THE CONVERGENCE OF TELECOMMUNICATIONS AND BROADCASTING IN JAPAN

by

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SUBMITTED TO THE ALFRED P. SLOAN SCHOOL OF MANAGEMENT
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

MASTER OF BUSINESS ADMINISTRATION

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2001

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ABSTRACT

Japan has fallen far behind the United States in the extent and sophistication of its information networks and Internet use. But Japan can catch up. A combination of changes, including the rapid growth of the Internet, advances in broadband technology, the introduction of digital TV, and deregulation are driving a transformation referred to as the "convergence of telecommunications and broadcasting".

At the same time, these drivers are dramatically changing the traditional industry structure of telecommunication and broadcasting, from vertical integration to horizontal stratification. Information companies need to plan strategies based on the new industry.

NTT, reorganized in 1999 into a holding company system that promotes group management, has committed to an aggressive plan to deploy FTTH (Fiber to the home) everywhere in Japan by 2005. FTTH service has just begun and my research finds that NTT's decision to implement FTTH has encountered fierce competition when analyzed from the basis of Porter's Five Forces.

There are four strategic points that must be dealt with in order to win in the optical fiber service competition: 1) open access, 2) reduction in prices, 3) construction of a platform, and 4) correlation with broadcasters. In addition, cooperation with the regulatory authorities and other information companies is also required, because NTT will find it difficult to win on its own.

NTT is a leader in the information/communication industry, and I believe NTT can expand its organizational capability and contribute to the development of the industry by responding to this new era.

Thesis Supervisor: D. Eleanor Westney
Title: Society of Sloan Fellows Professor of International Management

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ACKNOWLEDGEMENTS

I extend my sincere thanks and appreciation to Professor D. Eleanor Westney
for the very helpful and professional manner in which she guided
me through my research activities.

My thanks also go to Mr. Hiroyuki Sadaike and Mr. Hirohumi Abe
of the Business Development Division, NTT
for providing valuable information and comments.

I would like to thank Ms.Cherie Potts for her excellent editing.

Finally, I would like to thank
my wife Hiroko
for her cooperation and kind assistance —
with my sincere gratitude.

This thesis is dedicated to all the people of NTT Group.

CHAPTER 1

Introduction

On November 29, 2000, Japan's parliament, the Diet, passed a basic information technology (IT) law aimed at propelling Japan's IT development and providing low-cost Internet access to millions of Japanese. The law stresses the need to develop a network infrastructure that offers all citizens the ability to access information, and it specifies that such networks must be made available at a low cost. It also calls on the private sector to take a leading role in the creation of such a networked society and requires the government to ensure fair competition in the market. Other issues such as security are also touched upon in the bill.

IT has been one of the key policies pursued by Prime Minister Yoshiro Mori's since he came to power in April 2000.[1] He mentioned the subject during his first address to the Diet, shortly after becoming prime minister, and by the time a new Diet session opened in July, he had begun formulating his IT plans, pledging, "I will personally demonstrate leadership in order to realize a Japanese "IT society" in which everyone, from children to the elderly, will be able to enjoy the benefits of IT."

To aid him in drawing up the bill, Mori formed an advisory panel, the National IT Strategy Council. Headed by Nobuyuki Idei, chairman and chief executive officer of Sony, the council quickly called for a law that would push Japan past the U.S. in terms of information technology.

[1] Note: in late April 2001, Mori resigned as Prime Minister, and was replaced by Junichiro Koizumi.

Japan has fallen far behind the United States in terms of the extent and sophistication of information networks and Internet use. And while the rate of Internet diffusion in Japan is low, there have been some notable successes in the Japanese telecommunications sector, particularly the rapid rate of cellular telephone diffusion in Japan, which is higher than that in the U.S.

I believe the next stage will be digital TV because it will lead to real change in the traditional industries of telecommunications and broadcasting. Various manufacturers are now looking to digital TV as an interactive Internet device that could be used in place of the computer. It seems possible that televisions will evolve from purely receiver-oriented devices into multimedia data terminals capable of displaying televised broadcasts. One of the strengths of terrestrial digital broadcasting is that there is little or no deterioration in video or audio quality even when the receiving end is a car or another mobile vehicle. Therefore, future growth is foreseeable not only for digital TV hardware for home use but also for mobile and handheld variants.

In the following chapter, I describe the trend toward the convergence of telecommunications and broadcasting.

CHAPTER 2

The Trend Toward Convergence

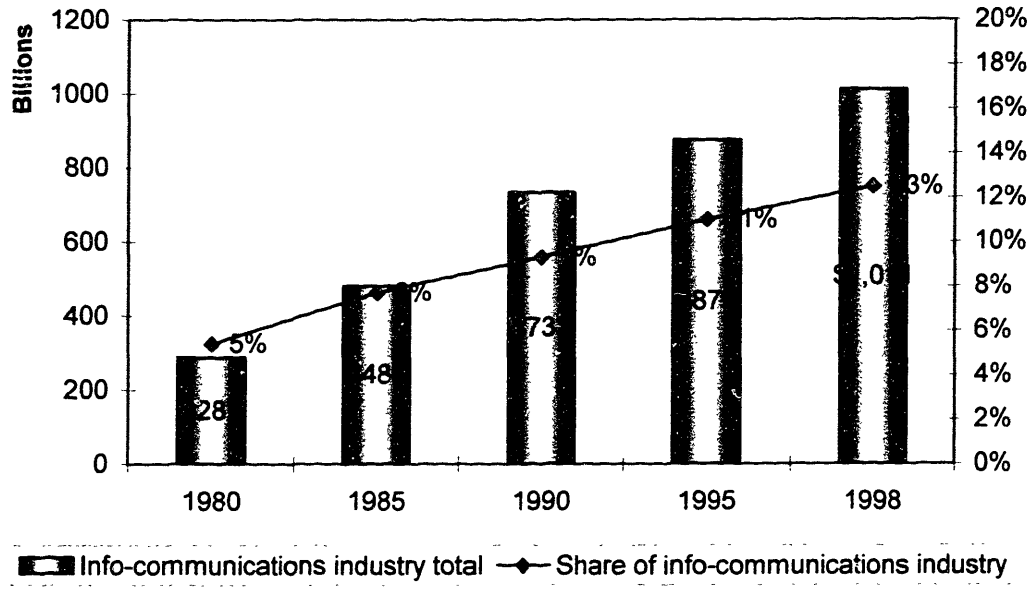
Convergence. It is a compelling "buzzword" for the Information Age, bringing to mind various combinations of the many different communications media that use digital signaling. Convergence has the potential for allowing effortless interactive communication among people and machines, where voice, text, and images are integrated and carried in an integrated digital infrastructure.

2.1 OVERVIEW OF TELECOMMUNICATIONS AND BROADCASTING

Many people expect that the information-communication (info-com) industry will be a lead industry in the 21st century. Using an inter-industry analysis, the Ministry of Post and Telecommunications (MPT)[1] estimated the real Gross Domestic Output of the info-com industry in Japan reached $1,011 billion in fiscal 1998, representing a 12.5% share of all Japanese industry (see Exhibit 2-1). Capital investment in facilities and equipment by the telecommunications and broadcasting has also shown huge growth since fiscal 1994, accompanied by active investment among mobile communications carriers (see Exhibit 2-2).

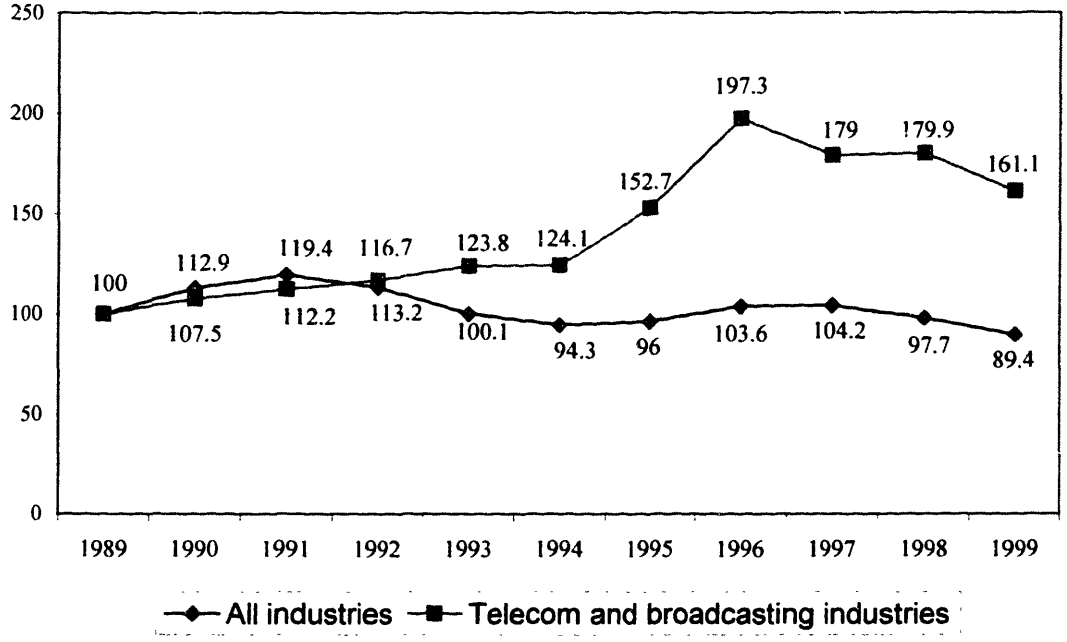
[1] MPT became part of a new Ministry of Public Management, Home Affairs, Post and Telecommunications on January 6, 2001. Although a number of ministries' names were changed pursuant to a restructuring of the [1] government, the previous name is used in this paper so as to be easily identifiable.

Exhibit 2-1 Gross National Domestic Output of the Info-communications industry



Source: MPT "Telecommunications white paper", 2000

Exhibit 2-2 Capital investment by the telecom and broadcasting industries, compared with all industries



Source: MPT "Telecommunications white paper", 2000

2.1.1 Overview of Telecommunications

The 1985 Telecommunications Business Law defined the state of competition in Japan's telecommunication sector. Prior to 1985, there were only two companies in the Japanese telecommunication market: NTT, with its monopoly on domestic services, and KDD, which provided international services. However, demand for more competition escalated in the early 1980s, following similar demands for liberalization and deregulation in other developed countries, as the United States moved to liberalize its market after the breakup of AT&T.

This first regulatory reform in 1985 resulted in the privatization of NTT and began to foster additional competition in the Japanese market. The reform authorized the entry of other carriers into the Type I and Type II telecommunication businesses. Type I telecommunications businesses provide telephone, telegraph, and other basic services as well as value-added network (VAN) services by establishing their own telecommunications circuits and facilities. Type II telecommunication businesses, as defined by the Law, provide telecommunications services by leasing telecommunications circuits and facilities from Type I carriers (see Exhibit 2-3). Examples include VAN services and communications circuit resellers.

The significance of this change in the telecom market was obviously the introduction of competition into Japan's long distance telecom market, although the monopoly of local service operation continued through NTT. New common carriers (NCCs) such as DDI, Japan Telecom, and Japan Teleway were able to enter the long distance market.

However, as NTT was the sole entity with the "last-mile connection" or "local-loop," which gives a direct wire connection to a home or an office, NCCs still had to rely on NTT's

Exhibit 2-3 Telecommunication Carriers

			Fiscal 1998	Fiscal 1999	Change
Type I telecommunication carriers	NTT		1	3	2
	KDD		1	1	0
	NTT DoCoMo Group		9	9	0
	NCCs	Long distance/International carriers	12	21	9
		Regional carriers	77	159	82
		Satellite carriers	6	5	-1
		Mobile carriers	73	151	-2
	Subtotal		179	249	71
Type II telecommunication carriers	Special Type II carriers (International carriers)		88(84)	101(96)	13(12)
	General Type II carriers		6,514	7,550	1,036
	Subtotal		6,602	7,651	1,049
Total			6,781	7,900	1,120

Source: MPT "Telecommunications white paper", 2000

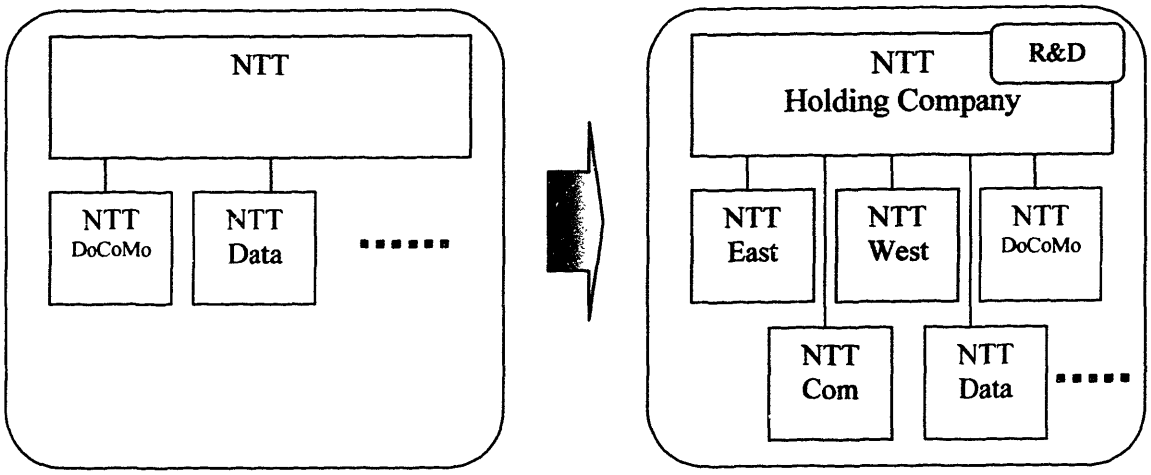
network infrastructure for their connection. The NCCs paid NTT every time they used NTT's network, which amounted to about one-third of the NCCs' total operating costs. MPT developed the open network policy to establish a fair competition environment for all carriers in 1995.

The second telecommunication regulatory reform went into effect in April 1997. The objective was to create more room for competition in the Japanese market and to promote further deregulation. The main effect of reform, however, seemed to be creation of the conditions needed for NTT to become a global competitor under the World Trade Organization system.

Thereafter, the Law Concerning Partial Revision of the NTT Law (the "Revision Law"), passed by the Diet in June 1997, officially determined NTT's corporate structure.

NTT would continue as a holding company, with service operations transferred to three wholly owned subsidiaries—two regional Companies (NTT East and NTT West) and one long distance and international service company (NTT Communications) (see Exhibit 2-4). At the same time, deregulation laid the foundation for far-reaching change in the area of market entry by foreign carriers and the elimination of barriers between market segments. Further, the Japanese government is now asking NTT to reduce the stock of NTT DoCoMo from its current 67% to 50% so as to produce a more effective management system.

Exhibit 2-4. Reorganization of NTT

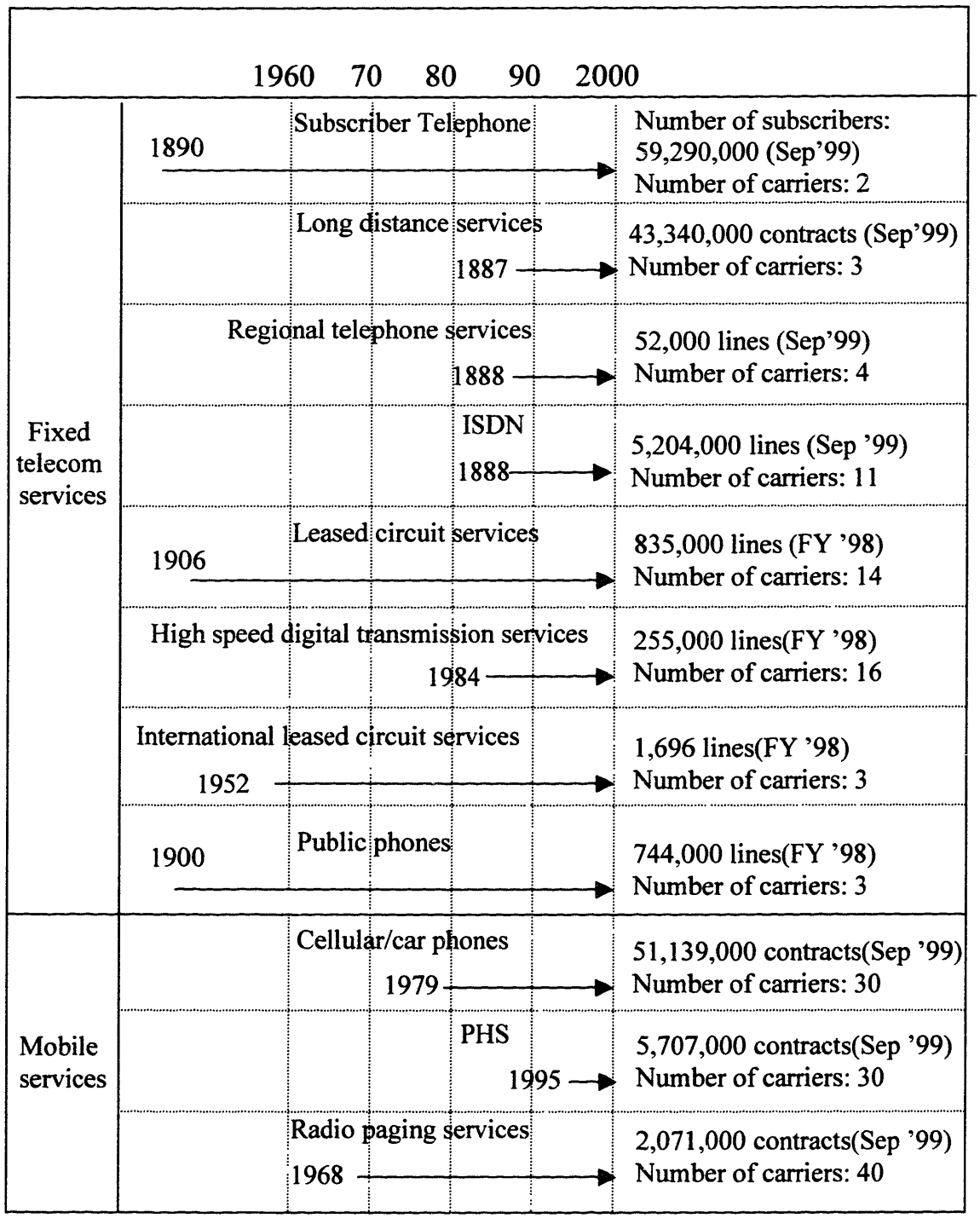


Source: NTT

Telecommunications services are shown in Exhibit 2-5. Regarding the current status of major telecommunications services, both the number of NTTs subscribers to subscriber telephone lines and the number of public pay telephones have decreased for the past three years (see Exhibit 2-6), partly due to a rapid increase in the number of ISDN and cellular phone subscribers.

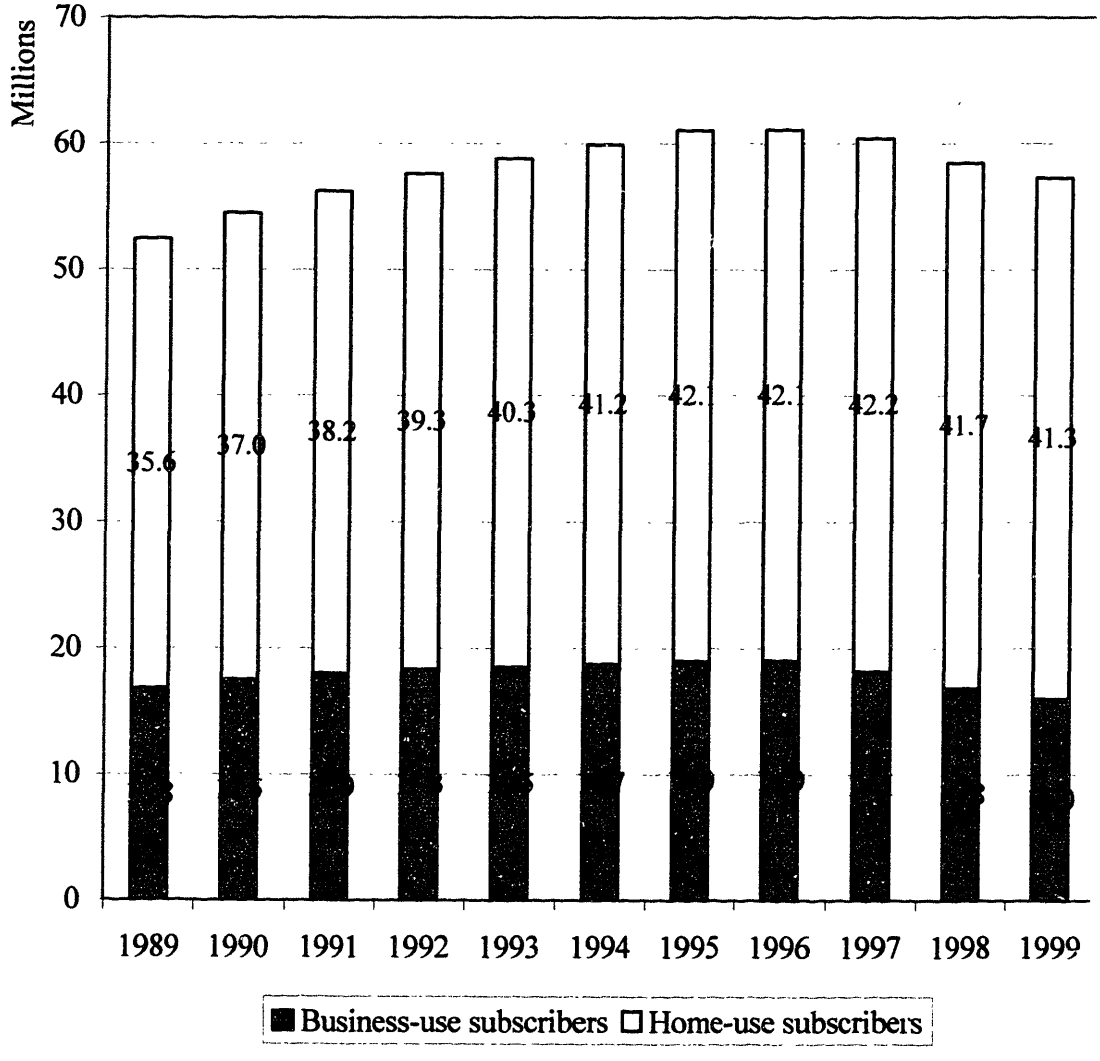
Thanks to deregulation, now corporations from different business categories can join in the telecom market; it is the approval of a type-I carrier license that allows construction of

Exhibit 2-5 Outline of major telecommunications services



Source: MPT "Telecommunications white paper", 2000

Exhibit 2-6 Trends in Number of NTT Telephone Subscribers

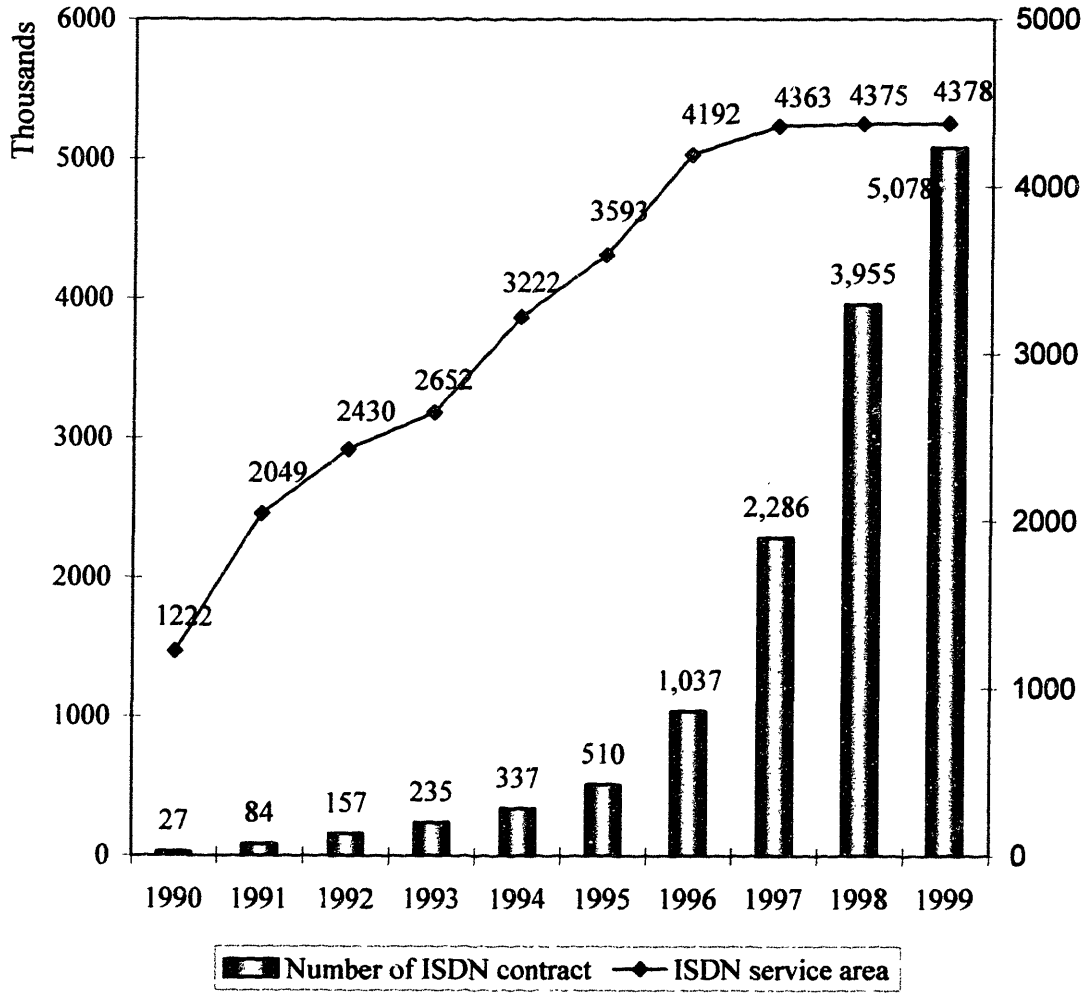


Source: NTT

telecom infrastructure. SpeedNet, a venture corporation led by Microsoft, Soft Bank, and Tokyo Electric Power Company (TEPCO), introduced fixed wireless service via Internet with a combination of ASDL and fiber optic cable for one flat rate of around $40. Tokyo Metallic Corporation is also now offering ADSL for $50. These newcomers from different business fields will surely be a huge threat to NTT.

