3G MOBILE POLICY:

THE CASE OF JAPAN

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1 Introduction

A universally acknowledged observation is that technology has been forging ahead in many fields, with significant advances in some. Mobile phones and the Internet are among these. Here, technological innovation and commercial development have gone hand in hand although societal influence has been far from absent. Japan has been a world leader in the field of telecommunications. This article examines developments in third-generation mobile phones and the situation reached in that country.

1.1 Geography and Demographics

Not far off the eastern coast of the world's largest continent, Asia, lies the relatively small Japanese archipelago – almost at a hollering distance from the Korean peninsula. This chain of islands, in which four distinguish themselves as the main ones, is home to some 127 million human beings, almost half the population of the United States. Its land mass is 377'835 square kilometres, 71% of which is mountainous. It is half again the size of the UK, but only one-ninth the size of the Indian subcontinent. Apart from fishing (Japan accounts for 15% of the world's catch), the country is lacking in natural resources. This is in sharp contrast to its huge economy, which is among the world's largest. Its rate of urbanisation is high, as 80% of its population now lives in crowded urban areas, a factor not be neglected in accounting for the considerable success of mobile communications in Japan. The national currency is the Japanese Yen (JPY). One language is spoken throughout the land even though two systems of writing prevalent. They are: *Kanji*, written in the manner of Chinese hieroglyphics (3'000 symbols are in daily use) and the phonetic *Kana* (with a 46-character set). Standard Japanese word-processors recognize up to 6'000 *Kanji* characters.

1.2 Human Development

Japan ranks ninth among the 174 countries that make up the United Nations Development Programme[1] Human Development Index and is placed in the high human development group. In this respect, it ranks ahead of France, Switzerland and Hong Kong SAR but behind Canada, the US and the Netherlands. Table 1.1 provides some relevant social and economic indicators for the country.

Table 1.1: Basic social and economic indicators for Japan

	1994	1995	1996	1997	1998	1999
Population (000s)	125'176	125'570	125'864	126'166	126'490	126'505
Urban population (in per cent)	77.50	77.60	78.26	78.42	79.00	n.a.
Gross Domestic Product (GDP) (JPY Billion)	479'260	483'220	500'310	509'645	498'499	495'375
GDP Per Capita (US$)	37'459	40'912	36'541	33'386	30'104	34'376
Average Annual Exchange Rate Per US$	102.21	94.06	108.78	120.99	130.91	113.91

Source: International Telecommunication Union, International Monetary Fund

[1] The UNDP's HDI is a composite of key indicators of well-being such as life expectancy, literacy, school enrolment and per capita GDP.

1.3 Political Economy

Japan is universally regarded as one of the world's leading industrial nations. Significant government-industry collaboration, rapid technological innovation and a strong work ethic have sustained the economy at its present high level.

One of the most remarkable characteristics of the economic scene is the "keiretsu", or tightly-knit groups consisting of manufacturers, suppliers and distributors. Much of the labour force enjoys lifetime employment and in general there is a high degree of staff loyalty. The use of robotic technology and telecommunications are important factors contributing to its economic strength. In fact, Japan possesses 410,000 of the world's 720,000 "working robots".

The economy suffered greatly as a result of World War II: destruction of infrastructure, severe food shortages and high inflation. Various social reforms were carried out after the war in order to establish a basic framework for economic recovery and development. The process of liberalisation began with the break-up of the "zaibatsu" or large business trusts. Postwar demilitarisation and the prohibition of rearmament were written into a new constitution, and Japan now spends as little as 1% of its total GDP on defence.

In the latter half of the 20th century, overall economic growth in Japan was phenomenal. In the 1960s, for instance, the annual growth rate averaged close to 11%. This was far above the growth rates for the Federal Republic of Germany at 4.6% and for the United States at 4.3% during the same period. This growth was spurred by large investments from the private sector in infrastructure and equipment, and by the increased capital spending and the introduction of new technology.

There was a significant slow down between 1992-95, largely due to the after-effects of increased investment during the late 1980s, and constrictive domestic policies intended to wring out speculative excesses from the stock and real estate markets. Since then, periods of growth have been frequently interspersed with stagnation. It picked up in 1996 following the introduction of stimulating fiscal and monetary policies coupled with low inflation. In 1997-98, Japan's economy took a downward turn. Output started to stabilize in 1999 as emergency government spending began to take hold and business confidence gradually improved. In 2001, on the eve of the IMT-2000 service launch, Japan was once again plunged in a severe recession.

2 Telecommunications Regulatory Framework

2.1 Regulatory History

Telephone services were introduced in 1880 and a Ministry of Communications was established soon after, in 1885. It remained in place until the end of World War II when it was split up into the Ministry of Telecommunications and the Ministry of Posts. In 1952, the Ministry of Telecommunications became a public corporation and NTT (Nippon Telegraph and Telephone) was born. It was to be the monopoly domestic operator. At the same time, the Ministry of Posts became the Ministry of Posts and Telecommunications (MPT) responsible for the regulation of the telecommunication market. In the same year, the *KDD Corporation Law of 1952* was enacted, establishing KDD (Kokusai Denshin Denwa) as the international operator. NTT was the primary regulator, responsible for the setting of technical standards, the development of telecommunication regulation, and for policy-making in conjunction with the Japanese parliament (the Diet). NTT already controlled an R&D system in collaboration with the large equipment manufacturers, such as Fujitsu, NEC, Hitachi and Oki Electric. Although the MPT was charged with overseeing NTT operations through a Telecom Supervision Bureau, it had a tight budget and one of the its two senior members was to be from the NTT.

While substantial network development had been achieved, NTT was nevertheless perceived as being out of touch with user needs. Consequently, in 1970, the MPT set up a number of study groups to consider reforms to telecommunications policy. These study groups, made up of about 100 younger MPT staff, examined the possibility of reorganizing the NTT, and openly questioning its monopoly status. The report, released in June 1971, recommended the "reorganization" of NTT and the liberalisation of value-added services. These reforms were not adopted until 1985, fifteen years later. And despite NTT's role as primary regulator, the involvement of the MPT in regulatory reform in the 1970s sealed MPT's future role as the telecommunications regulatory authority for Japan.

Significant reform in telecommunications occurred in the 1980s, as the United States began liberalizing its telecommunications market and started the process leading to the break-up of AT&T. In Japan, the Second Provisional Council on Administrative Reform (*Rincho*) announced a proposal in 1982 to allow competition

in all sectors of telecommunication services, as well as to privatise and "reorganize" NTT. Approval was given to separate telecommunication services on the basis of ownership rather than service types. Under this scheme, Type I service providers (those owning their own facilities or infrastructure) would require permits from the MPT. Special Type II service providers (those not owning infrastructure but with a large user base) would need "permission" from the Ministry. Basic Type II service providers (confined to operation in limited areas) would need to merely register. The licensing regime in Japan is discussed further in section 2.3 and Chapter 4. The Liberal Democratic Party accepted the proposal, with one exception: Special Type II value-added service providers were not to require permissions but only registration.

Surprisingly, the *Rincho* collaborated with officials in the NTT to push forward privatisation. NTT agreed to proceed with privatisation so long as it was not broken up. On 1 April 1985, three reform laws came into effect: the *Telecommunications Business Law,* the *NTT Law,* and the *Background Law for the Telecommunications Law.* NTT privatisation began in October 1986, when the government issued the first block of 200,000 shares. Complete privatisation did not take place and the government still holds a substantial share in NTT. In 2001, moves were afoot to continue the process. [2]

The reforms of 1985 placed regulatory power firmly in the hands of the MPT, e.g. the authority over price and service regulation (the Diet's original domain) and technical regulation (NTT's original domain). The MPT also increased its role in telecommunication policy, and research and development. It even began exerting its authority over competition issues, and to select new entrants (new common carriers – NCCs) in the 1980s and 90s. A large number of companies entered the market and by 1996, 124 Type 1 and 3134 Type II carriers were offering services.

In the 1990s, the MPT evolved its regulatory framework significantly to adapt to technological innovation and changing market dynamics. It started with the liberalisation of the cable TV market in the early 1990s. In 1996, the MPT embarked upon a deregulation process which included, *inter alia,* a new regime for end-to-end interconnection with NTT (known as "ko-sen-ko" interconnection) and a relaxation of foreign ownership restrictions. Box 2.1 lists the milestones of the liberalization process. Once the privatisation process had begun, the MPT was able to focus more effectively on developing policies for information and communications technology (ICT) in Japan. The MPT and two other ministries were merged into the Ministry of Public Management, Home Affairs, Post and Telecommunications (MPHPT) in January 2001 (See Annex B for more details).

2.2 Current Regulatory Framework

2.2.1 Overview of Telecommunication Business Related Laws

In April 1985, NTT (until then a public corporation) was privatised and the Japanese telecommunication market was opened to new entrants. At the same time, the *Telecommunications Business Law* (hereinafter referred to as the "Business Law") was established to regulate telecommunication companies. Businesses wishing to offer telecommunication services were required to either obtain permission for it, or register/notify the Ministry of their intention, depending on their type of operation.

The *Radio Law*, enacted in 1950, ensures the equitable and efficient utilisation of the spectrum. This law covers spectrum use, wireless equipment and related issues. An operator wishing to establish a wireless network must obtain a *Radio Law* licence in addition to the permission stipulated in the *Business Law*. Operators were required to meet all requirements relating to the radio station license, as prescribed by the Radio Law, including equipments and operations.

[2] See "NTT Shares a Tough Sell", April 2001, Wired News, http://www.wired.com/news/business/0,1367,42830,00.html

Box 2.1: Liberalization Milestone

1952	Establishment of Nippon Telephone & Telegraph as a public corporation
1985	Privatisation of NTT and creation of new common carriers (NCCs)
1990	Decision regarding break-up of NTT postponed until 1995
1993	Cable TV operators allowed to connect to Type 1 carriers and to offer telephony services
1995	Decision regarding break-up of NTT postponed another year
1996	• Major package of deregulation announced by the MPT • Final agreement on future 'restructuring of NTT under a holding company structure • Telecommunication Council issues report on basic rules for interconnection
1997	• WTO agreement on basic telecommunication services: Revision of NTT, KDD and Telecommunications Business Law in Japan • Restrictions on foreign ownership lifted except for NTT, which is still capped at 20%. • Diet passes laws on the terms and conditions of the WTO agreement (to go into effect in Feb 1998) • KDD starts domestic long-distance services • International IP Telephony services legalized • Cable TV operators begin offering telephony services through Type 1 licences • Local interconnection access rules go into effect • International simple resale liberalized • Details of NTT restructuring released
1998	Cabinet sets up "Three-year Program for the Promotion of Deregulation" as part of Japan's "second info-communications reform" Mobile operators exempted from having to receive permission for tariff changes from MPT (a notification is now sufficient)
1999	NTT restructured as holding company consisting of NTT Data, NTT DoCoMo, NTT East, NTT West and NTT Communications (long-distance and international operations)

Source: MPHPT and Pyramid Research

2.2.2 Types of telecommunication businesses

The Business Law classifies telecommunication businesses into Type I and Type II businesses. The latter is divided into General Type II and Special Type II businesses. Operators that own their own circuits and facilities are classified as Type I businesses and others as Type II businesses. Precise definitions are set out in Table 2.1. The rationale behind this classification stems from the crucial role played by Type I operators, who are responsible for providing basic infrastructure indispensable to people's lives and overall socio-economic activity. They are therefore subject to tighter regulations.

As indicated above, mobile phone operators must obtain both a Type I permission and a *Radio Law* license.

2.2.3 Licensing Term and Fees

The *Business Law* does not envisage the concept of expiry dates and fees for telecommunication licences. Upon grant of a license, the operator entering into the business of telecommunications remains in it until found in violation of the *Business Law.*

Table 2.1: Types of Telecommunications Businesses in Japan

Type of business	Type I telecommunications business	Type II telecommunications business	
		Special Type II telecommunications business	General Type II telecommunications business
Definition	Business that provides telecommunications services by establishing its own telecommunications circuits and facilities	Telecommunications business other than that described as Type I telecommunications business	
		1) Type II telecommunications business that provides voice services for an unspecified number of general subscribers through the interconnection of both ends of leased circuits with public switched networks (the so-called "Ko-Sen-Ko" interconnections). 2) Type II telecommunications business whose telecommunications facilities are used for communications with locations outside Japan	Type II telecommunications business other than described for Special Type II telecommunications business
Condition for entry	Permission	Registration	Notification

Source: Adapted from the Manual for Market Entry into Japanese Telecommunications Business, MPHPT

Due to their role in providing basic services, Type I operators, however, need the permission of the Minister to suspend or discontinue their services.

The *Radio Law* stipulates that operators of radio stations (including mobile radio stations) should renew their licences every five years. PHS handsets are exempt from this requirement (MPHPT ordinance) due to the fact that they use low power radio equipment ("Exceptional Licensing of Specified Radio Stations"). All other handsets are licensed through a simplified process. They are certified by Japan's Telecom Engineering Centre (TELEC) through a "Certification of Conformity for Specified Radio Equipment".

Unlike the *Business Law,* the *Radio Law* obliges operators to pay a license fee. Mobile operators must pay JPY 9'700 (about US$ 80) as a "blanket" fee once the TELEC certification is received. In addition, under this legislation, operators must pay an annual spectrum user fee of JPY 540 (US$ 4.5) per handset.

2.2.4 Price Regulation

A Type 1 operator wishing to modify charges or tariffs for a telecommunication service is required to file a notification with the Minister seven days prior to the date of implementation. Minor changes are exempt from this requirement.

However, if that operator intends to change or add any conditions or terms relating to a telecommunication service, full authorisation from the Minister is mandatory.

A type I operator whose regional (i.e. 'inner prefecture') market share is over 50% is defined as an operator owning "designated telecommunications facilities". These type 1 operators are subject to price-cap regulation for their PSTN, ISDN and leased circuit tariffs in the regional telecommunication market (NTT East and West Regional fall into this category).

2.2.5 Interconnection Regulation

The *Business Law* sets out the regulatory framework for interconnection between operators. Upon reaching an interconnection arrangement for their telecommunications facilities, operators are required to obtain authorization from the Minister. This ensures that unjust conditions have not been imposed on either party and that the agreement does not include any provision that unfairly discriminates against either party.

Operators can also propose generic interconnection agreements for future use, for which authorisation from the Minister is required in order to ensure against unjust conditions and unfair discrimination. Once such authorization is granted, operators need only notify the Minister when the agreement is signed with another party is completed.

2.2.6 Amendment to the Telecommunications Business Law in 2001

In June 2001, the Japanese Diet passed a number of amendments to the *Telecommunications Business Law* and the *NTT Law*. These are expected to go into force by the end of 2001. The objectives of these amendments are as follows: promotion of competition in the telecommunication market, creation of incentives for improving services through deregulation and the establishment of a high-speed network. To meet the first objective, regulation of dominant operators, universal service schemes and a telecommunication business dispute settlement committee are to be established. To meet the second objective, the de-regulation of non-dominant operators and the expansion of NTT's regional companies are to be encouraged. Enhanced support for network development and the introduction of the concept of wholesale telecommunication businesses will help meet the third objective. Amendments of particular significance to mobile operators are the dominant operator and interconnection provisions outlined below.

