there a unifying plan identifying organizational needs?

- Does the organization have a set of criteria from which to develop priorities for the telecommunications development backlog?
 - Is 75% or more of the system's development budget allocated for developing new, required utilizations?
 - Does management, especially at the executive or strategic level, easily get the information it needs in a timely fashion? Or is the pipeline always full because of inadequate communications capability?
 - Has the communications capability responded quickly to changes within the organization?
 - Is there a very small backlog of new telecommunications requirements to implement?
 - Are users sufficiently involved in determining the organization's needs and priorities?
 - Do users feel they have control of their own telecommunications needs?
 - Does the organization have a strategy for managing the expanding data and telecommunications resources needed to satisfy the information requirements of its end users?
- If not all the issues enumerated above are (or can be) addressed, then a different planning methodology may be required. The systems approach doesn't need as many specifics, but it requires a more generalized view, not only of the communications function, but of the entire organization.

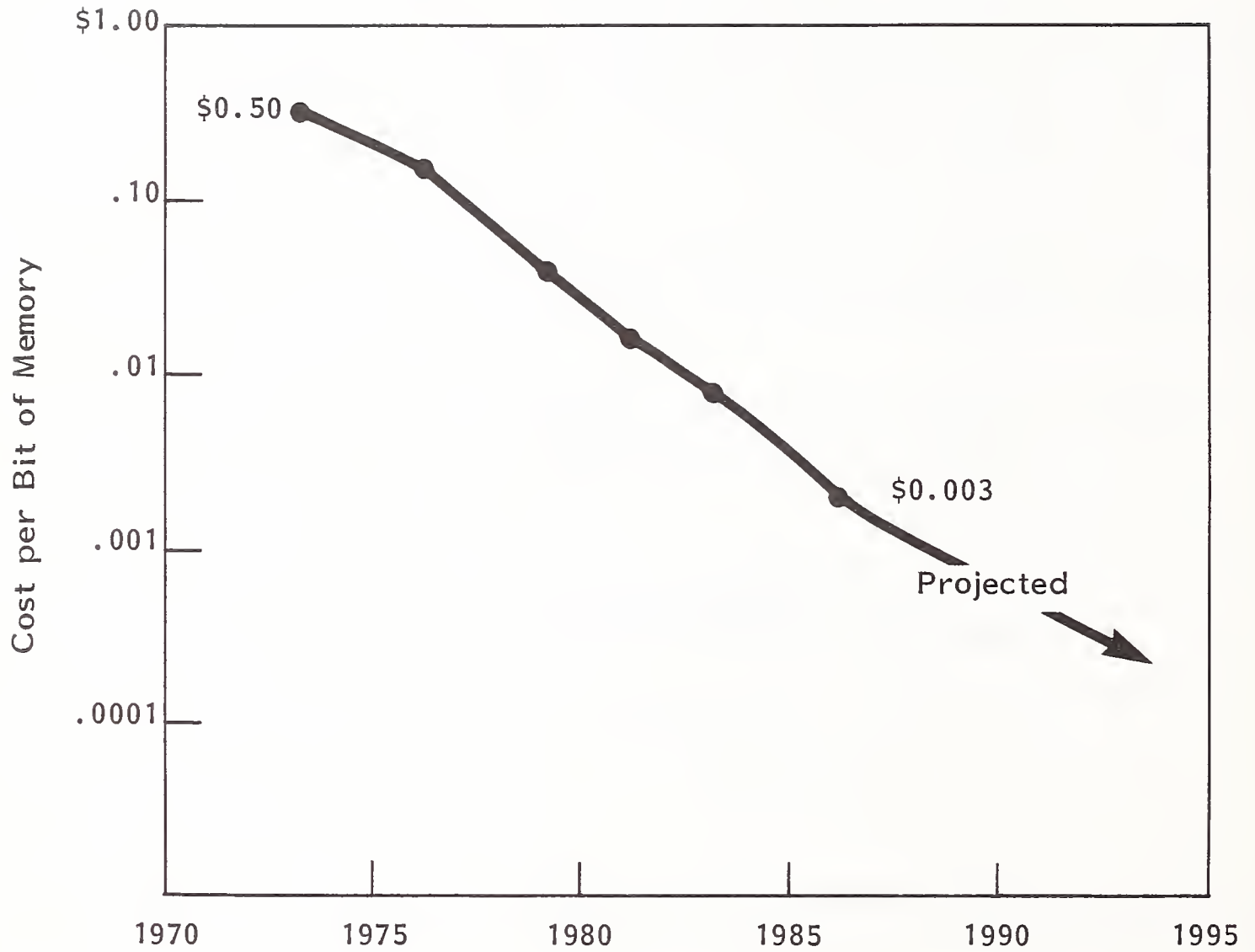
B. PLAN II: MAJOR COMMUNICATIONS COMPANY

- Organizations may require unique systems approaches to defining business planning requirements. The following example shows one approach used by a major communications company that especially needs to respond quickly to changing market and technological conditions.
- First, the senior managers define those conditions that influence current and future networks, e.g., the critical factor of the environment within which the organization must operate. Environmental considerations are the major conditions that must be observed continually throughout the life cycle of the plan. A major shift in any one item could have dramatic effects on the company's ability to meet its objectives or to employ its stated strategies.
 - Environmental conditions can be divided into several categories:
 - The industry.
 - Divestiture and deregulation.
 - Internal telecommunications.
 - Technology.
 - Ongoing changes in the environment can occur in several major areas:
 - The pricing of services.
 - New, emerging technologies.
 - A new set of "rules" within which to do business with regulated carriers.
 - The management of telecommunications.

- To successfully deal with these conditions, the plan requires the identification and management of specific major telecommunications industry trends. In the example case of a telecommunications company, the current trends include the following factors:
 - Toll rates will decline approximately 15% in 1984.
 - Short-haul private line tariffs will increase 10-25% in 1984.
 - AT&T long-haul private line tariffs will decrease as much as 15% in 1984.
 - Basic local service rates are increasing dramatically, as much as 200% within five years.
 - In addition to FCC-mandated access charges, users will have to pay similar costs mandated by each individual state.
 - Cost and availability for long distance and private lines for international traffic will continue to be unstable and unpredictable.
 - In five years, WATS-like service will gradually merge with direct distance dialing (DDD).
 - AT&T and IBM continue to establish de facto network standards.
 - Incompatible vendor-specific local area network technical methods are evolving and becoming de facto standards.
 - Transmission suppliers and user choices are increasing.
 - Digital component and equipment costs continue to decline and have the potential to decrease further. Exhibit IV-1 charts one example of declining costs.

EXHIBIT IV-1

COST PER BIT OF MEMORY



Technology Has Not Reached Its Zenith
Costs Continue to Decline

- Use of digital products in networks and value-added facilities is expanding.
 - Demand throughout the industry for qualified telecommunications personnel is increasing, as Exhibit IV-2 shows.
- Exhibit IV-3 identifies three major factors influencing this company's activities in relation to the telecommunications industry as a whole:
 - The direction of future growth in the communications industry (line A).
 - The thrust of divestiture and deregulation (line B).
 - The environmental factors influencing the direction and extent of the example company's efforts (line C).
 - Each of the trends taken into account during the planning process isolate areas for specific growth and market capture. In addition, they help management to define the corporate direction (and philosophy) for further development.
 - However, in order to get this planning approach to work, corporate philosophy, strategy, and the effects of change upon these two items needs to be considered. Since goals are defined by philosophy and strategy, the importance of these items becomes apparent.
- I. CORPORATE PHILOSOPHY
- The corporate philosophy of XYZ Corporation encompasses four major categories of concern. These categories, which define its goals, are supported by its strategies.

EXHIBIT IV-2

GROWING DEMAND FOR TELECOMMUNICATIONS PROFESSIONALS
(Industrywide Projection)

