

5. THE IMPACT OF MARKET FORCES AND USER NEEDS

"You can't always get what you want, but if you try, sometimes you get what you need."

The Rolling Stones, 1972

It is important here to distinguish between network users, providers, and suppliers. User demands for service influence the service providers. The providers' needs in turn influence the equipment manufacturers and suppliers. Other forces may be acting on all three. Government policies and standards development affect the providers, and to some extent the suppliers. See Figure 5-1.

Providers, suppliers, and users all have different goals and perspectives of their telecommunications world. For example, the provider, for economic reasons, develops a single network that he hopes will meet the needs of many users. The users, on the other hand, want optimum choices for specific applications.

Traditionally the telecommunications provider conducted basic research, developed equipment and facilities, and applied them to meet operating needs but, not always the users' needs. Today, the user is becoming more involved in the entire process, and the suppliers more independent. Table 5-1 summarizes today's different perspectives between users, providers, and suppliers. Their conflicting interests are discussed in the following two subsections.

Table 5-1. User, Provider, and Supplier Perspectives

Users	Providers	Suppliers
price terminal choices service reliability service selections speed of service quality of service time to implement	cost to implement efficiency survivability time between failures traffic types traffic volume	cost to manufacture technical feasibility proprietary market innovativeness maintainability

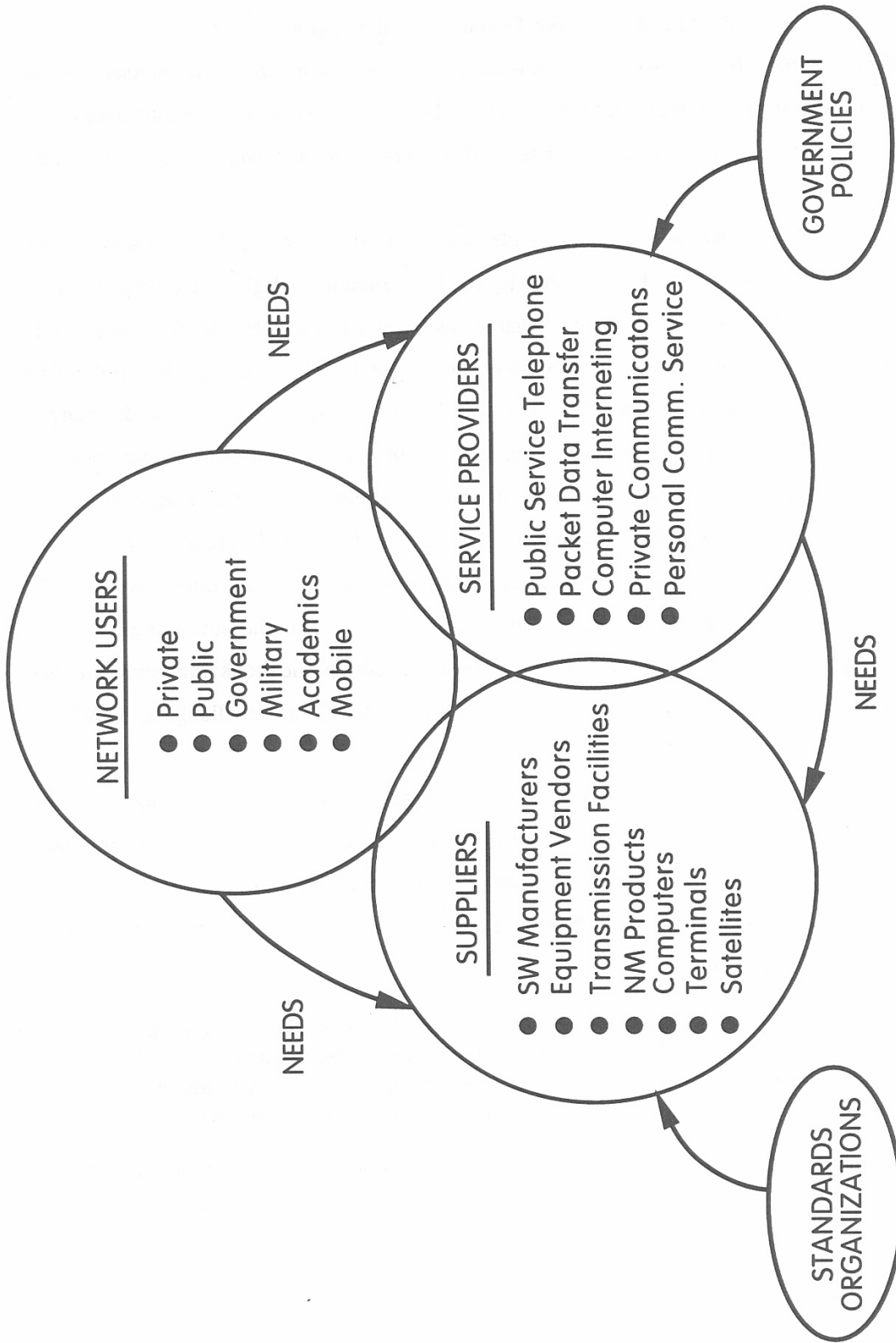


Figure 5-1. Major participants in telecommunications infrastructure.