2.2.6.1 Regulations affecting Dominant Operators

The 2001 amendments to the *Telecommunication Business Law* introduce the concept of "dominant operators" for the regional fixed (local loop and calls within inner prefecture) and mobile telecommunication markets. Table 2.2 summarizes these amendments. Long distance and international markets were not covered, as they were most likely viewed as sufficiently competitive.

While the precise definition of "dominant operators" in the mobile phone market is yet to be determined, the expectation is that any Type 1 mobile operator with a market share of over 25% will be considered dominant.

Dominant operators will be prohibited from using information gained through interconnection agreements for unrelated purposes. They will also be prohibited from unfair intervention with manufacturers and resellers and from unfairly discriminating between operators. Procedures to order suspensions or changes in the activities of dominant operators will be established to deal with any violation of these prohibitions.

Table 2.2: New Regulation for Dominant Operators in Japan

<table>
<tr><th></th><th colspan="2">Dominant Operators</th><th rowspan="2">Non-dominant Operators</th></tr>
<tr><th></th><th>Fixed Regional</th><th>Mobile</th></tr>
<tr><td>Call Charges</td><td>Price cap
Notification</td><td>Notification</td><td>Notification</td></tr>
<tr><td>Service Conditions</td><td>Authorisation</td><td>Notification
(formerly Authorisation)</td><td>Notification
(formerly Authorisation)</td></tr>
<tr><td>Interconnection Agreements</td><td>Generic Agreement Authorisation & Disclose</td><td>Generic Agreement Notification & Disclose
(formerly Authorisation)</td><td>Agreement Notification
(formerly Authorisation)</td></tr>
<tr><td rowspan="2">Protection of Fair Competition</td><td>Fire Wall between Dominant Operators to ensure fairness</td><td rowspan="2"></td><td rowspan="2">In case of violation, Ministry issues order to change business activities</td></tr>
<tr><td colspan="2">Prohibitions such as using information for outside purposes, unfairly discriminating (Order to discontinue)</td></tr>
</table>

Note: Bold text indicates amendments to the legislation.

Source: MPHPT

2.2.6.2 Interconnection with Mobile Operators

According to the new amendments, dominant mobile operators will be responsible for disclosing their interconnection agreements to the public and of notifying the Minister. The new amendments reduce the administrative burden on mobile operators, as they no longer require Ministerial authorisation. Nevertheless, if an agreement is seen to violate the provisions of the *Business Law*, the Minister reserves the right to intervene and order the necessary modifications.

3 Overview of Japan's Telecommunication Market

Working closely with the MPT, NTT rebuilt the nation's telecommunication infrastructure devastated in the Second World War. By the mid-1970s, most of Japan had access to basic telephone services. By March 1978, the long waiting list for telephone connections had for the most part been cleared. In April 1979, NTT completed rolling out a nationwide direct dial network. Basic telecommunication indicators for the country are set out in Table 3.1.

Over the past few years, overall telephone density in Japan has been increasing at a rapid rate. However, the expansion of main lines has slowed and is being overtaken by mobile connections. In 2000, fixed telephone penetration was 58% and mobile penetration over 50% (Figure 3.1). The number of mobile subscribers has been increasing dramatically since 1994. Including ISDN connections, the figure for mobile lines as a percentage of fixed lines reached 87% in 2000 (Table 3.1). Mobile connections are set to overtake fixed lines in 2002 and have already overtaken PSTN lines in 2000.

Table 3.1: Basic Telecommunication Indicators for Japan

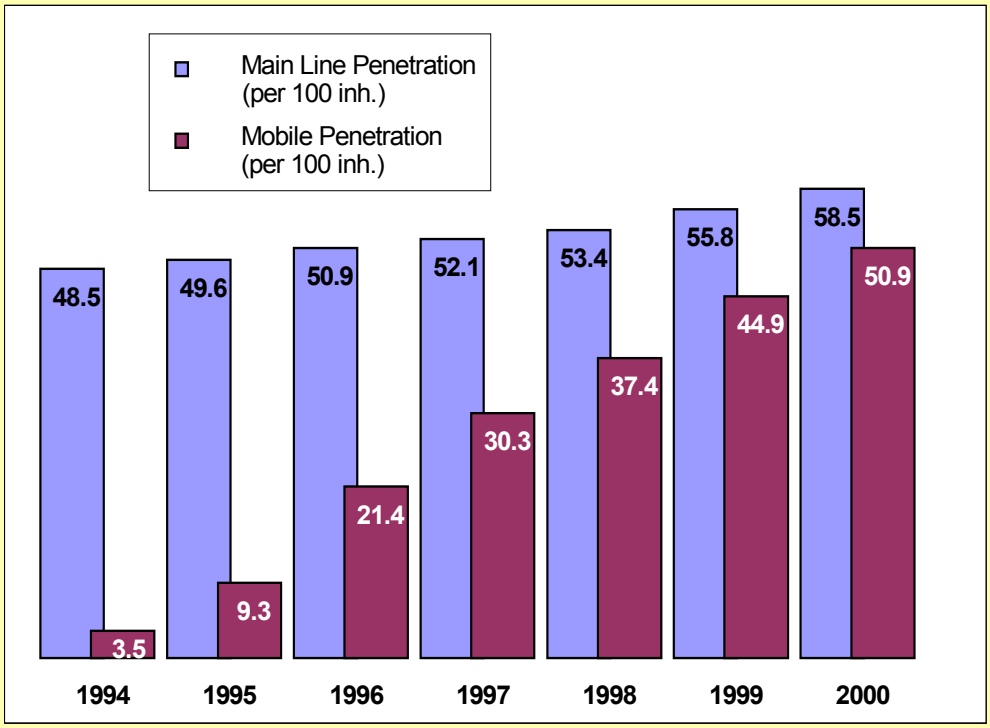
	1994	1995	1996	1997	1998	1999	2000
Main Telephone Lines (000s)*	60'690	62'292	64'037	65'735	67'488	70'530	74'220
Main Lines per 100 inhabitants*	48.48	49.61	50.88	52.10	53.35	55.75	58.47
Mobilephone Subscribers, Cellular and PHS (000s)	4'331	11'712	26'906	38'254	47'308	56'846	66'784
Mobilephone Subscribers per 100 inhabitants	3.46	9.33	21.38	30.32	37.40	44.94	50.87
Mobile Lines as % of Fixed Lines	7.1%	18.8%	42.0%	58.2%	70.1%	80.6%	87.0%
Number of Personal Computers per 100 inhabitants	9.19	12.03	16.21	20.21	23.72	28.69	31.51

* includes ISDN connections

Source: International Telecommunication Union

For the most part, the Internet services market had been largely unregulated. Local access charges remain an obstacle to ISPs and interconnection arrangements do not include revenue-sharing arrangements for Internet calls. The diffusion of the Internet market in Japan has been relatively sluggish. High leased line rates have been identified as one of the leading causes of this slow growth in the early 1990s. Relatively low PC penetration rates (between 20 and 30 per cent over the last few years) have also delayed the take-up of Internet services. In fact, fixed Internet use in Japan has been limited compared to other high-income countries (See Figure 3.3). At the end of 1999, only 14.4% of the Japanese population was using the Internet, whereas other high-income countries in the region exhibited higher penetration rates: Singapore at 29.5% and Hong Kong SAR at 25.2%. In the early days, the Internet was used mainly in large businesses. 11.7% of these businesses used the Internet in 1995 compared to almost 90% at the end of 1999. The growth rate among small businesses or households was much lower. Household penetration at the end of 1999 was still under 20% (see Figure 3.2). The MPHPT's 2000 White Paper released in July 2001 released figures of 34% for household penetration.

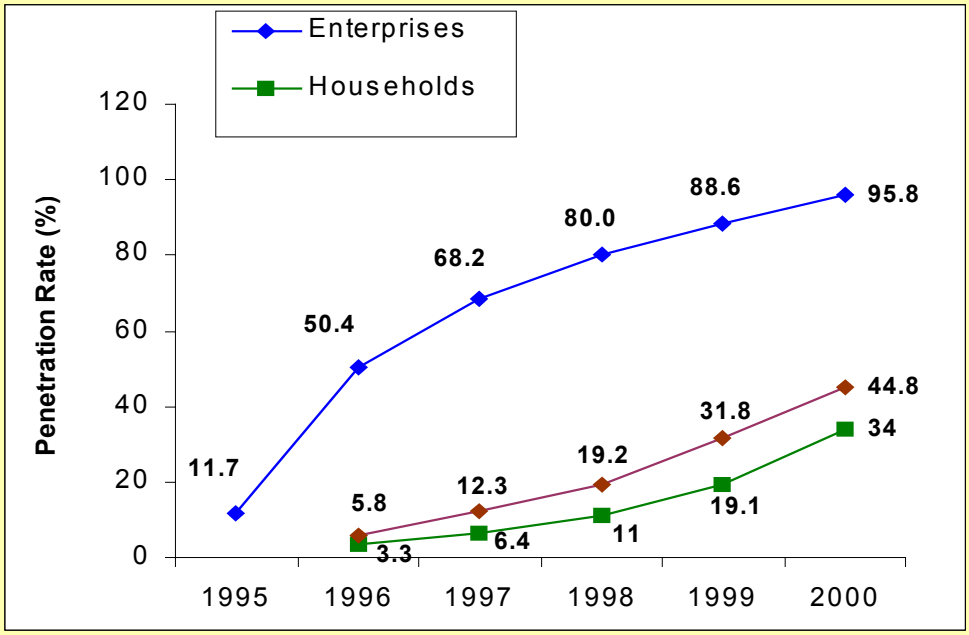
Figure 3.1: Growth of telephone penetration rate (fixed + mobile) in Japan



Source: ITU World Telecommunication Indicators, ITU estimates, MPHPT

Note: Main Lines includes ISDN connections. If ISDN connections are not taken into account, the number of mobile overtook fixed in the year 2000.

Figure 3.2: Penetration of the Internet among Establishments, Enterprises and Households in Japan

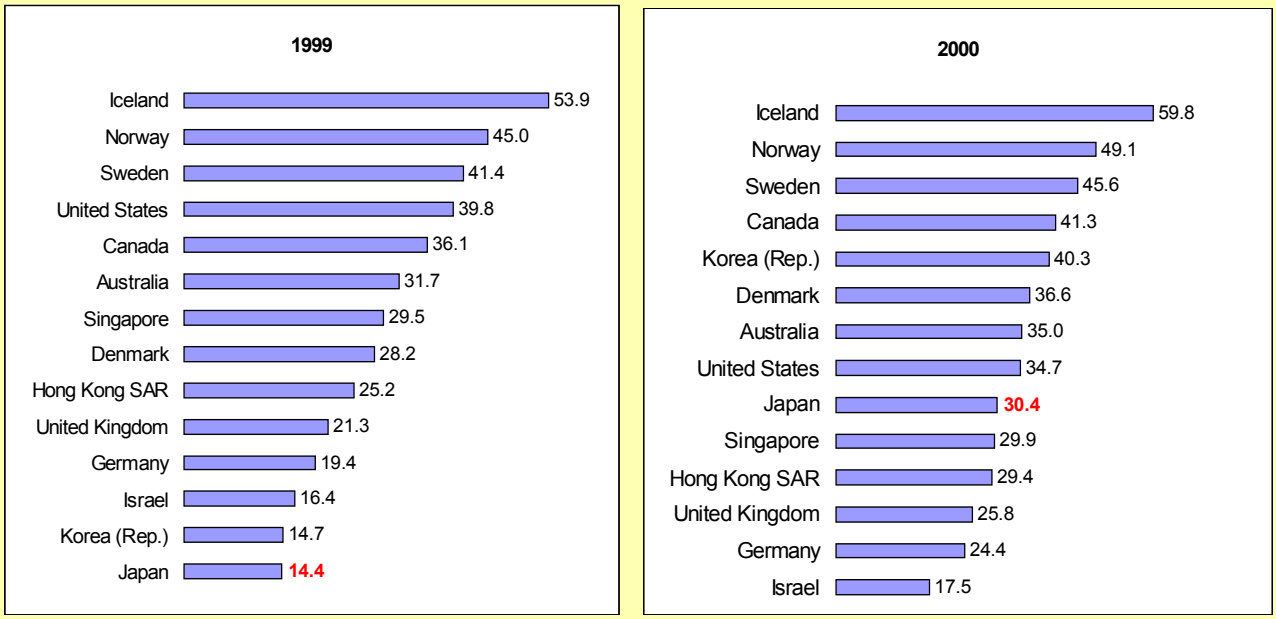


Notes: "Establishment" is defined as a single physical location (excluding postal services and communications businesses) with five employees or more where an economic activity is being conducted. "Enterprise" refers to a business (excluding agriculture, forestry, fisheries and mining) with 300 employees or more.

Source: MPHPT, White Papers: Communications in Japan 2000 & Communications in Japan 2001.

However, due to the phenomenal success of mobile Internet services such as "i-mode" (NTT DoCoMo), Internet penetration doubled to 30.4%, and Japan now has a higher Internet penetration rate than both Singapore and Hong Kong. In 2000, the monthly growth rate of mobile Internet was 16 per cent compared to a fixed Internet rate of only 3 per cent (Figure 3.4). Over the next few years, however, main line growth may increase again due to the replacement of PSTN lines with xDSL (digital subscriber lines), FTTH (fibre to the home) and CATV (cable TV) access lines.

Figure 3.3: Internet Penetration from 1999 to 2000



Source: ITU, World Telecommunication Indicators

The largest fixed-line Internet Service Providers in Japan are affiliated to equipment manufacturers. In the late 1980s, NEC and Fujitsu started offering closed PC communication network services. It was in the mid-1990s that Fujitsu and NEC launched their Internet access businesses. In the late 1990s, fixed-line operators, such as KDDI, Japan Telecom and NTT entered the market.

The majority of fixed-line ISPs do not own circuits or facilities and are therefore categorised as Type II operators. The average flat-rate subscription charges for ISP services are JPY 2,000 (US$ 16.00). In addition, users have to pay the associated call charges. In terms of licensing, Type II service providers do not require a license: a simple "notification" to the Ministry under the Telecommunications Business Law is sufficient (see Section 2.2.2).

The top 6 fixed-line ISPs in Japan as of February 2001 are set out in Table 3.2. After the launch of the 'i-mode' mobile Internet service in February 1999, NTT DoCoMo quickly became the largest ISP in Japan and in the world, at 25.7 million subscribers in July 2001, with KDDI and J-Phone in second and third place respectively[3].

[3] At the end of June 2001, KDDI had 7.9 million and J-Phone had 7.4 million mobile Internet subscribers.