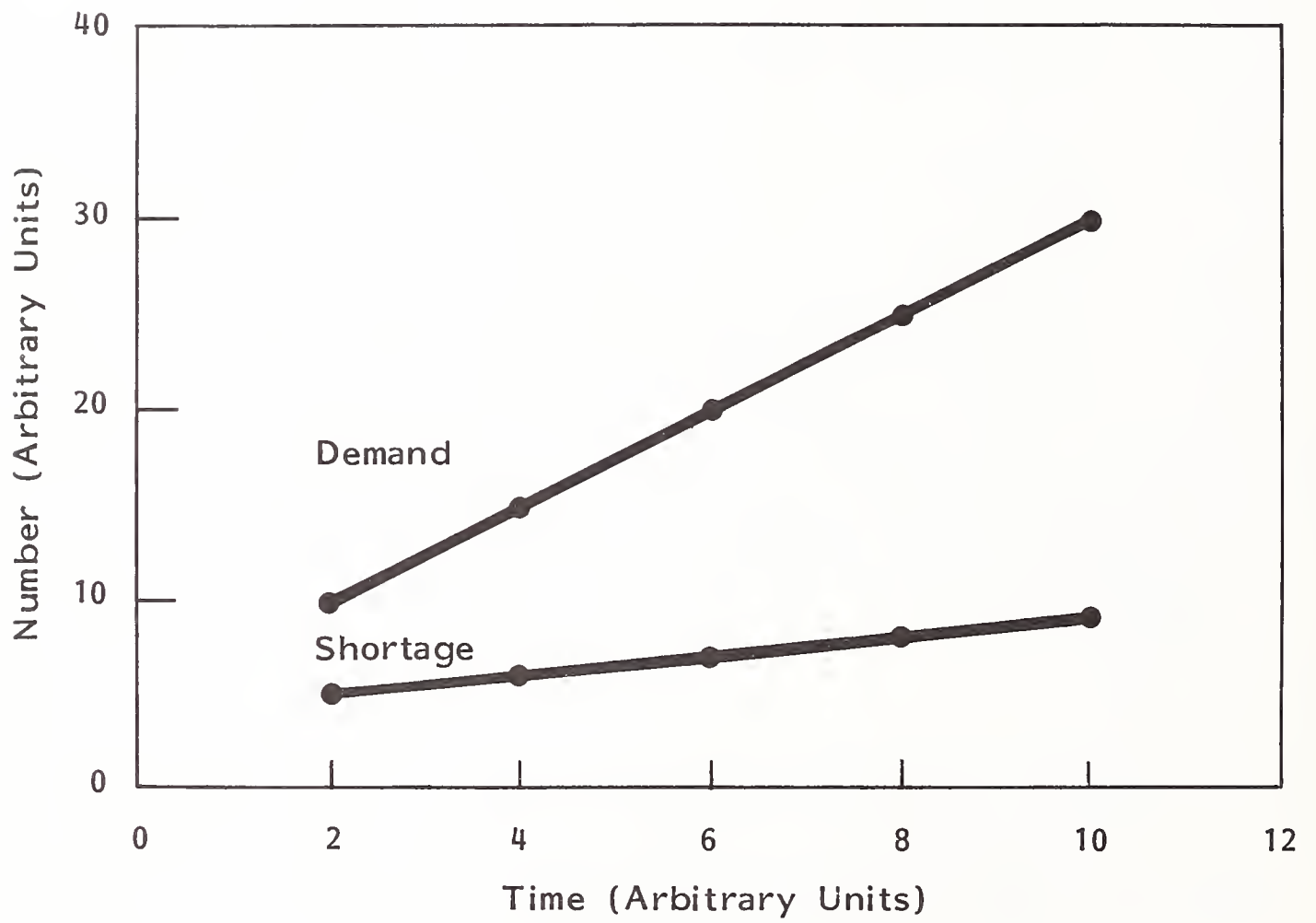
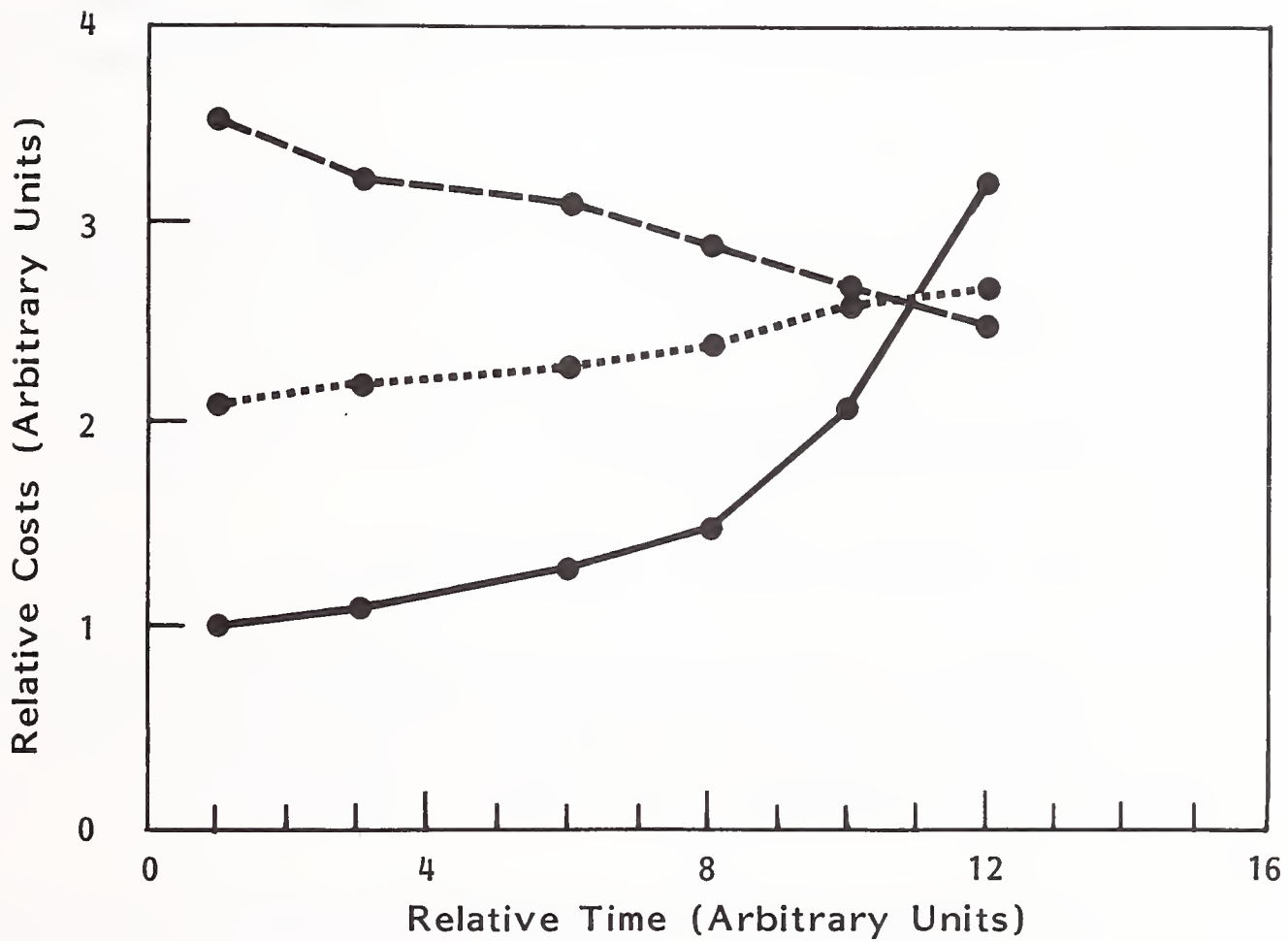


EXHIBIT IV-3

COSTS INFLUENCING INTERNAL NETWORKS



- A. ——— The Communications Industry
- B. - - - - - The Thrust of Divestiture and Deregulation
- C. ······· The Environmental Factors Influencing the Company

- To its customers, it must offer products and services of excellent quality and value.
 - To its employees, it must offer satisfying career opportunities.
 - To its shareholders, it must offer superior investment returns with growth to fulfill their expectations.
 - To the general public, it must exhibit leadership in influencing public issue decisions and be a good corporate citizen in all communities in which it operates.
- To fulfill these philosophical goals, the company's performance should be characterized by:
 - Strong marketing orientation.
 - Technological leadership.
 - A focus of corporate resources upon those business areas in which the organization can achieve significant market shares and still make a unique contribution.
 - Stimulation of employee performance by means of challenging career opportunities within an environment that encourages and nurtures innovation, creativity, and entrepreneurial ideas and actions.
 - Superior return on equity coupled with growth that fulfills shareholders' expectations.

2. OBJECTIVES AND STRATEGIES

- Once the philosophy is defined, goals and objectives need to be identified. These, combined with strategies that evolve during the definition process, are the keys to the entire strategic planning process.
- The objectives can be broken down into two definable segments: basic objectives and planning objectives. The strategies that result can then be delineated into two separate and distinct activities: basic strategies and planning strategies.

a. Basic Objectives

- Sustain return on equity in the 18-20% range.
- Improve capital recovery by increasing internally generated funds.
- Improve working capital management.
- Improve productivity.
- Develop integrated strategy for the telecommunications business.
- Increase focus on new markets.
- Accelerate management development.

b. Planning Objectives

- Ensure essential levels and types of internal telecommunications services.
- Avoid redundancy.

- Use and evaluate internal telecommunications products and services in an operational environment.
- Ensure that operations and businesses do not become captive of any single nonaffiliate vendor for telecommunications products and services.
- Ensure that the return on internal telecommunications investments meets or exceeds corporate goals.
- Establish and maintain national account status with specified vendors.
- Provide office systems and data processing access to remote information and other networks.
- Deploy networks that conform to the specific network architecture and protocol standards for internal telecommunications.

c. Basic Strategies

- Ensure effective consideration of internal telecommunications products and services for use in internal networks.
- Automate office and manufacturing functions.
- Develop an integrated services digital network (ISDN).
- Expand public data network linkages to satellite.
- Shift a larger share of investment from regulated to deregulated business.
- Introduce usage sensitive service.

d. Planning Strategies

- Position for future integration opportunities.
- Maximize practical use of available technology.
- Use corporate products and services.
- Implement network architecture and standards.
- Implement digital switching and transmission facilities.
- Share common resources, switching, and transmission.

C. CHANGE AND ITS IMPACT

- A number of technologically oriented factors must be given due weight and consideration as part of the planning process. As the technology changes, so must the planning process, taking into account the dynamism of the industry.
- Cost and rate changes, technological changes, operating and environmental changes, and business strategies all need to be evaluated continually in the face of ever-changing technology.
- The following summarizes the technological considerations in three critical areas: identifying problems, determining the significance of the problems, and assessing the strategy.

I. COST AND RATE CHANGES

a. Problems

- Access charges will increase basic exchange rates.
- Long-haul private line and toll rates are decreasing.
- Short-haul private line costs are increasing.
- Network management, maintenance, and circuits must be contracted out at a premium or performed by business unit personnel.

b. Significance

- Operating expenses are being affected in both amount and distribution.
- More opportunities are available to reduce costs, but most impose greater risk.
- Confusion and uncertainty will prevail in the industry for about the next three years.

c. Strategy

- Review the cost impact of federal and state tariffs on all networks.
- Consider the potential of private facilities as compared to publicly offered facilities.

2. TECHNOLOGICAL CHANGES

a. Problems

- De facto standards for data, voice, and local area networks continue to proliferate and evolve.
- Analog-to-digital converters and digital transmission and switching products are becoming more prevalent.
- Compression and multiplexing schemes are becoming more cost-effective in advanced products.

b. Significance

- Network interface and protocol requirements are becoming clearer as de facto standards are more widely accepted.
- Digital transmission and switching products will become more attractive, forcing older equipment to be replaced at a faster rate than before.
- More opportunities to reduce unit costs will become available through integration and resource sharing as digital technology proliferates.
- Error rates for transmission will continue to decline, improving network performance.

c. Strategy

- Analyze communications requirements to determine thresholds for substituting telecommunications for physical means of transporting information.

- Review the potential of new switching technology and associated costs as compared to recent transmission cost and rate changes to determine total network improvement opportunities.