5.1 The Role of the Providers and Suppliers

Telecommunications service providers today are focusing more and more on users' needs because of the competitive, deregulated marketplace. The entire telecommunications industry is being forced by the users to provide greater flexibility, control, responsiveness, and integration into their products.

Before 1984, the telephone service provider was the Bell System. Telephone service was viewed as a natural monopoly to be regulated by the Government and given the responsibility of providing universal service for all at a reasonable cost. The "system" determined users' needs not the user. Technologies advanced at a pace set by the telephone company. Following divestiture in 1984, the long-haul service providers finally focused on users' needs using a marketing approach to service provision. Suppliers and service providers no longer took the customer for granted. Divestiture, along with other more recent technological, economic, and regulatory changes in the telecommunications industry, introduced widespread growth in the number and type of services offered. Competition in price, performance, and innovative features and functions fostered dramatic changes in the industry. Except for the seven regional Bell operating companies (RBOCs), the monopoly-oriented telecommunications infrastructure has largely disappeared. Long distance carriers like US Sprint and MCI are challenging AT&T for a share of the market.

Customer premises equipments (CPEs) were deregulated almost 25 years ago. Today several thousand interconnect services companies buy, sell, or lease a wide variety of products ranging from telephone hand sets to PBXs, facsimile equipment, and more.

This new competitive philosophy, based on concern for the user, is summed up by Fluent (1987) with the following quote;

"Our premise is to satisfy our customer's needs, and we have an obligation to provide our customers with the most efficient, streamlined, up-to-date communications system possible. It is important therefore, to investigate the various technologies available to see if they will work for our customers."

This new industry-wide approach puts a new responsibility on the user, as described next.

5.2 The Role of the User

Users today play a more active role in developing new applications, new standards, and even in formulating new regulations. This new involvement, following divestiture and the subsequent deregulation of the industry, resulted in a more competitive environment, gave users a greater influence over what equipment is produced, and increased the variety of services that were offered. At the same time, users found a pressing need to manage their own networks and to select special features and functions which met their business requirements for maximum efficiency at the lowest cost. Instead of buying just what is available, users today buy what they need, or have it developed. Because of this, user devices and features have changed substantially in the past few years. End user premises equipments, terminals such as personal computers (PCs), local area networks (LANs), facsimile (FAX), and multimedia workstations have all grown dramatically in the last few years as shown in Figure 5-2.

The ISDN evolution is another example of the user's role in the changing infrastructure. Users have been actively involved in defining their needs and determining where new technologies can best serve these needs.

Finally, users are becoming actively involved in standards organizations and the standards setting process. Users want standards that ensure equipment compatibility from the multivendor sources. Ubiquitous technical standards and availability of services are obviously to the users' advantage. It is also to the users' advantage to promote competition throughout the industry by reducing barriers to entry and by participating in user organizations as well as developing standards.

Users today have considerable impact on the telecommunications infrastructure. For example, they now have the ability to by-pass the public network with private facilities including very small aperture terminals (VSATs). User influences are also already being felt in office automation. In the traditional office, the telephones and the PABX that controlled them were the most dominant fixtures. Records and correspondence were produced by typewriters, and later by shared wordprocessors. Storage facilities included file cabinets and punched cards. In the near future, offices may use multimedia workstations with multitasking, interconnected with LANs, MANs, WANs, using digital PABXs or wireless media, and ISDNs. Spreadsheets, desktop publishing, graphic art, electronic mail, and voice messaging are in demand already in