The number of ISDN lines providing high-speed transmission of a large amount of data has been growing at an exponential rate due to the expansion of Inte.. ..e (see Exhibit 2-7). In the leased circuit business, demand has also shifted to lines with larger capacity.

Exhibit 2-7 Trends in Number of ISDN Contracts and Service Areas

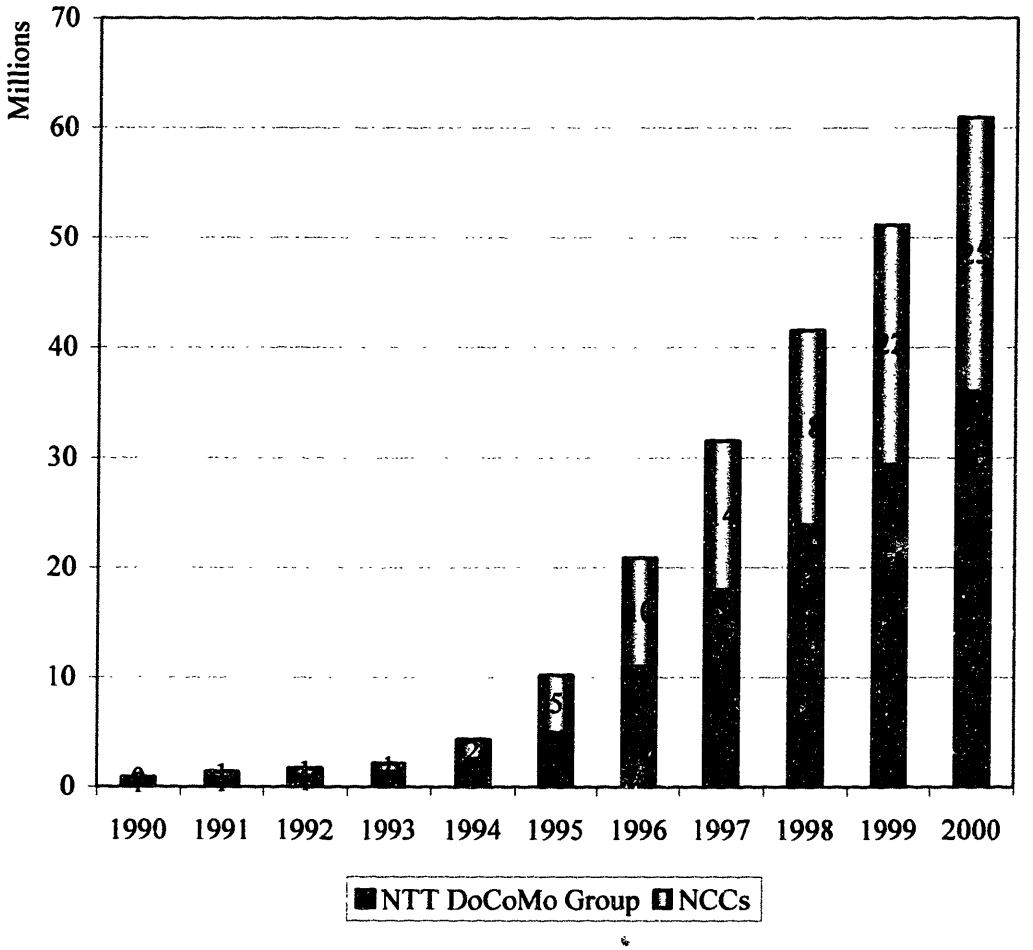


Source: MPT "Telecommunications white paper", 2000

The mobile phone market has also been quite impressive (see Exhibit 2-8). Although NTT's affiliate, NTT DoCoMo has been the leading player in the mobile phone market,

Japanese people have been enjoying fairly reasonable costs with the most advanced services, such as i-mode, and visual enabled PHS (Personal Handy-phone System, similar to the

Exhibit 2-8 Trends in Number of Cellular/Car Phone

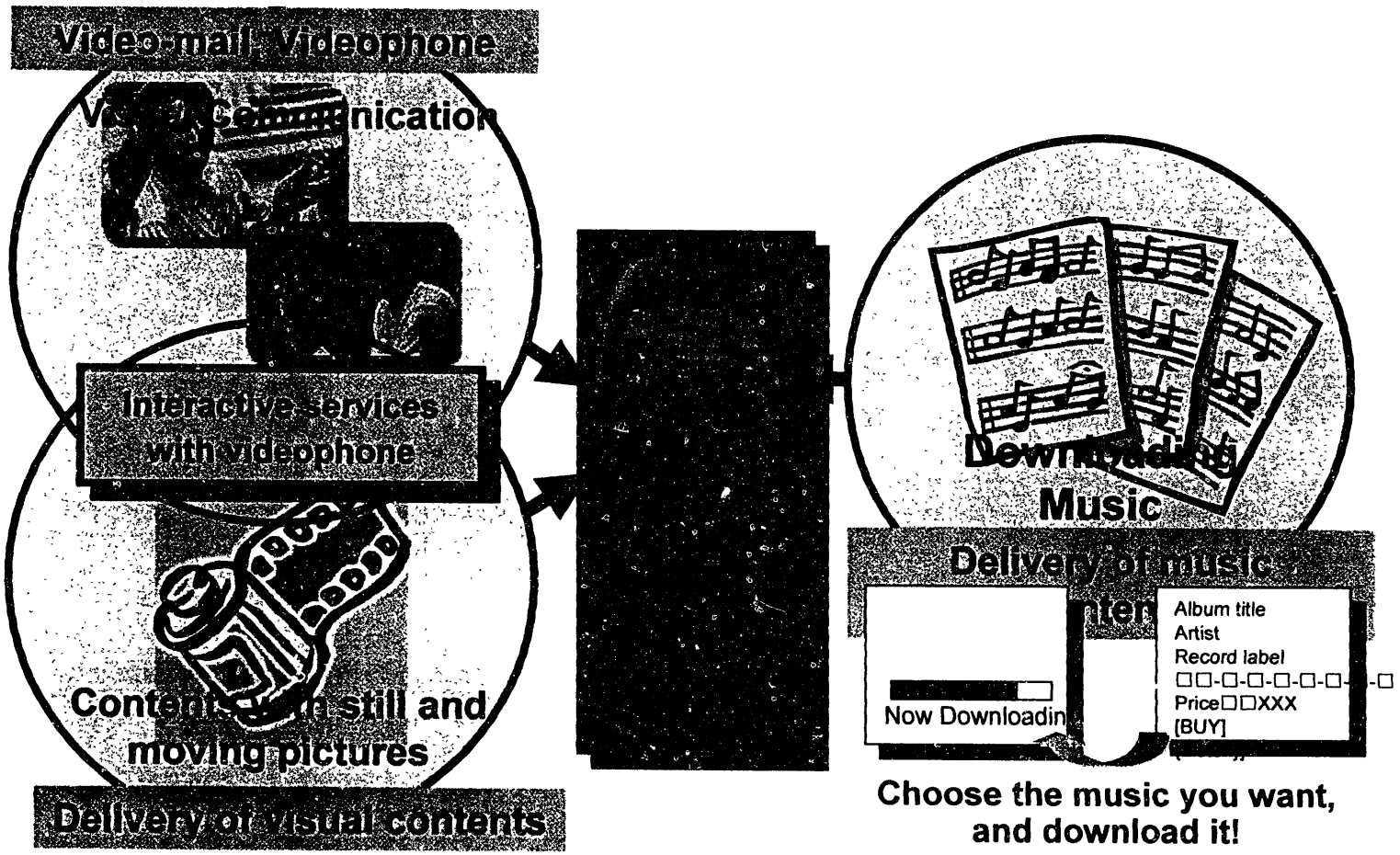


Source: TCA (Telecommunications carriers associations)

specification of Sprint's PCS). NTT DoCoMo will be the first in the world to introduce IMT-2000 service in May 2001, the so-called 3-G or W-CDMA technology, which transforms large files, voice, and pictures wirelessly without the annoyance of slow connection (see Exhibit 2-9). In fact, IMT-2000 will have a connection speed of 2mbps.

Exhibit 2-9-1 W-CDMA Services Envisaged

384kbps (max.) is planned to enable transmission of video/music



Source: NTT DoCoMo

Exhibit 2-9-2 IMT-2000 terminals NTT DoCoMo Plans to launch

Standard Terminal (Voice + Data communications)

- Audio quality on a par with or better than the fixed network systems
- Standardly equipped with a Web browser

Motion Picture Terminal (Visual Phone)

- Full-fledged support for image-oriented services (including motion pictures)
- Terminal integral with a built-in camera

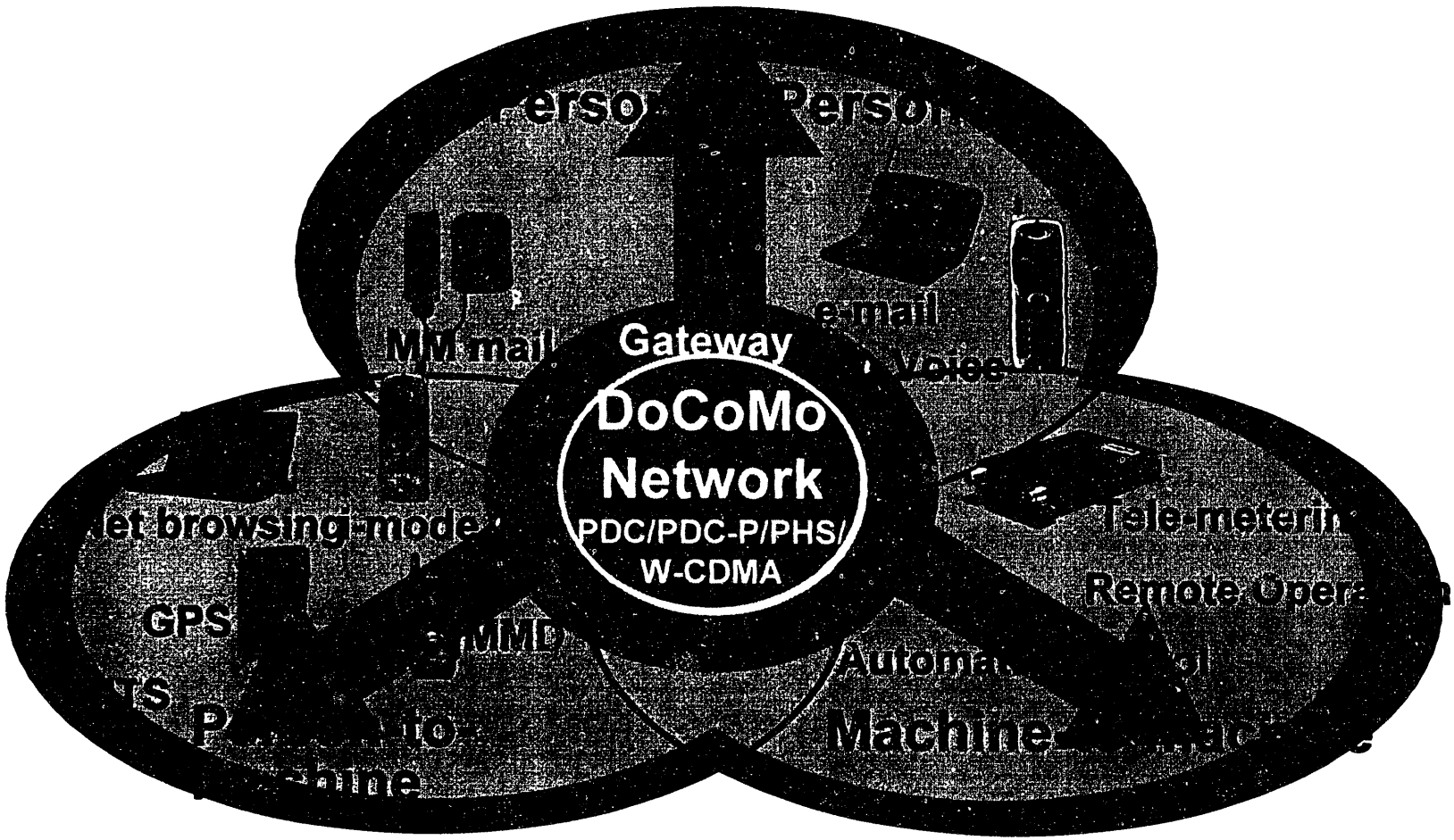
Data Communications Dedicated Terminal

- Terminal to allow incorporation into a PC and other devices
- Terminal to support corporate communications such as SOHO

Source: NTT DoCoMo

Exhibit 2-9-3 Growth of Mobile Multimedia

Three directions of growth:Person-to-person, person-to-machine, machine-to-machine



Source: NTT DoCoMo

Competition had heated up with the involvement of foreign carriers such as Concert, led by BT and AT&T, which acquired 30% of Japan Telecom, and by Vodafone Airtouch which also invested in Japan Telecom.

As a result, the mobile phone market has been reorganized into three groups: NTT DoCoMo, Japan Telecom (Vodafone Airtouch), and KDDI group (KDD, DDI, and IDO). In April 2000, the number of mobile phone subscribers for the first time exceeded those with fixed lines.

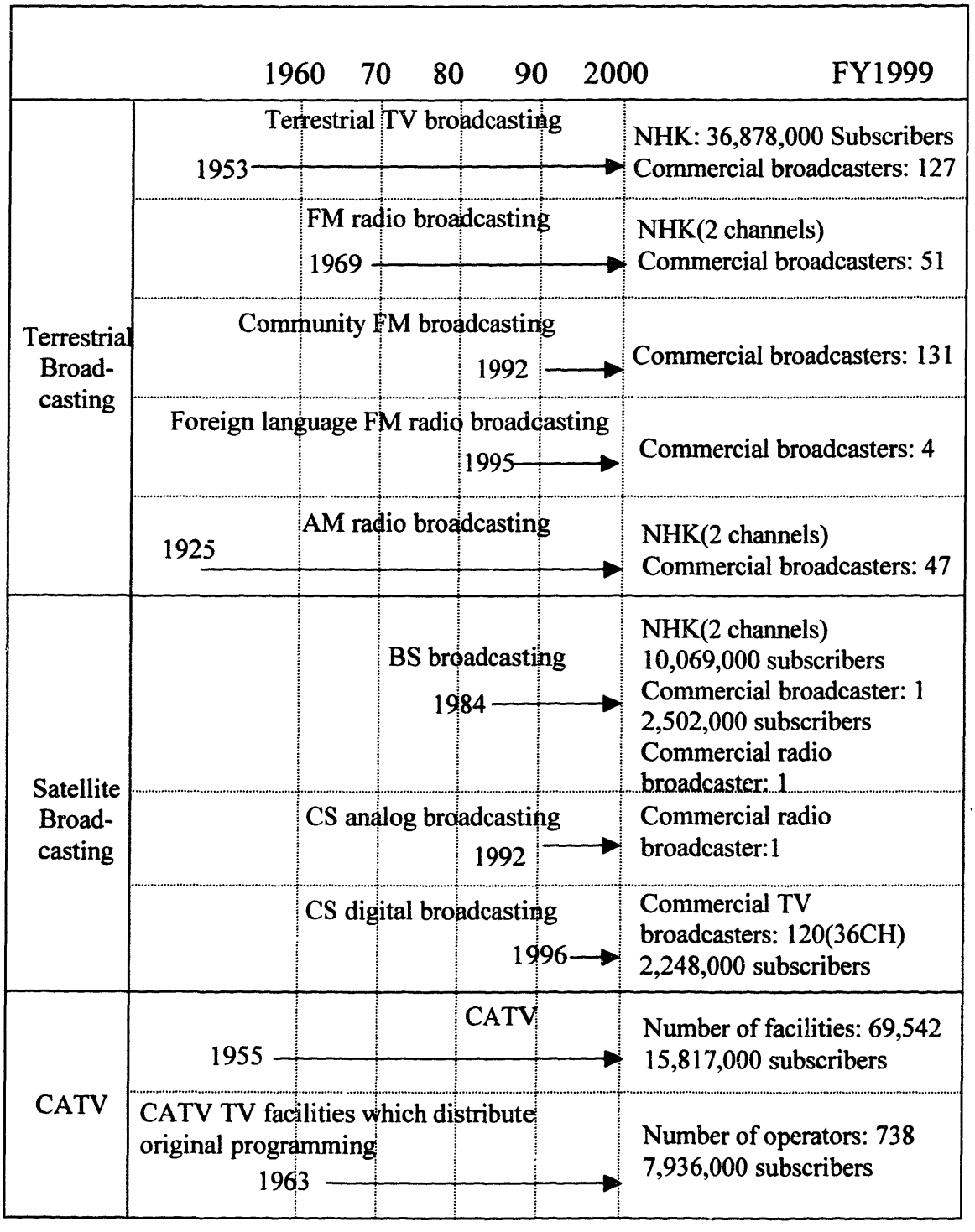
2.1.2 Overview of Broadcasting

TV broadcasting in Japan is divided into that using terrestrial waves, that using satellite waves, and CATV. TV broadcasting using satellite waves is divided further into that using the broadcasting satellite (BS) and that using the communication satellite (CS). The TV broadcasting using terrestrial waves is the mainstream of TV broadcasting in Japan (see Exhibit 2-10).

Terrestrial broadcasting

Terrestrial TV broadcasting in Japan began in 1953. The present coverage is 100%, and broadcasters include one public broadcaster (the Japan Broadcasting Corporation, or NHK) and several commercial broadcasters. NHK collects mandatory viewing fees from households that own TV sets, which is one source of funds for its wide activities. NHK operates a nationwide network with 2 MW radio, 1 FM radio, 2 VHF television, and 2 BS television channels. It also has a short wave overseas radio, Radio Japan.

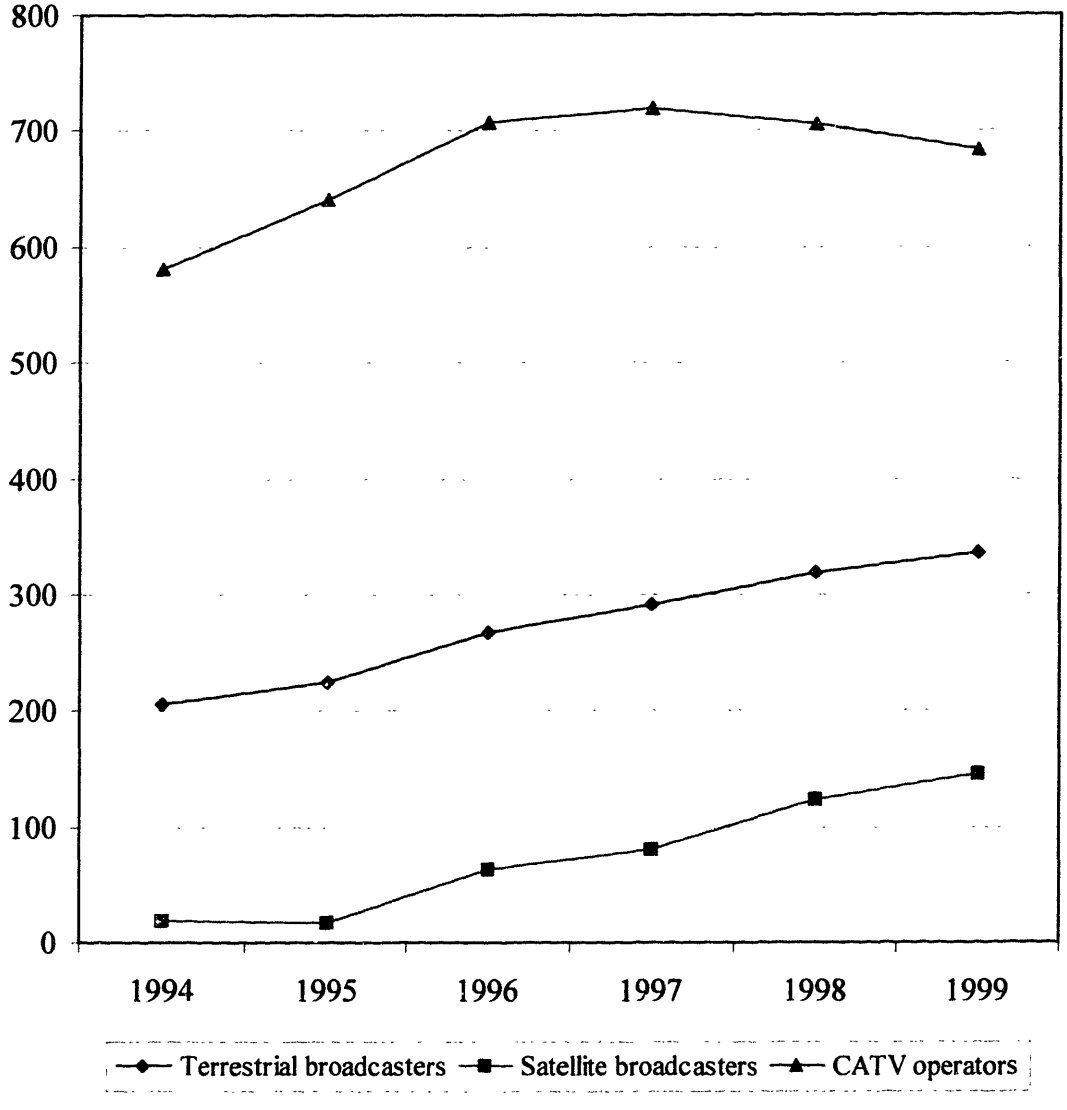
Exhibit 2-10 Outline of Broadcasting Media in Japan



Source: MPT "Telecommunications white paper", 2000

As of March 1999, there are 335 terrestrial broadcasters, 129 of which operate TV (see Exhibit 2-11). Local TV stations form tie-up networks with major companies in Tokyo, such as NTV (Nippon Television network), TBS (Tokyo Broadcasting System), Fuji-TV, TV-Asahi, and TV-Tokyo. Roughly 80% of programing comes from these dominant

Exhibit 2-11 Trends in the Number of Broadcasters



Source: MPT "Telecommunications white paper", 2000

stations. The commercial broadcasting companies rely on advertising revenue. Sponsors are very sensitive to audience ratings; hence TV stations tend to make junk programs that only aim for ratings.