3. OPERATING AND ENVIRONMENTAL CHANGES

a. Problems

- Customer premises equipment (CPE) is now unregulated.
- Message toll service (MTS) and WATS will eventually merge in structure and cost, both interstate and intrastate, as shown in Exhibit IV-4.
- There is no single source for total network responsibility.

b. Significance

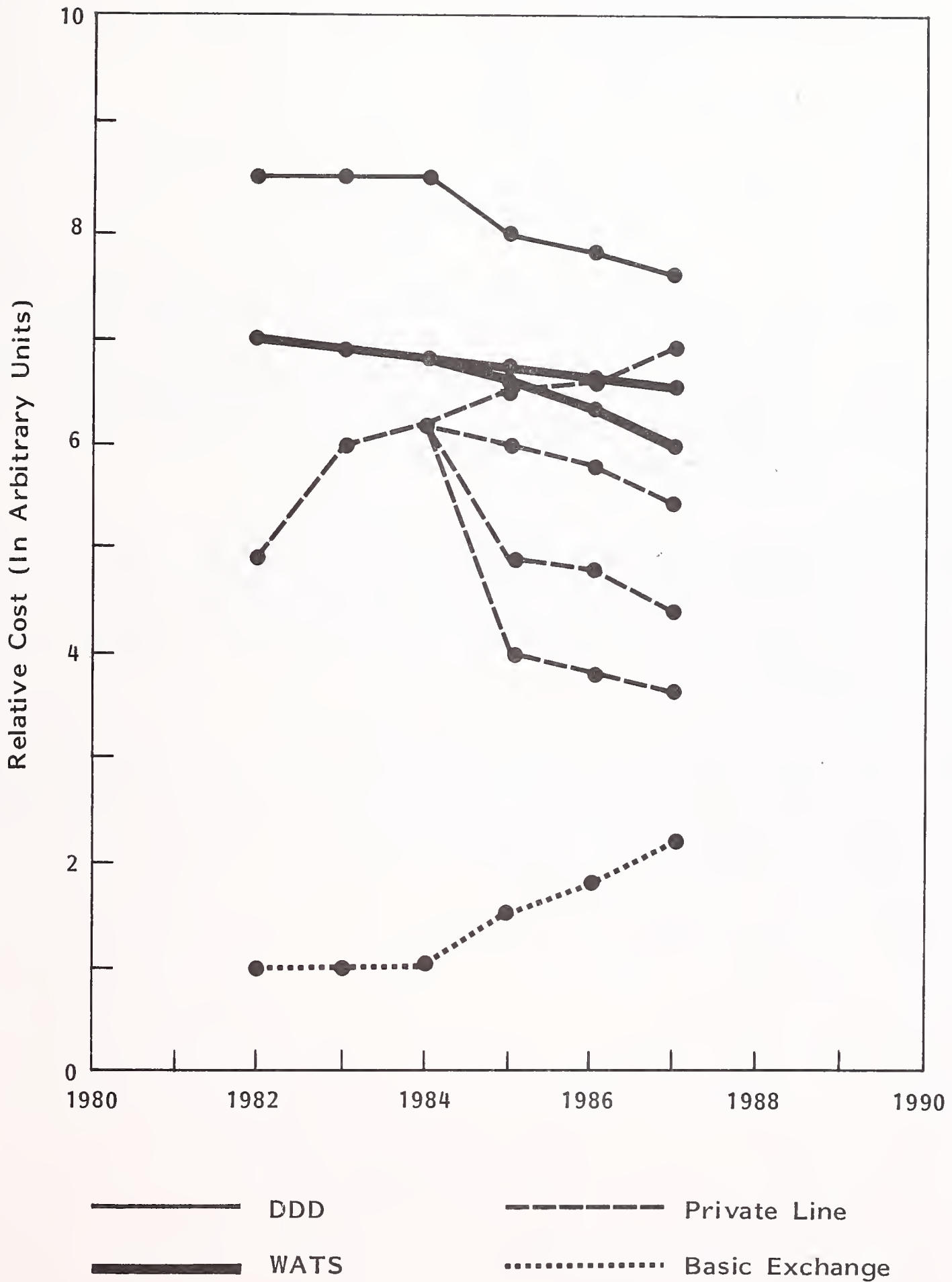
- Vigorous competition will "shake out" CPE vendors.
- Restructured WATS and MTS toll tariffs will force business units to more closely monitor calling patterns and bills.

c. Strategy

- Business units must weigh financial and market strength of potential CPE vendors in addition to considerations of price/performance.
- Be prepared to make changes in private automatic branch exchange (PABX) least-cost-routing tables and in the distribution of FX, private line, WATS, and DDD circuits.

EXHIBIT IV-4

EFFECTS ON RATES OF DIVESTITURE



4. BUSINESS STRATEGY

- In addition to the strategies defined above, which are based on different types of conditions or problems, there are some that apply to the overall changing environment of telecommunications.
- The company should position personnel to be effective.
 - Individuals will need training to understand the new tariffs, rate structures, and responsibilities of users.
 - The off-loading of certain functions (circuit ordering, maintenance, fault isolation, etc.) that formerly were performed by vendors and carriers must now be handled directly by users, or the company will pay a premium. If users will assume these responsibilities, new personnel must be hired.
- The company should initiate processes to maintain awareness of the proliferation of options in facilities, equipment, and services. Current status of interstate and intrastate rates of AT&T, OCCs, and resellers should be maintained.
- As costs increase over time, most of the functions costs (plotted in Exhibit IV-4) decrease, particularly in the 1984-1985 time frame. Basic exchange costs, lower to begin with, do however increase over time.

V STRATEGIC IMPLICATIONS

V STRATEGIC IMPLICATIONS

- To properly plan a telecommunications strategy, it is necessary to take into consideration the vast and numerous technological changes that are occurring within the telecommunications industry and its close relative, the information services industry. What follows is a brief synopsis of the more important technology events that will affect any reasonable strategic plan. For a fuller discussion of these events, refer to INPUT's Telecommunication Annual Planning Report.

A. INTRODUCTION

- The data in Exhibit V-1 illustrates some important factors affecting the future planning process for telecommunications. Note that INPUT expects substantial increases in orders for modems, multiplexers, and other private network equipment, all indicative of sustained, long-range telecommunications growth.
- Additional considerations for long-range planning include:
 - The continued rise in private communications line costs, which, with the imposition of new access charges, should fuel the growth of bypass and alternative information distribution technologies.

EXHIBIT V-1

MAJOR SECTOR EQUIPMENT APPRECIATION
1984 OVER 1983

MAJOR SECTORS	TYPES OF EQUIPMENT	PERCENT SHARE PRICE APPRECIATION OVER CALENDAR 1983
Data Communications	Modems, multiplexers, LANs, and other components	42%
Network Services and Equipment	Components, network transmission and switching equipment, carrier services	34
Business Communications	PBX and emerging applications	26

- Considerable growth in the purchase of telecommunications equipment for the in-house use of RBOCs (regional Bell operating companies).
- The emergence of the RBOCs as major forces of distribution of data communications and business communications equipment.
- Continued commitment by specialized carriers (such as GTE SPRINT and MCI) to increase budgets for the purchase of capital equipment designed to upgrade and modernize their network facilities.

B. MAJOR INDUSTRY TRENDS

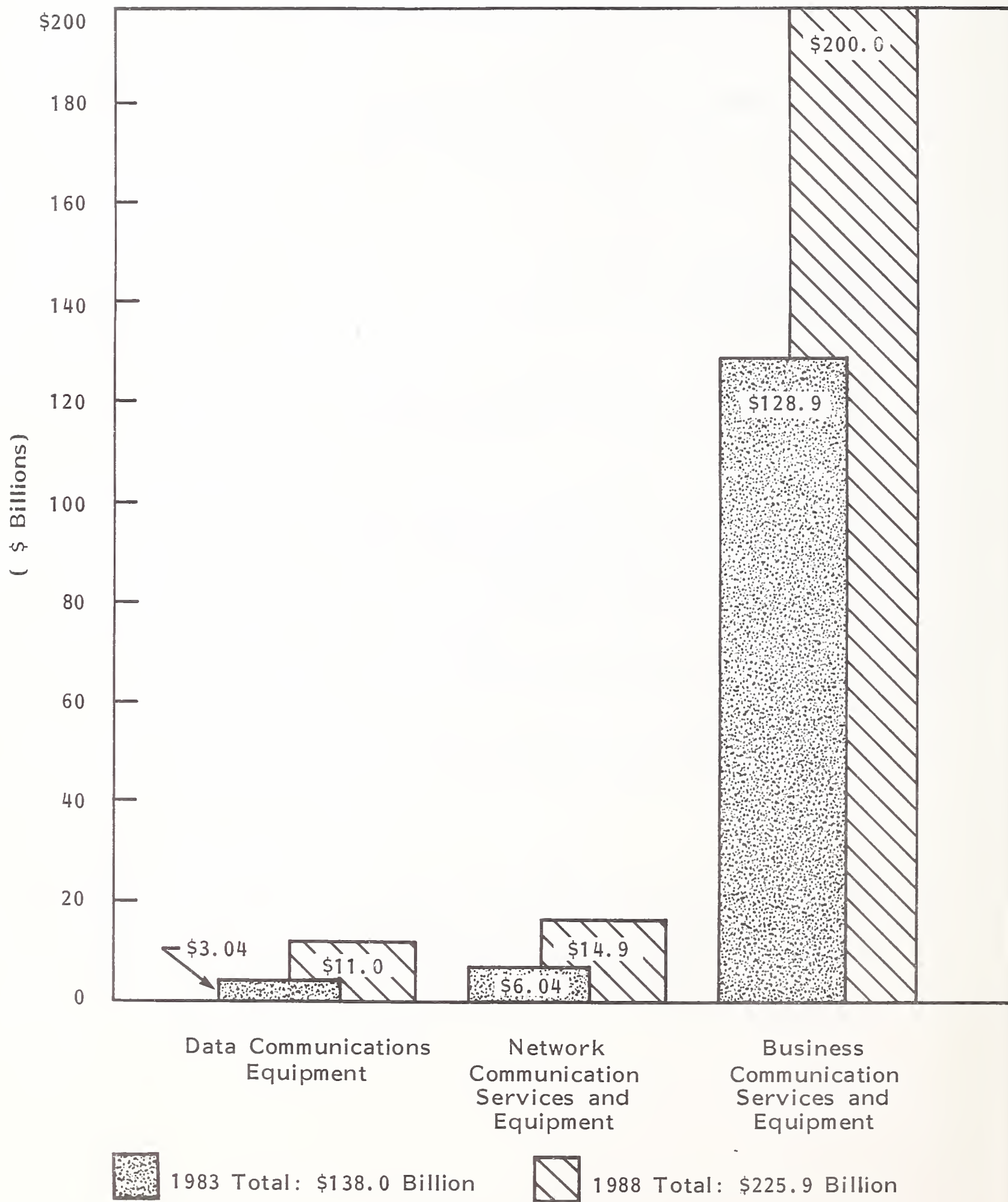
- The telecommunications industry is undergoing rapid change and restructuring. An analysis of the salient factors includes:
- Exhibit V-2 illustrates current and projected market expansion in three major areas: data communications equipment, network communication services and equipment, and business communication services and equipment.

I. INCREASE IN DEMAND FOR TELECOMMUNICATIONS EQUIPMENT

- With the creation of the RBOCs, major new avenues of distribution have been created. This should stimulate demand for all types of telecommunications equipment.
- As the newly divested RBOCs make use of higher capacity communications lines, more digital switching and compression products will be utilized. The RBOCs have already signed multimillion-dollar contracts with a number of companies in the PBX and key systems (telephone) market segments.

EXHIBIT V-2

TELECOMMUNICATIONS MARKET EXPANSION



2. FACILITY UPGRADE AND ENHANCEMENT

- As competition in the interexchange carrier segment of the industry increases, carriers (including OCCs and resellers) will be forced to make major capital equipment purchases to upgrade and enhance their respective network facilities.
- In fact, MCI and GTE SPRINT have committed billions of dollars to improve the performance of their networks.