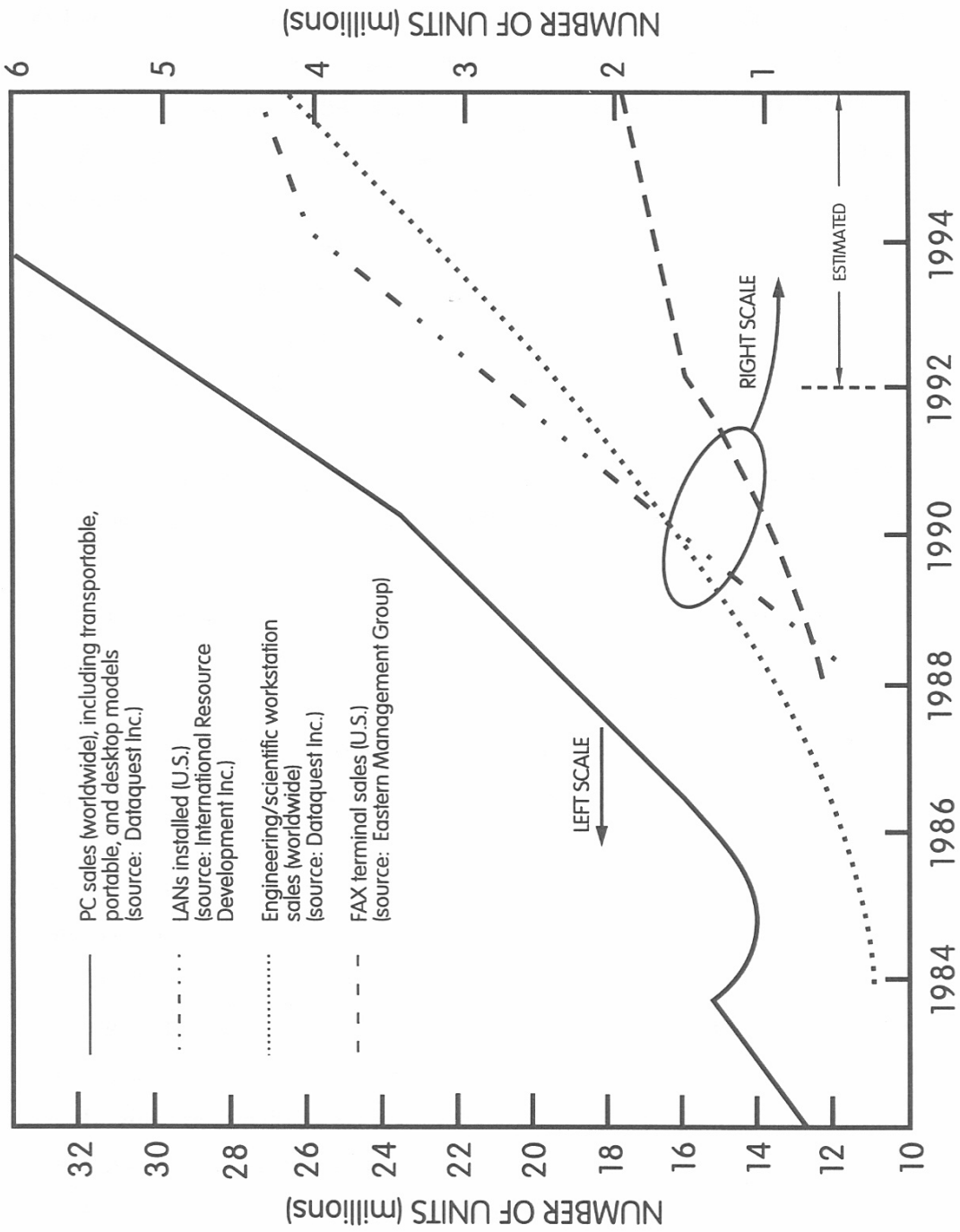


Figure 5-2. Growth in network-attached user devices (Anonymous, 1990).

many offices. Video teleconferencing, cordless phones, wireless LANs, and expert systems for network management could become commonplace.

The information business involves a complex interplay between public and private institutions, between government and industry, and between national and international entities. The participants in the information business are concerned with the acquisition, packaging, processing, storage, transmittal, and distribution of all kinds of information including voice, data, imagery, and video. They are constantly striving to make business more profitable by adding more features, operating more efficiently, and exchanging information faster. This is the purpose of many of the emerging new products, systems, and services as described in the next section.

6. THE EMERGENCE OF NEW PRODUCTS, SYSTEMS, AND SERVICES

"There is nothing more difficult to plan, more doubtful of success nor more dangerous to manage than the creation of a new order of things."

Machiavelli, 1513 A.D.

The following subsections discuss a number of new products, systems, and services including multimedia communications, electronic messaging, and video services. Multimedia communications is the field referring to the representation, storage, retrieval, and dissemination of machine-processible information expressed in multimedia, such as text, voice, graphics, images, audio, and video. Electronic messaging covers a broad field ranging from telex and facsimile to voice mail and electronic data interchange (EDI). Video systems and services include video telephony, multicast video teleconferencing, compact video disk storage, videotext, and the like. The products, systems, and services that will actually dominate in the future are difficult to assess as noted by Machiavelli almost 500 years ago! The information services market is expected to grow since RBOCs are now able to market their own information services according to Newsfront (1991). Table 6-1 depicts this expected growth through 1994.