Satellite Broadcasting

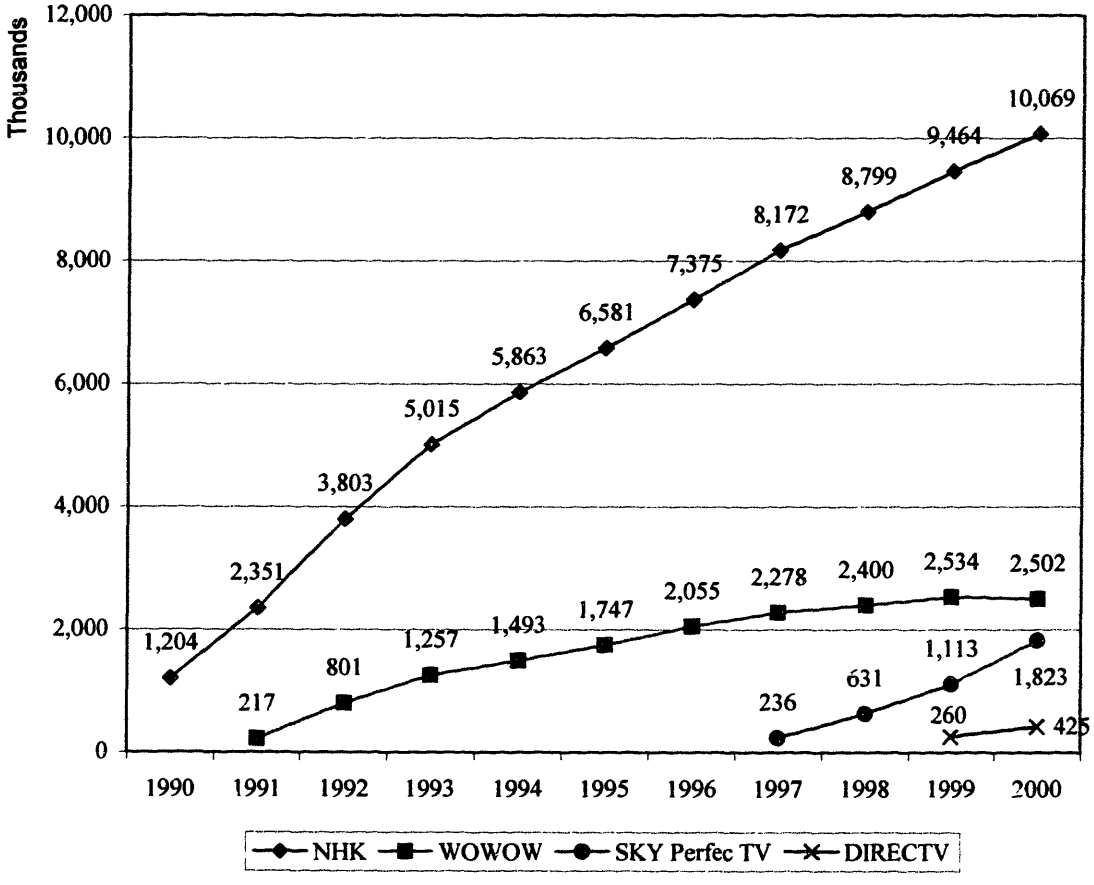
The development of media that uses satellites is making commercial headway. BS broadcasting by NHK was started, in June 1989, as regular BS broadcasting and was the first direct satellite broadcasting in the world. Two years later, in April 1991, pay TV broadcasting by WOWOW (Japan Satellite Broadcasting) was started.

BS broadcasting by NHK is based on a reception fee system, like its terrestrial broadcasting, but because scrambling is not applied, it can be received by anyone with an antenna and satellite broadcasting receiver. At present, the number of homes receiving these broadcasts is about 10 million as of March 2000 (see Exhibit 2-12). Within a very short time, it has grown to be the world's largest satellite broadcasting system.

On the other hand, WOWOW broadcasting is based exclusively on a pay system, and because scrambling is applied, a decoder is necessary for reception. The number of homes with contracts for WOWOW broadcasts was 2.5 million as of March 2000. WOWOW was the first pay broadcasting system in Japan.

At the beginning, the Broadcast Law expected commercials would be the principal source of revenue for commercial broadcasters and no further provisions were made. However, upon granting permission for commercial broadcasters to engage in satellite broadcasting, MPT decided to introduce a pay broadcasting system, and subsequently the Broadcast Law was revised.

Exhibit 2-12 Trends in the Number of Satellite Broadcasting Subscribers



Source: MPT "Telecommunications white paper", 2000

CS broadcasting in Japan began in 1992. Originally the communication satellite was launched with an aim of providing data communication for enterprises, but later, with the progress of technology, broadcasting with the CS became possible, and it began to be used for broadcasting. On June 30, 1996, the Japanese satellite JCSAT-3 aired the first experimental digital broadcasting. This was PerfecTV, the joint venture of four large

Japanese trading companies, which started commercial service in October 1996, providing 61 TV and 104 sound channels selection.

The U.S. DirecTV entered the Japanese market, and shortly Rupert Murdoch, who held a major stock position in TV Asahi, announced he would offer 100 channels, J Sky B, within two years. Thus, the Japanese people will soon be able to enjoy several hundred programs. Japan Digital Broadcasting Services and J Sky B merged in May 1998 with the new name of Japan Digital Broadcasting Services and the channel name of Sky PerfecTV. The number of CS receivers contracts totaled 2.3 million as of March 2000.

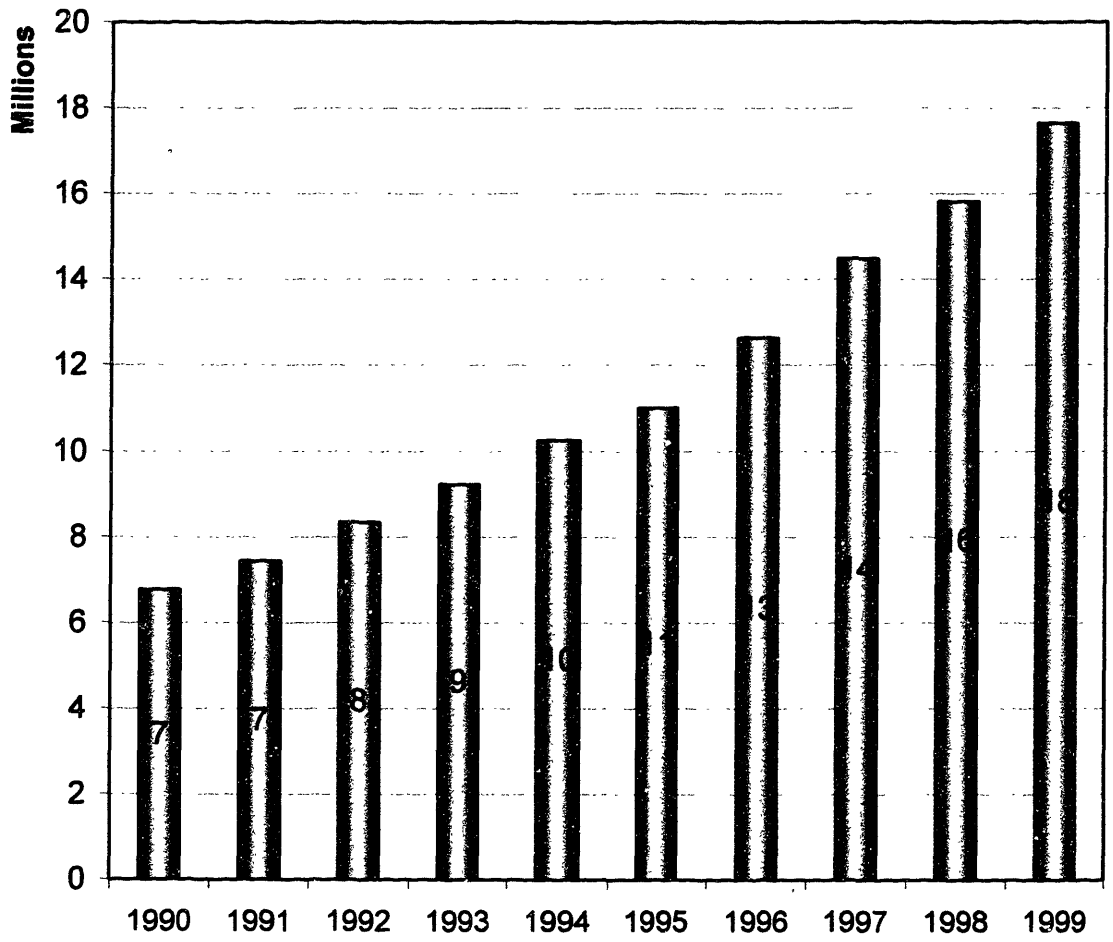
CATV

Until recently cable TV was used only in those areas where radio wave reception is poor, such as secluded mountain regions and outlying islands. However, urban cable TV, defined as having over 10,000 tap-offs, more than five independent channels, and two-way functions, is now becoming an important medium in metropolitan areas, offering a multitude of programs on numerous channels. Tokyo's first cable TV station began broadcasting in Spring 1987. As of March 2000, subscriber amounted to 17.6 million (see Exhibit 2-13).

HDTV

HDTV and Digital Hi-Vision TV, the Japanese version of high definition television, is being developed primarily by NHK. With roughly twice the scan lines of standard TVs, Hi-Vision TV has made possible high-resolution, high-detail images. Apart from broadcasting, it is attracting attention in the fields of arts, medicine, and education.

Exhibit 2-13 The Number of CATV subscribers



Source: MPT "Telecommunications white paper", 2000

Digitalization

Television broadcasting is also being influenced by the tide of digital technology (see Chapter 3 for more information). The standard so far has been analog technology, in which pictures and sound are transmitted on separate radio waves. But with digital technology, one radio wave can be compressed without loss of quality, which means four to seven channels can run on one conventional analog frequency band. Since Hi-Vision TV

uses analog technology (for encoding), its proponents are opposed to the introduction of digital technology.

2.2 THE TREND TOWARD CONVERGENCE OF THE TWO INDUSTRIES

In the past, broadcasting and telecommunications had separate purposes and separate roles so their paths never crossed. But today's evolving digital technologies and ongoing deregulation are beginning to erase the borders that once separated these two functions. Internet and telephone services that use cable television, and the distribution of content using telecom resources, are among the achievements wrought through the convergence of these two industries.

The primary function of broadcasting has always been to send information one way to many unspecified people; communication, on the other hand, transmits information between individual specified persons. These two modes clearly differ from one another in several aspects: 1) one-way versus two-way communication, 2) the coincidence and separation of software and hardware (since 1985), and 3) the open, public nature of one versus the private nature of the other.

However, with the progress of technology and entrepreneurial activities, these differences have gradually become obscure. Providers are actively working to meet changing user needs, make effective use of business resources, and exploit synergies among various business activities by developing activities that transcend the barriers between telecommunications and broadcasting (see Exhibit 2-14).

Exhibit 2-14 Cases of the Convergence of Telecommunications and Broadcasting

Category	Contents	Specific case
Convergence of Service	A combining of services called middle-ground services	Provision of streaming contents (the so-called Internet broadcasting)
		JP multicast distribution service using communication satellites
Convergence of Network	Joint use of a single switching route for both communications and broadcasting	CATV providers providing Internet access services and communications services
		Provision of broadcast service through communications satellites (CS broadcast)
		Telecommunications carrier provide CATV service to subscribers through fiber optic network
Convergence of Terminal	Use of a single terminal for communications and broadcasting	Internet terminal that uses the television

Source: Keidanren Website http://www.keidanren.or.jp/english/policy/2000/012/
Telecommunications Council "Info-Communications Vision for 21st Century", 2000

2.2.1 Convergence of Services

In the field of communication, multi-address calling, off-talk communication, and various other telephone services that are part of overall communication but are directed to many persons, have appeared. Recently, "broadcasting" via the Internet also has appeared.

These all have the basic characteristics of communication but no privacy characteristic about the information.

On the other hand, in the field of satellite broadcasting and CATV broadcasting, broadcasts for specific objectives have appeared, and hardware and software are separate. For example, Internet Protocol (IP) multicast services based on communications satellites and other infrastructure, delivery of information to specific individual users, such as the interactive programs that are now being considered for broadcasting satellite (BS) service. These services have the basic characteristics of broadcasting but furnish information to a limited audience. In the Interim Report submitted by the Advisory Board on the Convergence of Communications and Broadcasting toward the 21st Century to MPT in June 1995, communication was referred to as "communication with public characteristics" and broadcasting as "broadcasting with limiting characteristics".

2.2.2 Convergence of Networks

With continuing technical development and the growing use of wide area networks, the shared use of telecommunications and broadcasting networks is becoming increasingly common. Typical examples include the use of CATV networks for telephone and Internet connection services, the use of communications satellites for broadcasting purposes, and cable television services delivered via fiber optic telecommunications networks. In addition to making possible the provision of a wider variety of services, the shared use of networks also stimulates the entry of telecommunications operators and broadcasters into each other's territory, thus making the market that much more vital.

2.2.3 Convergence of Terminal Equipment

Today's terminals are also showing clear signs of the convergence of telecommunications and broadcasting in the form of multimedia PCs receiving BS digital broadcasting and TV receivers equipped with communications functions like Internet TV.

However, to date the MPT has addressed the progress of technology in communication and broadcasting in a "patchwork" manner with partial revisions of laws. In the future, a thorough review of the legal system will be necessary, including definitions for communication and broadcasting in the Digital Age. The fusion of TV and computer terminals, the co-ownership of transmission channels in broadcasting and communication and the content of broadcasting and communication will be even further advanced.

In the field of software, there will be strong need, on the one hand, to relax the application of program regulations in broadcasting and, on the other hand, to regulate the content of communication if such content is no longer private.

These changes represent real changes for the corporations that have dominated each industry. Thus, the questions are: how will they deal with the blurring of the boundaries of between their industries? What should their strategies be? The next chapter takes a more detailed look at the forces driving the convergence of the two industries.

CHAPTER 3

The Background of Convergence

3.1 GROWTH OF THE INTERNET

Thanks to rapid advances in digital signal processing (DSP) techniques, the technologies of computing and communications have effectively converged. The astonishing growth of the Internet—a global PC-based communications network—is by far the best example of convergence in multimedia telecommunications.

The Internet is a medium that has caused fundamental changes in the nature of communications, entertainment, and commerce. Businesses use it to communicate with suppliers, co-workers and customers. They sell, place orders, receive orders, provide customer service, and bid for products over the Internet. People commonly use the Internet to exchange electronic mail with family members, handle their banking, conduct online stock transactions, make travel reservations, shop, and conduct research. They also spend time on the Internet playing games and using entertainment services.

The Internet is a connection of multiple networks. The networks communicate with each other over a suite of standardized protocols, TCP/IP, which send data over the Internet broken up into "envelopes" of data called "packets". Internet traffic is sent at gigabit speed over lines connected by routers and switches. These high-speed lines are the backbone of the Internet. They carry Internet traffic, requests for information, entertainment, audio and video broadcasts, e-mail, and business-to business transactions.

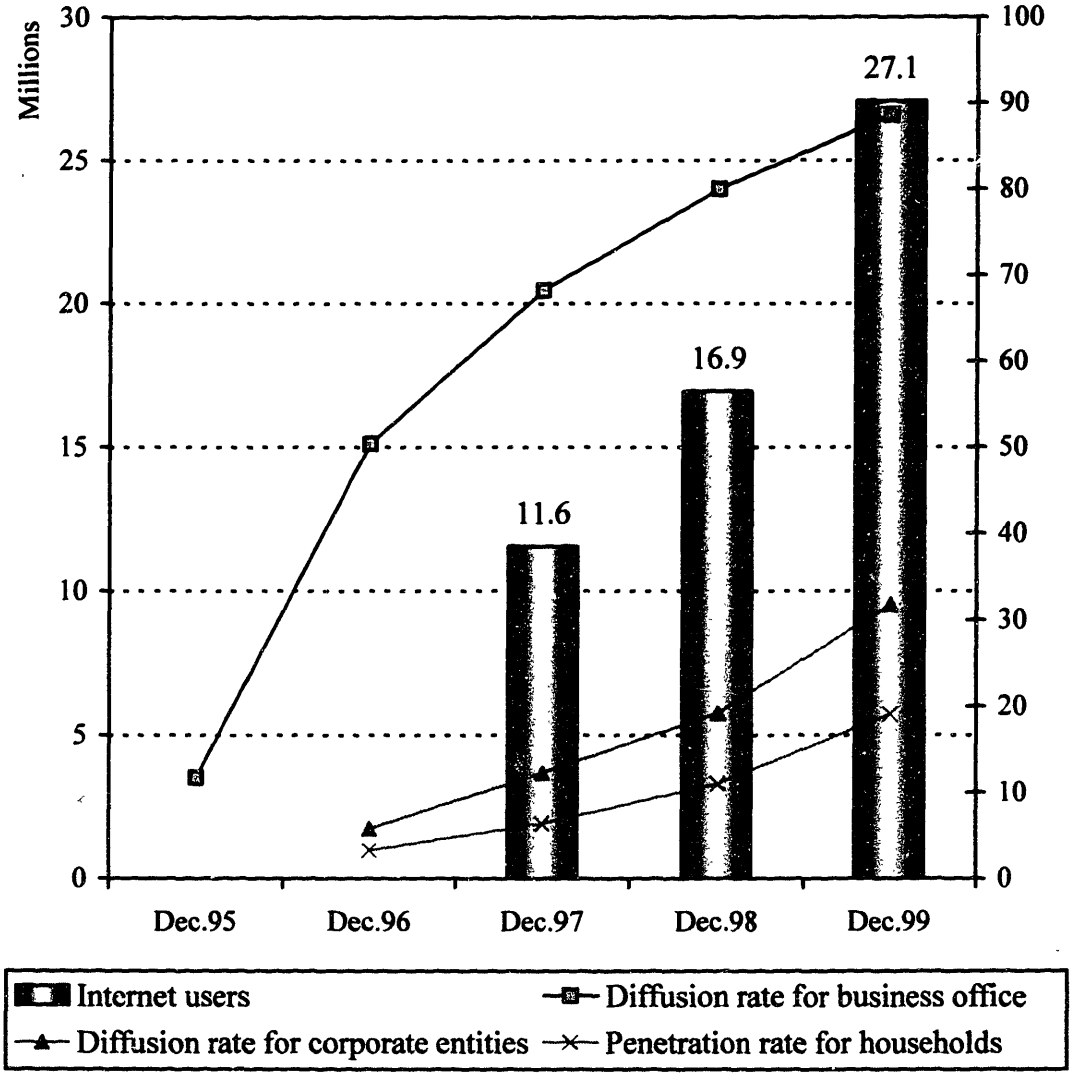
The World Wide Web is a way to link together documents such as home pages on distant computers. Regardless of the type of computer they use, people with browsers can connect to the Web. Through the use of a single common digital bit-stream to transmit audio, video, and text simultaneously, the Internet's Web is truly the archetypal multimedia telecommunications network of the future.

In fiscal 1999, it was estimated that there were some 27 million Internet users in Japan between the ages of 15 and 69. According to the MPT's "Telecommunications White Paper, 2000", the Internet penetration rate for households was 19.1% (a rise of 8.1 percentage points over the previous fiscal year). Included within this figure is the diffusion rate for business office at 31.8% (12.6 percentage points over the previous fiscal year) and for corporate entities at 88.6% (8.6 percentage points over the previous fiscal year). These figures thus indicate that the Internet is taking hold in several distinct facets of society (Exhibit 3-1). According to the White Paper, Internet users in Japan will reach 77 million in fiscal 2005.

More and more people, especially the young, are using portable telephones to access the Web, get information, and play games as part of their lifestyle. Many industries now include Internet marketing as an integral part of their corporate strategies. Seen from another perspective, the Internet creates a channel for direct access to consumers, for foreign companies as well as Japanese.

Accessing the Internet via mobile telephone has experienced major growth, as evidenced by the popularity of NTT DoCoMo's i-mode services, a data communication service for cellular phone users, and this has set the stage for a new mobile Internet revolution. With a special micro-browser built into the telephone, users can access the

Exhibit 3-1. Internet Population in Japan



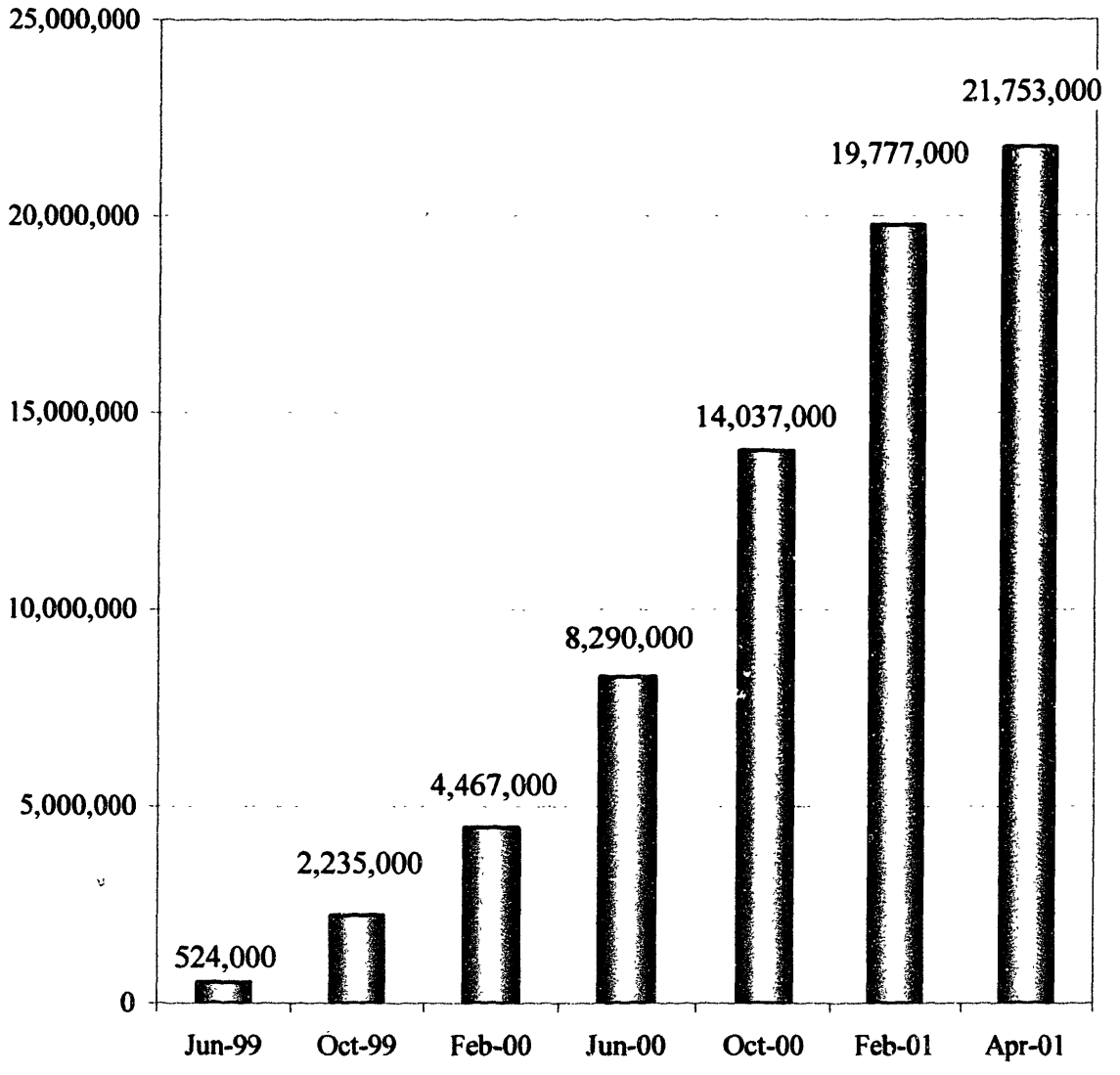
Source: MPT "Telecommunications white paper", 2000

Internet, send and receive e-mail, make ticket reservations and purchases, and perform some banking activities. The i-mode phone is considerably cheaper and easier to use than the computer platform.

The i-mode is considerably cheaper and easier to use than a computer, and according to a Jupiter Consumer Survey, Japanese users cite high cost barriers and difficulty understanding computers as the top two reasons for not buying a home PC. Subsequently, the rise of the i-mode will have a significant impact on overall online penetration in Japan, because many i-mode subscribers use the service as their primary form of Internet access. This differs from the U.S., where online penetration is overwhelmingly PC-driven and mobile services are a complementary mode of access.

Subscriptions to i-mode have grown at an unprecedented rate. NTT Mobile launched the service in February 1999 and signed up one million users during the first six months. As of March 2001, i-mode surpassed the twenty million subscribers mark (see Exhibit 3-2), and boasts a growth rate of more than 750,000 subscribers per month. While i-mode began by partnering with 67 companies that provide customized content, it now works with 242 companies. Now, more than 5,000 sites offer content specifically for i-mode phones.

Exhibit 3-2 The number of the i-mode subscriber



Source: NTT DoCoMo

3.2 ADVENT OF BROADBAND

In the context of telecommunications, the term "bandwidth" refers to the speed or frequency of a transmission or communications channel. The term "broadband" is used to describe a high-speed (or high-frequency) transmission signal or channel. It is the functional opposite of narrowband, which connotes relatively low speed. While large-scale telephone network trunk lines always operate at broadband speeds, local phone lines connecting households and small businesses to the trunk line network are limited to narrowband speeds. Cable television lines are already broadband connections, but they require costly specialized electronic equipment (e.g., modems) to allow them to transmit and receive two-way point-to-point signals the way telephone lines do (Egan 1996).