3. INCREASE IN COMPETITION

- Competition will intensify across the spectrum of telecommunications markets. For example, interexchange carriers and equipment vendors are becoming very aggressive in their quest for new customers. These carriers are expected to continue spending large sums of money for advertising and marketing.
- New entrants are multiplying, and large multinational corporations and computer vendors are entering the market as providers of telecommunications equipment.
- IBM is expected to spend more than \$100 million during the next several years to expand its foothold in the telecommunications market. Its recent purchase of approximately 20% of ROLM points to its intention to aggressively pursue the voice communication market.
- Several multinational corporations, especially financial service organizations (e.g., American Express, Merrill Lynch, and Citicorp) are rapidly penetrating the telecommunications market, especially in the videotex and satellite communications areas.

- Aggressive marketing moves on the part of European and Japanese companies will continue. During the past two years, the number of joint ventures between European and U.S. companies has increased. Although competition from internationally based companies will increase, the demand for telecommunications equipment and services is growing at an adequate rate to accommodate competition within most of the markets.

4. VOICE AND DATA INTEGRATION

- During the past several years, there has been a rapid increase in the integration of voice and data communications in both transmission networks and customer equipment.
- Local computer networks that handle voice as well as data communication , and digital PBXs that handle data as well as voice, are increasing in number. In many cases great efficiencies can be achieved by a single integrated voice and data network, but there are many instances in which voice and data communications should remain on two separate networks.
- New types of voice/data switch products that manage corporate private networks will proliferate in the marketplace.
- Compression technology will make a significant impact on the market. Most products are designed to provide at least a two-to-one throughput improvement over standard communication lines.
- Computer vendors are stimulating growth in voice data integrated products in two ways.
 - A number of computer vendors have signed agreements with leading PBX vendors for the development and certification of high speed interfaces to PBX switches.

- Many computer vendors will be integrating and/or reselling PBX equipment from suppliers such as Telenova and Ztel.

- As for networking, expect a continuing trend toward voice/data integration. In many cases, savings of up to 25% can be achieved by multiplexing voice and data on the same T-1 line.

5. MOVEMENT FROM ANALOG TO DIGITAL NETWORKS

- The rate of replacement of analog circuits with digital facilities has been increasing over the past several years, and this trend should escalate for the remainder of the decade. The trend is occurring most rapidly inside users' facilities and within corporate private networks. It is occurring less rapidly (approximately 5-7% compounded annually) for local loops and more gradually within the public long-haul transmission networks.
- By late 1985, 5% of all circuits in the long-haul transmission network market will be digital. Furthermore, by the end of 1985, digital circuits will represent 10% of all circuits in specialized common carrier networks.
- This rather conservative estimate of the rate of replacement of analog circuits by digital circuits is based upon the existence of underutilized microwave and terrestrial analog facilities. However, if current trends continue over the next couple of years, over 50% of circuits may be digital in certain urban areas.
- In summary, the following factors are contributing to the growth of digital networks:
 - The availability of low-cost, highly reliable digital equipment and facilities.

- The global movement toward development and standardization of ISDN (described below).
- The recent development of important algorithms for data and voice compression, and the development of improved digital speech interpolation and voice encoding techniques.
- The rapid replacement of existing in-plant communications links by fiber optics.

6. INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

- ISDN is a new network service for which standards and definitions are still being coordinated by the International Telegraph and Telephone Consultative Committee (CCITT) of the International Telecommunications Union (ITU).
- The CCITT defines an ISDN as an integrated digital network in which digital switches and paths are used to establish connections for different services.
- There is a wide diversity of views regarding how ISDNs should be designed. Some feel, for example, that an ISDN should be a single worldwide network or several national networks with a high degree of international connectability. Others insist that an ISDN should operate in parallel with dedicated public and private networks and compete for those customers on an equal basis.
- Although the ISDN is still being standardized, it is evolving from the continuing increase in the digitalization of the existing public networks and greater distributed processing, as well as telephone and workstation functionality.
- Although there continues to be disagreement on what a fully implemented ISDN will look like, some of the following characteristics are more than likely to emerge:

- A limited set of standardized, multipurpose user network interfaces, which allow for the connection of disparate types of terminals as well as dissimilar and similar networks.
- A basic network with transport capability for a variety of voice and nonvoice services, using a wide range of telecommunications modes.
- ISDN will probably incorporate a wide range of information storage and processing facilities, in addition to allowing for choices of various switching modes, coding methods, and bit rates. In this role, the ISDN should provide a high-speed, wide-band, standardized digital network with universal access to a variety of network services.
- A great deal of progress has been made in ISDN standardization.
- As of this writing, most of the physical characteristics of the system have been decided upon. These physical attributes will include:
 - Two pairs of wire, one pair for each direction.
 - Power and data through the same plug or modular jack.
 - A passive bus and two 64 Kbps channels with 16 Kbps reserved for signaling.
- Additional standards being discussed apply to performance characteristics, protocols, service features, additional interfaces, and network applications. These characteristics will be developed using the open systems interconnection (OSI) type of reference model.

- Some of the major design principles include the following:
 - Compatibility and transparency of user's data transmission.
 - Compression (adoption of a 32 Kbps standard).
 - Flexibility and modularity.
 - Upward compatibility.
 - International connectivity.
- Whether the ISDN is ever fully implemented is not important; its major principles will be the driving force behind future network product technologies.

7. UTILIZATION OF BYPASS TECHNOLOGIES

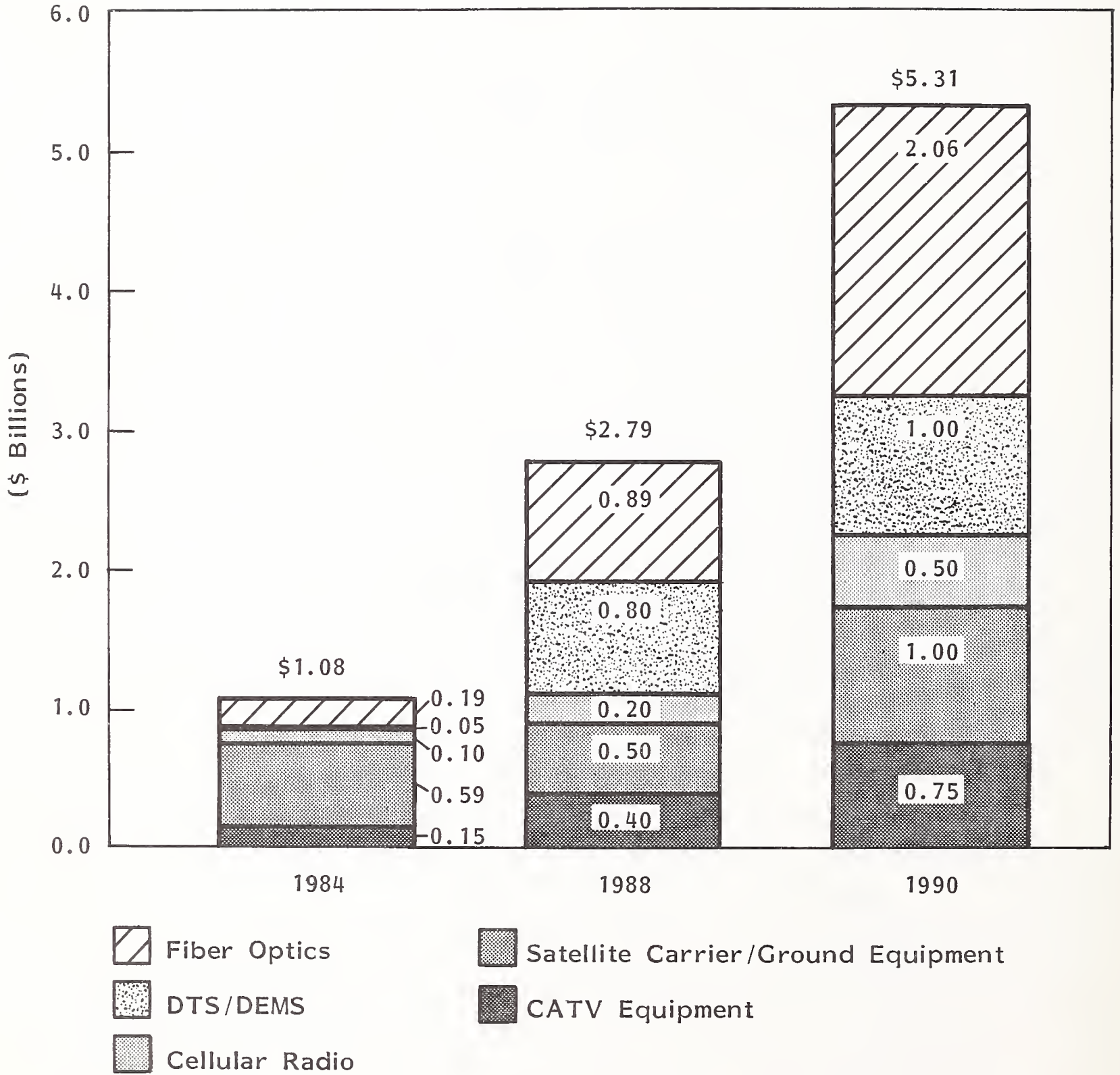
- In this postdivestiture environment, rates charged for local loop usage and access to interexchange carrier networks will continue to climb. This factor, along with the corporation's need to control the operation of its telecommunications facilities, will stimulate the growth of bypass technologies.
- Explosive growth in the development and implementation of bypass technologies is anticipated. (Bypass refers to any technique or process that avoids the use of local loop facilities serving as links between the telephone company central office facilities and customer sites.)
- Substantial demand for high-speed, wide-bandwidth communications is fueling the growth of bypass technologies, including cellular radio, digital termination systems/digital equipment management systems (DTS/DEMS), cable TV facilities, fiber optics, private point-to-point microwave systems, and thin-route satellite communications. Information transmitted point-to-point or multi-point directly via satellite, using customer-owned or shared earth stations,

will also be more common as a result of the desire to bypass the local loop facilities.

- In many cases, these bypass technologies have wider bandwidth (i.e., bigger information pipelines) and are more cost-effective than Bell-supplied 56 Kbps or T-1 (1.54 Mbps) communications applications (such as teleconferencing and videotex).
- Regardless of the popularity of bypass techniques, local loops provided by telephone companies will remain the dominant type of communications path for local communications. There are three basic reasons for this:
 - Digital circuits are replacing analog circuits at an annual conversion rate of 5-7% in the local loops. Currently, it can take more than a year to secure a T-1 circuit (1.54 Mbps) from the RBOCs. This situation should ease within the next couple of years. Thus, the local loops provided by telephone companies will meet the requirements of their customers for digital communications in a shorter period of time. In addition, several RBOCs will be experimenting with bypass techniques.
 - Telecommunications users having fewer than 25 trunks going to one location or point (i.e., to another facility or accessing a specialized common carrier such as MCI) may not find the investment in bypass to be cost-effective.
 - The implementation of bypass may be slowed by Congressional legislation, such as Senator Packwood's proposal to subsidize local residential calling with "bypass tariffs," and by state regulatory policies that may also impose tariffs on bypass users.
- Both the tremendous economic incentive to use bypass and the need for higher capacity communication links are rapidly driving corporations to embrace bypass technology. One projection for the utilization of bypass technology is found in Exhibit V-3.