6.1 Advanced Terminals and Services

The advent of high-capacity storage devices, economical but powerful workstations, and high-speed integrated-services digital networks has led to a variety of multimedia services using broadband terminals. Multimedia documents, when communicated with short delays, have applications in medicine, education, scientific research, travel, real estate, banking, insurance, advertising, and publishing. Future transactions could be conducted by groups using computer-controlled cooperative workstations exchanging multimedia documents. Publicly available information services from multimedia, multilocation data could also expand according to Irven et al., (1988). Multimedia software demonstrated at trade shows combining TV, compact disk (CD), and PC technologies in a convenient service package could revolutionize the entertainment and business field. These service packages are used to create multimedia presentations combining music, voice, animation, text, photo, and video images on optical disks. Compact disk

Table 6-1. Information Service Markets in the United States in Billions of Dollars (estimated by Link Resources, Inc.)

	1989	1990	1991	1992	1993	1994
On-line transaction processing	\$ 2.590	\$ 2.753	\$ 2.927	\$ 3.483	\$ 4.120	\$ 4.379
Alarm monitoring/telemetry	2.176	2.502	2.827	3.166	3.544	3.969
Telemessaging services	1.025	1.096	1.172	1.279	1.369	1.482
Voice messaging	0.157	0.220	0.282	0.367	0.489	0.666
Electronic messaging	0.464	0.580	0.737	0.958	1.274	1.707
Database services	8.587	9.675	10.916	12.336	13.962	15.829
Residential data services	0.235	0.272	0.319	0.373	0.434	0.505
Voice information services	0.726	1.048	1.342	1.609	1.879	2.113
Enhanced facsimile	0.020	0.045	0.059	0.078	0.104	0.135
Electronic data interchange	0.097	0.160	0.264	0.435	0.696	1.114
Value-added network services	0.724	0.790	0.861	0.935	1.018	1.104
Business video services	0.066	0.078	0.092	0.112	0.128	0.143
Total	\$16.867	\$19.219	\$21.798	\$25.131	\$29.017	\$33.146

read-only-memory (CD-ROM) systems store over 500 Mbytes of multimedia information for playback on the PC. This information can be accessed quickly and manipulated much faster than video tapes, and with better quality.

Electronic messaging is a fast-emerging technology. For example, it is predicted that by the year 2000 over 40 million people in the United States will be active users of electronic mail (Figure 6-1).

Electronic data interchange (EDI) is another important trend. EDI refers to the computer-to-computer transmission of business documents using standard formats that are readable by the computer. This automated process is already being used by the transportation, retail, and health industries to improve the efficiency of doing business.

Videotex services, whereby users can access sources of information for a variety of purposes, are available. Examples include Prodigy, Compuserv, and Delphi. These three alone serve over 2 million customers.

Audiotex systems that permit telephone callers to access prerecorded information are proliferating. Voice response systems that allow callers to interact directly with a computer are also now beginning to appear.

Enhanced Service Providers (ESPs) are offering numerous applications and services designed to increase productivity and to reduce costs.

Video teleconferencing has increased in popularity due, in part, to standards that make multipoint interoperability more feasible. Picture quality can be enhanced at lower transmission rates (112 and 384 kb/s) using sophisticated coder-decoder systems. In the past, video conferences were conducted from special studios designed for that purpose. In the future, desktop video systems, some of which are already on the market, are expected to prevail. See for example, Gold (1992). These desktop systems, however, are not accessible via LANs installed over the last 10 years. Conventional LANs currently operate at approximately 10 Mb/s and this transmission rate is shared by several workstations. Full motion video requires continuous high data rate transmissions, often in real time. Video LANs of the future must be capable of providing a constant bit rate channel for each desktop workstation.

Many of the traditional enhanced services are provided by value-added networks (VANs). VANs offer enhanced data transmission services such as speed and protocol conversion along with packet switching, error detection, and correction. Services such as electronic funds transfer,