The bandwidth, or speed, of a subscriber's local telecommunications connection is very important in the multimedia business because it is the primary factor limiting the type and quality of telecommunication services that can be transmitted and received. The relevance for multimedia telecommunications is that while broadband communication channels can accommodate high-quality interactive multimedia services, narrowband channels may not.

The transmission speed of a broadband telecommunication channel is usually measured in megabits per second (Mbps), and it may be used for almost any type of service, potentially including video telephony. A low-speed narrowband channel, like the traditional basic telephone line, is usually measured in kilobits per second (Kbps), and it is used for traditional telephone service, low-speed data and image transmissions, or slow-scan video telephony. Compared to narrowband telecommunication channels, broadband channels

require sophisticated and expensive electronics and DSP equipment because high-speed signals increase the risk of transmission errors (see Exhibit 3-3).

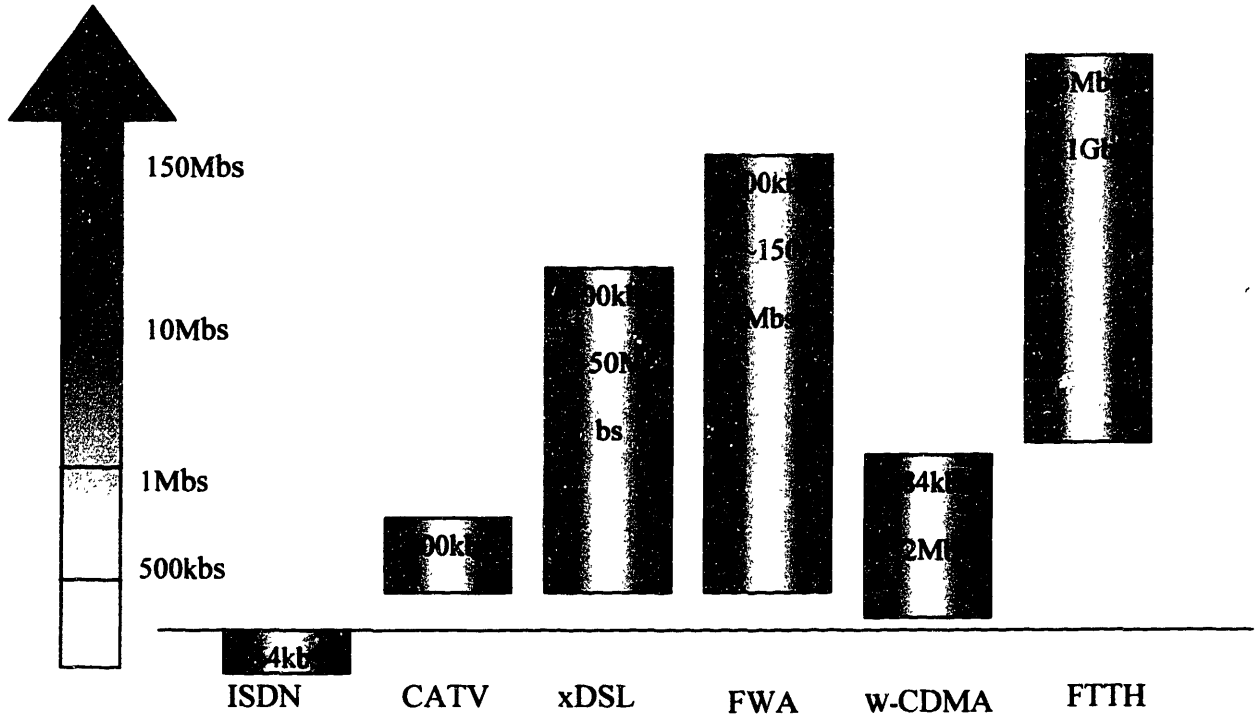
3.2.1 Cable Broadband

The cable industry architecture is in the middle of a transformation from closed cable systems that feature one-way delivery of analog television signals to two-way, interactive broadband systems that involve a hybrid of traditional coaxial and modem fiber optic technologies. These new networks enable the cable industry to deliver a wide range of services, including digital television, Internet access, and telephony.

Historically, cable networks were constructed to provide only traditional video programming services that required only one-way transmission of signals. Until recently, the traditional one-way cable system provided approximately 50 channels of analog video. But today, full coaxial systems are being replaced with hybrid systems consisting of fiber optic and coaxial lines. These cable networks are also referred to as hybrid fiber-coaxial or "HFC." The HFC architecture replaces the previous coaxial trunk with a fiber-optic "trunk." The fiber terminates at the node, where the signal is then carried over an upgraded high bandwidth coaxial cable to the customer premises. HFC networks require fewer amplifiers and offer improved reliability, increased capacity, and clearer signal transmission, all of which facilitate two-way transmission.

The replacement of coaxial cable with fiber-optic cable increases the system's capacity and reduces noise, providing cleaner transmission paths that are necessary for two-way interactivity, telephony, and other new services. The use of HFC enables cable operators to deliver applications at very high data rates. These new networks allow a cable

Exhibit 3-3-1 Comparison of Broadband Services



Source: Nikkei Communication 4.17.2000

Exhibit 3-3-2 Transfer Rate for A 10Mbyte File

Modem Speed / Type	Trandfer Time
28.8Kbps Telephone Modem	46 minutes
56Kbps Telephone Modem	24 minutes
128Kbps ISDN Modem	10 minutes
4Mbps Cable Modem	20 seconds
10Mbps Cable Modem	8 seconds

Source: http: www. cablemodems.com/whatis.html

operator to offer more than 100 analog video channels, hundreds of digital video channels, as well as provide capacity for Internet access, telephony and other services. With respect to Internet access, upgraded cable systems can carry data up to several 100 times faster than transmission using dial-up modems over ordinary telephone lines, and 100 times faster than ISDN (integrated services digital network) telephone lines (FCC, February 12, 2001).

3.2.2 Digital Subscriber Lines

Digital Subscriber Lines (DSL), sometimes referred to as xDSL because of the variety of DSL technologies and implementations, are the telecommunications carriers' version of broadband access. DSL is quickly emerging as an economical solution that can provide high-speed Internet access to end users, both residential and small to mid-sized businesses. With DSL, the average analog connection of 56.6 kbps can be upgraded to 1.5 Mbps or higher.

DSL technology upgrades the performance of the standard twisted pair (the copper line connecting most homes and businesses) to carry high-capacity data transmission. The technology expands the amount of frequency used over the copper line, whereby the line's higher frequencies are used to transmit the data and the lower frequencies are free to transmit voice or fax transmissions. Thus, DSL is able to function on a line simultaneously with standard voice and fax services and avoids the installation of a new separate line. Because the technology works over the existing telephone plant, DSL is significantly less expensive to deploy on a broad scale than other approaches, such as new fiber or cable construction.

Despite the promise of DSL to deliver broadband access to businesses and consumers, there are several technical issues standing in the way of widespread implementation of DSL. One of the primary inhibitors is signal attenuation, also known as the distance limitation. Attenuation describes the dissipation of signal strength as it travels over the copper line. DSL utilizes a higher frequency that is more susceptible to attenuation than ordinary voice transmission. Consequently, the various DSL technologies have distance limitations ranging from 4,000 to 18,000 feet from the telephone company's central office (see Exhibit 3-4).

Exhibit 3-4 DSL Technologies

Acronym	Full Name	Muximum Date Rate		Max.Distance(feet)
		Downstream	Upstream	
HDSL	High-data-rate DSL	1.5Mbps	1.5Mbps	12,000
SDSL	Symmetric DSL	768kbps	768kbps	10,000
VDSL	Very-high-data-rate DSL	51.8Mbps	2.3Mbps	4,000
ADSL	Asymmetric DSL	1.5-8Mbps	640kbps	18,000

Source: Lehman Brothers; Ferris Baler Watts Research

Although there are several versions of DSL service, there are two general categories, symmetrical and asymmetrical. Asymmetrical versions offer different data rates upstream and downstream and are ideal for residential users who receive a lot of data but do not originate or send much (e.g. Internet surfers). One such version is called asymmetric digital subscriber line (ADSL). As ADSL does not interfere with the basic voice service, the user can simultaneously browse the Internet or watch a movie while talking on the telephone.

3.2.3 Fixed Wireless

As with cable and telephone (collectively, "wire-line") companies, fixed wireless providers use their existing microwave networks to transmit high-speed Internet services. Unlike their wire-line competitors, fixed wireless providers enjoy a few competitive advantages. Because they avoid the high costs and delays associated with laying fiber or upgrading cable networks, fixed wireless companies can enter the market quickly and deliver broadband services at relatively low cost.

However, this technology also presents a number of deployment challenges, most notably, the line-of-sight requirements between the transmitter and receiving antenna. The presence of obstacles, such as foliage, buildings, and even heavy rain, can hinder reception.

3.2.4 W-CDMA

For radio interfaces, most countries have adopted CDMA (Code Division Multiple Access) as the base system; Japan has proposed W(Wideband)-CDMA, similar to the European one, to the International Telecommunication Union (ITU). Meanwhile, a similar

system has been proposed in the U.S., called cdma2000, which differs from W-CDMA in certain detailed parameters.

The first generation system was the analog cellular and car phone service; the second generation is digital cellular and car phone service. IMT-2000 represents the third generation of cellular and car phone service and will facilitate such new services as: 1) mobile computing; 2) car multimedia; 3) wireless Internet access; and 4) wireless access to corporate information systems.

Expectations for IMT-2000 differ somewhat among the U.S., Europe, and Japan. Japan expects the system will (1) expand the subscriber base for cellular and car phone services; 2) facilitate full-scale mobile multimedia communication; and 3) establish a global system. Europe expects it to be a continuation of the superior Global System for Mobile communications (GSM) developed there and as a facilitator of full-scale mobile multimedia communication. In the U.S., expectations focus on advancing Personal Communication Services (PCS), i.e., full-scale mobile multimedia communication. Accordingly, all three major countries share expectations that IMT-2000 will facilitate full-scale mobile multimedia communication (IngBarings, January 10, 2001).

In May 2001, NTT DoCoMo will launched a third-generation mobile communications system known as IMT-2000 (International Mobile Telecommunications) in Japan. With this service, the same telephone will provide high-speed, clear, mobile communications anywhere in the world. Comprised of land-based and wireless systems, IMT-2000 is expected to cover outdoor communication, car phone services, and public

phone services; it is not limited to mobile communications but will also include a fixed-line communication network.[1]

3.2.5 Fiber to the Home (FTTH)

Deployment of fiber in the access network has major significance for future high-speed broadband network needs. To date, NTT has worked to replace metallic feeder cables with optical fiber cables (up to the feeder point) using the Remote Terminal (RT) system. NTT reached the access network's opticalization rate of 20% in year 2000 with a goal of 100% by 2010 (see Exhibit 3-5).

A new-generation access network, FTTH (Fiber To The Home), has been developed which has become Japan's first priority for access network technology development, for several reasons. First, the coaxial cable infrastructure for CATV has not been available to date. This means that hybrid fiber-Coaxial (HFC) is less superior compared to FTTH because of investment costs. Second, it is very difficult to find an area for a remote FTTC (Fiber To The Curve) terminal system since the urban area is very dense and land prices extremely high.

Fiber-based networks have evolved in response to consumer demand for an array of multimedia services and applications. In order to meet this demand, service providers need a robust, broadband networking solution such as fiber technology, which offers unlimited bandwidth and the flexibility to meet customer demand for two-way, interactive, video-based services (Gematel, March 5, 2001).

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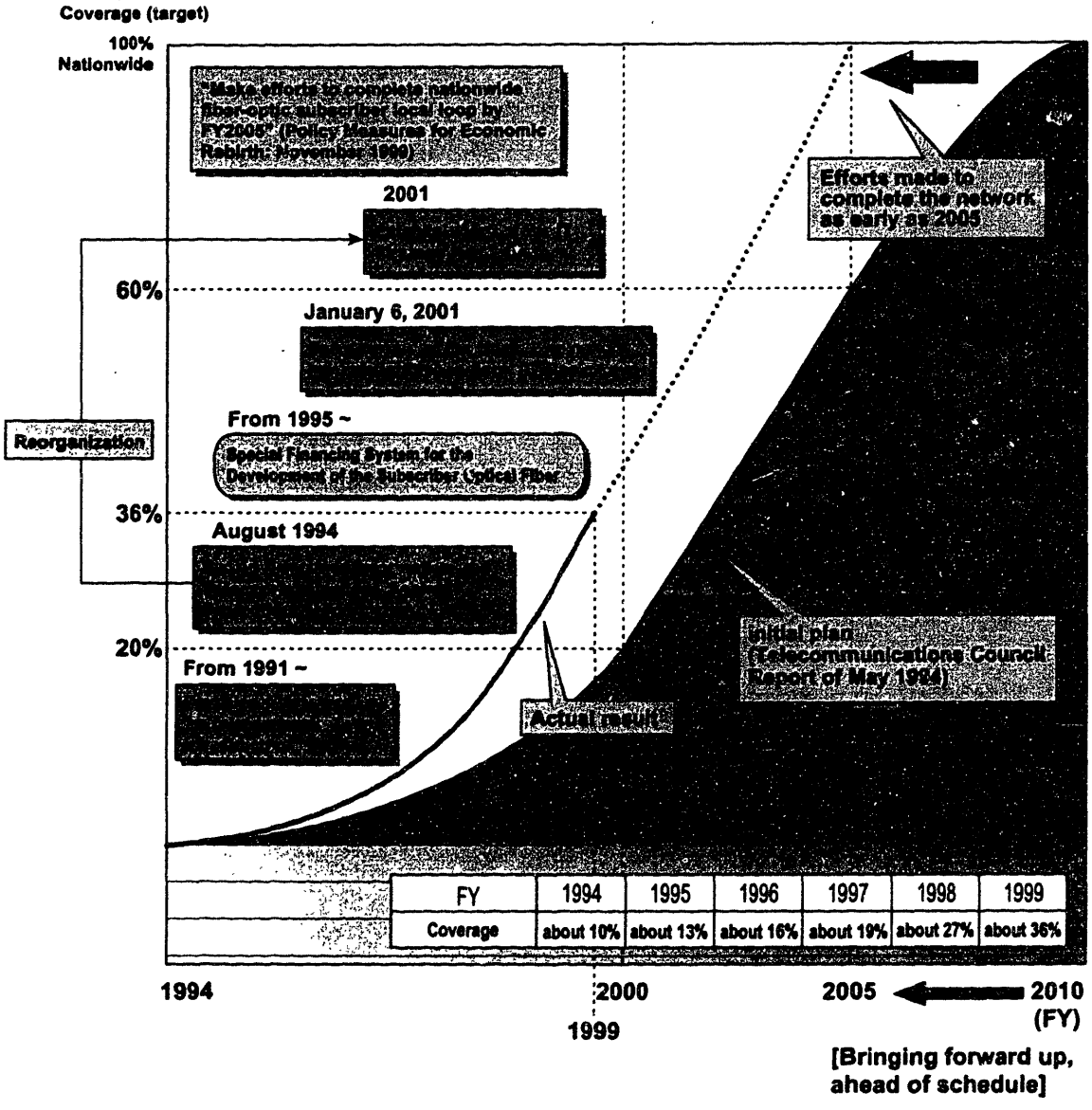
[1] Previously, it was called Future Public Land Mobile Telecommunication Systems (FPLMTS).

Exhibit 3-5 Schedule for Construction of Optical Subscriber Network



Source: MPT "Outline of Telecommunications Business in Japan", February 2000

FTTH enables service providers to offer a variety of communications and entertainment services, including carrier-class telephony, high-speed Internet access, broadcast cable television, direct broadcast satellite (DBS) television, and interactive, two-way video-based services. All of these services are provided over a passive optical distribution network via a single optical fiber to the home. In addition, an FTTH solution based on wavelength division multiplexing (WDM) allows for additional flexibility and adaptability to support future services.

All of these signals are then combined onto a single fiber using WDM techniques and transmitted to the end user via a passive optical splitter. The splitter is typically placed approximately 30,000 feet from the central office. The split ratio may range from 2 to 32 users and is done without using any active components in the network. The signal is then delivered another 3,000 feet to the home over a single fiber. An ideal FTTH system would have the ability to provide all of the services users are currently paying for, such as circuit-switched telephony, high-speed data, and broadcast video services.

At the home, the optical signal is converted into an electrical signal using an optical electrical converter (OEC). The OEC then splits the signal into the services required by the end user. Ideally, the OEC will have standard user interfaces so that special set-top boxes are not needed to provide service.

The full-service access network (FSAN) initiative, whose objective is to obtain cost-effective solutions to accelerate the introduction of broadband services into the public network, is also testing asynchronous transfer mode (ATM)–passive optical network (PON) technology for FTTH, which transports network services in ATM cells on a PON. This mode of transport provides key service features, such as multiple quality-of-service (QoS)

guarantees, which enables the successful transmission of integrated voice, video, and data services by prioritizing traffic. It also permits statistical multiplexing for burst traffic, such as Internet access and data transfers.

As a result, demand for fiber technologies such as FTTH is on the rise. Technology advancements in the area of WDM are expected to further refine and enhance the technology, enabling more service providers to justify the investment in FTTH (IEC, January 21,2001).

3.3 DIGITALIZATION OF TV BROADCASTING

Broadcasting digitalization results in multi-channeling, higher picture quality, and higher sound quality, and if there are up-links, two-way functions. Moreover, many household appliance manufacturers are developing digital TV receivers that have built-in home servers which allow recording and playing of many programs compared with existing VCRs.

In addition, significant economic effects can be expected from broadcasting digitalization. The audio/visual industry anticipates $400 billion demand for ten years just from broadcast satellite (BS) broadcast receivers as a result of BS broadcasting digitalization. The MPT's Advisory Committee on Digital Terrestrial Broadcasting prepared its final report in October 1998. It states that a $2 trillion effect is expected in the coming ten years from broadcasting devices, receivers, and new services such as data broadcasting, as a result of terrestrial broadcasting digitalization (NHK, January 21,2001).

3.3.1 Schedule for Digitalization of Broadcasting

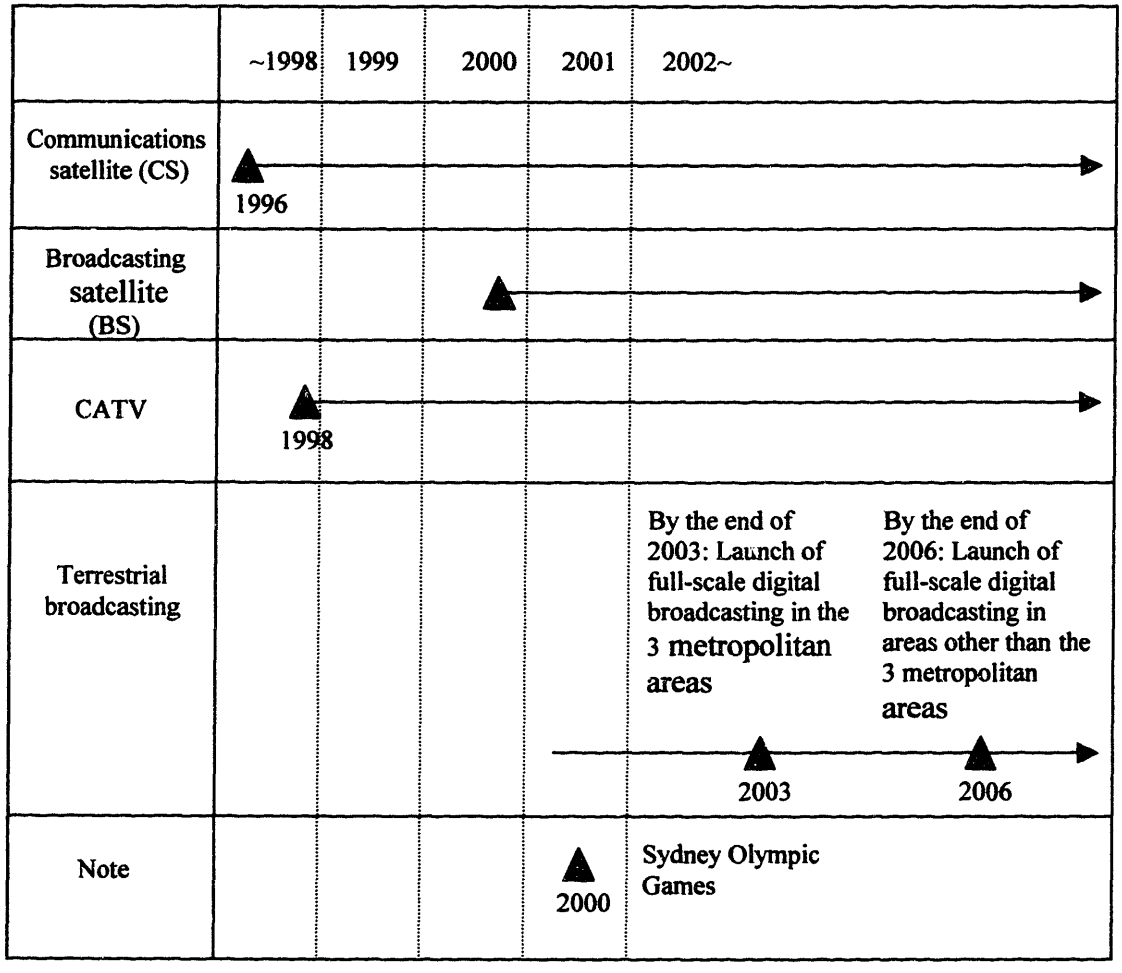
Broadcasting in Japan entered its first year of digitization in 1996 when CS broadcasting using a communication satellite (CS) was digitized. BS broadcasting using a broadcasting satellite (BS) was also digitized in 2000, and further, in 2003, digitization of terrestrial broadcasting will be started. And, in 2010, all broadcasting including CATV will be digitized completely, superseding the existing analog broadcasting. This year, Japan enters its second stage of broadcasting digitization, so to speak (see Exhibit 3-6).

3.3.2 Digitalization of Communication Satellite Broadcasting

As mentioned in chapter2, in October 1996, the Japan Digital Broadcasting Services started a regular service for communication satellite (CS) digital broadcasting through a channel called "PerfecTV"; in December 1997, DirecTV Japan Management started through a channel named "DirecTV". This was the beginning of the digital age of TV broadcasting in Japan. In addition, J Sky B, with the News Corporation at its center, began CS digital broadcasting in April 1998, but then merged with Japan Digital Broadcasting Services to become Japan Digital Broadcasting Services with the channel name "Sky PerfecTV".

The biggest attraction of digital CS broadcasting was its ability to offer viewers a choice of many channels. Although individual CS transponders were nominally able to handle only one analog-based TV broadcasting channel, the shift to digital signals immediately expanded their capacity from four to six channels. This breakthrough set the stage for several new broadcasting service providers who had not been able to gain a foothold in the market up to that point. Digital signals significantly widened the range of

Exhibit 3-6 Schedule for digitalization of broadcasting



Source: MPT "Telecommunications white paper", 1999

choice for viewers by providing access to a diversified array of specially broadcast programming (Sakura, January 22, 2001).

3.3.3 Digitalization of Broadcast Satellite Broadcasting

In the case of BS digital broadcasting, regular broadcasting began in December 2000 and data broadcasting was also offered. In December 1999, in addition to the eight stations that had already decided to take part in this broadcasting activity, the participation of eight more companies was approved by the MPT. These included the Hi-Vision Promotion Association organized by NHK and seven commercial broadcasters: Nippon MediArk funded by Jiji Press, Megaport Broadcasting funded by a group including the Mainichi Newspapers, and the publishing giant, Kadokawa Shoten—in other words, a large number of companies from outside the broadcasting industry.

BS data broadcasting includes (1) a storage-type service which permits access to data at any time, and (2) a two-way-type service which is combined with telephone circuits. NHK plans a service whereby dialing a postal code number will give the viewer access to news and weather forecasts from that particular region or area. Tokyo Broadcasting System's (TBS) affiliate plans a quiz program of viewer participation type. Kadokawa Shoten, which publishes program information magazines, is planning to broadcast electronic program guides. With data broadcasting, television will change from being passively viewed to being actively used.

3.3.4 Unification of BS and CS broadcasting systems

Unification of the present BS broadcasting and CS broadcasting systems is important for the growth of satellite broadcasting.

CS broadcasting was digitized earlier and has a total of 300 channels. However, differing from BS broadcasting, for which receivers are contained in TV or video sets, CS broadcasting requires dedicated receivers, and for this reason has not grown satisfactorily. The number of receiving contracts was still 2.3 million in total as of March 2000. On the other hand, because the number of homes receiving BS analog broadcasts is already 13 million, it seems that use of digital BS broadcasting receivers will spread fast. However, at present, reception of CS broadcasts and BS broadcasts requires separate antennas and receivers, and the cost of this has to be borne by viewers, a factor which works to prevent its spreading.