EXHIBIT V-3

BYPASS UTILIZATION 1984-1990



8. DRAMATIC INCREASE IN THE HOME SERVICES MARKETPLACE

- With the availability of interactive communications systems in the home and the proliferation of personal computers, telecommunications companies are vying for a market share in the expanding home information services market. This emerging marketplace is stimulating the growth of a vast number of business communications applications such as teletext, home electronic mail, and interactive video services.
- A change in emphasis from marketing exclusively to the business community to marketing home services will cause telecommunications companies to rethink product and marketing strategies. This could have a profound effect on business planning, since the private sector may have to compete for resources and services.
- As was the case in the distribution of personal computers to the home market, many companies will face enormous challenges and reap the rewards if they can implement successful strategies in this burgeoning market.

9. EMERGENCE OF THE OFFICE OF THE FUTURE

- The integration of telecommunications equipment in the office of the future will be a \$100 billion market by 1990 and will continue to be a major factor in the stimulation of a number of telecommunications product markets (especially PBXs, LANs, and office workstations).
- Most companies realize that the successful implementation of office-of-the-future technologies depends upon the utilization of high-speed communications within and among distributed offices or facilities.
- The growth in the factory-of-the-future market will also stimulate growth in a number of telecommunications service and equipment areas (such as LANs, network software, modems and multiplexers, and communications processors).

VI TELECOMMUNICATIONS LONG-RANGE PROJECTIONS

VI TELECOMMUNICATIONS LONG-RANGE PROJECTIONS

- Until last year, the telecommunications industry, unlike the computer industry, had three unique characteristics that discouraged growth:
 - A high degree of regulation: The regulated nature of the industry added a dimension of political risk to investments.
 - High interest rates: During the past several years, a sluggish economy, high interest rates, and the highly capital intensive nature of the industry have acted as barriers to investment.
 - Complexity: The telecommunications industry is extremely complex both in terms of the technologies employed and the number of overlapping market segments. In order to deal effectively with these factors, it is necessary to examine all aspects of the telecommunications industry, and this has always been a difficult task.
- In 1983, the first two factors were less of an obstacle to investment, and thus to growth. The economy improved, many aspects of the industry became less capital intensive, and the government took measures to deregulate and restructure the industry. Largely because of these changes, the coming years look promising for exciting growth opportunities in telecommunications, as Exhibits VI-1 and VI-2 reflect.

EXHIBIT VI-1

TELECOMMUNICATIONS GROWTH ACTIVITY:
THREE INDICATIVE MARKET SEGMENTS

1983-1990

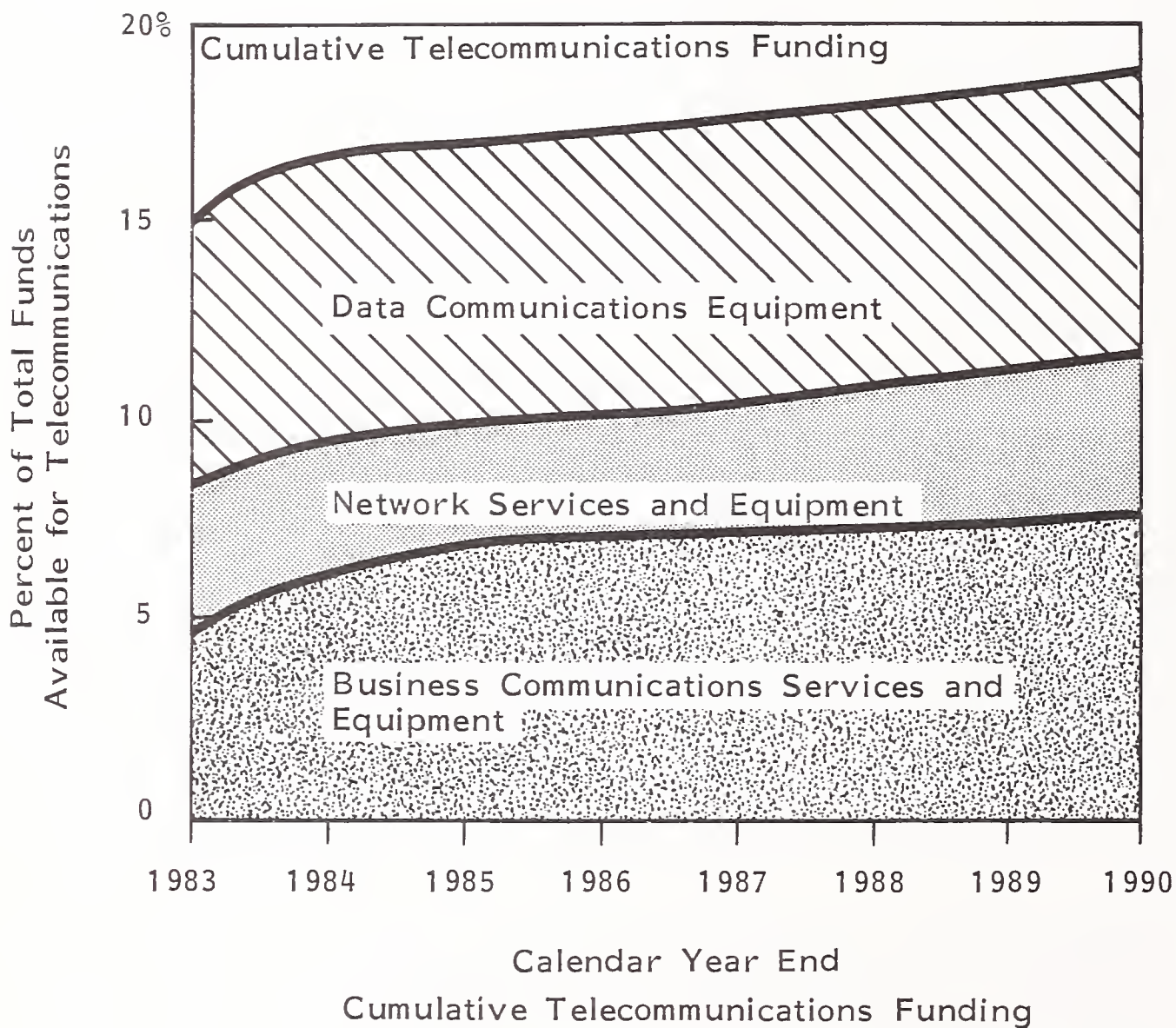
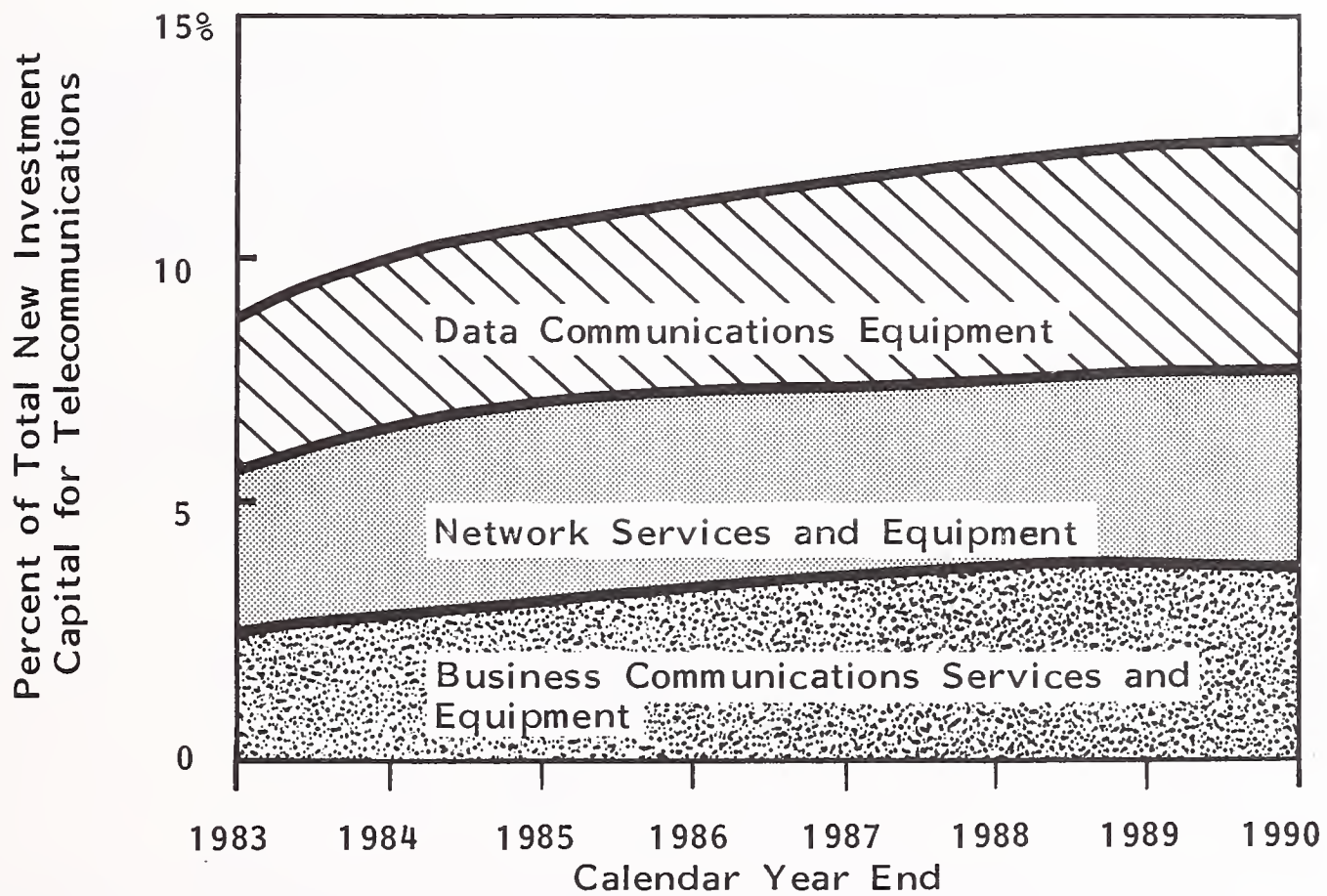


EXHIBIT VI-2

TELECOMMUNICATIONS NEW INVESTMENT ACTIVITY:
THREE INDICATIVE MARKET SEGMENTS
1983-1990



Cumulative Telecommunications Initial Public Offerings

- Although large and small corporate customers, as well as residential users, cannot take advantage of alternative technologies, those who do not implement a well-planned approach will find that their overall telecommunications costs will increase dramatically.
- Given the myriad alternatives and the uncertainty resulting from major changes in the structure of the industry, users are faced with the complex task of managing their rapidly changing telecommunications networks, on-premise equipment, and diverse business applications use.
- In the postdivestiture period, users can expect much confusion and serious delays in obtaining private communications lines, WATS, and MTS services. For example, the RBOCs face backorder problems on many products, services, and facilities, causing installation delays of up to 60 days in many areas of the country on leased-line facilities, and up to 18 months on some T-1 circuits.
- Maintaining communication networks is becoming increasingly difficult as suppliers are more reluctant to accept blame for network failure in a multi-vendor environment.