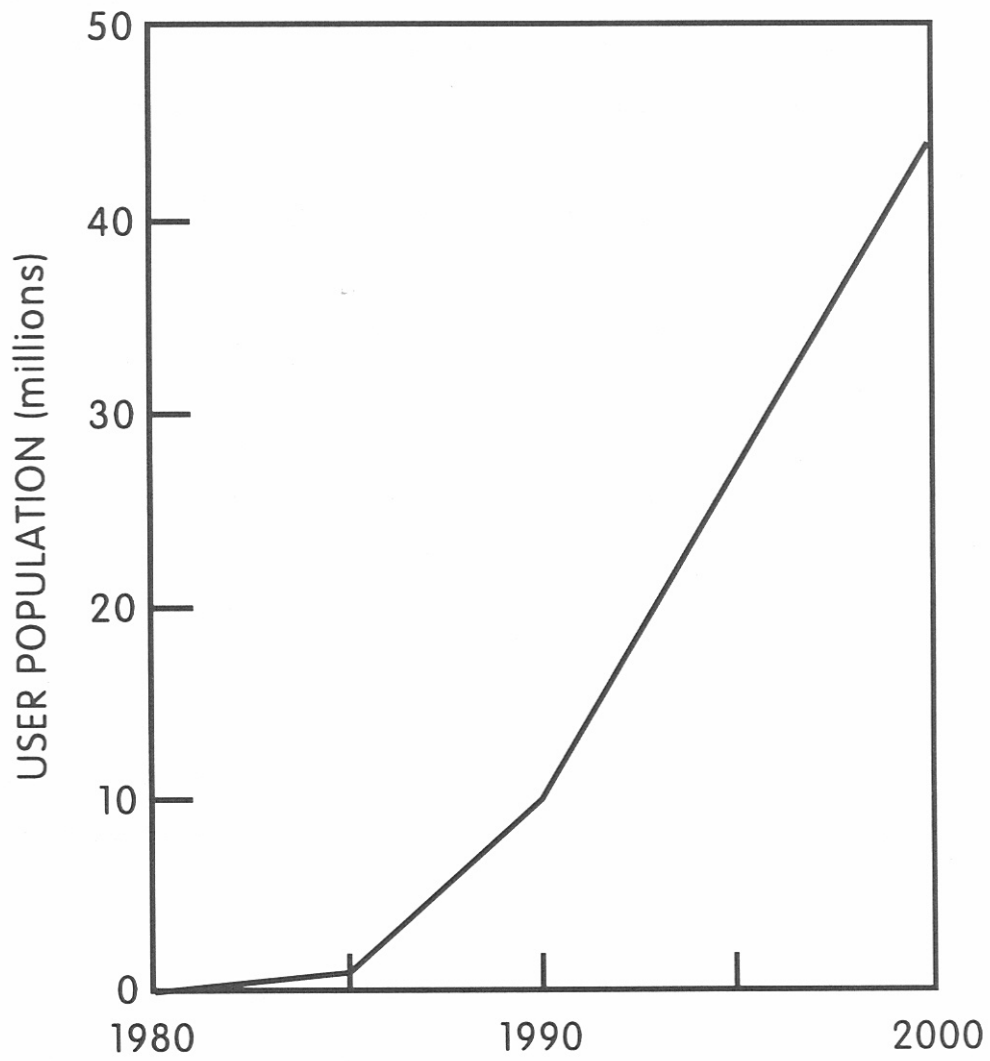


Figure 6-1. Users of electronic mail (estimate by A.D. Little, Inc.).

electronic mail, and energy management are considered VAN offerings. They fill the niche between the small data communications user who needs only a dial-up analog line and the large corporate user who has their own dedicated communication network. Until recently, the RBOCs were restricted from offering information services. However, in 1992 this restriction was lifted and their entry into the market is expected to stimulate growth in the area of residential data services such as videotext and information gateways, and in voice and electronic data messaging.

6.2 User/Provider Interconnections

User terminals for multimedia communications, electronic messaging, and video applications must interconnect locally, nationally, and globally to meet many applications. The interconnecting networks range from fiber distributed data interfaces (FDDI), distributed queue dual bus (DQDB) networks for local and metropolitan area distributions, and narrowband ISDN (N-ISDN) and broadband ISDN (B-ISDN). Figure 6-2 depicts a mixture of the technologies that interconnect information users with information providers using these advanced networking schemes. Intelligence provided by the B-ISDN allows the user to browse for the desired source of information. The networks involved are described elsewhere in this report.

There are basically three types of transmission services available to the users: dedicated lines (leased private lines), carrier services (reserved transmission time), and switched services (unreserved). Narrowband and broadband transmission types and rates are described in the next subsection.

6.3 Standardized Broadband Services

As network capacity available to the user increases, more and more services can be supported. The CCITT has proposed two initial rates for B-ISDN. One of approximately 150 Mb/s and the other approximately 600 Mb/s for single and multiple video applications. Higher rates may follow. A local exchange could handle multiple ISDN subscriber loops using twisted wire pair at 1.544 Mb/s for data and voice plus several B-ISDN subscribers using optical fiber for data, voice, and video. According to Stallings (1990), the 150 Mb/s rate seems adequate for most office subscribers-to-network directions and 600 Mb/s should suffice for the network-to-subscriber direction. Other rates including narrowband ISDN rates would also be supported, as shown in Figure 6-3.