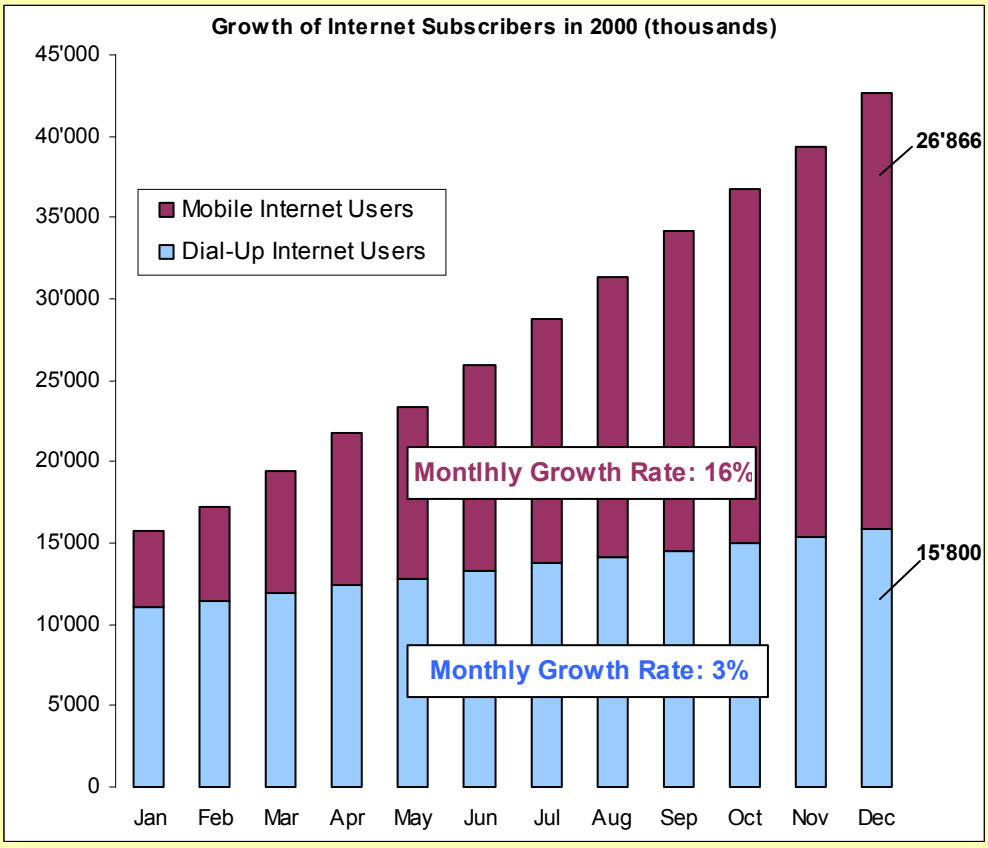
Table 3.2. Top 6 Fixed-Line ISPs in Japan by number of subscribers (February 2001)

Name	Ownership	Subscribers (millions)
@nifty	Fujitsu	4.5
BIGLOBE	NEC	3.6
OCN	NTT Communications	2.0
DION	KDDI	1.8
SO-NET	SONY	1.6
ODN	Japan Telecom	1.3

Source: Industry estimates, Yahoo Japan (May 2001), ISP websites

Of the current 65 million mobile subscriber base in Japan, the rapidly growing "browser" or "mobile Internet" subscriber base accounts for over 31 million. Figure 3.4 shows the growth rate of mobile Internet users as compared to dial-up PC Internet users in the year 2000. Figure 3.5 sets out the various modes of Internet access and their subscriber base. There are several factors contributing to the success of mobile networks for Internet access in Japan - low PC and Internet penetration are the most important ones. Some analysts point to the large number of long-distance commuters using public transport as a stimulus for growth. The early adopters of mobile services are usually young users, who account for the largest proportion of data traffic. It seems that the Internet and electronic services market in Japan will be spurred by the mobile industry. In fact, the demand for browsing services has been responsible for transforming NTT DoCoMo into the world's largest ISP almost overnight. Mobile communications account for 40 per cent of the entire telecommunication market in Japan (JPY 5.2 trillion in the year 2000).

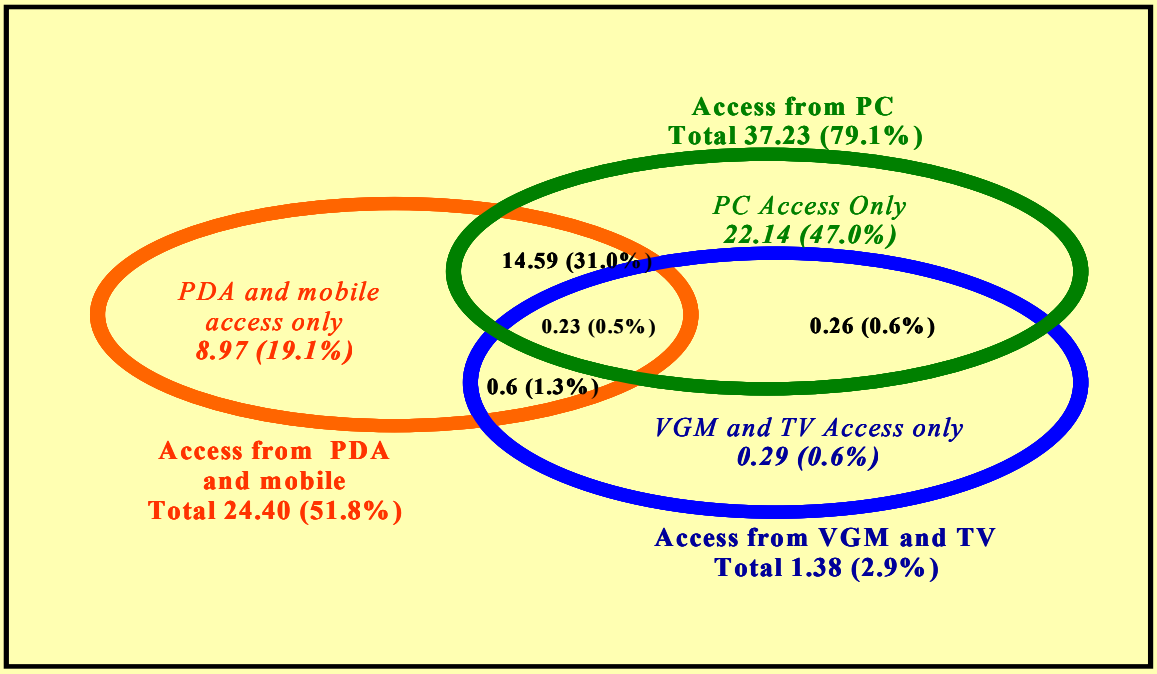
Figure 3.4: PC Internet Access and Mobile Internet Access in Japan



Note: Dial-up Users do not include CATV Internet users.

Source: Adapted from MPHPT

Figure 3.5: Modes of Internet Access in Japan (millions of subscribers, end 2000)



Note: VGM = Video Game Machine. PDA = Personal Digital Assistant

Source: MPHPT White Paper

4 The Mobile Success Story

4.1 A Japanese history of Mobile

It all began with car phones. These were introduced by the NTT in 1979. They were limited to use in cars and were thus not properly portable devices. In April 1987, NTT (privatised in 1985) began offering portable mobilephone services under an analogue "HiCap" system that it had developed. At the same time, NCC (New Common Carriers), IDO and Cellular Phone Group were established. IDO was a subsidiary of the long-distance fixed line operator Nihon Kosoku Tushin, and Cellular Phone Group was a subsidiary of long-distance fixed line operator DDI. IDO started its service from December 1988 in Kanto and Tokai region. Cellular Phone Group operators launched their service in other regions. At that time, two mobile operators (NTT and IDO or Cellular Phone Group operator) offered mobile services in each region. Roaming between operators was not an obligation and depended on negotiations between them. In August 1991, with a view to ensuring fair competition in the mobile market, NTT separated its mobile phone business. NTT DoCoMo was established as a subsidiary company of NTT. Further, in June 1993, DoCoMo was split into 9 regional operators.

Digital mobile phone services in the 800 MHz frequency band were launched in 1993. Operators adopted the PDC (Personal Digital Cellular) system developed by NTT DoCoMo. In April 1994, the 1.5GHz frequency band was also opened up for mobile services. DoCoMo now uses this band in the Kanto, Tokai and Kinki regions, where population density is very high. In these areas, two additional mobile operators (Digital Phone Group of Japan Telecom and Tu-ka Group of Nissan) also entered the market in April 1994. In other regions, Japan Telecom and Nissan Motors jointly established one operator (Digital Tu-ka Group).

In July 1995, a new mobile phone system by the name of PHS (Personal Handy Phone System) was launched. Three groups of PHS operators (NTT Personal, DDI Pocket, and ASTEL Group) launched their services simultaneously in each region. Until the mid 1990's, mobilephone users had 6 or 7 service providers (3 or 4 PDC operators and 3 PHS operators) to choose from.

Deregulation too has accelerated the growth of mobile services. In April 1994, customer ownership of handsets was introduced. Within this system, handsets could be sold to individual customers, rather than

making them available on a rental basis.. In December 1996, MPT deregulated its procedure for amending mobilephone call charges from permission to simple notification. As a result, mobile operators could reduce their call charges more easily and efficiently.

As a result, PDC operators abolished the use of connection fees and reduced their per-minute tariffs. They also introduced attractive handsets and customized tariff packages. This further led to phenomenal growth in new mobile subscriptions. The evolution of the mobile phone market in Japan is laid out in Figure 4.1.

An unforeseen effect of all this competition was its negative impact on PHS operators. In October 1997, there were over 7 million PHS subscribers, but since then subscribers have been decreasing steadily: in January 1999, the number had dropped to 5.8 million.

The reasons behind this phenomenon are as follows:

- the limited service area and mobility compared to mobile phones: the PHS service does not cover many rural areas and users could not make or receive calls in moving vehicles.
- competition and reduced interoperability with the PDC mobile phone network.
- initially, it was not possible to connect PDC mobilephones with PHS mobilephones. When it was finally made possible in 1996, the call charges between these two systems were much more expensive than calls on the same system.
- the PHS brand suffered because users had the impression that a cheaper mobilephone service could only be an inferior one.
- PHS lost its price advantage when other operators reduced their call charges and handset prices.
-

In later years, certain technical weak points of PHS, e.g. its low radio power and failed hand-overs, were addressed (See 4.2.2). For this reason, the PHS subscriber base has been stable since 1999: in May 2001, it stood at 5.8 million.

The DDI group (Cellular Phone Group and IDO) felt that it could not compete with NTT DoCoMo on the PDC platform, because the latter had been responsible for PDC development. For this reason, it decided to adopt an entirely different mobilephone technology, cdmaOne, in 1998. In May 2001, the cdmaone service had 9 million subscribers and the operator's PDC subscribers were at 2.4 million.

Table 4.1 provides a summary of the history of mobile in Japan and Annex A provides an overview of the main players in the mobile market.

4.2 Current Digital Mobile Technologies in Japan

4.2.1 PDC (Personal Digital Cellular system)

NTT DoCoMo has been responsible for developing this system, based on TDMA (Time Division Multiple Access) technology. With this system, one frequency channel (33.6kbps) can cover three simultaneous transmissions. Thus, each transmission has an available capacity of 11.2 kbps. In the PDC system, the data transfer capacity is 9.6 kbps (the remaining frequency is used for error correction sign and control signal). PDC has been adopted only by the following Japanese operators : NTT DoCoMo, J-Phone and KDDI (KDDI group has also adopted the cdmaOne system). Operations in the 800 MHz frequency band were launched in March 1993 and operations in the 1.5 GHz were launched in April 1994.

The fast growth of mobile phone subscribers caused a shortage of frequency in the mid 1990s. Thus, all PDC operators adopted the "half rate" technique in 1996. With this technique, one frequency channel is shared by six users – twice the number of users at "full bit rate". This means that the quality of voice service suffers. Recently, operators have tried to improve the quality. For instance, they offer handsets which use the full bit rate when lines are not busy.

Table 4.1: Overview of Mobile Phone Market History in Japan

Dec 1979	NTT started car phone service
Apr 1987	NTT launched analogue mobile services
Dec 1988	IDO launched analogue mobile services
Jul 1989	*Cellular Phone Group* launched analogue mobile phone services - Two mobile operators (NTT and IDO or Cellular Phone Group) now in every region
Aug 1991	Establishment of NTT DoCoMo (NTT separated its mobile communications department)
Mar 1993	800MHz Digital mobile phone (PDC system) service launched
Jun 1993	NTT DoCoMo split into 9 regional operators
Apr 1994	1.5GHz PDC system PDC service launched - Digital Phone and Tu-ka group launched their mobile services (3 or 4 operators in every region) - Introduction of customer-owned handsets
Jul 1995	PHS operators (NTT Personal, DDI Pocket, ASTEL group) launched mobile services
Mar 1996	Mobile (PDC + PHS) subscribers exceed 10 million
Oct 1996	Mobile (PDC + PHS) subscribers exceed 20 million
Jun 1997	Mobile (PDC + PHS) subscribers exceed 30 million
Dec 1998	NTT DoCoMo group merges with NTT Personal group (PHS operators)
Jun 1998	Mobile (PDC + PHS) subscribers exceed 40 million
Feb 1999	DoCoMo launches Internet connection service "i-mode"
Apr 1999	IDO/Cellular phone group launched internet connection service "EZweb" IDO/Cellular phone group completed cdmaOne nationwide seamless service
Dec 1999	J-Phone group launches Internet connection service "J-Sky"
Jul 1997	Mobile (PDC + PHS) subscribers exceed 50 million
May 2000	Mobile (PDC + PHS) subscribers exceed 60 million.
Jun 2000	3G license given to 3 groups (NTT DoCoMo, J-Phone, cellular phone)
Oct 2000	KDDI established (3 operators merged)
Sep 2000	End of Analogue service
May 2001	DoCoMo launches 3G trial service in central Tokyo area.