A. DATA COMMUNICATIONS TRENDS

- Assuming that the stock market is a reasonable barometer of economic conditions, an evaluation of telecommunications industry stocks might give some indication of what the future may hold. For example, stocks within the data communications sector performed very well throughout calendar 1983, and the share prices of many of these companies held up reasonably well during the first half of 1984.
 - The two segments that performed very well thus far in 1984 include the modem/multiplexer segment and the local area network segment. The

1984 projected stock appreciation for these segments is found in Exhibit VI-3. An additional breakdown by resource allocation of telecommunications services is shown in Exhibit VI-4, and Exhibit VI-5 illustrates the major areas of data communications equipment growth.

- Thus it can be inferred, at least in these two critical areas (LANs and modems/multiplexers), that sustained growth and industrial expansion will apply to the data communications industries at least in the foreseeable future.
- There are several major trends affecting the modem and multiplexer market. Since this area is a crucial one and represents the industry as a whole, it is advantageous to delve a little deeper into what is happening with the modems market, and thus what is happening to the industry.
 - Sustained growth: With the economy gaining momentum and expenditures for data communications equipment within most corporations increasing, the modem and multiplexer market is slated for stable, healthy growth over the next couple of years.
 - Analog-to-digital conversion: The conversion of transmission networks from analog to digital circuits will probably not have any major impact on the modem market until the late 1980s at the earliest. However, those companies that market digital network interfaces to AT&T's DDS and recently introduced higher-speed networks are wisely protecting themselves from any shift to fully digital, integrated system networks.
 - The emergence of regional bell operating companies: As mentioned before, the RBOCs are becoming major forces for the distribution of modem and multiplexer equipment. The seven new RBOCs are expected to buy several hundred million dollars worth of modem and multiplexer equipment in each of the next several years.

EXHIBIT VI-3

DATA COMMUNICATIONS
ESTIMATED 1984 APPRECIATION

SEGMENT	ACTUAL CY 1983 APPRECIATION	JANUARY - JUNE 1984 APPRECIATION	ESTIMATED CY 1984 APPRECIATION
Modems / Multiplexers	52%	(18%)	40%
Local Area Network Vendors	N/A	(3)	30

EXHIBIT VI-4

PERCENT OF COMPANIES USING VARIOUS TELECOMMUNICATION SERVICES

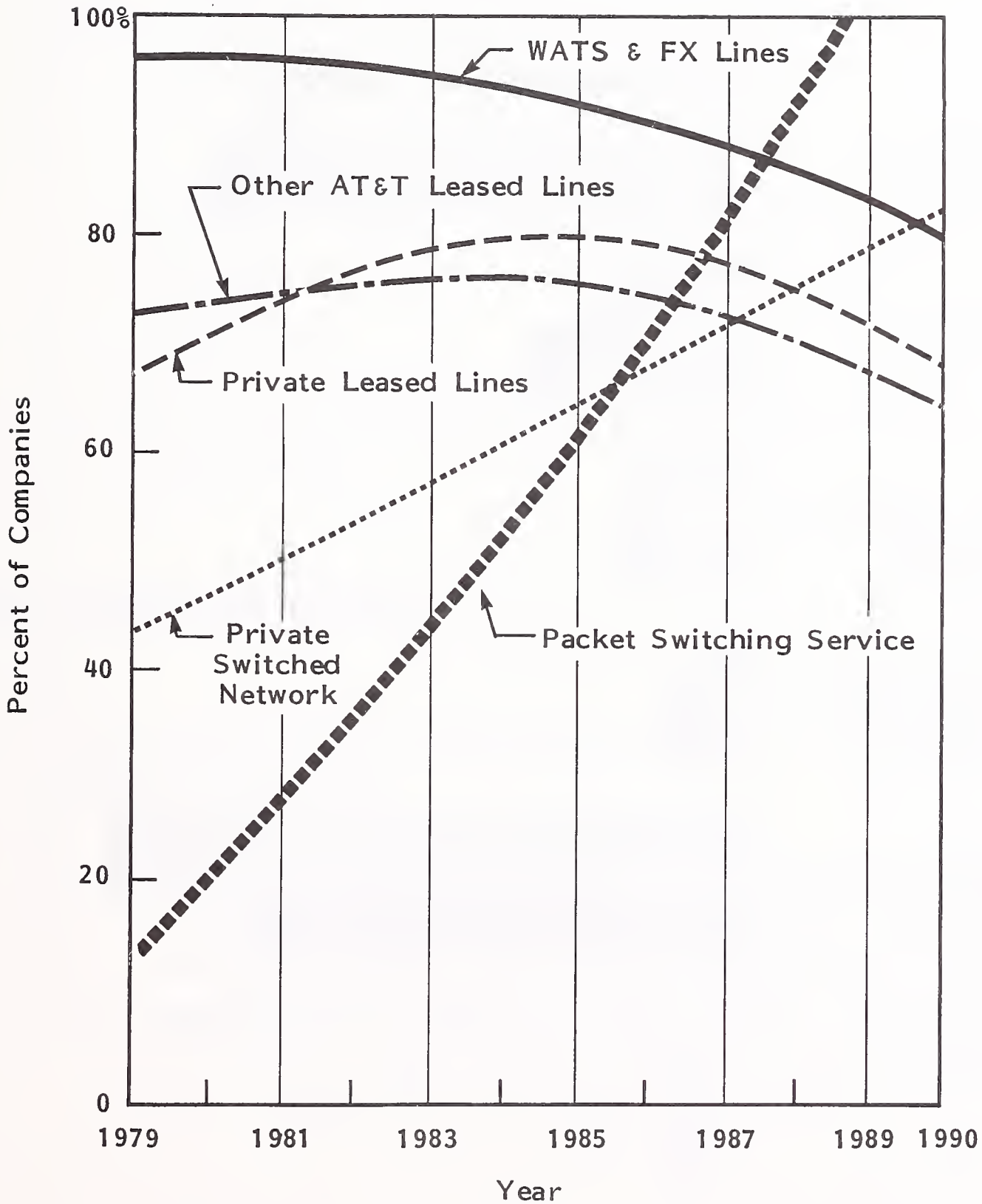
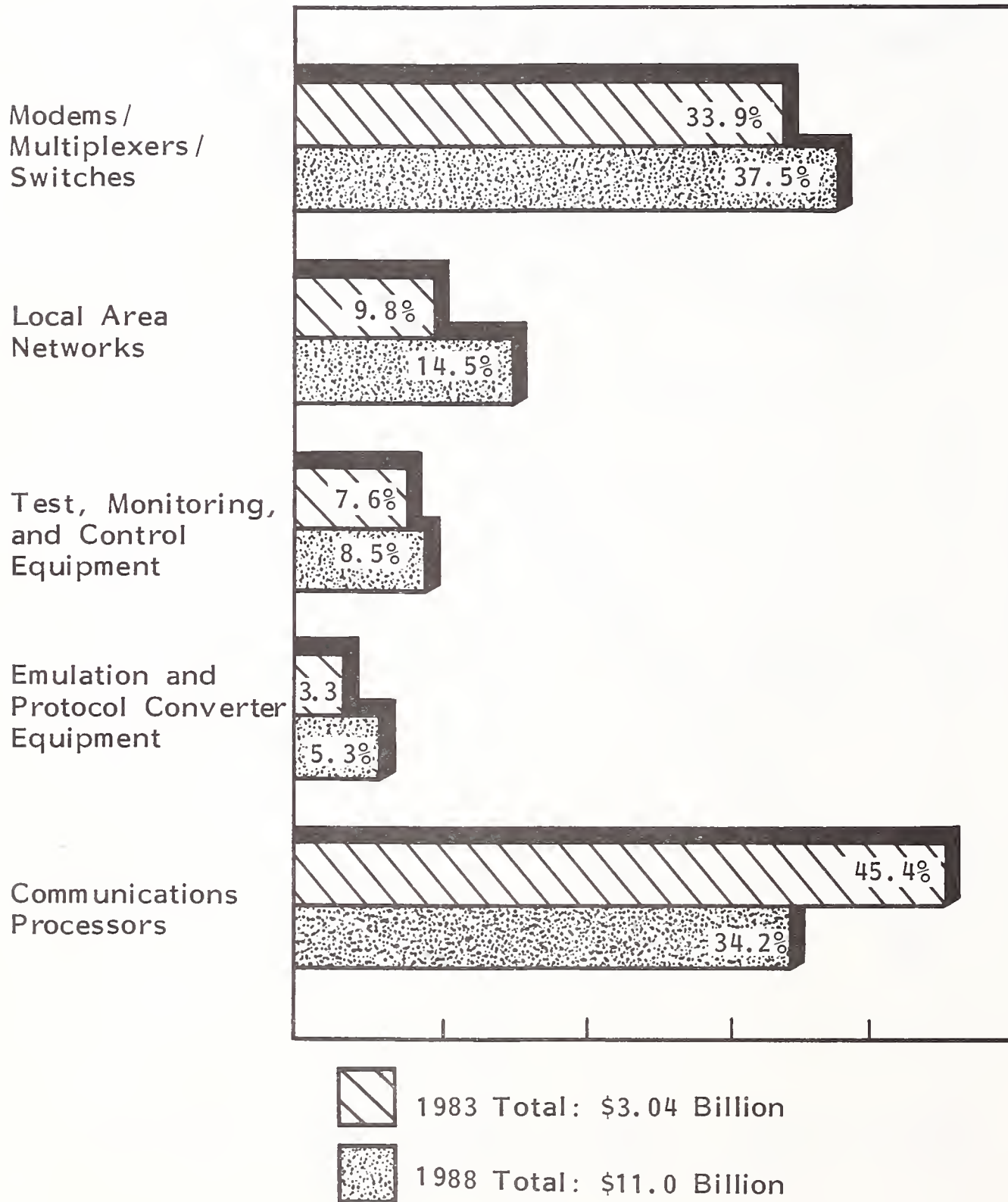


EXHIBIT VI-5

DATA COMMUNICATIONS EQUIPMENT GROWTH PROJECTION
1983-1988



- Growth in personal computer modems: With the proliferation of personal computers in the corporate and home environments, the demand for modems to interface with these systems is almost insatiable.
- Demand for T-1 Multiplexers: As T-1 circuits (a 1.5 Mbps high-capacity pipeline provided by AT&T and other carriers) become widely available, shipments of T-1 multiplexers will grow at a rate of approximately 45% annually.
- Increased demand for emulation products: During the next several years there will be a continued rise in the demand for IBM 3278 terminals and other emulation products both at the circuit board and system levels.
- To some extent, many LAN companies will be near-term competitors of each other.