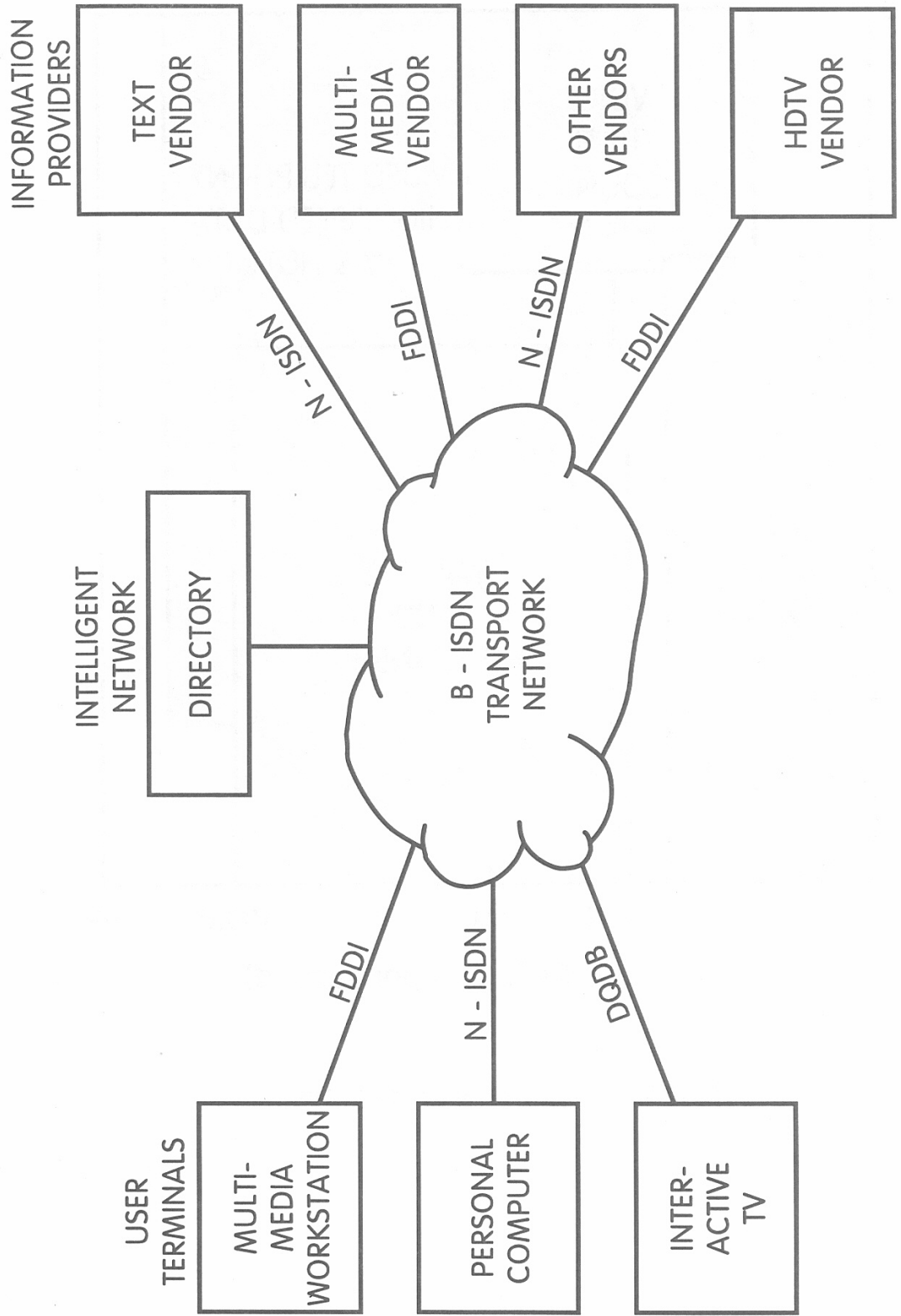


Figure 6-2. Interconnecting information users with information providers via B-ISDN (from Irven et al., 1988).