Source: ITU, adapted from MPH

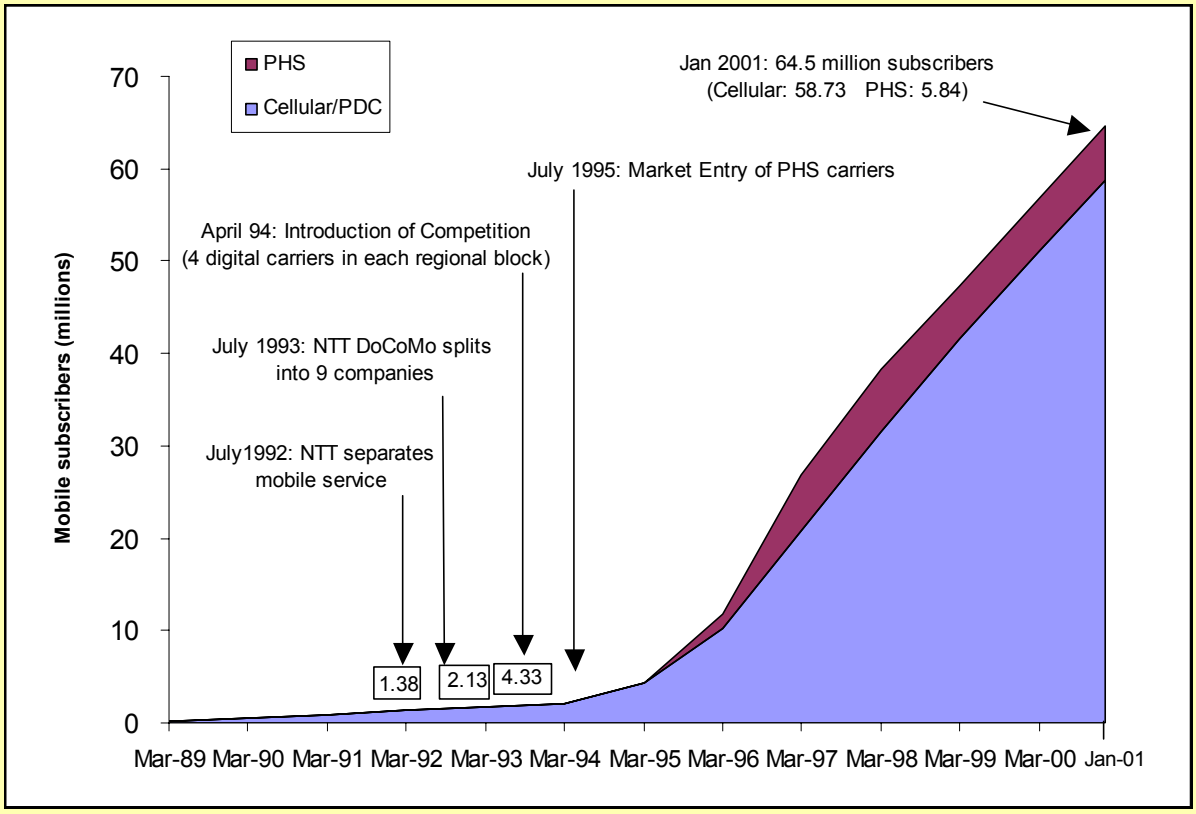
4.2.2 PHS (Personal Handy phone System)

The PHS service was originally conceived as a cordless phone that could be used outdoors. The biggest difference with other mobile phone systems is the small radio power of both its handsets and wireless base stations. The average radio power emitted is 10mW, about 1/10 of the power of PDC base stations. Consequently, the area covered by each base station is more limited: the radius is 100m-500m.

The PHS system has the following merits: its base stations are less expensive to set up due to the lower radio power, it is more suitable for indoor and underground coverage due to the size of the base stations, and the transmission speed at 64 Kbit/s is substantially higher than the PDC speed of 9.6 Kbit/s ensuring higher voice quality and faster data transfer.

On the other hand, the disadvantages of PHS include disruptions in service due to the limited coverage area and failed hand-overs for users travelling at more than 40km/h. As mentioned above, some of these technical aspects were improved with time.

Figure 4.1: Evolution of the Mobile Market in Japan



Source: MPHPT

4.3 The "Mobile Internet": Precursor to 3G?

The main highlight of 3G services will be enhanced data transmission, particularly Internet access. In the 2G world, very few countries have been successful with the "mobile Internet". WAP in Europe has suffered from low transmission speeds, paucity of content and disenchanted users. Japan, on the other hand, has introduced a wide array of mobile Internet services, and witnessed phenomenal growth in usage and subscribers. Much can be learned from Japan's experience with data services and there is reason to expect that the country will have a head start in the 3G space.

NTT DoCoMo launched its Internet connection service, 'i-mode', in February 1999. I-mode subscribers can connect to the Internet through special designated handsets. The main services are e-mail, information services and applications such as Internet banking and ticket reservation. Other mobile operators also began competitive Internet connection services in 1999 (KDDI group launched Ezweb and the J-Phone group launched "J-Sky"). In May 2001, there were 68.4 million mobile subscribers in Japan, of which 50% were using some kind of Internet browsing service. By far, the most popular service remains NTT DoCoMo's i-mode. Mobile Internet services are offered both on the PDC and PHS platform.

4.3.1 PDC Mobile Internet Services

4.3.1.1 i-mode

Mobile browsing services began when NTT DoCoMo introduced its i-mode service in February 1999. At that time, some 13% of the population was on line. In its first year of operation, DoCoMo's subscriber base roles to the level that Fujitsu's NiftyServe did after 15 years. Through its i-mode service, it has now managed to become the world's largest ISP (reckoning by the number of subscribers). In July 2001, DoCoMo had over 24 million i-mode subscribers. This represents over 60% of its total cellular subscriber

base. The service has been so popular that during the year 2000, the DoCoMo server has been known to crash on occasion owing to a surfeit in the number of simultaneous requests (This led the operator to increase its server capacity and to temporarily limit the number of i-mode handsets)[4].

"Information-mode" or "i-mode" was launched by NTT DoCoMo in February 1999. But the history of i-mode goes back to 1992, when DoCoMo was separated from NTT. When most staff were reluctant to leave the giant NTT to join a fledgling operator, former President Kouji Ohboshi decided to develop new service streams and recruit externally for DoCoMo. This is what set the i-mode wheel in motion. One of the people he recruited was a young woman by the name of Mari Matsunaga. Her main objective was to introduce simple value-added services which would appeal to younger users. She finally developed a service which would initially target young female users. Indeed, today's i-mode service is very popular among young users aged 18 to 30 and the heaviest i-mode users are teenage girls and young women.

An i-mode enabled phone allows users to access customized Internet content over a packet-based network. Web content for i-mode is developed using compact hypertext markup language (cHTML), a subset of HTML coding which is used to create typical Web pages. These then become i-mode compatible websites. There is also special DoCoMo coding which enables the creation of icons representing concepts such as joy, kisses, sadness, hot spring baths, noodle shops, a particular train line (e.g. *Shinkansen* train line) and Japanese holidays. The "i-mode" system does not use the open source Wireless Application Protocol or WAP technology and uses instead a special set of simplified HTML tags.

Subscribers to i-mode can download images of cartoon characters, weather reports, news and entertainment listings. The most popular services are the ones that enable people to people interaction. SMS and e-mail are the most used services, followed by downloading of cartoon characters ('mobile wallpaper') or musical ringing tunes. Other transactional services include mobile banking and ticket reservations. I-mode users can send e-mail to other i-mode users, other mobilephone users with compatible handsets, as well as to PCs. The data is transmitted over a packet-based network at the transmission speed of 9.6 Kbit/s. The structure of the i-mode network is illustrated in Figure 4.2.

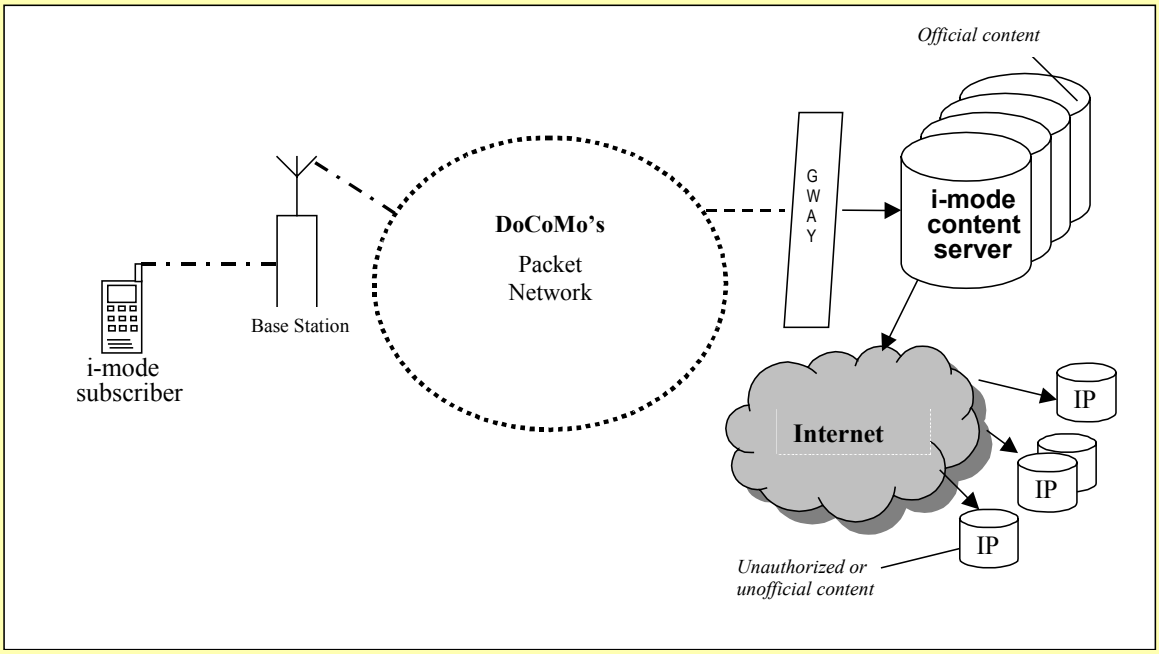
Users are charged a subscription fee of JPY 300 per month. In addition, they are billed JPY 0.3 per packet (128 bytes). Some content providers charge an additional fee of JPY 200-300 per month. There are both "official" and "unofficial" i-mode sites (Figure 4.2). In the case of official sites, there is a contractual arrangement between DoCoMo and the content provider under which DoCoMo collects the content charge for the content provider and keeps a commission of 9 per cent. In the case of unofficial web sites, users must pay the content provider directly. Unofficial sites that charge for access are therefore rare, given that electronic payment methods in Japan are limited and only a handful of credit cards are in circulation. Currently, i-mode users have access to just under 1'800 official content sites and over 40'000 unofficial sites.

The main reasons for the success of i-mode are the packet-switched data network and billing system, the use of compact HTML for viewing web content, and the positioning of DoCoMo as both ISP and mobile operator.

In an effort to extend its browser and Internet services, the incumbent operator NTT East and West (the regional fixed-line operators) launched an Internet service for fixed line users in June 2001. As mentioned in Chapter 2, Internet penetration in Japanese households continues to be lower than other countries with similar income levels. The new "L-mode" service will allow residential users to access unofficial i-mode content services via special fixed telephone sets equipped with display panels. The MPHPT gave its final approval for the service in April 2001, after ensuring that other ISPs will be allowed to carry data traffic between a user's local access point and NTT's Internet gateway. The charge for this service is JPY 200 per month in addition to ISP charges. NTT hopes to attract 1.5 million subscribers in the first year of the service.

[4] See April 2000 article from allnet devices at http://devices.internet.com/news/0004/000420imode.htm. Also, within a period of a week in August 2000, there were two major breakdowns of the I-mode server leaving many subscribers without access. For more information, see article at http://www.security-informer.com/english/crd_ntt_218302.html .

Figure 4.2: The structure of DoCoMo's i-mode network



Source: ITU

4.3.1.2 Other leading browser services: EZWeb and J-Sky

EZWEb and J-Sky are i-mode's competitors in the mobile browsing market. Though not as popular as the ubiquitous i-mode, these services are gaining momentum.

EZWeb

For its browsing services, au and Tu-Ka of the KDDI Group employ technology from phone.com. Rather than compact html, EZWeb uses a combination of wml (wireless mark-up language) and hdml (handheld device mark-up language). In addition, it employs the Wireless Application Protocol (WAP), which has been extensively used in Europe for mobile Internet services. A disadvantage is that the language and protocol are incompatible with html pages, also making graphics difficult to read. The handsets placed on the market prior to January 2000 were based on circuit-switched technology: data services are charged at the rate of JPY 10 per minute. Handsets on the market after January 2000 use packet-based technology and users are charged at a rate of JPY 0.27 per packet (or 128 bytes). It is understood that a flat-rate tariff scheme for data services is currently being considered by KDDI.

At this time, EZweb users must pay a standard subscription of JPY 200 per month. With this contract, users can access 80-90% of the available content, and can use e-mail (maximum of 2000 characters). Some content providers require an additional subscription of JPY 200-300 per month. For official sites, KDDI collects the content fee on behalf of the information providers (IPs) and keeps a commission of 9%. EZWeb had about 900 official content services in July 2001, about half of the total number of i-mode sites. However, in July 2001, KDDI upgraded its EZWeb technology to enable EZWeb users to access .HTML content, including unofficial i-mode content and graphics. AT present, however, official i-mode content remains inaccessible to EZWeb subscribers (see section 3.2.3). KDDI also offers a PC Wireless connection service, "PacketOne64" which provides users with up to 64 Kbit/s downstream. The packet rate for this service is JPY 0.1 per minute, for users utilizing the gateway of other ISPs, and JPY 0.15, for KDDI Internet subscribers.

Table 4.2: NTT DoCoMo operational data for 2000 (FY ending 31 march 2001)

		Fiscal 2000 ended March 31,2001
Cellular		
Subscribers (thousands)		36,026
Aggregate ARPU [1] (JPY/month/contract)		8,650
Voice ARPU		7,770
i-mode ARPU [2]		880
MOU (Minutes of usage) [3]		189
i-mode		
Subscribers (thousands)		21,695
503i (thousands)		1,598
i-mode subscription rate (%)		60,2
Number of IMenu Sites		1,620
Number of I-apply Sites		68
Voluntary web Sites (number)		41,093
Access (% of Sites)	*i-menu*	30
	Voluntary web	31
	Mail	39
Categories (% of Sites)	Ringing tone/ Screens	70
	Game/ Horoscope	
	Entertainment	
	Information	15
	Database	5
	Transaction	10
ARPU generated purely from i-mode		2,110

Note:
[1] ARPU (Average monthly Revenue Per Unit)
Aggregate ARPU = Cellular Phone Service ARPU (Voice ARPU) + i-mode ARPU.

[2] i-mode ARPU = ARPU generated purely from i-mode x
(No. of I-mode active subscribers/ N0. of cellular phone active subscribers)
No. of active users + (No. of subscribers at the end of previous quarter + No. of subscribers of current quarter / 2x month)

[3] MOU (Minutes of Usage): Average communication time per one month per one user.

Source: NTT CoCoMo

J-Sky

J-phone's mobile browsing service is known as J-Sky. This service uses the mobile mark-up language (".MML"), which is compatible with .HTML. J-Sky is organized very differently from EZWeb and i-mode, as users do not need to sign an additional contract to make use of the service. J-Sky uses J-Phone's circuit-switched network – however, charges for data transmission are now based on the amount of data rather than time spent on line: users are charged JPY 2.0 per kilobyte. In May 2001, out of 10.3 million J-phone users, just under 70% or 7 million subscribers were using the J-Sky service. J-Sky had over 800 official content sites in July 2001.

Table 4.2 summarizes the mobile Internet services offered on the PDC platform: i-mode, J-sky and EZWeb. Figure 4.3 gives the market share of mobile Internet service providers.