B. LOCAL AREA NETWORK

- The local area network market is poised for growth in the next several years. (Refer to Exhibit VI-5.)
 - One factor contributing to growth is that IBM appears to be much more willing to work with many LAN companies than it does with micro-computer companies. The company's dual strategy of offering both broadband-based personal computer networks and general purpose, baseband star-radial networks, is based upon joint development and marketing agreements with several LAN companies.

- The marketing of local area network products, or any communications product for that matter, is not akin to the sales of generic personal computers. In the LAN marketplace, one must accommodate (to varying degrees) other manufacturers' devices and existing or planned public and/or private local networks.
- Most networks will evolve into hybrids, which will be a mixture of products from several LAN vendors, including specialized application networks that tie into larger high-speed backbone networks that will accommodate multiple applications. This hybrid nature of local area networks will diffuse some of the potential competitive focus in this market.
- The emergence of standards, especially those published by the IEEE 802 committee and ISO, will also provide a "compatibility factor" for users who want to buy networks marketed by different vendors. However, at the present time, Ethernet-based networks marketed by different vendors, as well as broadband networks, are not compatible.
- The development of gateways and protocol conversion programs for dissimilar network products will also encourage the user to leave open the option of buying from several vendors.
- Local area networks are evolving into an efficient, practical communications solution to a wide variety of user needs. Users recognize that most intra-company communications take place within a local area. This recognition plus the need to share expensive network resources for high-speed communications have led to acceptance of local area networks as a viable, cost-effective means of meeting the tremendous demand for communications services.

C. NETWORK SERVICES AND EQUIPMENT TRENDS

- The first half of 1984 saw a dramatic decline and a continuing weakness in the network services and equipment market. Refer to Exhibit VI-6. The share prices of some companies fell sharply. However, although companies within the transmission equipment and digital switching side of this sector experienced the greatest decline, those within the "emerging network" portion of this sector continue to remain very strong.
- Two of these explosive growth subsegments include the television receive-only (TVRO) market and the emerging by-pass or alternative information distribution market segment.
- Major trends within the network services and equipment market, shown in Exhibit VI-7, include:
 - Substantial increase in IBM PC LANs. Given IBM's dominance in the personal computer market, a number of companies are aggressively marketing LANs that are designed to support resource sharing on the IBM PC. Ungermann-Bass offers a direct channel attachment to the PC. Network Systems Corporation recently announced a 1 Mbps network that supports the IBM PC through RS-232 and runs under the NETEX system (network operating system). In addition, there is at least one other LAN company that will soon take a major share of the personal computer network segment.
 - Increase in LAN OEMs. Until recently, the LAN market suffered from a notable lack of OEMs and system houses that were willing to make a commitment to add value to and sell LAN products. This situation is changing rapidly.

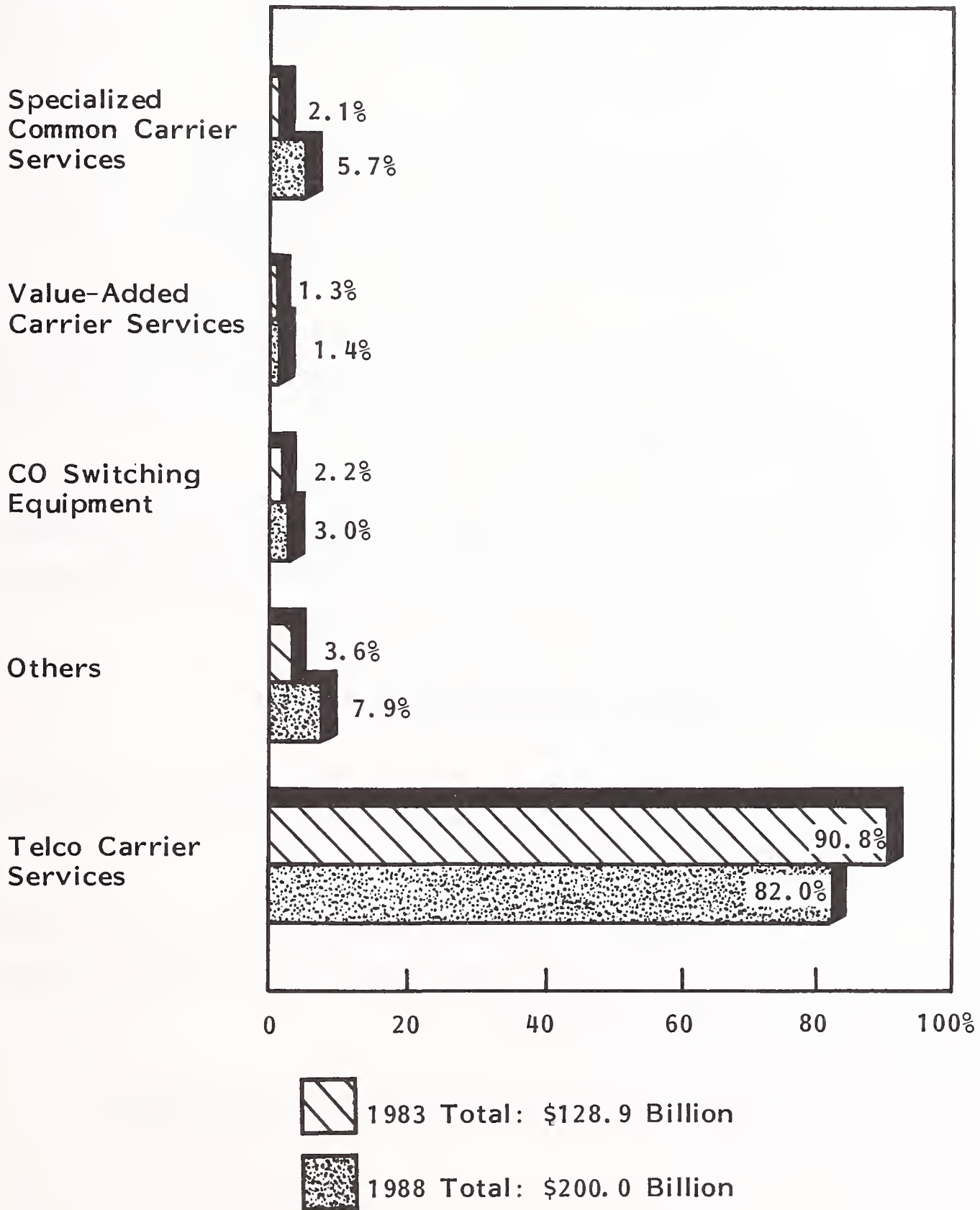
EXHIBIT VI-6

NETWORK ESTIMATED 1984 APPRECIATION

SEGMENTS	ACTUAL CY 1983 APPRECIATION	JANUARY- JUNE 1984 APPRECIATION	ESTIMATED CY 1984 APPRECIATION
Network Transmission Equipment	45%	(22%)	35%
"CO" Switching	110	(18)	20
Carrier Services	(25)	(17)	5
Emerging Network Technologies	N/A	27	45

EXHIBIT VI-7

NETWORK SERVICES AND EQUIPMENT GROWTH PROJECTION
1983-1988



- An increase in the availability of protocol packages. In the years to come, a tremendous increase is expected in the availability of high-level protocols that will be provided at the network interface instead of the host or frontend processor (as is prevalent in DDP installations).
 - The ability to provide modular, plug-in protocols at the interface level adds tremendous flexibility to a communications network and, for the most part, provides increased price/performance on a network.
 - Protocols such as Xerox's XNS, ISO (high level), X.25, and TCP/IP will continue to be the most commonly used local area network protocols.
 - In addition to these protocols, a new high-level protocol developed by Microcom--MNP--appears to be gaining widespread acceptance.
- Development of "second generation" products. New products are emerging that will increase the price, performance, and capability of LAN systems. These developments include:
 - Baseband and broadband chips.
 - Specialized, high-speed switches optimized for LAN interconnection.
 - Ultrahigh-speed systems, such as the 275 Mbps Datapipe (Network Systems Corporation) and the 80 Mbps ProNet LAN (Proteon Associates).
 - Enhanced message-based network operating systems.

- "Plug-in," high-level protocol packages.
 - Bridges and gateways that will link dissimilar networks and provide high-speed interconnection to public and private wide-band networks.
 - LAN application software packages and distributed network data bases.
- Increase in the retail distribution of LANs. Although microcomputer-based LANs have been distributed on a retail basis for some time, there has been a notable increase in the number of LANs recently distributed through this channel. In addition, IBM will soon market its board-level products through this channel.
 - Increase in fiber optic networks. To date, very few fiber optic LANs have been installed; those that have been are primarily point-to-point systems and are not true LANs. As the price and configuration capability of fiber optic cable improves, there will be a substantial increase in the availability of fiber optic LANs.
 - Net/One (Ungermann-Bass), UniLan (Applitek), and ProNet (Proteon Associates) can operate on fiber optic cable.
 - Altnet, (developed by Aetna Telecommunications Laboratory), one of the first fiber optic LANs, has been optimized for the unique characteristics of fiber and is being readied for commercial introduction.