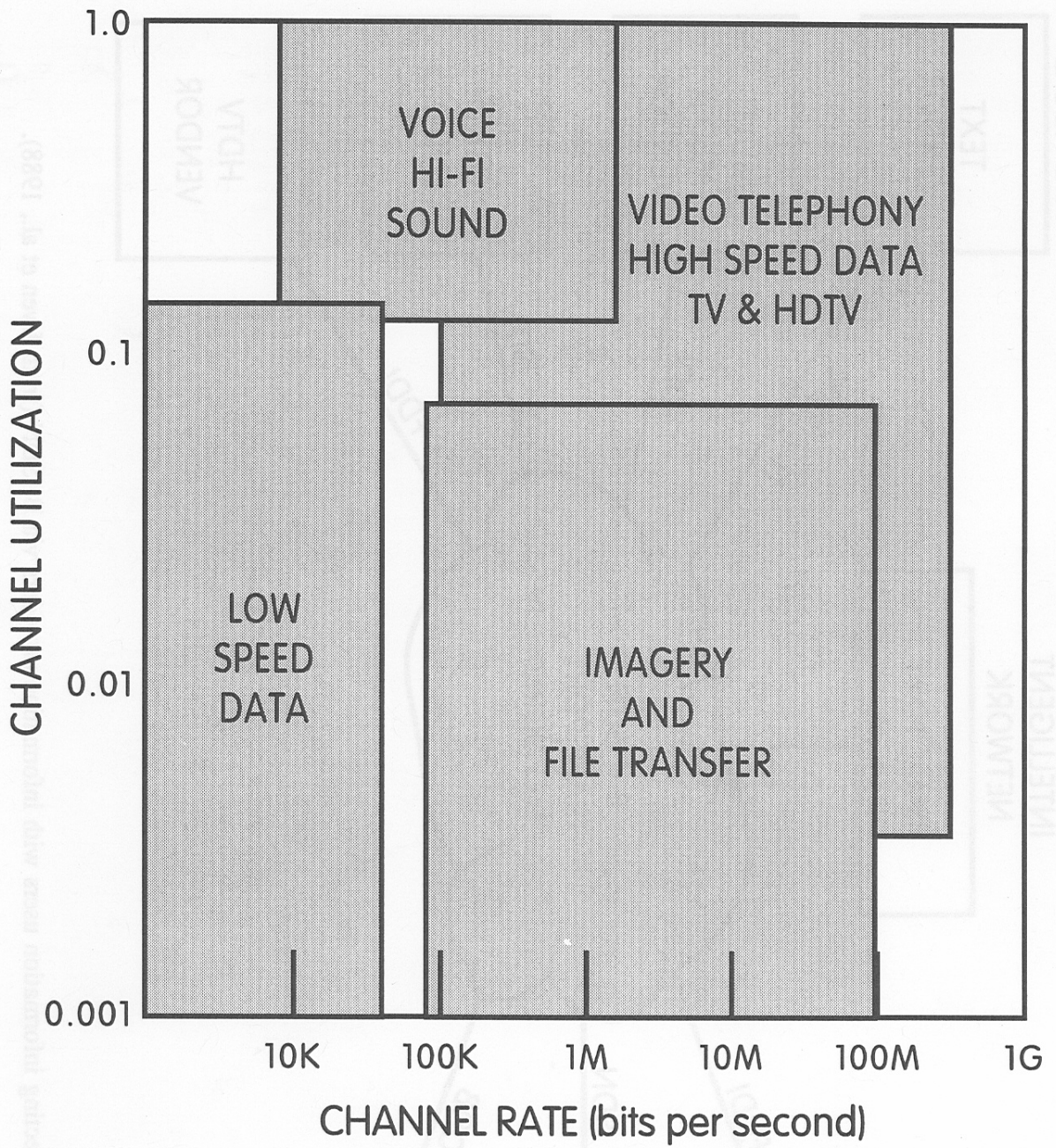


Figure 6-3. B-ISDN service characteristics.

Recommendation I.121 given in CCITT (1988a), defines the broadband aspects of ISDN and includes the service classifications. These service classifications are based on existing recommendations for ISDN and include two main categories: interactive services and distribution services, as shown in Figure 6-4. Interactive services provide a two-way exchange of information between users whereas distribution services are primarily one-way. The subcategories are defined below:

conversational services provide the means for bidirectional communications and support general transfer of data

messaging services offer communication between individual users via storage units such as store-and-forward, mailbox, and message handling functions

retrieval services provide the user the capability to retrieve information on demand from public storage centers

distributed services without user presentation control are essentially broadcast services. With presentation control, the user can control start and order of information as in teletex.

The narrowband and broadband rates proposed by the CCITT (1988a) are given below in Table 6-2. Note that the H22 and H4 rates must be multiples of 64 kb/s.