Under these circumstances, JSAT (Japan Communications Satellite) and SCC (the Satellite SUPERBIRD-B of Space Communications Corporation) decided jointly to launch a communication satellite, N-SAT-110 on the same east longitude, 110 degree, as the BS in October 2000. This is the first time that the BS and CS are to be in the same orbit, and if it is possible to transmit broadcasts with N-SAT-110, it will be possible to receive BS and CS broadcasts with the same antenna.

3.3.5 Digitalization of CATV

Japan's CATV was originally intended to improve poor broadcast reception. Later, however, with the progress made by multichannelling, CATV could also be used for retransmitting BS and CS broadcasts. The number of subscriber homes amounted to 17.6

million at the end of fiscal 1999, but 70% of these were subscribers to CATV for retransmitted programs (40% terrestrial broadcast viewers and 30% BS broadcast viewers).

Therefore, if digitalization of BS broadcasting and terrestrial broadcasting goes forward as a successor to CS broadcasting, the necessity for CATV digitalization will become even more paramount. Moreover, if CATV is digitalized, the speed of its data transmission will be 100 times faster than NTT's ISDN. This enables broadcasting of high picture quality and two-way service of higher grade.

However, Japan's CATV is behind in digitalization. It was only 1998 when Kagoshima Cable Television became the first to employ digital broadcasting. For this reason, the Telecommunications Council of the MPT, in May 2000, submitted a report entitled "Policy on Development of Cable Television and Its Future Image". This report set out a CATV digitalization plan for the first time. It stated targets for CATV advancement: (1) to completely replace the CATV trunk line networks with optical fiber by the end of 2005, and (2) to complete digitalization by 2010.

It is estimated that the investment required for CATV digitalization will require about $10 million per company. The MPT is of the opinion that individual companies cannot bear such a cost alone. Therefore, the Telecommunications Council's report points out that favorable tax treatment for investment in digitalization should be considered, and that it is desirable to widen areas of business operation through mergers or by business cooperation between broadcasters. The MPT started a "Discussion Group on Advanced Level Cable TV" in September 1999 to begin investigating measures that would reduce the burden of investment in CATV digitalization.

Given these circumstances, Jupiter Telecom, Japan's largest CATV system operator (MSO), plans to digitalize all 22 affiliated CATV stations in the country by the fall of 2001. This will increase the number of subscribers to BS digital broadcasting. This movement is definitely favored by broadcasters who desire the early and speedy spread of BS digital broadcasting.

3.3.6 Problems with Broadcasting Digitalization

The largest problem is cost. Key broadcasting stations expect to spend about $100 million each on equipment investment for BS broadcasting digitalization. However, each broadcasting station will be required only to carry out digitalization of its equipment and then wait for the spread of digital receivers.

Terrestrial broadcasting digitalization, on the other hand, involves digitalizing not only production and transmission systems but also the system as a whole, including 15,000 relay stations distributed all over the country.

Further, some of the present channels used for analog broadcasting will have to be allocated to digital broadcasting which will require channel allocation changes, called "analog-analog conversion", among the channels used for analog broadcasting, and it is said that this cost the entire industry $10 billion.

Moreover, CATV digitalization requires the installation of optical fiber cable to each home, and also (like the case of BS broadcasting and terrestrial broadcasting) replacement of the transmission-reception equipment. This is expected to cost each company about $10 million. However, as mentioned, many CATV broadcasters are small-scale operations, and the MPT believes it will be difficult for each broadcaster to carry out digitalization alone.

The Ministry is investigating the possibility of special depreciation allowances for investment in digitalization equipment, or to promote mergers or business cooperation between broadcasters. Thus, it is expected that broadcasting digitalization should offer considerable momentum that will encourage the broadcasting industry's restructuring (NHK, January 21,2001).

3.3.7 Overseas Trends in The Digitalization of Broadcasting

Digitization of ground broadcast is considered in every country in the world (see Exhibit 3-7), and digitization of all broadcast media — ground digital television broadcast is already started — serves as the current in the world in the U.K., the U.S. The outline of the digital terrestrial broadcasting in the U.S, the UK is as follows.

Exhibit 3-7 Schedule for Digitalized Broadcasting in Foreign Countries

	Terrestrial Digital Broadcasting	Satellite Broadcasting	Cable TV
U.S.	Launched in 1998	Launched in 1994	Launched in 1997
U.K.	Launched in 1998	Launched in 1998	Launched in 1999
Germany		Launched in 1996	Launched in 1997
France		Launched in 1996	
Sweden	Launched in 1999	Launched in 1997	Launched in 1997
Korea	Scheduled for launch in 2001	Launched in 1996	
Australia	Scheduled for launch in 2001	Launched in 1995	

Source: MPT "Telecommunications white paper", 1999

United States

Digital terrestrial broadcasting was launched by 42 stations in 22 metropolitan areas in November 1998. Originally, the service was to begin in all ten of the country's biggest metropolitan areas; however, Chicago failed to launch the services because it could not secure the land needed for a transmission tower. On the other hand, services were launched in 13 additional metropolitan areas where the start date had originally been scheduled for later than 1999.

Digital broadcasting which includes high definition television (HDTV) program are carried by 117 the broadcasting station of United States 44 city now at the end of January 2000. Since FCC (Federal Communications Commission) imposed a duty of terrestrial digital broadcasting by the big four networks by November 1999 in main 30 cities, the rate of a population cover is over 60% by the end of 1999.

The feature of U.S. terrestrial digital broadcasting is the adoption of HDTV format, then, the main networks of ABC, CBS, and NBC are broadcasting HDTV program, and also PBS, which is public broadcasting company is broadcasting HDTV program. In addition, ABC and NBC have started the electronic commerce (EC) service, which harnessed the feature of digital broadcasting, and the both-directions service, which cooperated with the Internet.

Although Television sets that can receive HDTV programs retailed as expensive as $7,000 or more at the beginning of terrestrial digital-broadcasting start, it is gradually becoming cheaper. Still such high prices are considered to be a significant obstacle to the dense penetration of digital terrestrial TV broadcasting in the U.S.

According to an announcement by the US Consumer Electronics Manufacturer Association (CEMA), the selling number of the digital-broadcasting television in the U.S. has become 134,402 sets in the total by 1999 ends of the year. It aims at the analog broadcasting abolition in 2006 in the U.S.

United Kingdom

On September 23, 1998, the BBC launched the world's first digital terrestrial broadcasting. BBC started the multi-channel broadcast service by the standard television (SDTV) program as it is considering implementation of the both-directions service using the Internet etc. taking advantage of the feature of digital broadcasting.

The frequency for digital terrestrial broadcasting is assigned with the priority to BBC, which is public broadcasting, the existing analog broadcasting entrepreneur's TV3 and S4C, the channel 4, and the channel 5.

Moreover, the frequency for digital broadcasting is also assigned to ON digital, which is a new commercial-broadcasting entrepreneur, and the charge and multi-channel broadcast service were started from November 1998. Since BSkyB which had already carried out the digital satellite broadcasting of the charge and many channels announced gratis distribution of a set top box required for reception in May 1999, ON digital which sold the set top box by £199 also performed gratis distribution of a set top box against BskyB. It led intense subscriber acquisition competition. Thereby, ON digital lengthens the number of members favorably, and the present subscription number has become 552,000 at the beginning of 2000. ON digital is offering multi-channel broadcast service by

SDTV program of 16 or more channels, connects it to a telephone circuit from a set top box, and the both-directions service which performs electronic commerce etc. has also appeared.

Usually, digital television sets are marketed prior to launch of such broadcasting services. However, in the U.K. digital television sets were put onto the market only after November 1998. Until then, these programs could not be seen at an ordinary home.

These sets are selling at about £400-500 more than ordinary sets. Their prices are lower than similar sets in the U.S., since they do not need to be equipped to receive high-definition television (HDTV) programs, which are not at present aired in the U.K.

70% or more of the household can receive the digital terrestrial broadcasting now, and The U.K. aims to shift to digital broadcasting by 2010 from 2006.

3.4 DEREGULATION IN JAPAN

With economic growth in Japan currently stagnant, hopes are being pinned on deregulation as a new driving force for encouraging growth. The government of Japan has initiated a series of measures aimed at promoting deregulation in various sectors of the economy with the goal of simplifying administrative work, contributing to international harmony by promoting imports, and expanding domestic demand, thereby offering consumers a diverse range of choices (Embassy, January 26, 2001).

3.4.1 Regulatory Environment

The telecommunications and broadcasting industries in Japan are regulated by the Ministry of Post and Telecommunications (MPT) through a number of laws;

telecommunications is governed by the Telecommunications Business Law and the NTT Law. The Broadcast Law regulates the broadcasting industry as well as the Cable Television Broadcast Law and the Radio Law. In addition to these laws, the so-called "administrative guidance" procedure also plays a very important role in these industries.

3.4.2 Deregulation in Telecommunications

As I mentioned in chapter2, when the Telecommunications Business Law went into effect in April 1985, it authorized the entry of other carriers into the Type I and II telecommunications businesses, and competition was introduced into the telecommunications sector. Nevertheless, foreign capital investment in Japanese telecommunications businesses was limited to less than 20% in both NTT and KDD, and to less than 33% in the case of other Type I telecommunications businesses.

In February 1997, agreement was reached in World Trade Organization (WTO) negotiations to liberalize basic telecommunications services. To comply with the provisions of that agreement, in June 1997 the Japanese government amended the Telecommunications Business Law by revoking restrictions on foreign ownership of Type I telecommunications business, effective February 1998. This opened the door for foreign telecommunications carriers to enter the market and invest in Japanese telecom enterprises (see Exhibit 3-8). U.S.-based WorldCom Inc. and British Telecom moved quickly to acquire permission to invest in Type I telecommunications businesses. WorldCom also deployed a fiber optic network in the business districts of central Tokyo.

Exhibit 3-8 Current status of Foreign Investment in Telecommunications Carriers
(Type I, as of Jan 2001)

Carrier	Major foreign investors
Cable & Wireless IDC	Cable & Wireless plc (C&W), etc.
TITUS Communication Corp.	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
J-COM Kansai Co., Ltd.	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
KDDI Winster Corp.	Winster Communications, Ltd.
KVH Telecom Co., Ltd	Asia Telecom Group, Ltd.
Hutchison Corporate Access Pte Ltd.	Hutchison Telecommunication Ltd.
PanAmSat International Systems, Inc.	Hughes Electronics
MCI WorldCom Japan,Ltd.	MCI WorldCom,Inc.
Metromedia Fiber Network Japan K.K.	Metromedia Fiber Network Services, Inc.
Global One Communications Network, Inc.	Global One Communications World Holding B.V.
Global Access Ltd.	Asia Global Crossing, Ltd.
Primous Japan, Co., Ltd.	Primous Telecommunication Group, Inc.
K.K. Teleglobe Japan	Teleglobe Communications Corp.
RSL COM Services Japan K.K.	RSL COM Asia Pascific Ltd.
SingTel Japan, Co., Ltd.	Singapore Telecommunications Ltd.
Telstra Japan K.K.	Telstra Singapore Pte Ltd
PSI Networks Japan Inc.	PSINet Inc.
IXnetTelecommunication Japan K.K.	Ixnet Inc.
Japan Backhaul Co., Ltd.	Metromedia Fiber Network, Inc.
Level 3 Communications K.K,	Level 3 International Inc.
EGN B.V	Equant Finance B.V.
Deutsche Telekom Japan K.K.	DeutscheTelekom AG
Sony Corp.	Moxley & Co., State Street Bank and Trust Company, etc.
FLAG Telecom Japan Limited	FLAG Telecom Ireland Limited
New Century Global Net Corp.	NCG Holdings L.P.
Genulty Japan K.K.	Genuity Inc.
Asia Global Crossing Japan	Asia Global Crossing Limited
World Exchange	World Exchange Communications
Cable and Wireless HKT Pacific Japan	C&W HKT
Dacom Japan	Dacom Corporation
Circle Asia	Circle International Communications Inc.
Ster Telecom Japan K.K.	Ster Telecommunications Inc. Japan K.K.
J-COM Kitakyushu Co., Ltd.	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
J-COM Shonan Co., Ltd.	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
J-COM Sapporo Co., Ltd.	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
Kisarazu Cable TV	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
Jupiter Gunma	Liberty Japan, Inc., Liberty Jupiter, Inc., Microsoft Holding Inc.
GTE Far East (Service) Ltd.	VerizonHawaii International

Source: MPT "Outline of Telecommunications Business in Japan", February 2000

In May 1998, the KDD Law was repealed, leaving NTT as the only remaining carrier subject to foreign ownership restrictions. NTT itself was reorganized in July 1999, touching off a wave of consolidation among both Japanese and foreign-affiliated carriers.

3.4.3 Deregulation in Broadcasting

The broadcasting industry has a significant social impact as a key mass medium that supports free speech and free expression. This has been the premise in the past for restrictions imposed by the Radio Law and the Broadcast Law on entry into the field and on rate setting.

Nevertheless, stunning advances in info-telecommunications and broadcast technology have brought global multi-channel satellite broadcasting, the enormous transmission capabilities of CATV, and the diverse and sophisticated services of digital broadcasting. These advances are altering the very definition of broadcasting. MPT abolished local operator requirement (a franchise system restricting service areas) for CATV operators. With this revision, Multiple System Operators (MSOs) started launching their businesses.

March 1998 saw the relaxation of regulations on the concentration of mass media ownership. These regulations had prohibited private ownership or control of two or more broadcast stations, in the name of freedom of expression, by preventing mass media dominance. In June 1999, all restrictions on foreign ownership of CATV broadcasters were abolished.

These deregulation measures are likely to produce still greater changes in broadcasting in Japan.

3.4.4 Deregulation in the Cross-industry Diversification

MPT's policy is directed by its approach toward the broadcasting and telecommunications business; in its view, the convergence of the industries can no longer be avoided.

Permission for CATV Carriers to Participate in Telecommunications

Due to revisions that allowed CATV carriers to provide telecommunication services in 1986, there were 84 carriers providing these services as of January 2000. Subscribers receive dedicated Internet access and special services, water meter reading, home security etc. In the current legal system, there are no restrictions on telecommunications carriers participating in broadcasting or on broadcast companies participating in telecommunications — except on NTT.

Legal Amendment to Separate CS Broadcasting and Programming

In broadcasting, a system of licensing was being used that enforced unified administration and operation of broadcast stations by requiring that hardware (licensing) and software (broadcast programming) be unified. However, to make it easier to enter the broadcast industry without needing to invest in satellites, and thus to create a variety of broadcast programming, the Broadcast Law was revised in June 1989 to allow the separation of licensing and programming in CS broadcasting. With this revision, CS digital broadcasting of Sky-perfect TV and Direct TV began, and as of the end of December 1999

there were a large number and variety of television programs provided on 295 channels with approximately 1.93 million customers.

Utilization of FTTH for CATV

In June 1998, telecommunication carriers were permitted to utilize the optical fiber networks of subscriber lines for CATV transmission lines. With this revision CATV carriers were not only able to construct and own their own facilities, but also became able to quickly and smoothly construct a CATV network using FTTH. As of January 2000, there are three CATV carriers using FTTH.

All these changes pose real challenges, for corporations. Strategies are changing and the next chapter looks at how strategies are evolving.

CHAPTER 4

The Changing Industrial Structure:

From Vertical Integration to Horizontal Stratification

Digital technology and deregulation have put strong pressure on the conventional structure on both telecommunications and broadcasting to move from vertical integration to horizontal stratification.

4.1 THE INDUSTRY STRUCTURE OF TELECOMMUNICATIONS

4.1.1 Regulatory Reform

When the Telecommunications Business Law went into effect in April 1985, it authorized the entry of other carriers into the Type I and II telecommunications businesses. Operators are classified into two categories according to whether or not they provide services through their own facilities.

The core of Japanese telecommunication regulation has been the selection of market competitors and the management of aspects of their competition. The conditions of entry or exit of firms from the market, as well as services and fees, had to be approved through MPT permission, authorization, registration, or notification, depending on the type of business.

Changes in the pattern of competition in the telecommunication services market began with special emphasis on multimedia services related to the Internet.

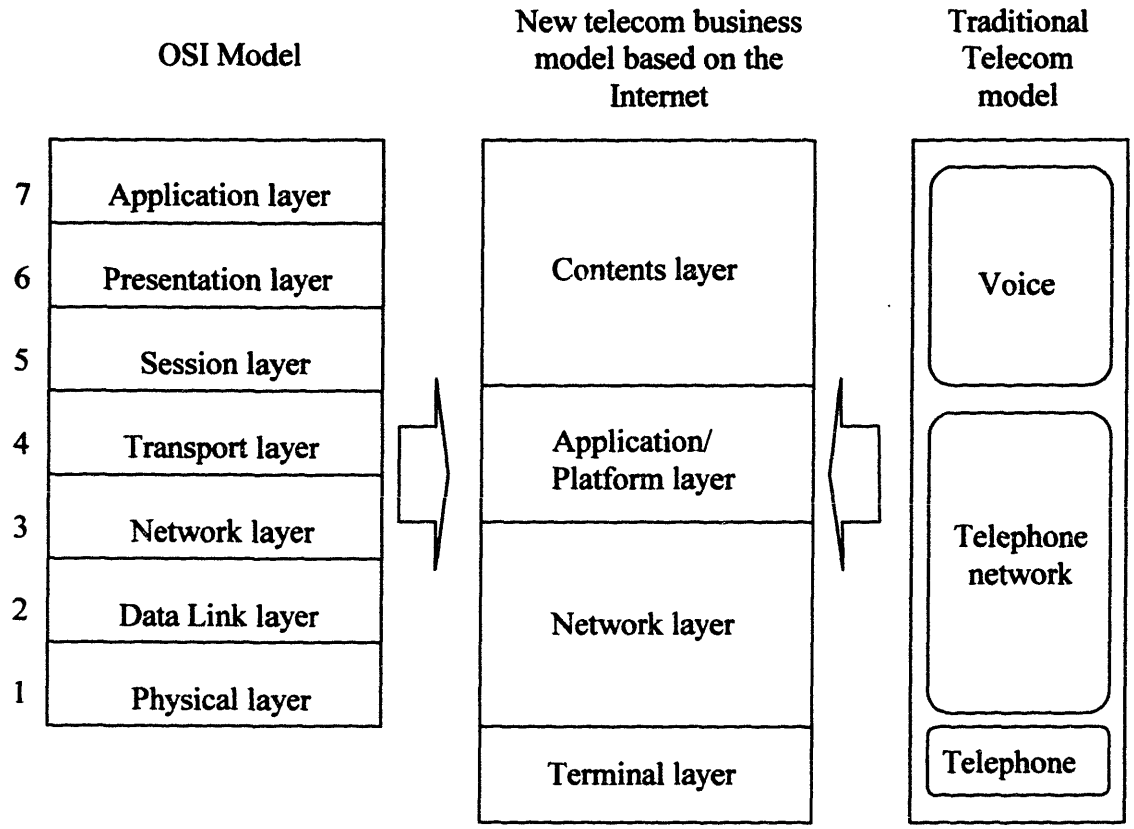
4.1.2 Internet

The Internet first appeared as ARPANET, an experimental wide-area network to interconnect many kinds of computers in universities and research institutes participating in ARPA (Advanced Research Projects Agency) and funded by the U.S. Department of Defense. ARPANET was designed as a distributed network with no headquarters in order to survive if any part was destroyed by nuclear war. It is a packet-switching network that switches data packets of TCP/IP (Transmission Control Protocol/Internet Protocol) by routers locally without any central supervision. This decentralized architecture is contrary to the circuit switching of telephone systems, where telephone exchanges control traffic and secure reliability centrally by connecting the circuit end to end. This architecture makes telephone systems so large and expensive that they were operated by state-owned companies.

In contrast, the Internet does not control traffic or guarantee quality of service but only makes "best efforts" locally. The IP corresponds to the function in layers 3 and 4 of the Open System Interconnection (OSI) model, open architecture, which is comprised of seven layers.[1] These functions are addressing, error control, and access to the network. As transport is conducted by software, content is separated from infrastructure (see Exhibit 4-1). The IP suite of protocols provides a uniform way for multiple devices to speak to each other from anywhere in the world. This layered structure allowed rapid innovation in technologies and services in the upper layer without permission from the telephone

[1] Open System Interconnection (OSI) was developed to allow devices from multiple vendors to communicate with each other. It is an open architecture. It laid the foundation for the concept of open communications among multiple manufacturers' devices. The basic concept of OSI is that of layering: Groups of functions are broken up into seven layers which can be changed and developed without having to change any other layer. Both LANs and the Internet are based on concepts developed by the OSI for a layered architecture.

Exhibit 4-1 New telecom business model based on the Internet



Source: Ikeda, Nobuo. "Architectural changes in the information and communication industries"

companies. In order to connect various kinds of computers, data on the Internet do not communicate directly but are encapsulated into standard IP packets by senders and decapsulated by receivers.

This architectural change in the technology has had a remarkable impact on organizations in the info-communication industry. As the Internet unbundled applications from facilities, most software developers in Silicon Valley outsourced their back-office staff and physical facilities, thus requiring only a few hundred employees. Since their

organizations are modularized, they can reorganize through mergers and acquisitions without causing significant difficulties (Ikeda, 1999).

4.2 THE INDUSTRY STRUCTURE OF BROADCASTING

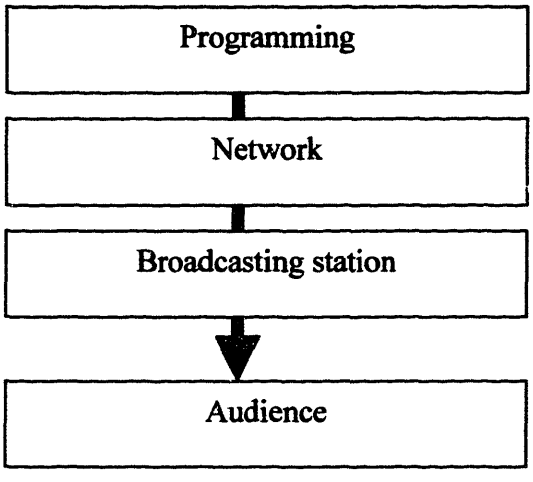
The industrial structure of the broadcasting sector, in contrast to the telecommunications sector, has been significantly changed thanks to technology and deregulation. In the conventional system of broadcasting in Japan, it was the basic rule that the broadcaster who was licensed to operate as a broadcasting station also produced programs. This coincidence between hardware and software in the broadcasting business changed for the first time with the introduction of a new system in which facilities supplied broadcasters and programs also supplied broadcasters.

4.2.1 Conventional Structure

A broadcasting industry can be divided into three layers: the programming section; a network section, and a broadcasting station section. Each section has a different market structure (see Exhibit 4-2).

Programming. During the industry's growth phase, although some of the programming came through internal specialization in the station itself, other programming was subcontracted or program packages were purchased—especially with the progress of image reproduction technology and the appearance of many programming companies. However, there are no public regulations governing the establishment of such programming companies; anyone can enter or exit the market freely.

Exhibit 4-2 Industry Structure of Broadcasting



Source: International Communications Economics Laboratory, 1999.

Network. The second section is the network section whose role is to take the supplied program is packaged and transmitted to each broadcasting station. Although NHK (Nippon Housou Kyokai), the Japanese public broadcaster, carries out the inner packaging of this function, a private broadcaster must not conclude any arrangement relating to the supply of broadcast programs which includes any terms where broadcast programs to be supplied exclusively by a particular person only. (Sec. 3 of the Art. 52 of Broadcasting Law). However, in reality, the main Tokyo office supplies programs to the local station. Again, there is no public regulations regarding entry into or exit from this market.

Broadcasting station. The last section is the broadcasting station (radio station). Entry into and exit out of this market are highly restricted because broadcasting stations are assigned to every region based on the frequency use plan for broadcast.

In the traditional broadcasting industry, the only income was from advertising, broadcast for free. As in many countries, individual station formed networks to gain a

critical mass of viewers to "sell" to advertisers—a form of vertical integration (the network or lead station then also vertically integrated into programming). (Suyaga, 1999).

4.2.3 Evolution of the Media

Although broadcast services in some form have been around since the beginning of the 20th century, they have evolved from radio, to black and white television, to color television, and the media itself appears in many formats. Broadcasting is technically one form of radio communications, or the "transmission of radio communications aiming for many and unspecified direct reception."

While problems with viewing and listening in Japan were resolved by broadcasting companies that installed relay stations at their own expense, in the U.S. CATV achieved a similar resolution. In the West, CATV as commercial business appeared in areas where gaps in electric waves exists. Thereafter, CATV formed many channels which evolved into the present CATV.