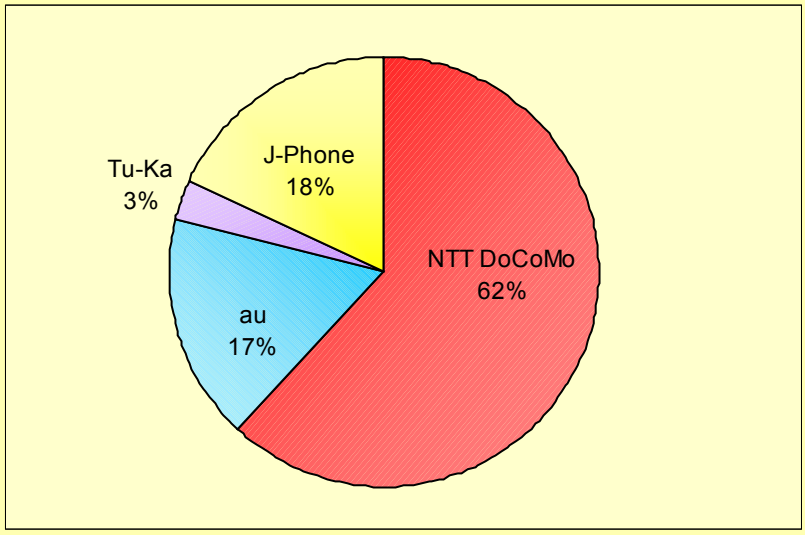
Table 4.3: Overview of PDC Mobile Internet Services

	NTT DoCoMo	KDDI (au)	J-Phone
Service Name	**i-mode**	**EZweb**	**J-Sky**
Transmission system	Packet	Packet	Circuit-Switched
Language	cHTML	WML	MML
Picture Format	GIF	BMP, PNG	JPEG, PNG
Basic Charge / Month	JPY300	JPY200	JPY200
Charge / e-mail	JPY 0.3/Packet	JPY 0.27/Packet	JPY 3.0 for sending Free for receiving
Sent e-mail capacity	250 Characters	500 Characters*	3,000 Characters*
Received e-mail capacity	250 Characters	5,000 Characters*	3,000 Characters*
Charge / Web Browsing	JPY 0.3/Packet	JPY0.27/Packet	JPY2.0 per request JPY2.0/kbyte (Max: 6 kbytes)
JAVA Applet Service	i-appli	EZplus	JAVA Contents
Maximum Application data size	10 kbytes	50 kbytes	30 kbytes

Note: * refers to KDDI Ezweb@mail Service or J-Phone's J-Sky Long E-mail Service

Source: Operators' Homepages

Figure 4.3: Mobile Internet Market Share by Number of Subscribers (April 2001)



Note : « au » is the brand name for the KDDI Group , which now owns Tu-ka. KDDI thus has a slightly larger market share than J-Phone.

Source: MPHPT

4.3.1.3 New services on the PDC platform

At the end of January 2001, DoCoMo launched the first java-enabled handsets in Japan offering the "i-appli" or "i-application"service. The i-appli service is an enhanced i-mode service and which enables the subscriber to download and run small Java applets. Applet access to information and entertainment falls into two categories: stand-alone applets and agent applets. Stand-alone applets, such as games, can be saved in the handset's memory. Agent applets are used for timely information alerts (such as stock quotes) and therefore need to connect to a server to provide up to date information. The applets are usually around 10 kbytes in size and handsets can save at least five such applets in their memory. Size and applications available in i-appli will be further enhanced with the arrival of 3G. For instance, images are currently based on .GIF format, but 3G will allow viewing and storing in .JPEG format. There were already 4.5 million i-appli users in June 2001.

KDDI's "au" group started a similar service on 4 July 2001, soon after J-Phone's service launch on 22 June 2001.

On 28 June 2001, DoCoMo announced its new location-based service for its i-mode handsets. J-Phone has been offering a similar 'J-Sky Station' service since October 2000. DoCoMo's "i-area" service provides weather, dining, traffic and other information for 419 areas in Japan. Information is organized according to the handset's current dialling code. This enables users to find search items about a specific area rapidly. To access the service, users simply go to the i-mode portal site and click "i-area" to view a large menu of i-area information. Since i-mode base stations automatically recognize the handset's area code, users do not need to enter their location. Initially, information services will include the following: weather forecasts, local guides to shops restaurants and hotels, detailed searchable maps, 24-hour traffic updates. The service will not be subject to a subscription fee, although some content providers may levy fees on certain types of information. This service is not yet available on DoCoMo's 3rd generation handsets[5].

4.3.2 PHS Mobile Internet Services

4.3.2.1 PHS: Mobile Browsing

PHS operators are also offering "mobile Internet" services. One of the key features of the PHS mobile service is the higher transmission rate of 64 Kbit/s. The main difference between PHS services and I-mode is that Internet access runs over a circuit-switched network (based on ISDN Technology) and is thus billed according to the time online. Typically, users are billed at JPY 10 per minute.

TTNET (ASTEL Group PHS operator in the Kanto/Tokyo region) offers mobile handset access to the Internet through its ".i" or "dot-i" service since December 2000. With this service, users can access sites written in c-html, such as i-mode sites. Dot-i users are thus able to access DoCoMo's unofficial sites (official sites are contained exclusively on DoCoMo's server). Notwithstanding, the user must connect separately to an ISP for the Internet connection service, as TTNET does not itself provide an Internet gateway service to its mobile users.

Most observers have noted that PHS providers are shifting their business focus to the PC market. There are two types of PHS Mobile Internet Services in relation to PCs:

1. PHS Handset with PC Access
2. PHS PC Wireless only (through PCMCIA Card)

ISPs need special designated ports to access the PHS network, and therefore users can only browse the Internet using the gateways of the major ISPs, such as BigGlobe and Nifty Serve.

As of June 2001, KDDI's DDI Pocket is offering a packet-switched service by the name of "Air-H". The PHS Internet Access Forum Standard (PIAFS) allows the use of two 32 Kbit/s lines for a total of 64 Kbit/s. This implies that when lines are busy, the transmission is at 32 Kbit/s on the packet network and when lines are not busy, the traffic is carried over the 64 Kbit/s PIAFS network. At this time, DDI Pocket offer this service at JPY 5800 (including the basic charge) for up to 25 hours/month. In August 2001, DDI pocket will begin offering this service at a flat-rate tariff of JPY 7000 per month (including basic charge) for a maximum transmission speed of 32kbps (US$ 58). This service is only available through special PCMCIA mobile

[5] See http://www.nttdocomo.com/new/contents/01/whatnew0628.html

handsets incapable of voice calls. A flat-rate service for the PC wireless access and a transmission speed of 128 Kbit/s will be introduced in the autumn of 2001.

Enhanced PHS services will be capable of transmission speeds of up to 1 Mbit/s. PHS operators are currently considering the possibility of offering such services. The fly in the ointment is that financial difficulties may stand in the way of launching these services, which may thus be delayed beyond the target date of 2002.

4.3.2.2 New services on the PHS platform

At the end of 2000 and in early 2001, PHS operator DoCoMo launched wireless distribution services for audi and video: "M-Stage Visual" and "M-Stage Music". These services use the carrier's PHS network and thus offer speeds of up to 64 Kbps. For the visual service, users access the network using a special terminal named "eggy". Not surprisingly, the device is egg-shaped and doubles as a digital still camera. "Eggy" can be used to watch videos, using MPEG-4 video compression, and exchange still images. DoCoMo believes that the service will provide a good testing ground for the launch of future 3G multimedia services. As in the case of i-mode, there is a three-tier billing structure for the service: a monthly subscription charge, the PHS per-minute connection fee and a fee for individual content. The M-Stage Music service enabling users to buy and download music through their handsets was launched at the end of 2000.

4.4 Peculiarities of the Market Structure

One of the most distinguishing aspects of the Japanese mobile industry is that it is operator-led. Equipment manufacturers and operators work togethere, hand in hand in closely-knit groups to supply the market with handsets and portable devices in line with end-user needs. The mobile operator actually owns the handset. As such, the operator's brand is dominant and not the manufacturer's. The Japanese subscriber first selects the service provider and then chooses the equipment. The subscriber's choice of handset is therefore limited to those on offer and branded by the service provider selected. This differs remarkably from the European case, where the handset brand rests firmly with manufacturers such as Nokia and Ericsson, as does the responsibility for research and development. By contrast, Japanese mobile operators play a leading role in research and development activities. The Yokosuka Resarch Park (YRP), just outside Tokyo, established by NTT DoCoMo, is famous and houses one of the largest R&D centres in the world for 3G technologies. DoCoMo's business model in this regard is unique. This close relationship between manufacturers and operators in Japan accounts in part for the sophistication and availability of handset technology and the take-up of value-added services (Figure 4.4).

Another reason for Japan's success in the mobile Internet market is the presence of mobile operators throughout the service value chain. For i-mode users, DoCoMo is both the mobile service provider and the Internet service provider. Users receive only one bill for the service and need to register only once. On the other hand, mobile operators in Europe tend to provide only a telephony service. The data traffic needs to pass through another operators' Internet gateway, meaning that typically, users need to sign up separately with their own ISP, making the service less attractive.

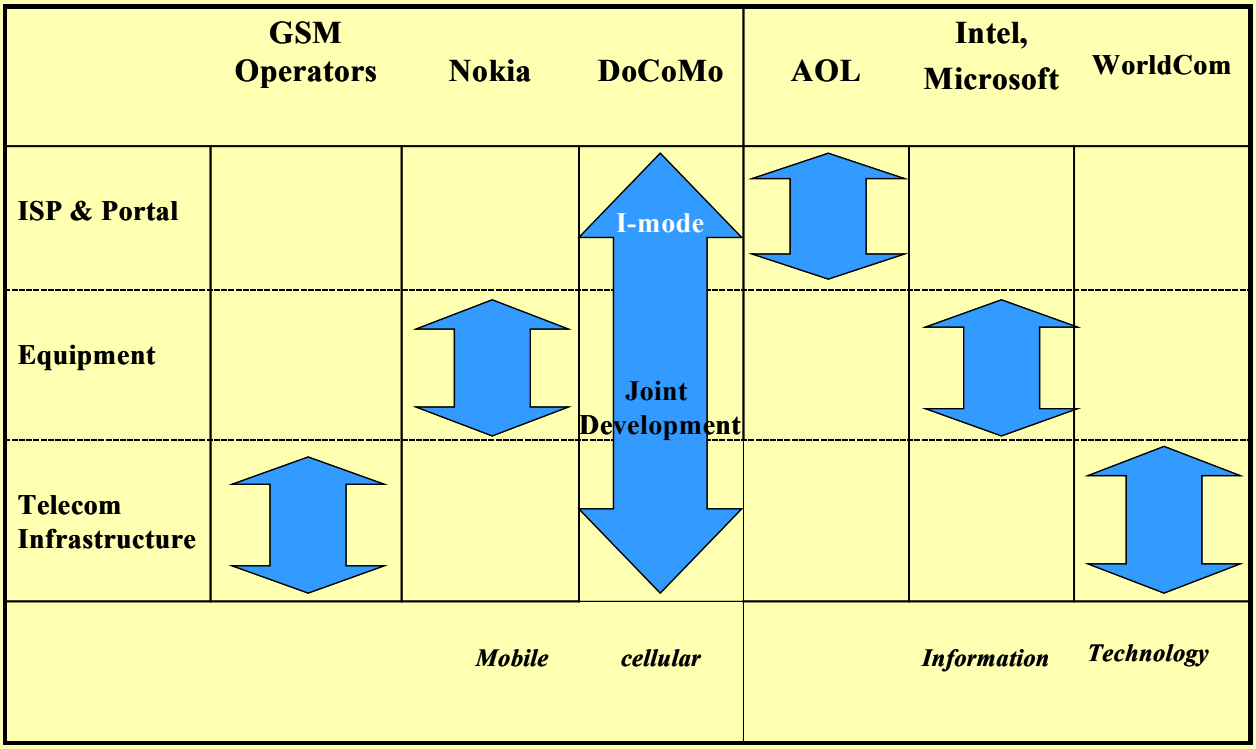
5 3G Mobile in Japan

5.1 Licensing Policy

5.1.1 The demand for IMT-2000

There are three main driving forces behind the introduction of IMT-2000 in Japan. The first is the growing demand for multimedia services. Now that Internet and narrowband ISDN have dominated fixed networks, the market is starting to call for similar capabilities in mobile environments. The phenomenal success of services such as i-mode pointed to the need for advanced mobile applications. The second force is the demand for international roaming. Despite being an island country, a huge number of Japanese people travel overseas for business and leisure purposes, creating a large market for global services. The final and perhaps most important issue is the lack of frequency caused by the dramatically unexpected rise in the number of cellular subscribers. Existing 2G frequency bands (800MHz and 1.5GHz) were seen to be insufficient and services using different frequency bands were required. In response, the Japanese government decided to work towards the deployment of IMT-2000 networks.

Figure 4.4: NTT DoCoMo's Business Model



Source: Adapted from Weekly Toyo-Keizai Magazine (14/10/00)

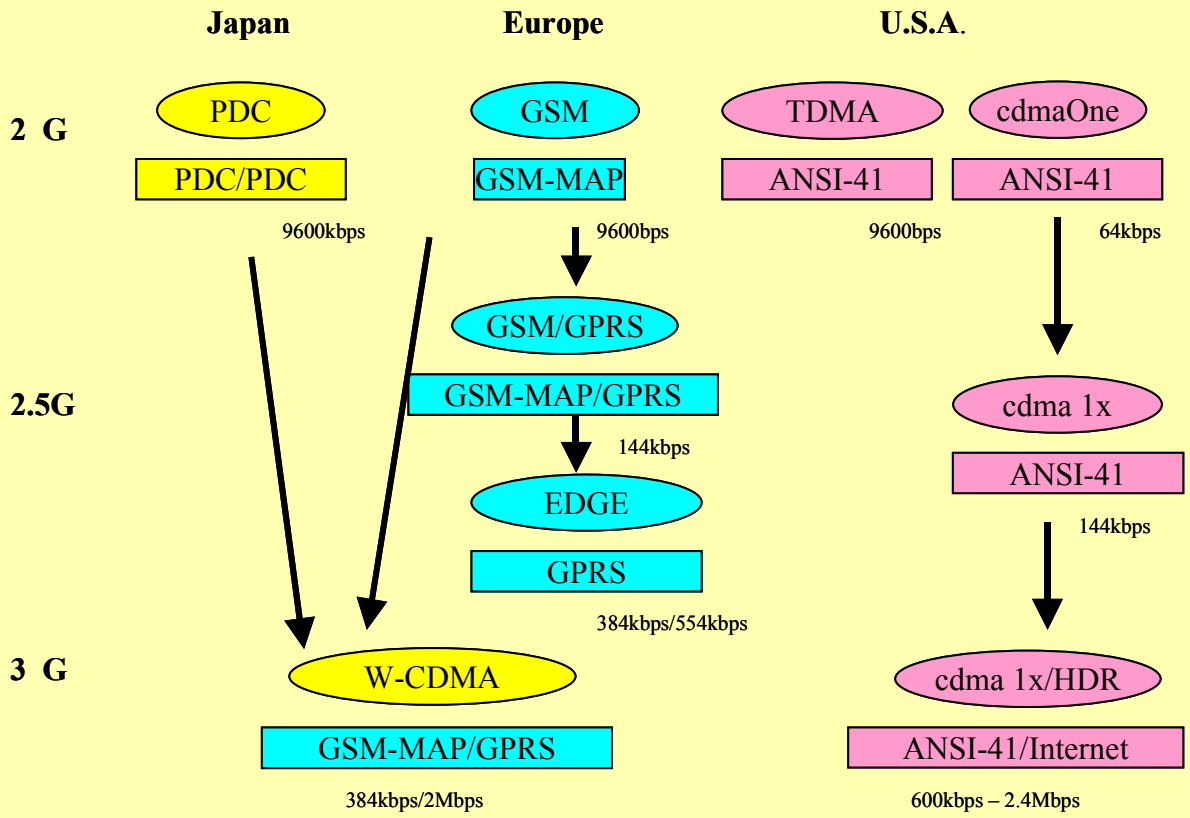
5.1.2 Japan's role in the International Standardisation Process

It was in the mid 1980s that the International Telecommunication Union (ITU) began its work on IMT-2000 standardization. Initial activities focussed on spectrum requirements in preparation for the 1992 World Radio Conference (WRC) at which the 2 GHz frequency was identified for IMT-2000 on a global basis. The World Radiocommunication Conference (WRC), held every two to three years by the ITU attempts to establish a global framework for the use of the radio spectrum. Its objective is to establish frequency allocations and regulatory procedures for the harmonious operation of global radiocommunication services. Global coordination ensures that services are not impaired by interference with competing signals and transmissions. The 1992 WRC identified the 2 GHz band for IMT-2000 on a global basis. The 2000 WRC, held in Istanbul in May/June 2000, allocated additional spectrum for 3G services: the three bands identified for use included one below 1 GHz, another at 1.7 GHz where most of the second-generation systems currently operate and a third band in the 2.5 GHz range. This effectively gave a green light to the mobile industry worldwide to start deploying IMT-2000 networks and services.