Table 6-2. Narrowband Channel Rates and Proposed Broadband Channel Rates

Narrowband		Broadband	
D	16 or 64 kb/s	H21	32.768 Mb/s
B	64 kb/s	H22	43 to 45 Mb/s
H0	382 kb/s	H4	132 to 138.24 Mb/s
H11	1.536 Mb/s		
H12	1.92 Mb/s		

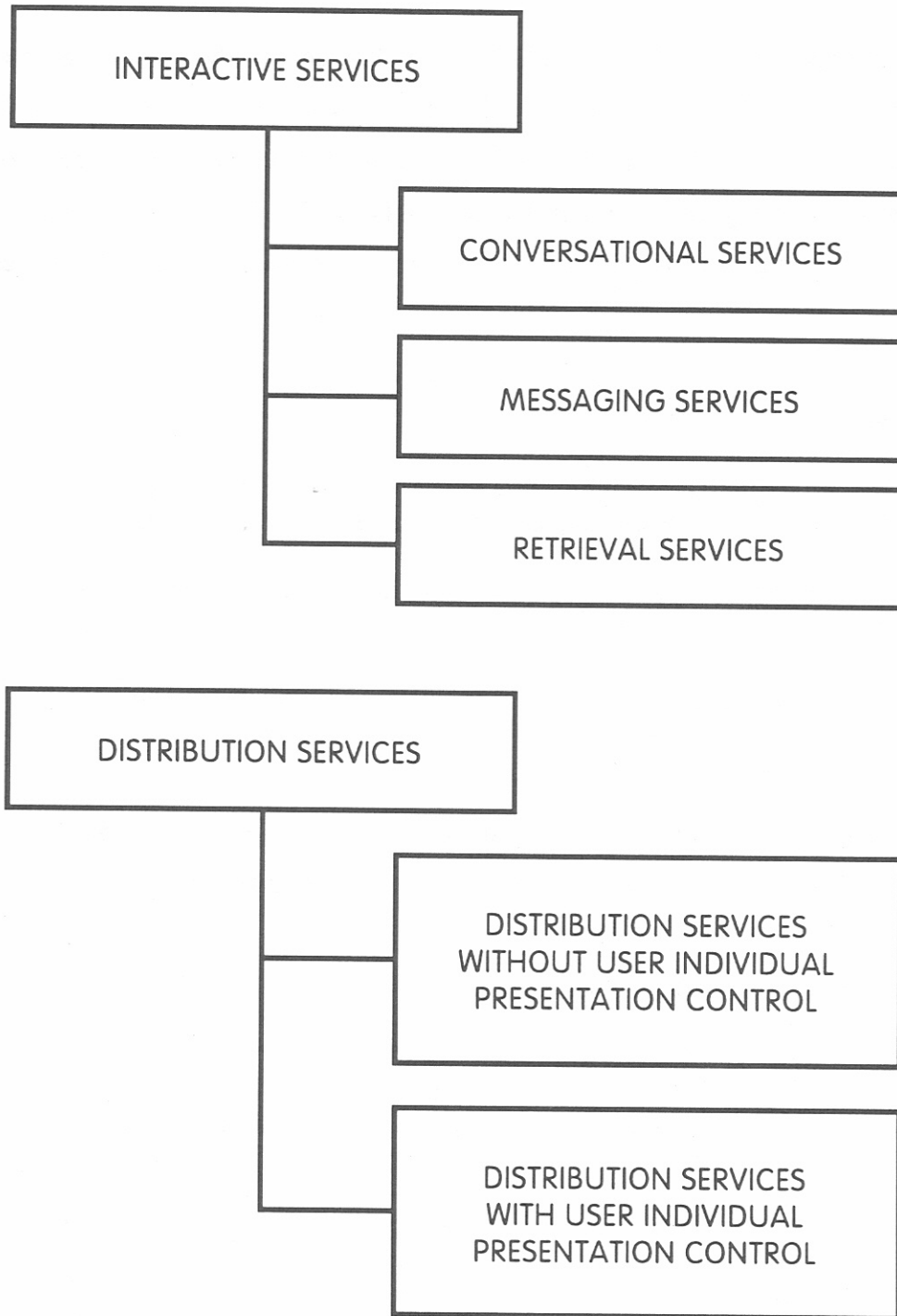


Figure 6-4. Classification of broadband services according to CCITT (1988a).

The broadband channels were selected to support the following:

- broadband unrestricted bearer services
- high-quality broadband video telephony
- high-quality broadband videoconference
- existing quality TV distribution
- high-definition TV distribution.

Only the last service would require the H4 rate. The Appendix to this report lists other possible broadband services as given in the annex to Recommendation I.121 (CCITT, 1988a). This table contains possible services, their applications, and some possible attribute values describing the main characteristics of the services.

It is expected that truly integrated multimedia services involving voice, high-speed data, image, and video will eventually emerge and penetrate the business and residential markets. These multimedia services have the potential to profoundly impact and transform those markets, and ultimately the nature of the work place.