On the other hand, in Japan, since difficult viewing and listening areas was not a problem, the demand for CATV service was small, and the number of large profit-making businesses was also restricted. In Japan, a satellite system appeared subsequent to the concept of CATV. Although satellite broadcasting was introduced purposes of resolving problems with viewing and listening, the NHK satellite appeared as a multi-channel service, although at the beginning it had only four channels.

As a new type of media, CATV and broadcast satellite appeared through the development of technical innovations; thereafter many channels developed and the concept of a platform appeared. Although land-based broadcast channels could offer a maximum of

ten per area, cable TV could offer 50-60 channels, and today a broadcast satellite offers 100 or more channels. An entrepreneur who sells one of these channel services is called a "platform entrepreneur".

Since terrestrial broadcasting, which uses income from advertising as its primary source of income, had been offered as a free broadcast, a pricing mechanism that paid-per-service broadcasts would not work in that market. However, all the new media that has appeared since terrestrial can charge for their broadcasts, users can select by program content or price, and the content has become independent as one enterprise field.

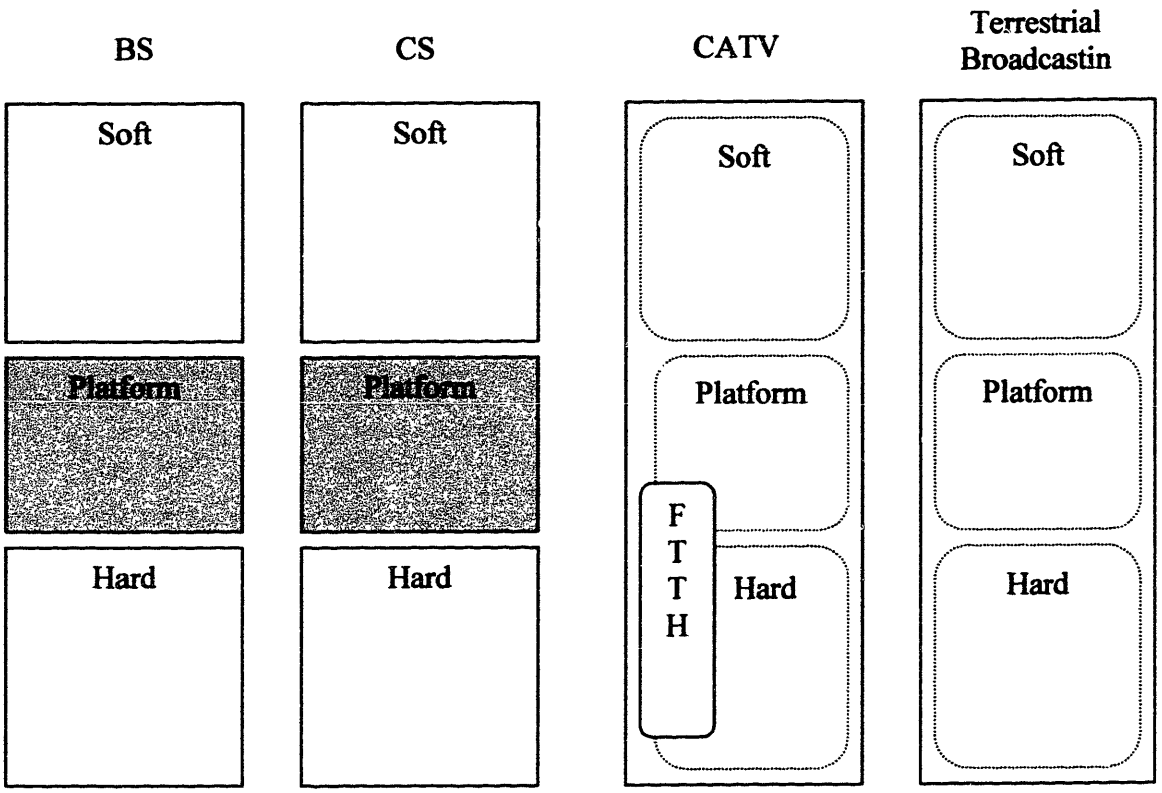
This change corresponded to changes in the broadcast environment itself, especially changes in the hard and soft separation which significantly impacted the industrial structure. In 1989, in order to make broadcasting services possible via communication satellite, the Broadcast Law and the Radio Law were revised, and a system was established in which broadcasters are divided between facilities-supplying broadcasters that own and manage satellites, and program-supplying companies that entrust broadcasting to the facility-supplying broadcasters. In this system, the facility-supplying broadcaster is required to be licensed as a broadcasting station, but the program-supplying broadcaster can join the business only if it is approved by MPT. This made it easy to participate in the CS broadcasting business.

The system of separate broadcasters, i.e., facility-supplying and program-supplying, which was introduced with at the start of CS broadcasting, has also been applied to BS digital broadcasting, but not to terrestrial digital broadcasting.

The emergence of paid-per-service broadcasting in the conventional broadcasting industry, the appearance of many types of media, the development of numerous channels,

and deregulation are all factors forcing the reexamination of the vertical integration strategy which the broadcasting industry company had taken until now (see Exhibit 4-3).

Exhibit 4-3 Industrial structure of Broadcasting



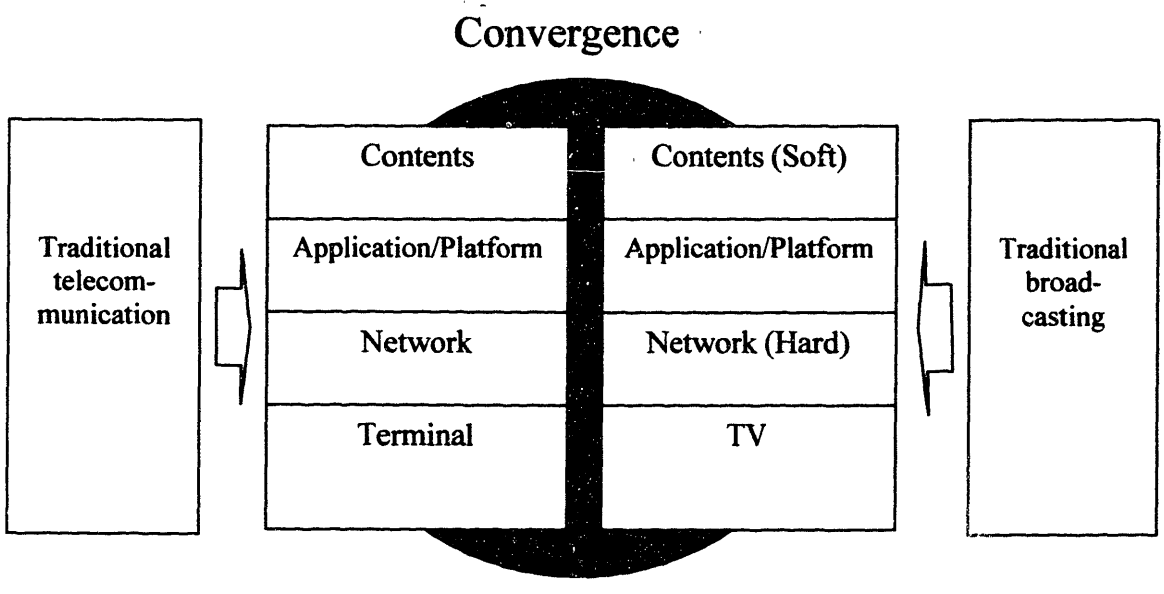
Source: NTT

4.3 NEW INDUSTRY STRUCTURE

As noted above, the communication and broadcasting industries have changed considerably. That is, in the traditional electronic network industry, although the owner of a network was also a simultaneous donor of service, in the telecommunications industry, even if the company did not own the network, a Type II carrier can offer communication services.

At the same time, new communication and broadcast services appeared as a result of the explosive development of the Internet, and this has meant a level separation of the traditional vertical-type integration in the communication industry. For these reasons, the industry has now been reconstructed at the level of terminal, network, application/platform, and contents (see Exhibit 4-4).

Exhibit 4-4 New Industry Structure



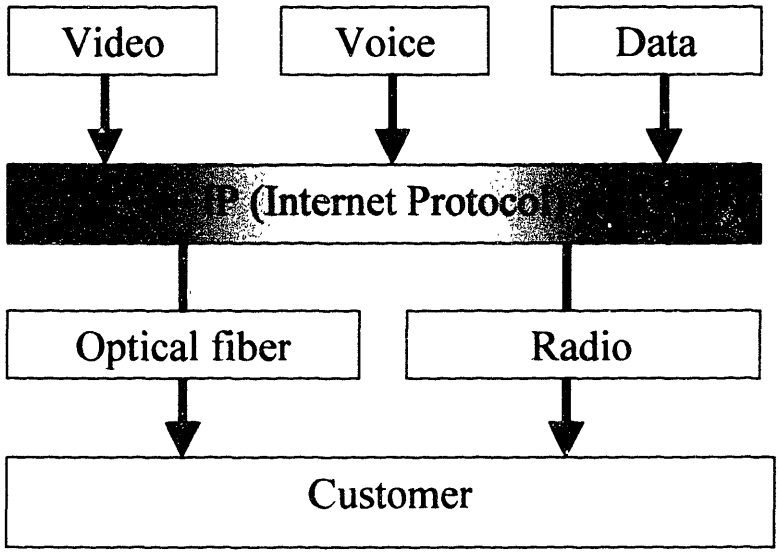
Source: NTT

Some common carriers, CATV operators, and vendors such as AT&T, TCI, and Microsoft are also building integrated broadband services, but they are being accused of monopolizing the Internet by binding subscribers to their proprietary set-top boxes. If the global network is divided by such vertically integrated systems that are incompatible with each other, the Internet runs the risk of being destroyed, and we will be brought back to the old days of proprietary networks.

It is said that in the future, in order to bring Internet-like interactivity to television, it will be necessary to transmit television programs digitally over the same infrastructure and use the same transmission technology currently supporting the Internet—fiber optic cable and the Internet's robust IP data routing standard. To ensure compatibility among potentially competitive data transmission standards, a mid-level protocol would need to be developed and implemented that would allow radio, television, telephone, and the Internet all to be transmitted over IP.

In the 21st century, instead of the ambiguous concept of "convergence", broadcasting may be completely integrated into wired or wireless communications over IP (see Exhibit 4-5). Once audio and video materials are encoded on IP, they can be carried through any media that is suitable for their content. Popular content, such as conventional TV programs, will be broadcast to millions of people by IP multicast; specialized contents will be delivered on demand from personal Websites; and video conferencing and videophones will absorb personal communications into streaming media (Glocom, January 14, 2001).

Exhibit 4-5 Uniform of Telecom and Broadcasting over IP



Source: Global Communication Website

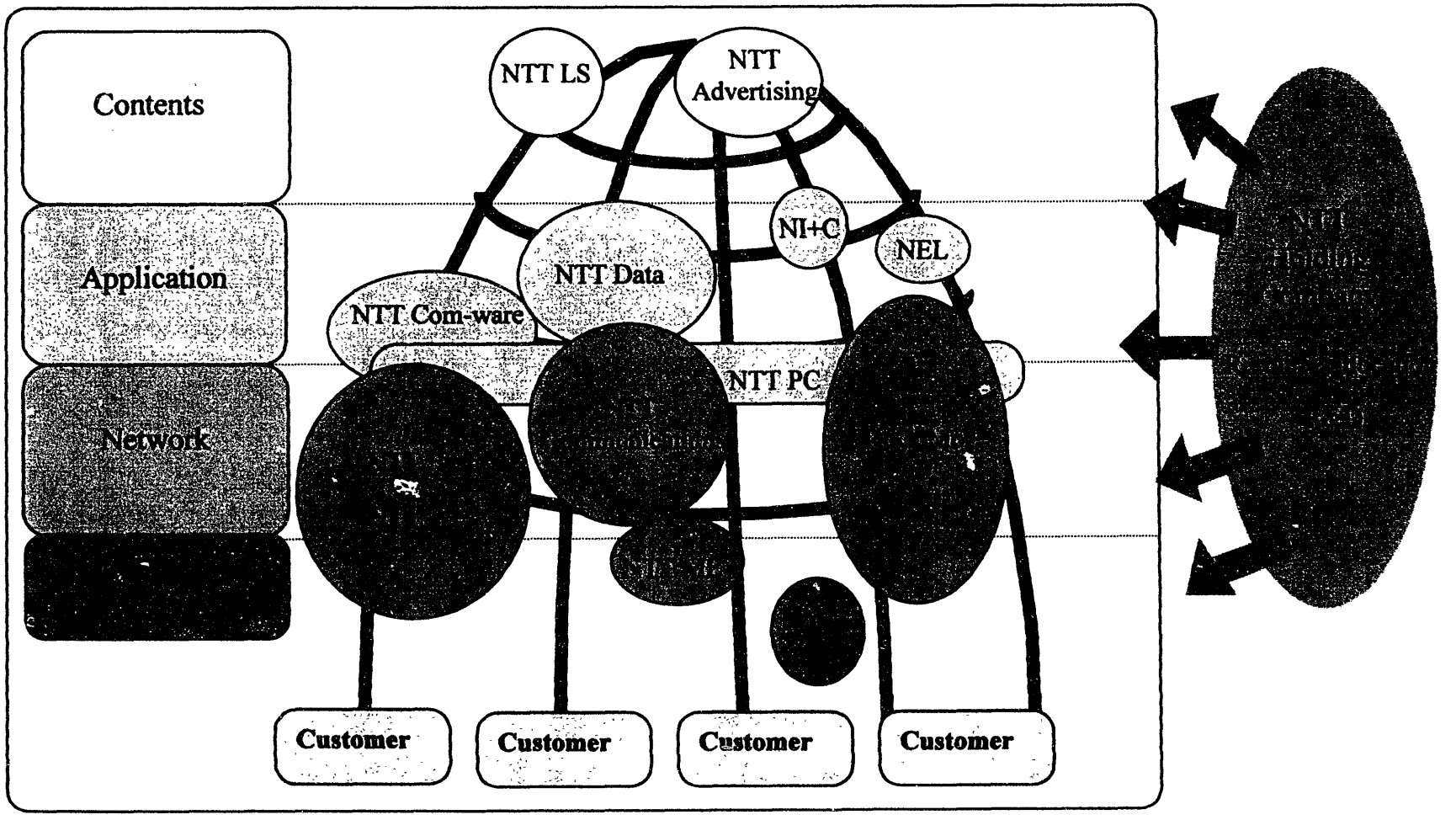
CHAPTER 5

Analysis of the Optical Fiber Business

NTT promotes group management in the form of a holding company monitoring subsidiaries on all four layers, contents, application, network and terminal, in order to become "a global information distribution corporate group" (trans.) as a whole NTT Group. For example, NTT DoCoMo covers three levels; application, network and terminal, NTT East and West cover two levels, network and terminal, and NTT Advertising focuses only on one level, contents (see Exhibit 5-1). However, NTT has developed primarily on the Network services, because it has been a leading common carrier in Japan. NTT also announced in 2000 that its three-year business plan would focus primarily on the Network Layer.

Common carriers worldwide are investing huge amounts of money to deploy optical fiber networks that will enable broadband services to integrate voice, data, and video over IP. Further capacity expansion has also been achieved by the explosive growth of wavelength division multiplexing (WDM) technology which is doubling the bandwidth of optical fiber every six months; is it expected that one fiber will soon be able to carry 2 terabits per second—equivalent to 500,000 TV channels (WWVI Website, January 29, 2001). Optical fiber networks could be the key for the convergence of telecommunications and broadcasting.

Exhibit 5-1 NTT Group Formation



Source: NTT

5.1 NTT'S THREE-YEAR BUSINESS PLAN

On April 12, 2000, NTT announced its three-year business plan for the NTT group (NTT February 5, 2001). The plan featured the introduction in Fall 2000 of a fixed-rate fiber-optics-based Internet access service for households. NTT President Junichiro Miyazu said at a press conference held to announce the business plans:

> As one of our research and development goals, we promised in the autumn of 1996 we would offer 10Mbps Internet access service for $90 per month by 2005. We have wanted to fulfill the pledge as early as possible so as to meet rising demand for fixed-charge Internet access service. We are now working toward starting pilot fiber-optics-based Internet access service for households within this year (Nikkei BP, March 5, 2001).

President Miyazu stated that improvement and expansion of Internet-related services is the highlight of the business plan. In addition to fiber-optics, the main improvement/expansion plans include expansion of the ISDN-based, fixed-charge IP connection service to cover all prefecture capitals and other major cities around Japan by the end of fiscal 2000. A full-scale commercialization of asymmetric digital subscriber line (ADSL) connection service and the expansion of areas where the service is available are also included.

The plans also set goals for the regional firms, NTT East and NTT West, to begin providing low-cost, 10Mbps, fiber-optics-based LAN communication service for businesses and government organizations during the first quarter of fiscal 2000; for households, FTTH service will begin in the third quarter of FY2000. Optical Internet access service for households will be the first large-scale FTTH service on which the NTT group will work.

5.2 FTTH SERVICE ANALYSIS USING PORTER'S FIVE FORCES

In this section, I analyze the FTTH service industry, on which NTT is focusing its efforts, using Porter's Five Forces.

5.2.1 Intensity of Competition

Although competition has just begun, I believe the intensity of competition will be **MEDIUM**. NTT announced FTTH service in 1996, and in July 1998 began its CATV programs transmission service based on the use of its fiber optic access network. It was in 2000 that NTT and other operators announced concrete business plans.

Japan has three FTTH service provider groups: NTT Group, an electric power company group, and a cable broadcasting company. New carriers will be competing against NTT in each region, especially in the Kanto area, and price competition will be very intense.

NTT East and NTT West jointly began an FTTH service on a trial basis beginning in December, 2000, that brings fiber optics into homes as access lines for connection to ISPs. Their FTTH service costs $120 per month, including charges for the maximum 10Mbps cable and equipment installed in the subscriber's premises. In addition, NTT subscribers must pay roughly $50 per month to their ISP, bringing the total monthly cost to around $170. NTT companies are also planning to add another level of service with a maximum 100Mbps in Spring, 2001. Fees and throughput types have not yet been determined. They have not started calling for providers to support the service.

In contrast, in March 2001, Usen Broad Networks Inc. began offering FTTH Internet access at speeds up to 100Mbps. Usen offers two services: "Home100" for residential users, and "Office100" for corporate users. The monthly charges are $50 and $100, respectively.

Based on these figures, the Usen FTTH service offers ten times the maximum bandwidth, (theoretically) at one-third of the price of NTT's regional companies' FTTH service.

President Miyazu admitted that Usen's 100Mbps FTTH Internet service is superior in terms of its price/performance ratio. He also expressed a strong sense of rivalry with Usen by saying:

> The new 100Mbps FTTH service which NTT East and NTT West will begin providing on an experimental basis in Spring, 2001 will be set at a price that competes strongly with Usen's service. The two regional companies will announce more details regarding the service in the near future. (Nikkei BP, March 5, 2001)

FTTH is gaining more attention for its price than for its speed. The primary broadband network service marketing focus has previously been on expanding its speed, dial-up, ISDN, ADSL and CATV. However, as speed has finally been achieved by FTTH, the focus will now shift to providing lower prices (see Exhibit 5-2).

Exhibit 5-2 Monthly Fee of Broadband Services

Service	Primary provider	Monthly fee
ISDN	NTT East, NTT West	$26
CATV	Titas Communication etc.	Approx.$45 to $55
ADSL	Tokyo Metalic Communications etc.	Approx.$45 to $55
FWA	Speednet etc.	$50
FTTH	NTT East, Usen Broad Networks	$110, $45

Source: Nikkei Communications

5.2.2 Presence of Substitute Products

The presence of substitute products is **STRONG**. There are several broadband services that can substitute for FTTH service. There are also a wide range of companies with related solutions that are attempting to circumvent NTT's last-ditch monopoly. From broadband cable, to DSL, to high-speed fixed wireless solutions, many firms will soon offer relatively cheap, flat-rate, and speedier access to Japanese consumers. I discuss some of these alternatives below.

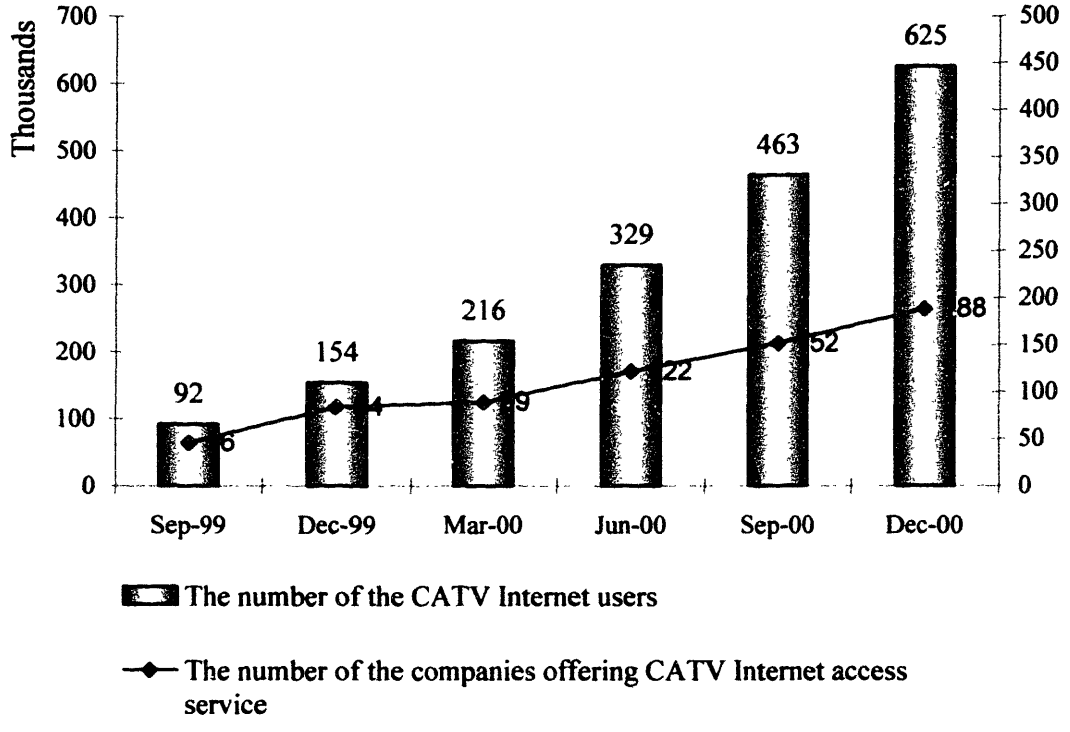
CATV

The Internet has an overwhelmingly greater number of subscribers who use the service to connect to the Internet for as long as they like at fixed monthly rates ranging from $40 to $60. For example, CATV Internet is an Internet connection service that uses the same coaxial cable originally designed for broadcasting as a high-speed access line. Subscribers are able to use the line at the maximum connection speed of several hundred kilobits per second, whenever they like, at the monthly rate of about $50.

The U.S.-backed operators Titus and Jupiter continue to lead the rollout of cable modem services in Japan, reducing up-front entry costs so building owners or subscribers do not have to pay additional fees to connect to cable Internet services.

The number of the companies offering CATV Internet access service totaled 188 as of the end of 2000, from 84 at the end of 1999, and 122 at the end of June 2000—apparently doubling every six months. The number of the CATV Internet users increased rapidly from 463,000 households at the end of September to 625,000 households at the end of 2000 (See Exhibit 5-3).