In April 1993, Japan's Association of Radio Industries and Businesses (ARIB), a private standardisation organisation, established the country's IMT-2000 Study Committee. Its role was to study the air-interface technologies for IMT-2000. The Study Committee was made up of about 90 companies including operators, such as NTT DoCoMo, KDDI and J-Phone, and manufacturers, such as NEC and Fujitsu. Members were responsible for proposing various IMT-2000 systems, which were then compared, merged and harmonised with foreign standards organisations, such as 3GPP (Third Generation Partnership Project) and the OHG (Operators' Harmonization Group). Finally, the committee concluded that Wideband CDMA (W-CDMA) was the most suitable standard for Japan. W-CDMA was accepted by Japan's TTC and proposed to the ITU in June 1998. Whereas Japan and Europe recommended W-CDMA, the USA recommended standards based on Qualcomm's cdma2000 and TDMA.

Until November 1998, countries negotiated wireless 3G systems for their core and wireless networks. For fear of creating another closed domestic system such as PHS and PDC, Japan opted to switch its core network to GSM technology. DoCoMo is currently in the process of migrating its core network (that is to say the network component between base stations) to GSM-MAP. J-Phone will also be migrating to GSM-MAP, whereas KDDI has adopted the ANSI-41 MAP. Figure 5.1 illustratesthe migration path to 3G.

Figure 5.1: Migration Path from 2G to 3G



Note : : Wireless Network : Core Network
Source: ITU, Weekly Toyo-keizai (14.10.2000)

5.1.3 Major Steps in IMT-2000 Licensing Policy in Japan

In order to maintain an equitable and transparent licensing process since 1998, the former MPT has published its draft and final policies as well as a request for public comments. A timeline for the introduction of 3G policy in Japan is provided in Table 5.1.

As mentioned in Chapter 2, mobile operators are subject to the *Telecommunication Business Law* and the *Radio Law*. For this reason, policy for IMT-2000 includes the Type 1 licensing framework under the *Business* Law and MPT policies on radio station licensing (*Radio Law*).

There were a number of important stages in the policy-making process for third generation mobile. The first step was the release in July 1998 of the "Draft Basic Guidelines" for public comment. The next step was the Telecommunication Technology Council (TTC) report on the "Technical Conditions for Radio Equipment Employing Frequency Division Duplex (FDD) using Code Division Multiple Access (CDMA)", in September 1999. This report proposed a number of technical conditions for IMT-2000 radio equipment. The third step was the amendment in December 1999 of the Principles on Radio Station Licenses and related Ministerial ordinances (this process was not subject to public comment). Similarly, based on the TTC's report, the MPT revised the technical provisions of the Radio Equipment Regulations and Ministerial ordinances in March 2000.

In response to the public comments received in July 1998 on the Basic Guidelines, the Draft Licensing Policies (Policies for the Introduction of IMT-2000 and Licensing of 3G Radio Stations) were released in February 2000. These are described below and Table 5.3 provides an overview. There were no serious objections to any of the policies proposed by the Ministry. Some public comments are summarized in later sections. The licensing policies were confirmed in March 2000.

Table 5.1: Schedule for 3G Licensing Policy in Japan

Jul. 1998	MPT released Basic guideline for public comments
Nov. 1998	MPT released the result of the public comments
Mar. 1999	TG8/1 approved draft key characteristics recommendation
Sep. 1999	MPT received Report from TTC on Technical Conditions
Nov. 1999	TG8/1 & SG8 approved draft radio interface recommendation
Dec. 1999	MPT publicized Principles on Radio Station Licenses and consulted with RCC on Amendment of Related Ministerial Ordinances
Feb. 2000	MPT publicized its draft licensing policies and requested public comments on them
Mar. 2000	MPT established technical regulations and publicized its licensing policies
Apr.-May 2000	License Application Period
June. 2000	MPT licensed 3 operators (NTT DoCoMo, KDDI, J-Phone)
Oct. 2001	Commercial services will be launched in Japan (NTT DoCoMo Oct. 2001, KDDI Sept 2002, J-Phone June 2002)

Source: ITU

5.1.3.1 1998 Draft Basic Guidelines for the Introduction of IMT-2000 in Japan

The MPT began the licensing process by holding a public consultation on the basis for introducing IMT-2000. In July 1998, it released the draft "Basic Guidelines for Introducing Third Generation Mobile Communications Systems (IMT-2000)".

Public comment was invited on the following points:

- Services were to be launched in 2001
- Technical conditions were to be those set out by the ITU for IMT-2000 and recommended by TTC (TC)
- Frequency allocation was to be 1920-1980 MHz (uplink), 2110-2170 MHz (downlink)
    - Blocks of 2 times 20MHz to each operator in each operating area
- Conditions for eligibility would be:
    - Existing or new telecommunication operators (excluding service providers) could apply
    - Existing local fixed operators could not apply
    - There would be a maximum of 3 operators per area
    - Eligible operators must have a certain level of know-how of IMT-2000 technologies and system operations.
- License allocation would occur at the regional level. Country-wide or licenses covering a number of regions would also be considered
- Licenses would be allocated through a comparative selection process or an auction

The above items were then discussed and considered by various players (in the private and public sector) through a consultation process.

The MPT released a summary of the public comments on its guidelines in November 1998. 26 comments from 33 organisations had been submitted to the MPT. The mix consisted of 18 mobile operators, 11 manufactures and 4 others. On the whole, they agreed with the substance of the basic guidelines. Highlights were choice of standard, technical conditions, and licensing. At the time, the standards recommended by Japan and Europe did not represent a unified standard, but different variations of W-CDMA. 18 of the 33 respondents commented that the standard adopted by Japan should not be unique, as in the case of 2nd generation PDC standard. 4 of the respondents were concerned about excluding the cdma2000 system from the list of adopted standards. In terms of licensing, all 20 respondents commenting on this issue opposed the auction method. 12 of them recommended comparative selection.

5.1.3.2 TTC's Technical Conditions for 3rd generation mobile services (September 1999)

In September 1997, The Minister of Posts and Telecommunications requested the Telecommunications Technology Council (TTC, distinct from the Telecommunication Technology Committee), to advise him on the "Technical Conditions for Next-Generation Mobile Communication Systems". The TTC filed its report on this subject in September 1999. Since then, the MPT has amended the related ministerial ordinances with reference to this report. Typically, TTC reports provide the technical basis for ministerial regulation.

The main elements of the report are as follows:

1. Frequency band to be allocated to 3G: 2GHz band identified for IMT- 2000 by ITU
2. Data transmission rates to be the following:
    i. 144 kb/s for Vehicular (in the interim) and
    ii. 384 kb/s for Pedestrian and Indoor (in the interim).
3. Minimum bandwidth to be 5 x 2MHz.
4. Allocation of frequency bands to operators: 20 x 2MHz for 2 Mbit/s transmission rate
    a. Minimum allocation to be 5 x 2MHz
5. Radio Transmission standards to be adopted in Japan are:
    i. DS-CDMA (Direct Spread CDMA) and
    ii. MC-CDMA (Multi-carrier CDMA).
6. In the PHS bands, stricter spurious emission restriction, antenna power limitation of mobile terminals (less than or equal to 250 mW) and appropriate guard band setting are required to avoid the effects from interference.
7. Other ITU recommended systems (CDMA/TDD and TDMA) are not included in this report. The report does state that if necessary, these systems would be considered in the future.

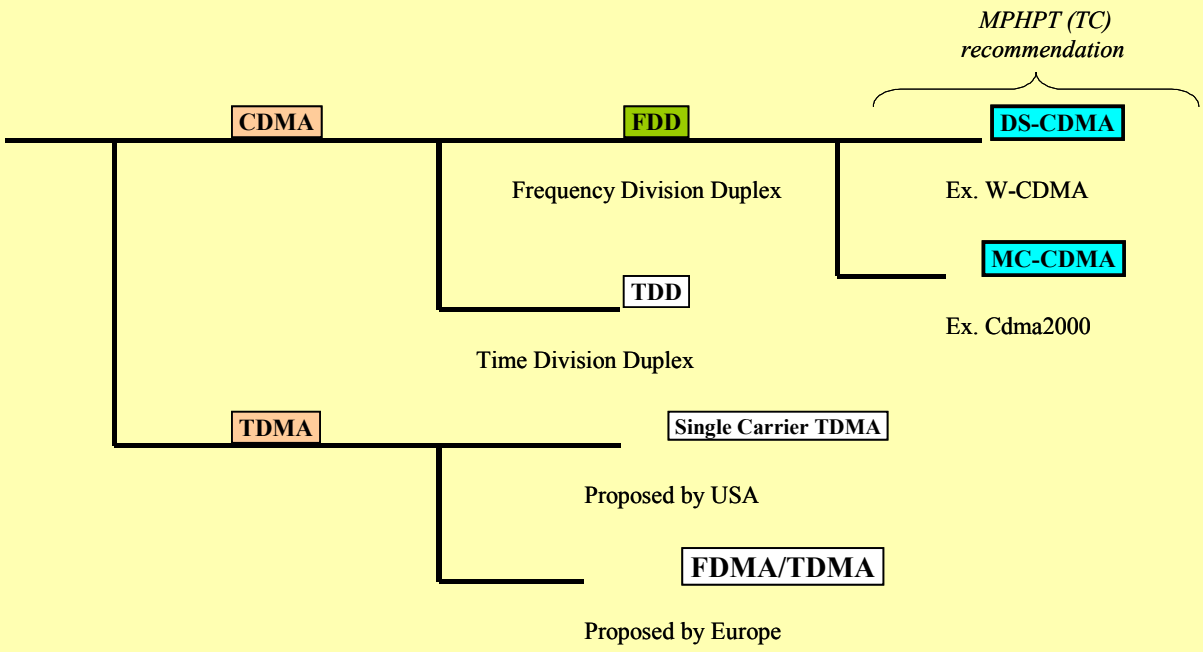
5.1.3.3 Principles on Radio Station Licenses for 3G (December 1999)

In December 1999, the MPT released its report on the "Principles of Radio Station Licenses". Based on this report, and in order to ensure an adequate legislative framework for the smooth introduction of IMT-2000, the Minister of Posts and Telecommunications consulted with the Radio Regulatory Council (RRC), regarding amendments to ministerial ordinances under the *Radio Law*. The amended ministerial ordinances came into force in April 2000, authorizing the establishment of IMT-2000 radio stations. At the same time, the MPT developed its policy for the introduction of IMT-2000 and for the licensing radio stations. It was following the enforcement of the new ordinances that the MPT began accepting applications for 3G licenses between April and May 2000.

The main principles outlined in the December 1999 document were as follows:

- Technical Regulations of Radio Equipment
    - The Ordinance for Regulating Radio Equipment was modified based on the Technical Conditions in the partial report by TTC (TC) in Sep. 1999.
- Spectrum Allocation
    - Operating frequency: 1920-1980 MHz (Up link), 2110-2170 MHz (Down link)
    - Three blocks of 20 MHz bandwidth
    - 190 MHz of Transmit- receive frequency separation
    - In the matter of frequency assignment, due attention will be given to ensuring the fair use of radio spectrum and the avoidance of harmful interference from PHS and existing fixed stations

Figure 5.2: Relationship of terrestrial systems on IMT-2000



Note: TC :Telecommunications Council
TTC :Telecommunication Technology Council
MPHPT :Ministry of Public Management, Home Affairs, Posts and Telecommunications
MPT :Ministry of Posts and Telecommunications
Source: MPHPT

- Number of licenses
  - Each geographical area was to have a maximum of three licenses. Where the number of applicants exceeded three, selection was to be made through a comparative selection process.

5.1.4 Final IMT-2000 Policies of March 2000

Before the enforcement of the amended ministerial ordinances, the MPT finalized its policies for the introduction of IMT-2000 and radio station licensing after accepting comments from the public during the month of February 2000. Table 5.2 shows the evolution from the Basic Guidelines of 1998 to the Licensing Policies of 2000.

A total of 16 comments from 30 organisations were submitted[6]. There were no strong objections to any of the proposed policies. One of the concerns expressed related to the equitable treatment of DS-CDMA and MC-CDMA. The MPT responded that since both systems are covered by the regulation on wireless equipment, treatment would not be discriminatory. Another concern related to the lack of consideration given to international roaming. The MPT responded that negotiations for roaming would only occur at a later date and that for this reason, it was not cited as a licensing condition. Japan's Licensing Policy does not oblige operators to roam between different systems because in the MPT's view, this should be left up to commercial negotiation between the parties.

[6] These included: 19 operators, 10 manufactures and 1 other entity.

Table 5.2: From the Basic Guidelines (1998) to the Draft Licensing Policies (2000)

	Basic Guidelines (July 1998)	Policies on Licensing (Feb/March 2000)
Licensing Date	By the year 2001	Regulations come into effect on 1 April 2001
Technical Conditions	ITU IMT-2000 standards, and as recommended by the TTC (MPT)	Set out in Radio Equipment Regulations (DS-CDMA and MC-CDMA)
Frequency Bands	3 blocks of 20MHz * 2 to each operator in each operation area	15MHZ * 2 to each operator from three 20MHz * 2 blocks
Operator	New or existing operators. Existing local fixed operators not eligible.	New or existing operators. Existing local fixed operators not eligible.
Business Unit	Block per area. Multiple blocks or nationwide allowed.	Block per area. Multiple blocks or nationwide allowed Obligatory coverage: 50% of the population within 5 years
Other	Operators to be selected by Auction or Beauty Contest	Operators to be selected by a Beauty contest in case of over 3 applicants

Source: MPHPT

The policies on the introduction of IMT-2000, finalized in March 2000, fixed the number of operators to three per region. New as well as incumbent operators were eligible for these three licences, with the exception of fixed regional operators. Operators were required to cover 50% of the population in the first five years. The policies favoured applicants with know-how of IMT-2000 technologies and systems. Licences could be granted on a regional or nationwide basis. The policies endorsed the technical conditions as outlined in the TTC Report, approving DS-CDMA (or wideband CDMA) and MC-CDMA (cdma2000). 3G operators were to be chosen through a comparative selection process. The 40-day application period was to begin in April 2000. Service was to be launched sometime in 2001.