D. BUSINESS COMMUNICATIONS TRENDS

- Exhibit VI-8 reveals the recent trend for two segments of business communications equipment and services.
- Currently, this field is dominated by three PBX companies: Northern Telecom, ROLM, and InteCom. Companies that market emerging business communication applications (e.g., voice mail, video conferencing, and videotex products and services) will soon be exerting considerable influence over the three PBX giants and will modify the way they do business. If the PBX companies wish to continue to control large areas of their market, they will have to bow down to the applications demands for compatibility between systems. Otherwise, the emerging companies will develop strategies independent of the dominant companies and could thus become a challenging force.
- Although the PBX companies have been suffering from gross margin erosion brought on by industry "price wars," new markets have opened up for PBX suppliers, and the PBX switch will experience continued acceptance as the "controller" for the office of the future. Several major trends in the PBX industry are outlined in Exhibit VI-9.
 - The divestiture by AT&T of the seven RBOCs has created a large new marketplace for non-AT&T manufacturers. The RBOCs are becoming major distributors of non-AT&T products. The high-end, large customer segment of the market will most likely be targeted by the RBOCs, given their present resource constraints and the lucrative nature of the high-speed segment.
 - Requirements for new business communications and data processing equipment services associated with office automation have created the need for sophisticated integrated voice/data PBX systems. "Open"

EXHIBIT VI-8

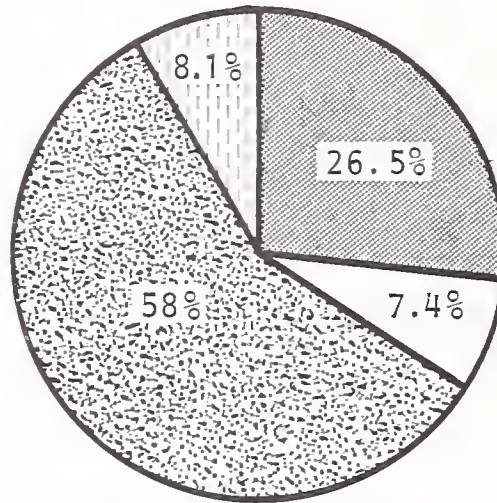
BUSINESS SERVICES ESTIMATED 1984 APPRECIATION

SEGMENTS	ACTUAL CY 1983 APPRECIATION	JANUARY- JUNE 1984 APPRECIATION	ESTIMATED CY 1984 APPRECIATION
PBX	26%	(21%)	20%
Emerging Applications	N/A	N/A	35

EXHIBIT VI-9

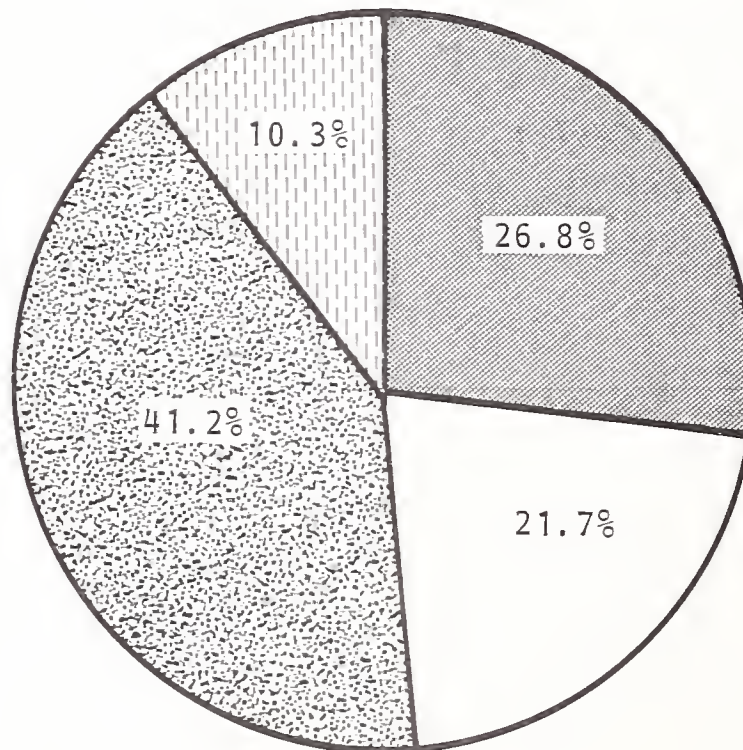
BUSINESS COMMUNICATIONS SERVICE AND
EQUIPMENT GROWTH PROJECTION
1983-1988

1983







Total = \$6.03 Billion

1988



Total \$14.90 Billion

-  PABX/Key Systems Equipment
-  Facsimile/Videotex
-  Network Information Services
-  Other

systems' architectures will be typical, especially in the larger systems, since users will need to interface with a variety of diverse equipment systems.

- Emergence of sophisticated voice/data workstations, sophisticated software enhancements and new office automation applications will provide PBX suppliers with sizable incremental revenues beyond those generated by basic PBX products.
- Close OEM/joint development associations between PBX suppliers and computer manufacturers are becoming common. These types of relationships offer the computer manufacturers access to voice users and applications. They offer PBX suppliers a tighter link into the information processing world as well as an excellent channel of distribution.
- Vertical and specialty application market niches are becoming more attractive and profitable for PBX suppliers. InteCom's success in the multitenant market is a good example.

VII RECOMMENDATIONS AND CONCLUSIONS

VII RECOMMENDATIONS AND CONCLUSIONS

A. CONCLUSIONS

- Be prepared for the tremendous growth and expansion (which is often integrated) of the telecommunications industry up through the year 2000. This is irrespective of the outcome of currently pending legal and legislative activities, economic uncertainties, and additional deregulatory efforts.
- The telecommunications industry, besides being one of the fastest growing industries in the United States today, is only now starting to get management attention in any number of large companies. Thus, it very well may be that the continued growth in the telecommunications industry, coupled with the merging of data processing technologies, may account for a significant percentage of all the people employed by the year 2000.
- Meanwhile, competition will continue to be extremely intense within the industry itself.
 - A number of large companies not previously in the industry are now moving into prominence as telecommunications suppliers.
 - Existing telecommunications companies, fulfilling a more traditional role, are experiencing phenomenal growth which will continue to climb during the next decade.

- Although competition is anticipated to be severe, the demand for telecommunications products and services will be greater than the suppliers can satisfy.
- In structuring the telecommunications and data processing environment, senior management within the corporate environment will therefore have tremendous leverage in being able to pick and choose the configuration they desire and the vendors with which to do business.
- The restructuring of the Bell System will continue with much the same flavor that it has during the past year or so. Granted, AT&T has divested itself of the Bell operating companies; however, the close relationship between AT&T and the BOCs will continue to strongly influence the products and services to be offered within the telephone industry. This relationship will also influence the degree and extent of competition with the Bell network of companies.
 - Traditionally, the Bell System has been very conservative and does not readily relinquish its dominance in areas in which it operates.
 - Because it has essentially been a monopoly, the Bell System has further allowed changes to proceed only at their pace rather than at the pace of the demands of the market. As organizations have imposed increasing demands for telecommunications products and services, the Bell System competitors will move quickly to fill the voids that have not previously been addressed.
 - However, it is important to keep in mind the nature of the business as structured by Bell Systems. It is unlikely that in the near future there will be significant changes in how the Bell System allows business to be conducted. If the past is any indication, business will be conducted at a much slower pace than Bell's competitors have been led to believe.

- The analog-to-digital conversion (voice data merger) will take longer than had generally been anticipated.
 - A significant capital investment is required for the conversion of analog-to-digital facilities, and this may require investments of such a size as to preclude any rapid conversion.
 - A conservative strategy in this respect would be well advised despite the pleadings of the popular press. The majority of the conversion efforts in this area will be confined to equipment suppliers rather than end users.
 - However, recognizing that a large number of users do not wish to be left out in the cold (should the conversion take place sooner than expected), strategic planners will be well advised to extend their plans to cover the period 1985-1995. Determining telecommunications strategies to this time frame will ensure that the planning considerations reflect any unexpected technological changes (e.g., breakthroughs).

B. RECOMMENDATIONS

- Anticipate and plan to accommodate the tremendous growth expected between now and the year 2000 in the telecommunications industry.
- Plan personnel requirements around the simple fact that, by the year 2000, a significant portion of all people employed will be in telecommunications or related industries.
- Competition within the industry will intensify with its attendant fallout to the purchaser/user of goods and services. Thus, the long-range acquisitions of equipment and services should take this into account.

- So far, divestiture has proven to be a good thing for most companies. A cost advantage can be gained by using either the reduced-rate special carriers (e.g., MCI or Starnet) or by-pass technology to build an in-house telecommunications facility.
- New switching techniques and technological advances in attendant electronics will mean lower costs for more and smaller businesses. Avail yourself to the use of PABX and its ancillary technology if you want to control or monitor your telephone costs.
- Alternatives to by-pass are fiber optics, cellular radio, satellite, and digital transmission service. Investigate their utility within your organization and incorporate the appropriate alternatives in your strategic plan.
- Terminals are becoming more user friendly with the passage of time. Accelerated development in this field promises great change. It may be wise not to get involved in very long term leases for terminal equipment; thus, you can take advantage of newer technology as current leases expire.
- Voice is the hottest ticket in town. It would be advantageous to incorporate some of the new technological voice-oriented (and voice-operated) equipment into the digital phases of the strategic plan.

APPENDIX A: GENERALIZED SURVEY QUESTIONNAIRE

APPENDIX A

TELECOMMUNICATIONS STRATEGIC METHODOLOGY

GENERALIZED SURVEY QUESTIONNAIRE

- 1) Do you have a formalized telecommunications plan?

For what time frame?

1 - 3 years

3 - 5 years

Frequency of the planning cycle?

- 2) What do you feel is the outlook in telecommunications for your industry over the next five to ten years?

- 3) What, if any, effect is deregulation having on your company's opportunities?

- 4) Do you currently use any type of telecommunications networking?

Type

Vendor/Manufacturer

Speeds

Protocols employed

Number of nodes

Location of nodes

Expansion plans

APPENDIX B: DETAILED SURVEY QUESTIONNAIRE

APPENDIX B

TELECOMMUNICATIONS PLANNING METHODOLOGIES

DETAILED SURVEY QUESTIONNAIRE

1. Do you have any formal telecommunications strategic plan (long- or short-term)? _____YES _____NO

2. What effect is deregulation of AT&T having on your business?

3. How do you tie computers and communications together (organizationally and technically) within your organization?

Telecommunications Planning Methodologies (cont.)

4. Have you addressed the problem of high-speed transmission of data (do you use T1 or higher speeds)? _____YES _____NO

If not, how do you plan to solve it?

5. What approximate percent of your total transmission activity is devoted to voice? _____% To data? _____%

6. Have your networks been integrated for both? _____YES _____NO

7. What kind of lines are you currently using?

Telecommunications Planning Methodologies (cont.)

8. How do you handle line/network problems?

9. Do you use distributed data processing? _____ YES _____ NO

Do you plan to? _____ YES _____ NO

When? _____

10. Do you have network control centers? _____ YES _____ NO

How are they being used? _____

How are they tied together? _____

Do you have a formalized disaster recovery plan? _____ YES _____ NO

Could you describe it? _____

Telecommunications Planning Methodologies (cont.)

12. How do you plan to control communications costs? _____

13. What plans for change have you over the next 6-12 months? _____

Over the next 12-24 months? _____

Over 24 months? _____

14. What issues would you consider important in a strategic methodology plan? _____

15. What do you feel is the outlook (thrust and direction) for your industry over the next five to ten years? _____

THANK YOU!