Exhibit 5-3 The Number of CATV Internet Users



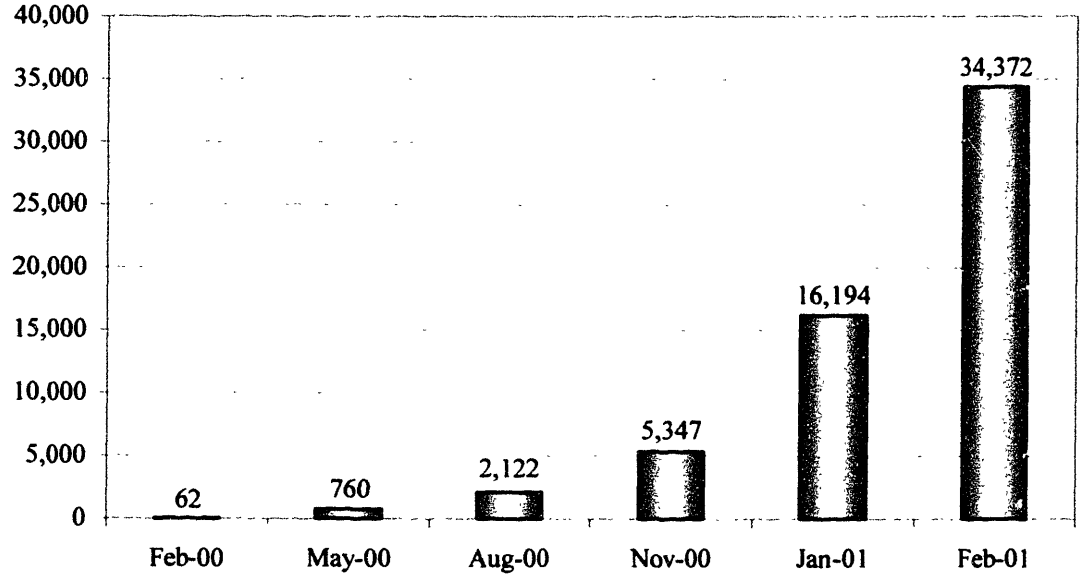
Source: MPT Website <http://www.mpt.go.jp/eng/Resources/top.html>

ADSL

In addition to cable initiatives, DSL initiatives have also arrived in Japan. The first commercial ADSL service was launched in Japan in September 1999 by a local government cooperative in Nagano prefecture. Tokyo Metallic Communications offers high-speed DSL services (640 kbps to 1.5 Mbps) to a test audience of 9,000 in the Tokyo area for $50 per month (infrastructure provided by KDD and KDD Communications.) and NTT started ADSL service last year. But NTT is still heavily marketing its ISDN service. For now, NTT's official position seems to regard ADSL as an interim technology that bridges the gap between the launch of third-generation cellular services in 2001 and FTTH services.

DSL subscriber numbers in Japan reached 34,000 as of February 2001 (see Exhibit 5-4), one year after the service started. Most of them use the Type II telecom service, where service providers themselves connect metal lines with DSL modems and DSLAM devices for their users. The metal lines are provided unbundled by NTT East and West.

Exhibit 5-4 The Number of xDSL Users



Source: MPT Website <http://www.mpt.go.jp/eng/Resources/top.html>

Fixed Wireless

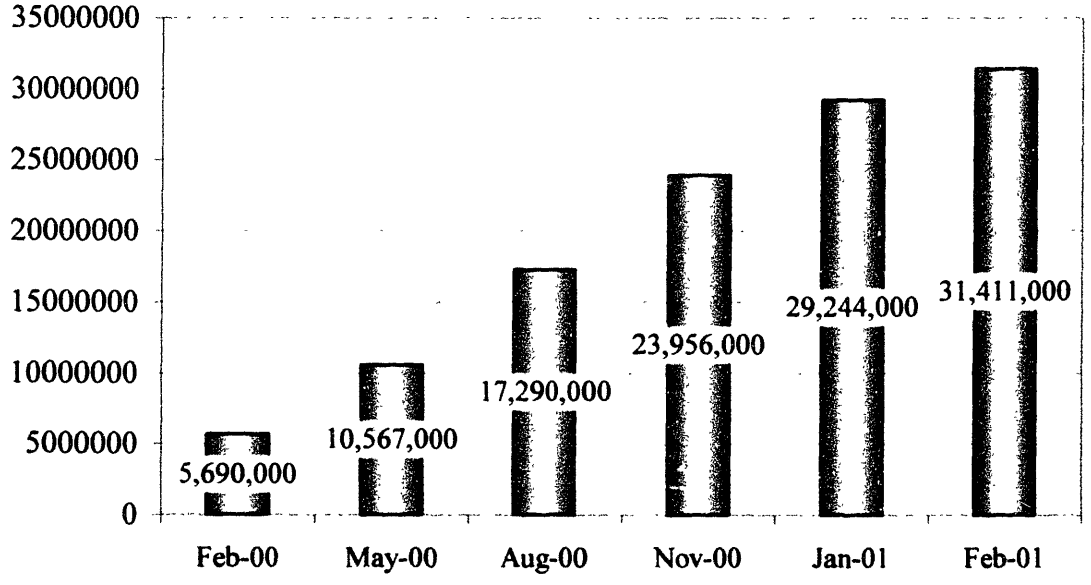
Microsoft, Softbank, and Tokyo Electric Power Company (Tepco) have agreed to form a new ISP called Speednet, which will offer 1 kbps wireless, flat-rate Internet access for under $50 a month. Tepco's fiber optic network will be used as a backbone while neighborhood utility poles serve as relay stations.

Mobile Access

In the area of mobile access, i-mode is the leading service. While a range of access solutions are trying to circumvent NTT's high local charges, there is a complimentary access offering that appeals to many Japanese: NTT DoCoMo's i-mode is a data communication service for cellular phone users. With a special microbrowser in the phone, users can access the Internet, send and receive e-mail, make ticket reservations and purchases, and perform some banking activities.

The number of mobile access service subscriber, the i-mode, KDDI group's EZ-Web and J-PHONE's J-sky surpassed the thirty million as of March 2001 (see Exhibit 5-5).

Exhibit 5-5 The number of the mobile access users



Source: MPT Website <http://www.mpt.go.jp/eng/Resources/top.html>

5.2.3 Buyer Power

Buyers are many and typically make small individual purchases. Although there will be two or three carriers competing in each region of Japan, users cannot easily switch from one operator to another because of the high entry cost of about $200. Significant switching costs blunt competition dynamics. The power of the individual buyer will be **LOW**.

On the other hand, ISPs and contents providers are another kind of buyer. They have a right to choose which FTTH service they will use. As NTT East and West provide "open access" to other carriers, the power of these buyers will grow stronger.

Overall, buyer power will shift between **LOW** and **MEDIUM.**

5.2.4 Supplier Power

The power of suppliers is **LOW**. There are many optic fiber makers worldwide, including Fujikura, Oki, Corning, Lucent, and others. They are engaged in their own competition to provide highly efficient, uniquely designed fiber and optic equipment to carriers.

An extremely complex situation arises in this industry, because some content providers can be as suppliers as well as buyers. In this analysis, I have considered them only as buyers.

5.2.5 Barriers to Entry

Barriers to entry are **HIGH**. The network industry is characterized by high fixed costs because it involves constructing the fiber optic networks, improving R&D, and so on. NTT has invested about $2 billion in optical networks every year.

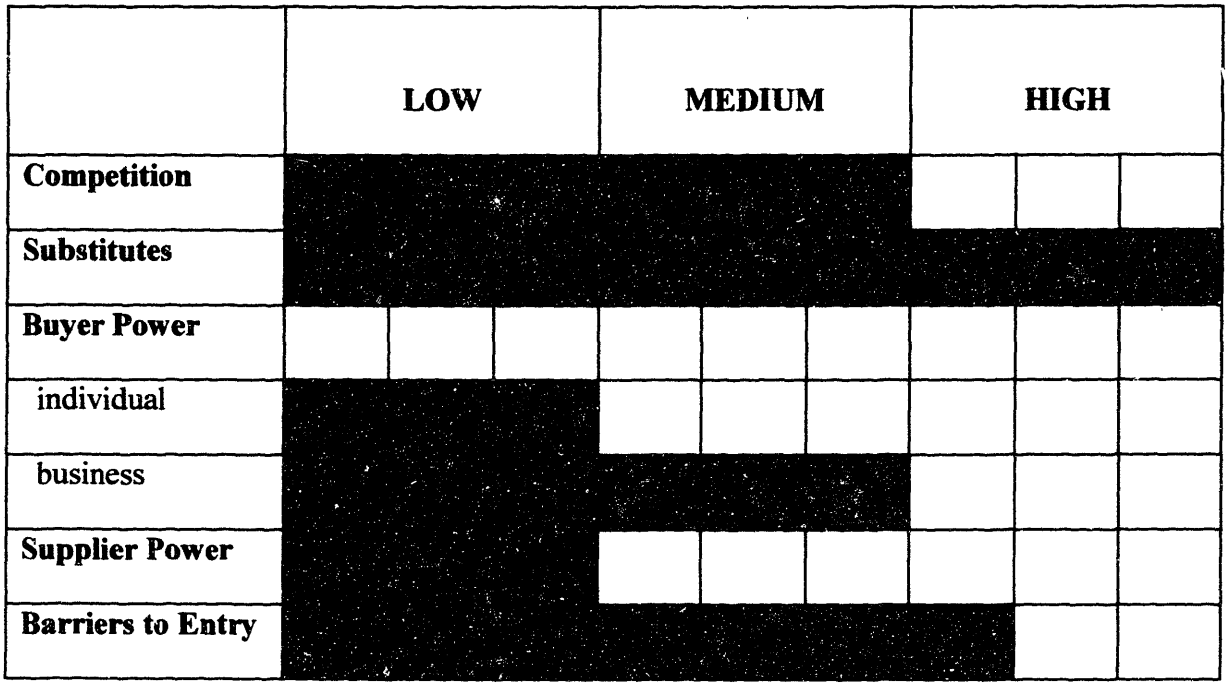
Another problem relates to regulations and formalities. When service providers wish to install lines in public spaces, such as roads and rivers, they must obtain exclusive use permits from the organizations that manage those spaces. These formalities are extremely complex, and it is difficult to obtain information about the location of public conduits or the availability of space in such conduits.

This has enabled other entrepreneurs to borrow optical fibers from NTT East and West, and then offer FTTH service because NTT opened its optical fiber business wide in December 2000. Although entrepreneurs who formally request optical fibers from NTT are not required to offer FTTH service immediately, the possibility that they will appear as a competitor sooner or later is high. For example, Tokyo Metallic Communication borrows the optical fiber of an NTT regional company and connects it to an apartment. Thus the wiring in the apartment is offers high-speed Internet service using ADSL. As a result of NTT opening its network business, entry barriers are getting lower from High.

5.2.6 Summary

Overall, the industry seems to be relatively unattractive based on the Porter analysis (see Exhibit 5-6). However, NTT could make full use of its property, FTTH, by implementing four strategies, which I have outlined in the next chapter.

Exhibit 5-6. Attractiveness of FTTH Service Industry Applying Porter's Five Forces



CHAPTER 6

NTT Strategy for the Convergence of Telecommunications and Broadcasting

In 1996, NTT committed to an aggressive plan to deploy FTTH everywhere in Japan by 2005. NTT invests no less than $2 billion in the optical fiber market every year, and today has optical-related property of $11 billion.

From the viewpoint of NTT management, if demand for optical service is not created early, and old investments are not collected, then poor capitalization of the optical equipment will result. Therefore, it is important that NTT develop strategies that optimize the opportunity to digitalization of TV and build a successful optical fiber business (Ikeda 1999).

6.1 OPEN ACCESS

The Internet scored its biggest success by becoming a network that carriers cannot control but which instead grants sovereignty to consumers, whose response in turn maximizes the carriers' investment in the network. Since intellectual property rights for protecting the technology developed by a company are not established, and the source code is wide open to any user who wishes to use it, these technologies become free goods that can be reproduced infinitely. In the economic system of network externalities, even if a closed network raises monopoly profits for a time, it will ultimately be defeated by contractions in

the network itself. Vertical integration, as in AT&T, is a dangerous strategy in the Internet era.

6.1.1 U.S. Open Access Policy

An open access policy maintains network openness by making key network components available to everyone so as to allow competition and innovation. The remarkable success of the Internet in America owes a major debt to determined regulatory actions that encourage complete network openness and interconnection. A large variety of service and content providers share the existing infrastructure: the basic telephone network. America Online and other Internet service providers, not the regional Bell Operating Companies, have popularized mass subscriptions to the Internet. Personal computers, Internet browsers such as Netscape and Internet Explorer, and companies like Cisco (not AT&T) have driven the developing architecture of data networking on the Web.

All these innovations were possible because the U.S. Federal Communications Commission (FCC) decided in the 1960s that the emerging world of data networking should not be treated like regular telecommunication services. The FCC allowed specialized providers of data services, including Internet Service Providers (ISPs) and their customers, access to raw network transmission capacity through leased lines on cost-effective terms. Open access essentially guarantees consumer choice, ensures fairness in the emerging electronic marketplace and sustains broad-based innovation and participation in the Internet's evolution (Stanford, February 3, 2001).

6.1.2 Open Access Debate in the U.S.

In the U.S., the debate over open access was precipitated by AT&T's 1998 acquisition of TCI, the largest cable network operator in the U.S., followed by the company's proposed acquisition of MediaOne in 1999. With the acquisition of TCI came AT&T's control of Excite@Home, the leading provider of broadband access over cable in the US. AT&T (along with other cable companies) argued that it should retain control over which ISPs have access to the Excite@Home broadband network, just as cable operators have always controlled which video programs are sent over their network. Government intervention, they argued, was unwarranted, technically unfeasible, and economically counter-productive as it would seriously decrease the company's incentives to upgrade its video network to Internet capabilities.

Opposing the cable companies' position were a number of local telephone companies (mainly SBC, GTE, Bell Atlantic), ISPs, and consumer organizations that argued for an open access policy that would let non-affiliated ISPs offer their service over cable networks just as they do over the telephone network. Open access, they argued, is essential to guarantee consumer choice, to ensure fairness in the emerging electronic marketplace, and to sustain broad-based innovation and participation in the evolution of the Internet.

In early 2000, AT&T took a step away from complete exclusivity when it announced its intention to let ISP Mindspring offer service on its cable in addition to @Home, once its current contract with @Home expires in 2002.

Apart from that, the lineup remains largely unchanged today, with one important exception: America OnLine (AOL), historically a leading advocate of open access, announced its intention to merge with Time-Warner Cable, thus securing access to a

broadband delivery channel of its own. AOL's markets, however, stretch far beyond Time-Warner's footprint, and it remains to be seen how the merger will affect the open-access debate. AOL so far remains a member of the OpenNET coalition and has pledged to implement open access, although it no longer advocates for regulations requiring open access.[1]

If the global network is divided by vertically integrated systems that are incompatible with each other, the Internet will disintegrate, and the world will be brought back to the days of proprietary networks. Vertical integration and closed access defeat the fundamental innovation dynamics that have made the Internet successful.

6.1.3 NTT's Open Access Policy

With the widespread use of the Internet, the basic strategy for many common carriers is to open the network wide, encourage the growth of traffic in the higher layer, and thus realize added profits as a result of the increased traffic. It is actually the common carriers whose data traffic had increased significantly that have realized the greatest profits from the development of the Internet. Thus, during this time of fusion between communications and broadcasting, since maximizing traffic is the overall goal, NTT believes it will realize the greatest long-run profits by unbundling services and accepting an open access connection policy.

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[1] On Jan. 12, 2001, the FCC announced it would approve the proposed AOL/Time Warner merger. Time Warner, one of the principal owners of the Road Runner cable modem service and second largest cable TV operator reaching 21 million homes in the U.S., will merge with AOL, the world's largest ISP with 26 million dialup subscribers. Prior to this, the Federal Trade Commission (FTC) gave its approval. The FTC's approval was contingent on Time Warner providing other ISPs Road Runner access to its cable lines before AOL can offer cable modem service to any Time Warner-controlled community. The only restriction the FCC imposed on the merger was for AOL to open its instant messaging service. These restrictions will only effect future versions of AOLIM. See: <http://www.cablemodemhelp.com/fcctw.htm>.

The content of the September 2000 announcement from NTT represents a very significant strategy for the company. NTT stated that NTT Group would now allow rival telecommunication carriers to use NTT's national fiber optic network with far less restrictions. NTT will lease its fiber optic cables to rival carriers without the need for a switchboard package, and it will allow joint use of a single cable by multiple firms.

6.1.4 Open Access Strategy for i-mode

In Japan, the i-mode is an excellent example that proves the importance of an open access policy. The amazing popularity of i-mode service can be attributed to (1) the adoption of an open technological standard, (2) its rich content, and (3) its user-friendliness.

NTT DoCoMo won many subscribers because of the company's adoption of an open technical standard for enabling its subscribers to access the Web. The i-mode service adopted a standard called "compact hypertext" (C-HTML) for its markup language. C-HTML is a compact version of the regular version of HTML used for Internet homepages. Therefore, it is easy to make an i-mode homepage with a few minor modifications to a standard homepage.

Rich content is a particularly important factor in the rapid spread of this unique mobile Internet service. NTT DoCoMo, with its strong brand-name appeal as well as its technological and marketing efforts, succeeded in tying up with hundreds of companies to ensure rich i-mode content for its subscribers.

The third factor is NTT DoCoMo's focus on user-friendliness. The i-mode solved the user-friendliness problem because a mobile phone handset is far easier to use than a computer. A key point worth noting is that the service is only available on cellular phones,

not on PDAs. Cellular phones are small enough to hold in the palm of one's hand and can be carried anywhere. The i-mode service represents a marriage of the Internet with the portability of cellular phones. This is why the number of i-mode subscribers has increased explosively and is more than 20 million.

6.2 REDUCTION IN PRICE

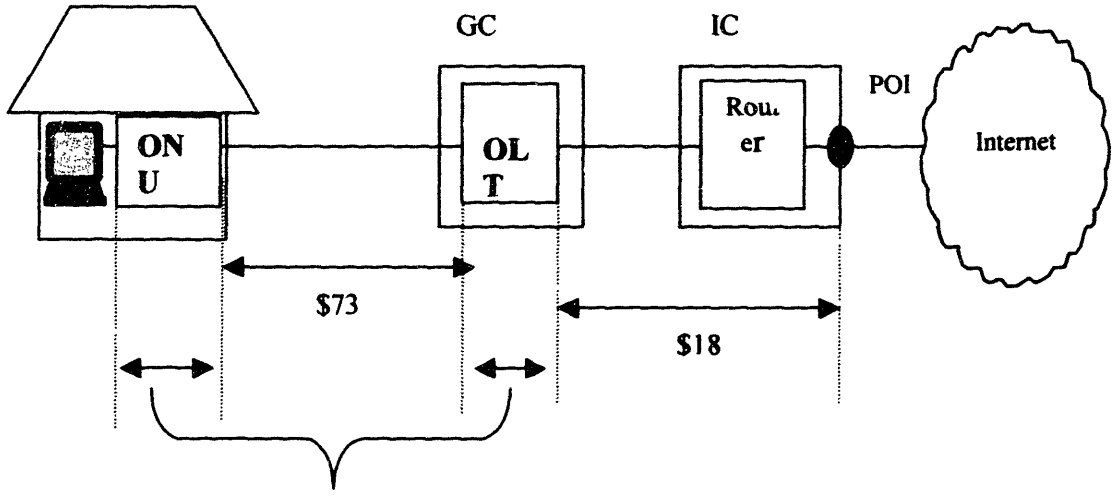
At a press conference on February 21, 2001, NTT President Miyazu admitted that Usen's 100Mbps FTTH Internet service is superior in terms of price/performance ratio, to the FTTH service that NTT East and West are about to provide in a test environment in the spring, 2001. Usen's service is priced at $50 per month, one-third of the NTT charge of $170, which includes an ISP charge ($50). Although NTT's service charge is presently $120, the competition with Usen or any other company makes it necessary to reduce the cost to about $50. Although it is necessary to examine how other companies hold down cost and to implement similar strategies at NTT, some cost reduction methods could be considered.

6.2.1 Cost Reduction of Optical Fiber

The cost of NTT's optical IP service includes the following (see Exhibit 6-1):

- the optical subscriber line linked from user house to a subscriber exchange station (GC) ($73 cost)
- a communication equipment ($29)
- an optical subscriber line and local IP network ($18).

Exhibit 6-1 Cost of Optical Fiber Network



Key:

ONU: Optical network unit,
OLT: Optical line terminal,
POI: Point of interface,
GC: Ground unit Center,
IC: Intra-zone center

Source: NTT

For this basic menu of services, the total cost is $120 per month. The key is to find optical fiber cost reductions that realize a decrease of at least one-half.

The charge of $120 is about ten times the cost of copper wire. In contrast, the cost of a single optical fiber line can be broken down by the number of users to compute the per capita cost. Since there are many fewer copper wires, companies that use optical fiber realize a cost differential that is ten times greater that copper wire. For this reason, NTT is considering changing to an optical fiber network as one way to reduce costs. The way to change the composition is to pull out the single line and replace it with a multiplex optical

fiber lines that will connect user houses to the subscriber exchange station. However, if demand remains stagnant, then replacing the present lines with multiplex lines will still result in cost increases.

NTT currently uses a system called PDS (Passive Double Star) in which a splitter is installed in the middle of a member line which then makes the changeover to a multiplex line. At present, this splitter is placed in the subscriber exchange station. When an NTT splitter is installed in a subscriber line, from that time forward it is difficult to introduce any other commercial communication apparatus. And with such an installation comes the problem of maintaining a facility and keeping it in good working order. Thus, deciding on such a change immediately has some difficult ramifications.

Although it is also possible to reduce costs by estimating the demand for optical fiber, and by breaking down the total cost of an optical fiber line by the number of people requesting service, if demand does not increase on schedule, there is an accompanying risk that the company might incur a deficit in the long run. Making these judgments is difficult.

With regard to the cost of communications equipment, changing the NTT apparatus specification to a commercial product could lower costs. This method was used by Usen. Currently, NTT has adopted a shared-access technology developed by NTT as its communication apparatus in the market. However, since the company's dominance in this market has faded as the price of commercial media converters has fallen, a new commercial product must be introduced. On the other hand, the cost of a local IP network could reduce costs by changing the local network into a mass network. The bit unit price of the data which flows inside a network would make the cost per user much less.

6.2.2 Multiplexing of Services

Another way to cut costs would be for NTT to consider raising the relative worth of a circuit by allowing services other than Internet connectivity to use their optical fiber lines. In the areas of telephone service, it is predicted that the present telephone will soon be replaced by the IP telephone. Broadcast services will also connect the end of CATV companies to FTTH networks activated by digitalization, and multiplexing of services will become a realistic method. The company could also reexamine the charge calculation method as another method of lowering the cost of FTTH service. However, since NTT's strong point is its R&D power, additional reductions may come as a result of new technical developments.

6.3 CONSTRUCTING A PLATFORM

As an Internet access charge may at present fall outside the limits of current technical innovation, providers are planning to break away from an income system centering on an access charge. It is expected that because users can access the Internet quickly they will be willing to pay a charge for the convenience and pleasure that are key elements. It is because the content distribution service will enable providers to survive.

Development of a broadband network has affected the Internet access providers who connect individuals and companies to the Internet. The spread of high-speed infrastructures is expected, and since the latter half of 2000, many new services have been established that distribute content such as an image. Nifty, which is the greatest user in Japan, started a

content distribution service using ADSL in December 2000, and it started an Internet connectivity service for CATV companies in August 2000.

The present content distribution services still face many problems, including transmission quality, developing a collection method for charges, and copyright protection. Distribution companies are beginning to work on these problems. With regard to transmission quality, entrepreneurs who install Cash Server, and entrepreneurs who build a high-speed relay network are increasing in number. Moreover, companies that will be responsible for copyright processing have also begun to appear.

Businesses that offer recovery of charges service and copyright management demonstrate what could be NTT's strong point. It would be simple for NTT Group companies to add the charge for information provided by other entrepreneurs to the telephone charges and collect them simultaneously, since the company already issues telephone bills and a charge recovery business. The charge recovery service is already in use with an NTT information service (Dial Q^2), which already uses the telephone circuit, as well as NTT DoCoMo's i-mode service.

Especially in Japan, there are no rules covering copyright when content is distributed and used in multiple contexts. For example, while terrestrial TV broadcasting content has high utilization value and the potential for wide-ranging use, copyrights are treated on the assumption that the material will be used primarily for terrestrial TV broadcasting. For this reason, it is difficult to use that type of content in other media such as satellite broadcasting or the Internet. Moreover, while digital content can easily be distributed through the Internet or other media, distribution is currently hindered problems of illegal reproduction. Reliable, efficient distribution of software and the effective utilization of existing materials would

result in enhanced user accessibility and market expansion. NTT is currently developing copyright protection technology such as digital watermarking. Such a copyright management platform, being open and neutral, demonstrates NTT's strong point, which offers the infrastructure of the info-com industry and is in a public position.

In July 2000, three companies, Nippon Television Network, NTT-ME, and NTT East, announced the "B-BAT" (Broad Band Mart) design as a copyright management system for image content. If a contract is not individually drawn with the copyright person when circulating copyrighted work in a network, a content provider just needs to exchange a B-BAT which is a contract with a copyright person. As for the role of the three companies in B-BAT, Nippon Television Network offers its unique knowledge of image copyright etc. Two companies in the NTT Group are in charge of the system side of B-BAT, managing the server and its content and developing digital-watermarking and MPEG encoding technologies.

Although copyright protection is expected, both technical and legal solutions take time. This is the field where NTT can demonstrate its strength, and it is important to promote these measures even more in the future.

6.4 RELATIONS WITH BROADCASTERS

In Japan, there were laws that strictly regulated entry into both communications and broadcasting by a single entity. Therefore, investment by NTT companies was limited to less than 3%, which has the effect of prohibiting direct entry into the broadcasting business (Pressnet, March 5, 2001). However, this regulation is gradually being relaxed.