The policies on the licensing of 3G radio Stations covered the comparative selection method. The following criteria for licensing were to be considered if more than three applications were received:

a) Suitability of services and alignment with customer demand

b) Base station deployment plan and the feasibility of resizing

c) Use of the spectrum to avoid or reduce interference with existing stations, such as PHS

d) Appropriateness of establishing radio stations to provide services unique to IMT-2000

e) Contribution to the healthy development of IMT-2000 through:

- Efficient utilization of radio spectrum
- Nationwide services
- Compatibility with international standards

5.1.5 The Licensing Process

The MPT began accepting license applications in April 2000 for a 40-day period. Only the three incumbent operators (NTT DoCoMo Group, IDO and Cellular Group (KDDI), and J-Phone Group) applied for the three available 3G licenses in each region and submitted their business plans. The licensing procedure was the same as for other Type 1 operators: the three applicants were required to obtain permission under the *Telecommunication Business Law* and a license under the *Radio Law*. On 30 June 2000, MPT allowed changes to their status under the *Business Law* and granted preliminary permits for their radio stations under the *Radio Law*. Upon construction, they were to be duly inspected and licensed by the Ministry.

3G license allocation in Japan was straightforward, the number of applicants matching the number of licenses (3). The policies for comparative selection were therefore not invoked. Effectively, there was no contest. As long as the applications met the basic requirement, 3G licenses were granted. Table 5.3

summarizes the final licensing decision issued by the MPT in June 2000. Licensees are subject to conditions as set out in the relevant legislation and in their business plans as submitted to the Ministry.

The main reason behind the limitation on the number of licenses was the shortage of frequencies. The regulator had a total of 60 Mhz available for 3G services (uplink and downlink). This meant that in order to allocate a minimum of 2X20 Mhz blocks of spectrum, only 3 licenses could be awarded. Owing to the shortage of frequencies experienced due to the unexpected growth in the number of 2G subscribers, the regulator was cautious in the allocation of 3G spectrum. In addition, since PHS operators were occupying the 1.9 GHz spectrum, there was significant concern regarding interference with the 2GHz spectrum for 3G allocated by the WRC.

As for applications, it is hardly surprising that only the incumbent mobile operators applied for licenses. The only new entrants with mobile experience were the 2G PDC and PHS operators. All PDC operators are now subsidiaries of one of 3 operator groups KDDI, DoCoMo and J-Phone. PHS operators would be the strongest contenders. However, PHS operators have been suffering from a lack of financial resources. In fact, even though the technical capability for PHS system upgrades already exists, PHS operators have not been able to make use of this new technology due to financial constraints. They were therefore not in a position to bid for licenses. Foreign operators provided another possibility for enhanced competition. However, there were no foreign applicants. Analysts argue that foreign operators did not bid for licenses in Japan due to three main factors: closed 2G systems in Japan (PDC and PHS), lack of experience in the mobile browsing market, and the timeline for deployment. Unlike Europe and the United States, Japan plans to leapfrog directly to 3G networks without passing through 2.5G (e.g. GPRS, EDGE). That is not to say that the Japanese 3G market will remain as local as its 2G market. Instead of bidding for a licence, UK's Vodafone bought shares in J-Phone, one of the 3G licensees, and now directly owns 46% of the operator.

Table 5.3: Results of Licensing Process in Japan, June 2000

	NTT DoCoMo	J-Phone	KDDI
Modulation Methods	DS-CDMA	DS-CDMA	MC-CDMA
Application Date	3 April, 2000	19 April, 2000	12 May, 2000
Service Launch	**30 May, 2001*** Kanto Region (Tokyo) **1 December 2001** Tokai & Kansai regions **1 April 2002** Hokkaido, Tohoku, Hokuriku, Chugoku, Sikoku, Kyusyu regions	**1 December 2001*** Kanto, Tokai & Kansai regions **1 October 2002** Hokkaido, Tohoku, Hokuriku, Chugoku, Sikoku, Kyusyu regions	**30 September 2002** Kanto, Tokai & Kansai regions **31 March 2004** Hokkaido, Tohoku, Hokuriku, Chugoku, Sikoku, Kyusyu regions

**Note*: Both DoCoMo and J-Phone applied for an extension of the launch date. First, J-Phone delayed its launch by six months. A few months after this announcement, DoCoMo postponed the launch of its commercial service until October 2001. It is currently running an introductory service in the Tokyo area.

Source: MPHPT

5.2 Life after Licensing: Regulatory Priorities

5.2.1 The Market Positioning of Information or Content Providers

Typically, mobile operators provide portals for their browser services. This is the first menu users see when accessing their Internet service. As mentioned above, content available can be in the form of official or unofficial ("open") content. Official content is content approved by the operators, such as DoCoMo and may be free of charge or at a cost to the user. Examples of official content include CNN and Japan Railway. For charged official content, the operators typically keep a handling fee of 9%.

There are a large number of content providers (or information providers) in Japan. Recruit and Dai Nippon Printing are among the largest. For their role in providing access to content services, DoCoMo and other mobile operators gain packet fees and increased traffic revenues through customer acquisition. However, information providers are increasingly concerned that their revenue potential is limited due to DoCoMo's current price cap on content fees of JPY 300 per month. DoCoMo retains the entire packet fee. Moreover, the small screens prevent information providers from selling any advertising to supplement their revenues. These concerns are exacerbated by the advent of next generation mobile services.

The Internet businesses of large equipment manufacturers also act as content providers, such as Nifty Serve and Big Globe. It is important to note that although these ISPs provide content directly to users, in this capacity they are not necessarily acting as Internet Service Providers, i.e. they do not provide the Internet gateway. They merely offer a content service and have been referred to as content aggregators. Traffic is routed to the mobile operator's ISP gateway and users are not permitted to choose their own ISP. Furthermore, content providers, be they ISPs or not, do not have access to the operator's network. In order to provide content, they must seek approval by DoCoMo. The only other method by which users can access outside content is to type in the precise URL. But mobile users rarely use this method for viewing web content.

This means that DoCoMo's packet-based network is effectively "closed" to other ISPs. For mobile users to browse i-mode sites, mobile users must use DoCoMo's Internet gateway. Figure 5.3 illustrates the current structure, which applies in the case of mobile Internet access for handsets and not PCs (see also Figure 4.2). However, this structure is likely to change in the near future. In March 2001, DoCoMo's President, Keiji Tachikawa, announced that DoCoMo intends to provide access to its packet-based network, i.e. to open up the specifications for its i-mode server and access gateway. Japanese press reports that DoCoMo has already ordered an upgraded i-mode network from NTT Data and NEC. According to the operator, it will have to invest about JPY 500 billion (US$ 400 million) in order to facilitate network access by 2003.

It is to address some of these issues and to investigate the potential for future mobile services in Japan that the MPHPT set up a Study Group in July 2000. The main objective of the Study Group was to advise the Ministry on the creation of policies designed to encourage the development and take-up of next generation mobile technologies. In June 2001, the Study Group released its final report on "business models for next generation mobilephones", focusing on the five following issues:

1. Open Network Concept for mobile Internet access
2. Common and Open Standards for mobile content provision
3. Open and uniform billing systems and user identification methods
4. Privacy Issues
5. Personalized Handsets and future use of SIM card ("UIM Card" in Japan)[7]

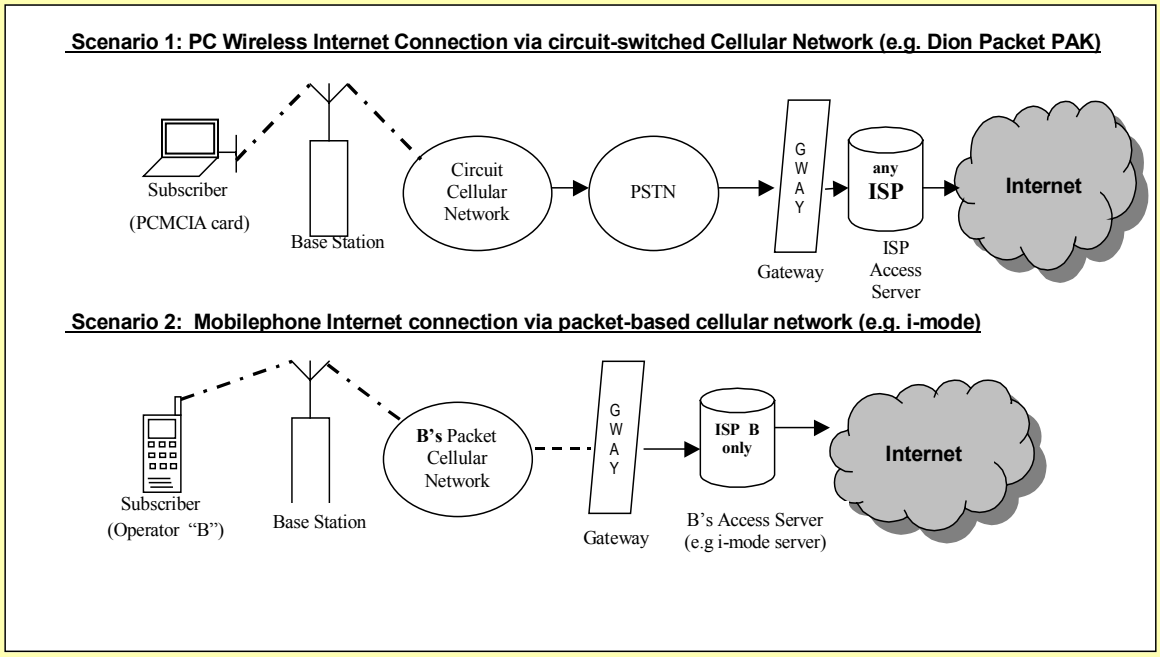
The first two issues are most relevant to the present study. On the first point, the report endorsed DoCoMo's plans to open its network to other ISPs by 2003. Similarly, it mentions KDDI's plans to open its mobile "EZ-web" network on a case-by-case basis but does not confirm a date. J-phone has yet to declare an open network strategy but is considering the possibility. The report emphasizes the importance of open network access to the expansion and success of future mobile services. It is clear that an open network policy will

[7] The last three issues are being further examined by the MPHPT "Study Group Concerning Policies for the Preparation of a Mobile Content Business Environment"

allow new players to enter the mobile browsing market and provide a basis for the development of mobile virtual network operators and alternative information providers (see Section 5.2.2).

On the second point, the report points to the need for unifying and standardizing mobile content, in terms of *inter alia,* transmission protocol, portal development, mark-up languages, graphic formats (.HTML, .cHTML, .MML, .WML, and .GIF, .JPEG, .PNG). The recommendation is for the development of a *de facto* industry standard through a transparent consultation process with government, rather than a mandatory standard imposed through regulation.

Figure 5.3: ISP Access: PC Wireless Internet connection vs. Mobile Internet Connection



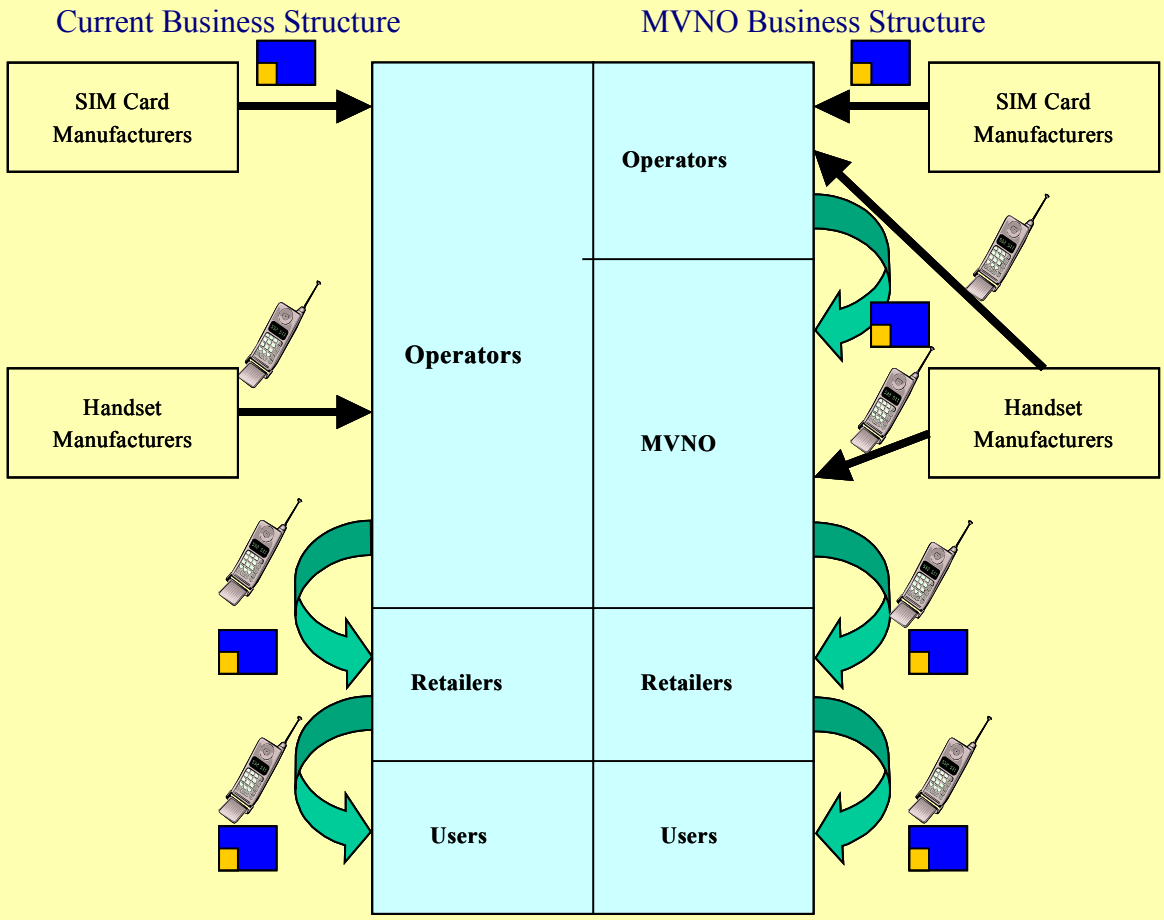
Source: ITU

5.2.2 The Status of Mobile Virtual Network Operators

A major limitation to the competitive landscape for 3G is the lack of additional radio spectrum for mobile services. The concept of a mobile virtual network operator (MVNO) offers the possibility of introducing new players who stimulate the development of innovative services, improved quality of service and price competition. Mobile operators in Europe, for instance, are considering the provision of network access to MVNOs through commercial negotiations or through regulatory measures. An MVNO has been defined as an operator that offers mobile services but does not own its own radio frequency. In this respect, it can be a mobile service provider or a value-added service provider. It is to be noted that there are differing views on how to define an MVNO, and this is one of the current challenges facing regulators, particularly in Europe. The June 2001 amendments to the *Telecommunication Business Law* introduce the concept of wholesale telecommunication businesses in an effort to create more flexible networks. In other words, the new provisions allow Type I operators to offer their network infrastructure to other Type I and II operators on a wholesale basis. The only regulatory procedure required would be a notification to the Minister. This concept is applicable to the radio spectrum, as the legislation does not limit it to the fixed-line environment. In fact, the June 2001 report of the study group on business models refers to these amendments as creating incentives for the introduction of MVNOs in Japan. However, the report does include the caveat that since the concept of MVNO is not clearly defined and can refer to various types of businesses, each individual

MVNO case is to be carefully examined under the *Business Law* before determining the appropriate set of regulatory measures. Figure 5.4 illustrates the Ministry's viewpoint on the effect of MVNOs on market structure. Even before these amendments came into force, the UK's Virgin Group had already announced its intention to enter the MVNO market in Japan in April 2001.