In December 2000, the MPT allowed eight companies to begin providing BS digital data broadcasting. Among those companies, Japan MediArk (jointly founded by, among others, Jiji Press, Kyodo News and NTT East) caused a stir because an NTT subsidiary company was listed as a major investor with a 30% share. The Ministry indicated that Japan MediaArk could continue broadcasting with the stipulation that the NTT subsidiary company's investment in the business be less than one-third to prevent over-concentration of ownership of the mass media. This was one reason why entry of Japan MediArk into BS digital data broadcasting was approved.

In October 2000, MPT began allowing companies that own telecoms to offer cable and satellite broadcasting services. As a result, NTT can now use its optical fiber network to air programs, without needing a license, as long as NTT notifies the MPT. Under current law, NTT is banned from broadcasting. The MPT's proposal encourages more companies to enter the cable and satellite broadcasting business which should stimulate competition. Japanese firms have lagged behind their U.S. counterparts in this market (NBR, March 5, 2001). With these trends in deregulation, NTT should be able to use FTTH for distribution of broadcasting, even terrestrial broadcasting.

At the same time, the broadcaster itself is a huge problem because of the cost of broadcasting digitalization. As mentioned in Chapter 3, NHK and key commercial broadcasting stations expect to spend about $100 million each on equipment investment for BS broadcasting digitalization. However, each broadcasting station will only be required to carry out digitalization of equipment and then wait for the expected spread of digital receivers. Terrestrial broadcasting digitalization, on the other hand, involves digitalizing not only production and transmission systems but also the system as a whole, including 15,000

relay stations distributed all over the country. Further, each local station will be required to take corresponding measures, and it is said that this cost will come to $10 billion industry-wide (NHK, January 21,2001). Who will pay for this?

Moreover, CATV digitalization requires installation of optical fibers to each home, and as in the case of BS broadcasting and terrestrial broadcasting, replacement of the transmission-reception equipment. This also is likely to cost each company about $10 million. However, as mentioned above, many CATV broadcasters are small scale, and the MPT considers that it will be difficult for each broadcaster to carry out this digitalization alone.

TV contents will play a leading role in the near future. Communication companies must begin now to establish better relations with broadcasters and to advocate the need for deregulation, which will enable terrestrial broadcasters to use FTTH network. Such a change will be good not only for NTT's business but also for the national economy.

6.5 CONCLUSION

In the U.S. digitalization of terrestrial broadcasting began in 1998, and it appears that even there, the advantages of digitalization will not be achieved any time soon. And an attempt to implement digital broadcasting services in Britain resulted in a significant budget deficit for BBC.

It is sometimes claimed that the Internet will unify all mass media, such as conventional newspaper, broadcasts, data communications, and even telephones. In other words, the industry fences which have been the traditional vertical dividers — that

Voice = telephone, data = Internet, and image = broadcast — will collapse, and all information will be unified by IP.

Although digitalization of broadcasting might be the breakthrough change in the information-communication industry in Japan, unfortunately BML (which is incompatible with the HTML used on the Web) was used for Japan's broadcast industry as the standard for BS digital broadcasting. It is said that Japanese broadcasters were worried about clean sweep for the U.S. Internet companies. At the current time, digital broadcasting in Japan has little ability to relate to the Internet.

No clear conclusion has been reached as to whether uniting broadcasting with telecommunication, especially via the Internet, will ever occur completely. There are several major hurdles which must be resolved with regard to technology and equipment investment, etc. Perfect convergence will not happen in one leap.

Therefore, it is important for all players in the Japanese info-communication industry to sink their differences for the sake of the common good and take the opportunities represented by the convergence of telecommunications and broadcasting, in order to avoid failures similar to the West, and to create a new market.

It is expected that NTT will be in a position to offer cheap and reliable service, despite severe competition, and thus make a major contribution to the development of the information-communication industry. NTT's competitive advantages are technology, reputation, a brand and customer base. As NTT has also emerging assets, "advanced network", NTT would be an attractive partner. NTT should pursue partnership with other companies, with strong complimentary assets.

APPENDICES

APPENDIX 1

Basic Law on Formation of an Advanced Information and Telecommunications Network Society

November 29, 2000
Cabinet Secretariat

1. Purpose

To promote measures for forming an advanced information and telecommunications network society expeditiously and intensively, in light of the urgency to adapt ourselves to the world's rapid and drastic changes in the socioeconomic structure caused by the utilization of information and telecommunications technology

2. Definition

An "advanced information and telecommunications network society" is a society in which people can develop themselves creatively and vigorously in all fields of activities by acquiring, sharing and transmitting a variety of information or knowledge on a global scale freely and safely through the Internet and other advanced information and telecommunications networks.

3. Basic ideas

- Significance of the formation of an advanced information and telecommunications network society
- Realization of a society in which the people can enjoy the benefits of information and telecommunications technology by having the opportunities to use advanced information and telecommunications networks easily and independently, and being able to fully and creatively demonstrate their individual abilities through such opportunities

Basic points of view

- Promotion of the economic structural reform (facilitation of e-commerce/creation of new businesses)
- Realization of a national life that evokes feelings of comfort and affluence (diverse information services at low rates)
- Realization of vital, individualized local communities (creation of local employment opportunities/expansion of diverse interchanges)
- Appropriate role sharing between the public and private sectors in which the private sector takes the lead in principle, and the State, etc. take charge of upgrading the environment such as promotion of fair competition
- Correction of gaps in opportunities and skills for use of information and telecommunications technology (measures against the Digital Divide)
- Dealing with new problems in areas of employment, etc.

4. Basic policy for the measures

- Integrated promotion of the further expansion of advanced information and telecommunications networks, enrichment of contents, and learning of the skills for utilizing information
- Formation of the world's most advanced information and telecommunications networks, promotion of fair competition, and other measures
- Upgrading of people's skills for utilizing information and development of expert human resources
- Reform of regulations and facilitation of e-commerce through appropriate protection and exploitation of intellectual property rights, etc.
- Promotion of realization of an electronic government and electronic local governments (simplifying as well as improving efficiency and transparency of administration) and application of information and telecommunications technology in the public sector
- Assuring security and reliability for networks and protection of personal data
- Promotion of creative research and development
- International cooperation and contribution (establishment of internationals standards/assistance to least developed countries)

5. Priority policy program

A priority policy program setting forth measures that should be implemented by the government expeditiously an intensively is formulated in accordance with the basic ideas and the basic policy for the measures, and published via the Internet, etc. (Operations within the jurisdiction of the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Society)

- Concrete objectives and time limits for accomplishment of the objectives shall be, in principle, decided for each measure.
- The accomplishment level of the objectives shall be investigated and published in a timely manner.

6. Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society

- Established in the Cabinet (Director-General: Prime Minister)
- United efforts of the public and private sectors (consisting of all cabinet members and knowledgeable people in the private sector, etc.)

7. Responsibilities

- Responsibilities of the State and local governments
- Mutual cooperation between the State and local governments

8. Compilation and publication of statistics/publicity activities

9. Supplementary provisions

- Enters into force on January 6, 2001
- The execution status is reviewed within three years after the Law enters into force, and revisions are made based on the results.

APPENDIX 2

NTT Group Three-Year Business Plan

April 12, 2000
Nippon Telegraph and Telephone Corp.

NTT Group Three-Year Business Plan
- Change to "Global Information Sharing Corporate Group" -

Recognizing last July's reorganization as an opportunity to change from traditional telephone oriented companies to a "Global Information Sharing Corporate Group", the NTT Group has been addressing business reforms within the new group operation framework. As part of these efforts, the NTT Group have drafted the following three-year business plan (FY2000-02), the first such Group plan, as an expression of the business direction of the Group as a whole and steps to be taken by Group companies in that direction.

This plan will be reviewed every year to ensure a sensitive response to the dramatically changing market, a process which will establish operation of Group business based on a holding company system.

I. THE CHANGING MARKET ENVIRONMENT

In January 1994, NTT released its "Basic Concept for the Coming Multimedia Age," subsequently undertaking business reforms designed to bring about a shift from telephone business to a multimedia focus. However, the market environment is changing at a speed far exceeding expectations.

(1) The number of mobile communications subscribers outstripped fixed-line subscribers by the end of March this year, and continues to grow, reaching 80 million in FY2003. *
* Mobile Computing Promotion Consortium survey (January 2000)

(2) The number of Japanese Internet users is also expected to skyrocket, with 50 percent of the population using the Internet through fixed lines by FY2003. Further, with the rapid growth of mobile computing, Japan's total Internet use, mobile communications included, is forecast to surpass the U.S. at the end of FY2001 to place Japan on a top level in the world, topping the 80 percent dissemination mark in FY2003.*
* InfoCom Research survey (March 2000)

At the same time, higher-speed network services, access lines included, will be provided to deal with the growing diversity and sophistication of contents, and the further development of fusion between telecommunication and broadcasting, bringing about enormous expansion and development in electronic commerce and a multitude of other Internet-based businesses.

(3) Fixed-line subscribers, on the other hand, will continue to dwindle, while the further evolution of GC interconnection and new market participation by foreign companies will create even fiercer competition not only in inter-prefectural telecommunications but also at the intra-prefectural level.

(4) Further, on-going globalization of the information communications market and the growing seamlessness of services is bringing about dynamic structural change, including the realignment of forces among existing carriers, while expansion of the global market, particularly in terms of mobile and IP communications, is bringing a new edge to competition which views the world as a single market.

II. NTT ACTIVITIES BY BUSINESS AREA

NTT Group fixed-line telephone business will inevitably fall off sharply in line with the changing market environment, reducing the share of fixed-line business from the current 50 percent to 30 percent of total Group revenue. Mobile communications and Internet-related business should expand from the current 50 percent to 70 percent of total Group revenue.

By improving the speed, lowering the cost and widening the diversity of its network/services – an IP-based structure which includes both wireless and cable services - the NTT Group will continue to contribute to that socioeconomic reform of Japan which is also known as the "IT revolution".

1. Fixed-line phones

(1) Regional phone services
Due to the changing market and competition environment, as well as the application of a long-run incremental cost method to carrier interconnection fees, the introduction of a price cap system and other changes in the regulatory framework, the regional phone business is faced with extremely stringent management conditions.

NTT East and West are enforcing management efficiency ("Mid-term Restructuring Plan," announced November 1999) and establishing the necessary business foundations to deal appropriately with changes in the regulatory environment, as well as the service diversification and fee reductions as a means of responding to the introduction of a presubscription and other factors intensifying intra-prefectural competition.

(2) Long-distance and international phone services
NTT Communications is diversifying services and lowering charges by, for example, expanding and improving bundled services both inside and beyond Japan and otherwise customizing service charges, responding actively to the introduction of a presubscription and other factors sharpening competition.

2. Mobile communications

Recognizing that the mobile communications market will continue to grow, the NTT DoCoMo Group is working steadily to expand business, and is also actively exploring the development of non-voice communications (mobile multimedia) ahead of the inevitable slow-down of growth in voice communications alone.

(1) Upgrading of "i-mode"
To further accelerate the growth of Internet connection service demand through cell phones, i-mode functions are being made a standard element of cell phones (800MHz band service) and Java-compatible terminals introduced as a means of upgrading these functions, while NTT DoCoMo is also working to further diversify and upgrade contents.

Other efforts include promotion of PHS 64K data transmissions, as well as the development and supply of new applications such as music delivery and visual phones.

(2) IMT-2000
The NTT DoCoMo Group will lead the world in launching IMT-2000 in spring 2001, expanding service areas to major cities nationwide by the end of FY2002. IMT-2000 will allow the provision of more sophisticated and diverse mobile multimedia services nationwide.

3. Internet-related services

(1) Internet access
To deal with the surge in Internet demand, NTT East and West are providing a full range of access services, including not only ISDN but also ADSL and optical access services.

One particular focus is the early development of low-cost and diverse optical access services in response to the expected sudden growth in demand for high-speed Internet access, with world-leading efforts underway to expand and improve the optic fiber access network.

(a) Flat-rate (metal) access service

(i) IP connection service
NTT East and West began offering this service on a trial basis last November, and will lower the monthly rate from 8,000 yen to 4,500 yen this May, as well as adding a new service for connection at central office (monthly rate 2,900 yen). And also the companies are expanding service areas to major cities by the end of FY2000 and afterward to nationwide in line with demand trends.

(ii) ADSL service
NTT East and West began offering this service on a trial basis last December (using subscriber's regular line: 5,100 yen monthly), and are expanding services and service areas in line with demand trends during the trial period.

(b) Provision of optical access services

(i) High-speed optical IP connection service
In the third quarter of FY2000, NTT East and West will begin offering on a trial basis optical access service (maximum speed 10Mb/s) providing faster and more convenient Internet use at a flat rate of around 10,000 yen a month (connection at central office).

(ii) LAN-style optical communication service
NTT East and West will launch a low-cost LAN-style optical communication service in the first quarter of FY2000. Operating at a maximum speed of 10Mb/s, the service is intended to meet the needs of business users such as local authority and corporate Intranets.

(iii) Further improvement of medium-high-speed access services
To respond to the needs of users looking for high-speed, low-cost and diverse services, optical services will be improved through the introduction of ultrahigh-speed optical access line and guaranteed-speed high-speed Internet access line, and the line-up of medium-high-speed access lines will be bolstered by teaming these with a menu exploiting wireless, xDSL and other technologies.

(2) Expansion of networks, platforms and contents applications
The Internet access breakthrough provided by low-cost optical access services will not only increase petitions for a higher-speed, higher-volume IP backbone, but also expand demand for the contents applications and platforms which form the upper layer of this backbone, as well as strengthening market pressure for more sophisticated and diverse services. Anticipating these trends, NTT Group companies will engage in dynamic business development through investment in and tie-ups with powerful external partners, as is explained below.

(a) NTT's Internet connection services will be accelerated and diversified in line with the greater speeds and lower costs of access lines, and value will be added to services by, for example, introducing SLA(Service Level Agreement) and improving customer support functions.

(b) To respond to the distribution demand for high-volume contents (music, software, video, etc.) which is expected to expand still further as a result of the greater speeds, greater volume and lower costs of access lines, the NTT Group will actively develop business such as housing, hosting, data centers, ASP, and EC platforms such as authentication, billing and settlement. One means of doing so will be to work together with major contents suppliers.

(c) To respond to demand for seamless, full support services, terminals included, the NTT Group will provide home gateways linking home networks with high-speed access lines, and promote the dissemination of terminal-free IC cards.

III. PROMOTION OF GLOBALIZATION

The NTT Group will aim to achieve 100 billion yen in global businesses in FY2002, as well as to become a world leader in this market, focusing on the high-growth areas of mobile communications, IP networks and platforms, and expanding out into U.S. and European markets from its Asian base, as is explained below.

1. Mobile communications

NTT DoCoMo will use its global competitiveness and strength in areas such as i-mode and IMT-2000 technology to build investment and financing ties with the world's major telecoms players and actively engage in business development with an eye to the full in the U.S. and Europe, while in Asia emphasizing the potential growth capacity of voice transmissions.

Tie-ups will also be formed with the world's leading multimedia companies toward establishing mobile communications standards and other de facto standards.

2. IP network

NTT Communications and NTT DoCoMo will spearhead efforts to develop a global IP network and IP connectivity in Asia and the U.S. in particular, responding to the borderless needs of Japanese global companies and global companies seeking to break into the Japanese and Asian markets.

3. Platforms

NTT Communications, NTT DoCoMo, NTT Data and other Group companies will combine their strengths toward capturing a considerable share of the rapidly growing EC market, and will also engage in the necessary partnering and alliances to promote global information sharing platform business based in Japan (ASP, data centers, etc.)

IV. STRENGTHENING TECHNICAL CAPACITY

The NTT Group will pursue R&D toward building a safe, secure, comfortable and convenient network society on photonic infrastructure supporting the 21st century information sharing industry.

More specifically,

(a) NTT will lead the way in diversifying the information sharing industry. Not only, for example, will it develop communications technology which takes advantage of the two-way and broadband nature of photonic infrastructure to present video images and other information with an unprecedented reality, as well as information sharing platform technology allowing safe and secure network use, but it will also create innovative applications that will exploit the full potential of the photonic infrastructure and new business models with strong international competitiveness.

(b) In addition to producing user-friendly devices and services, NTT will also conquer emerging challenges such as information literacy and the "Digital Divide," contributing to the creation of a more equitable and dynamic society.

In the immediate future, NTT will strengthen R&D in the following three areas, supplying the results in line with each particular Group company's mission in order to stimulate the development of an information sharing society and open up new business frontiers in the various business areas.

(1) DoPN (Data over Photonic Network)
NTT will push forward the development of the necessary technology for various network services on a high volume backbone and a broad range of access services, supplying low-cost, ultrahigh-speed communications infrastructure grounded in a photonic network.
* "Best-effort" through to "guaranteed" medium-to-high speed IP and IP-VPN
* Live/stored video contents delivery
* Next-generation backbone for fixed and mobile communications

(2) Rich Internet
The Group will advance R&D toward realizing information sharing platforms for safe and secure and electronic commerce, creating an environment in which the Internet is used universally on a daily basis.
In doing so, the Group will stimulate the various network service markets and content sharing markets on the Internet.
* Solutions for education, navigation and medical care, etc., provided on the photonic infrastructure
* Electronic commerce platform such as authentication, electronic settlement and multi-purpose smart cards
* Content sharing platform such as copyright protection and tracing illegal use

(3) Seamless, full and global
By promoting technology development toward flexible use of phone lines, the Internet, mobile communications and optical access, the Group will realize an affluent, high-quality living environment for clients operating on a global basis.
* SOHO and home network applications provided in combination with home electronics, mobile devices and portals
* Services with home information devices allowing mass-users to publish their own personal content including video images.

V. GROUP OPERATION

1. Mission clarification

While NTT as a group is centered on the information sharing industry, the various companies making up the group will be divided into the following four groups according to the type of company, target market and business content, clarifying the mission of each and laying out the direction which each should pursue. This will allow each company to exploit its independence and autonomy in pursuing dynamic business development, while also establishing the business foundations for the group as a whole.

In new business areas in particular, which attract companies from different industries, ventures and an otherwise diverse range of competitors, rather than predetermining the business territory of the various group companies, each will be left to engage in dynamic business development based on their own management judgement, actively exploring new business frontiers.

(1) Type 1: Regulated companies (NTT East and West)
* Introduction of optical access lines as infrastructure allowing greater speed and diversity and lower cost
* Establishment of solid financial foundations, stable provision of universal services
* Strengthening of competitiveness in regional market

(2) Type 2: Competitive companies (NTT Communications, NTT Data, NTT DoCoMo)
* Expansion of information sharing services
* International expansion
* Greater competitiveness

(3) Type 3: Management resource utilization companies (NTT-ME companies, NTT Facilities, NTT Comware, etc.)
* Efficient commissioning making service suppliers (Types 1 and 2) more competitive
* Expansion of business territory using the technology and know-how of these companies
  - Maintenance integration by NTT-ME companies (help desks, on-site maintenance, user network monitoring, hosting services, etc.)
  - Information environment construction services provided by NTT Facilities (design and construction supervision of highly reliable power sources, air-conditioning, security, etc., for data centers, call centers, etc.)

Once new business with no relation to the commissioned work undertaken by Type 3 companies has reached a certain scale, NTT will consider spinning this off and establishing independent entities as Type 4 companies.

(4) Type 4: Companies breaking into new business areas (NTT Electronics, NTTPC Communications, GrR HomeNet, etc.)
* Development of new business territory in areas outside the Group's market
* Strengthening of competitiveness by establishing core competencies and investing in and tying up with reputable external partners
* Consideration of listing, etc., in line with growth stage

2. Reallocation of staff and more flexible employment

NTT will reallocate human resources among Group companies in line with market changes. Further, as major disparities are expected to emerge in the competitiveness and profitability of the various Group companies, the Group will also work to develop compensation in line with corporate performance, business content, the nature of the region, and individual results and performance, etc.

(1) Reallocation of staff
NTT will reallocate staff in line with market changes in order to ensure optimal staff allocation. Around 27,000 personnel of NTT East and West will be shifted
- from fixed-line phones to information sharing and to metropolitan areas, which offer greater market prospects, and
- from NTT East and West to other Group companies to fill the necessary places arising from the business development and expansion of these companies.

To facilitate speedy and accurate personnel allocation, NTT will develop a highly flexible labor market within the Group, as well as considering the diversification of personnel and compensation systems in response to the growing flexibility of the employment environment. Professional staff, for example, could be appointed from outside the Group.

(2) Heavy emphasis on results and performance
NTT's traditional seniority-based, uniform compensation system will be eliminated as far as possible, with far greater weight placed on individual staff members' results and performances, in order to establish a compensation system which allows individuals maximum room to demonstrate their entrepreneurship and spirit of challenge, as befits a global information sharing corporate group.

Seniority elements have already been completely removed in the case of management positions, including the elimination of regular pay rise. In FY2000, NTT will shift further emphasis on to results and performance, expanding the difference between individual bonuses to a maximum of three times.

3. Cost structure reform

The NTT Group shares with Japanese industry structural issues such as an overly heavy ratio of middle-aged and senior staff and a multi-layered outsourcing structure. To address these issues and promote entry into new business, the Group will reform its cost structure, boost cost performance, ensure capital investment efficiency, and review its business outsourcing structure. Steps to this end will include increasing the efficiency of business management, reallocating staff and emphasizing results and performance.

VI. EMPHASIS ON STOCKHOLDERS

1. Management emphasis on investment returns

To increase the corporate value of the NTT Group in line with its duty to stockholders, the Group needs to respond to the paradigm shift in capital investment from an infrastructure development focus to a demand response focus. The Group also broadens the investment concept from capital investment to R&D and equity investment, by basing the management of Group companies on an emphasis on investment returns and engaging in business activities accordingly.

As a standard NTT Group measure will be needed for assessing returns, monitoring and assessments will be made based on indices adjusted according to the growth stage (new business, growing and mature) of each business area handled by Group companies and the risk entailed.

2. Group management indices

To optimize corporate value, NTT has introduced EBITDA margin, free cash flow and ROCE as management indices emphasizing cash flow. In the three-year management plan too, these will be positioned as NTT Group priority goals, with measures steadily implemented toward their achievement.

3. Expansion of IR activities

NTT seeks to present its stockholders with a highly visible profile, ensuring the constant clear communication of management direction. To this end, NTT will increase the number of opportunities for top management to personally explain management strategies and policies to institutional investors and analysts both at home and abroad.

VII. CORPORATE CULTURE INNOVATIONS

To fulfil its social duty of contributing to the realization of a rich information society, the NTT Group will work to provide customers with optimal services and reliability, establishing NTT as a "company leading the way into a new age".

1. Expansion of information disclosure

In addition to the information disclosure which a joint stock corporation is obliged to provide under the Commercial Code, NTT Group companies have also supplied information according to their particular status (e.g., listed companies, telecommunications carriers, special companies). With the shift to a corporate accounting system centered on consolidated settlement, active efforts will now be made to supply information from the NTT Group as a whole.

2. Enforcing company ethics

In addition to conforming with laws, regulations and contracts, the NTT Group will also act based on a social conscience and undertake fair and transparent business activities, doing its utmost to stand as a corporate group trusted by stockholders, customers, business partners and society.

As the leaking of customer information in particular is a serious issue causing customers to lose confidence in the Group and impacting heavily on business operation, the NTT Group will not only comply with the Guidelines on the Protection of Personal Data in Telecommunications Business as formulated by the Ministry of Posts and

Telecommunications, but also engage in various measures to raise morals and strengthen checking mechanisms, ensuring strict customer information control.

VIII. NTT GROUP STRUCTURAL ISSUES

The NTT Group is working to develop business based on the current Group formation, with keeping fair competition, and to respond to the expectations of stockholders and customers. However, compared to the time when reorganization was discussed, the management environment has changed substantially, including (a) dramatic changes in the market structure in the shape of the sudden popularity of mobile communications and the Internet and the emergence of fierce competition in regional telecommunications markets; and (b) the dramatic changes in and globalization of the business structure epitomized in dynamic M&As among global mega-carriers and mergers and tie-ups among domestic telecommunications carriers.

To respond to these changes, the NTT Group will proceed with considerations as to a possible future review of Group formation with the understanding of all those involved, looking to undertake this at some early point from FY2002 onward. The review will focus on (a) structures for maintaining universal services amidst increasing competition in regional telecommunications markets and (b) corporate management allowing speedy, accountable management amidst global competition and the accompanying large-scale M&As.

IX. Three-Year Business Plan Goals

The management goals which the NTT Group will seek to achieve by the final year of the plan (FY2002) through the above efforts are as noted in the Appendix.

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