Figure 5.5: Shift in Business Model due to the introduction of MVNO



Source: Report on Business Models for Next Generation Mobile Phones: MPHPT

5.2.3 International Roaming

International Roaming is one of the key considerations for IMT-2000 systems.

Within Japan, now that all operators have nationwide licenses, there is no longer any need for national roaming. Technically, networks have HLR/VLR (Home Location Register/Visitor Location Register) functionality. But this is not reflected by a mark-up in the retail tariff. Typically, the applicable regional tariff is the tariff of the local 2G operator (in the case of DoCoMo, its regional companies). The user is billed for minutes of usage and is unaware that any "roaming" is involved.

Neither DoCoMo nor J-phone offers an international roaming service. However, since KDDI's network is based on cdmaOne, KDDI offers a partial roaming service to interested users. With the C111SA and C412SA (colour) dual-frequency handsets from Sanyo, an au subscriber can use their mobilephone to make and receive calls in Korea, Hong Kong, Australia, USA and Canada. However, the roaming service is only available to Japanese subscribers - foreign users cannot use their cdmaOne handsets in Japan, due to the difference in frequency bands.

DoCoMo has placed a dual-band handset on the Market, NEC's N601wg, since January 2001. This phone can be used in the PDC 800MHz and GSM 900MHz bands (in Hutchison's service area, this accounts for about 110 countries). The handset is only sold in one particular DoCoMo retail outlet at the prohibitive cost of JPY 211'100 (2000 US$). It can be rented at a cost of JPY 6600.

Compared with the GSM world, Japan has very little experience with global roaming. No doubt this is one of Japan's key challenges for IMT-2000.

5.2.4 Global Circulation of 3G Terminals

Most countries employ a system of product certification or type approval for radio handsets. This ensures that terminals sold in a country conform to its prescribed domestic standards and regulations, e.g. consumer protection legislation and technical interference. However, such systems are not designed to facilitate the circulation of radio handsets in foreign jurisdictions. Given that international roaming is one of the key priorities for IMT-2000, developing a framework for the efficient global circulation of handsets has become a priority for societies the world over.

NTT DoCoMo plans to begin its commercial IMT-2000 service in October 2001. It will thus most likely be the only operator together with BT (Manx Telecom) to be offering 3G services in 2001. Global circulation may not pose a problem in the early days of 3G, but with more and more operators launching their third generation mobile services subsequently, the need for global roaming and global circulation will become greater.

There are two facets to global circulation. The first relates to a subscriber's right to carry a personal handset into foreign countries and to use it subject only to network coverage and commercial roaming arrangements between operators. This issue is currently being considered by the ITU-T, which is soliciting agreement on the following aspects: type approval, licensing requirements and customs/duties for visiting terminals[8]. This aspect deals with the temporary entry of pre-established terminals and their exemption from regulation, and has the following fundamental principles:

1. The personal use by visitors of IMT-2000 terminals should not require any individual licence
2. Such terminals should not be subject to additional certification or type approval procedures
3. National Customs Authorities should exempt IMT-2000 terminals, intended for personal use by visitors

The second facet relates to requirements imposed on foreign manufacturers for the import of handsets in a given country. This will most likely be dealt with through Mutual Recognition Agreements (MRAs), which are negotiated bilaterally and are measures for the mutual certification of radio equipment imported or exported for the purpose of conventional and permanent use.

In the long term, both facets need to be addressed. The ITU is now prioritizing the issue of visiting terminals, due to the fact that it is more conducive to an international consensus and agreement. The ITU is currently accepting proposals and comments from its member states on the above principles.

In Japan, global circulation for visiting terminals is covered under the *Radio Law*. Each handset in Japan requires a radio license under the Radio Law, due to the fact that it is defined as a "radio station". According to Article 103.5 of the *Radio Law*, each radio station requires a license to operate. However, handsets can be covered by an operator's comprehensive or blanket license. This implies that all of the operator's handsets in circulation are deemed to be licensed, provided that they continue to comply with the technical requirements of the *Radio Law*. The comprehensive license is valid for a period of 5 years and for a limited number of handsets. The technical requirements for IMT-2000 were set out in a Ministerial Ordinance, amending the *Radio Law* in February 2000, following recommendations by Japan's TTC (Telecommunications Technology Council) and approval by the RRC (Radio Regulatory Council).

[8] See ITU Circular Letter No. 97 available at http://www.itu.int/osg/imt-project/circulation.html

Article 103.5 of Japan's *Radio Law* covers the issue of foreign radio stations. These provisions were introduced in early 1997, in the days of the GMPCS (Global Personal Communications by Satellite) Memorandum of Understanding (MoU)[9]:

> "Operation within Japan is possible for foreign radio stations that meet the following conditions:
>
> 1) That the base station operating under a blanket license receives transmissions from a base stations and transmits to the same base station.
> 2) That the radio station is able to initially transmit radio waves based on the radio waves received from the same base station.
> 3) That the technical standards of the radio station are recognized to comply with Japanese technical standards."

How can foreign 3G handsets can this exemption in Japan? Since IMT-2000 terminals operating in foreign countries are assumed to fulfill conditions (1) and (2), they need only comply with the technical standards of the *Radio Law* (3) in order to be granted entry into Japan. However, the actual procedures or mechanisms for demonstrating such compliance are not yet in place and have yet to be determined. Japan is hoping for the possibility of a 3G MoU, similar to the GMPCS MoU, before determining which procedures need to be followed for foreign handsets. In the meantime, it awaits the results of the ITU's call for comments.

For the import and export of handsets by manufacturers, a significant breakthrough was made in April 2001, when the European Union (EU) and Japan signed a mutual recognition agreement (MRA) for equipment standards on a limited range of products. The MRA will facilitate trade between the EU and Japan, as manufacturers will not have to demonstrate that their equipment meets domestic standards prior to export. In 2000, the European Union imported terminals from Japan worth 1.5 billion Euros and exported terminals worth just over 1.0 billion Euros to it. Japan's position on terminal circulation is contrasted with Europe's in Table 5.4. The MRA has gone a long way in resolving some of these issues. However, the agreement only covers a handful of countries in the world and does not begin to address the issue of visiting terminals. There is still much work to be done in order to ensure that IMT-2000 users will be able to roam freely with their handsets from country to country.

5.3 3G Services and Applications

NTT DoCoMo will be the first operator to launch 3G services in Japan, under the brand name "FOMA" or Freedom of Mobile Multimedia Access and based on the ITU standard W-CDMA. The full-scale commercial launch of FOMA was initially scheduled for 30 May 2001. However, in a surprise announcement on April 26, 2001, DoCoMo postponed the launch until 1 October 2001. In a similar announcement on March 2001, J-Phone delayed the launch of its 3G service by six months to June 2002. KDDI plans to introduce 2.5G services in the autumn of 2001, viz., cdma2001x. This system will offer speeds up to 144kbps.

Despite the delay, DoCoMo is set to be the first operator worldwide to launch commercial 3G services. The first European country scheduled to launch 3G services, Spain, has postponed its launch from August 2001 to June 2002. Although the Japanese operator delayed the full-scale commercialisation of its services, it began providing an "introductory" trial service to a select group of users starting on 31 May 2001. The main reason cited for this delay was the need felt to ensure a higher level of system stability and to reflect the total conformity with the March 2001 version of the 3GPP[10] specification. According to DoCoMo, the "introductory service" will be used to assess system performance and to provide customer feedback in anticipation of the October launch. The selected users or "monitors" pay only communication charges, are provided with a free handset and are exempt from paying monthly subscription fees.

DoCoMo trial users were able to choose from two different types of handsets (see Figure XX): Standard Type (FOMA N2001), Visual Type (FOMA P2101V) and Data-Card Type (FOMA P2401). The free handsets have to be returned at the end of the period (September 30, 2001). The voice tariff is equivalent to existing cellular voice charges and the packet charge is JPY 0.02 higher than the i-mode charge, at JPY 0.05

[9] See http://www.itu.int/GMPCS/gmpcs-mou/

[10] 3GPP is the Third Generation Partnership Project. 3GPP is responsible for revising the IMT-2000 family of standards of June 2000. This is the third revision (the first two being in September 2000 and December 2000).

per packet. The introductory service area will include 23 special wards of Tokyo and limited areas of Yokohama and Kawasaki. The operator was initially aiming for a trial subscriber base of 4,000, but later decided to raise the number of mobile handsets to 4,500 upon receiving 4,700 applications from consumers.

Table 5.4: Japanese and European Framework for IMT-2000 Terminals

Issue	JAPAN	EUROPEAN UNION
Licensing of Radio Stations	Comprehensive License	Comprehensive License
Technical Standards	Radio-equipment standards (based on ITU-R recommendations)	The Radio and Telecommunication Terminal Equipment (RTTE) [11]directives. These are standards mainly for the prevention of cross-transmissions. Standards for radio interference are not covered.
Certification of compliance with technical standards	Third-party certification (Certified by TELEC, which type approves the handset)	Self-certification. Although manufacturers attach their own "CE" mark, third-party institutions participate indirectly in the process)
Treatment of radio stations from other countries	Approval is given to applications by domestic firms to operate radio stations from countries that have the same or equivalent technical standards as Japan	Approval is given to terminals that fulfil RTTE directives regardless of region of origin.
Conditions on the Approval of foreign radio-station operations	Conditions require the demonstration that radio station conforms to the same technical standards as Japan. (e.g. a letter by the ITU or other organization in the country attesting to the conformity)	If the terminal meets RTTE directives, no further conditions are required and no certification mark is necessary.

Source: MPHPT

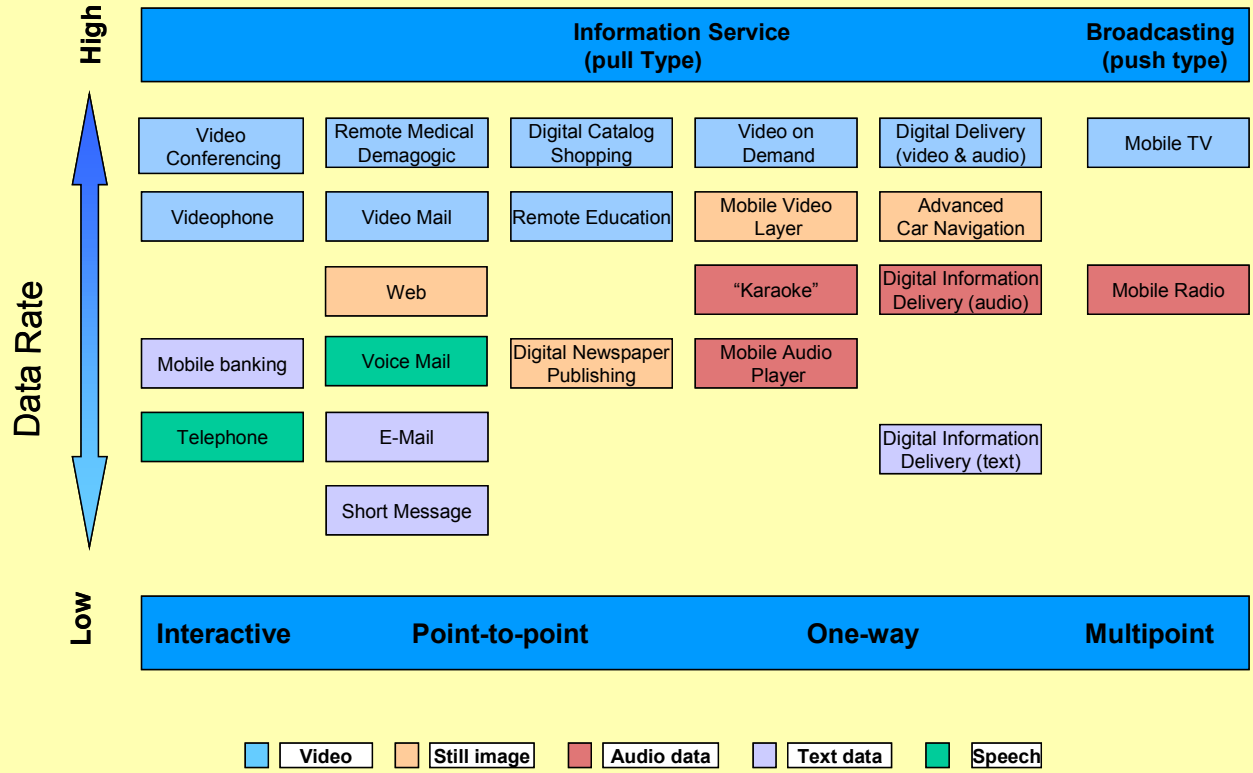
The number of handsets include 2,000 phones for private consumers and 2,500 phones for some 700 corporate users. The breakdown includes 1,400 standard phones, an upgraded version of the current i-mode cellular phone featuring sound quality similar to that of a fixed-line phone, 1,200 "visual" phones equipped with a video screen, and 1,900 "data-card" phones for dedicated mobile high-speed data transmission. Consumer testers were provided with 600 standard-type phones, 700 visual phones and 700 data-cards. Corporate monitors were allocated 800 standard-type phones, 500 visual phones and 1,200 data-cards. Distribution of the mobile phones began on May 30, 2001, with the visual model being delivered on 25 June 2001. Number portability will be available for DoCoMo's PDC users migrating to the FOMA service, but will not be available for new DoCoMo subscribers or PHS users. The issue of number portability is currently being explored by the MPHPT's "Number Study Committee".

The current packet-switched capacity for i-mode phones is 9.6 Kbit/s. With 3G, DoCoMo will support up to 384 Kbit/s (downlink). The introductory service launched in May 2001 has a limited data transmission speed of 64 Kbit/s. The basic services offered to trial users are as follows: voice communications, visual phone service (for visual handset users), packet-based digital communications at 64 Kbit/s, SMS, Email, multi-access service (simultaneous communications). Additional services include enhanced i-mode access, video

[11] See http://www.dti.gov.uk/eurobrief/rtte.htm.

distribution, 'mopera', voice mail, call forwarding and call waiting. The service is available in 23 Special Wards of Tokyo, and limited areas of Yokohama and Kawasaki. Figure 5.5 outlines DoCoMo's future vision for IMT-2000 and provides examples of future services and applications.

Figure 5.5: DoCoMo's Vision for Future Services and Applications



Source: NTT DoCoMo

DoCoMo aims to cover 97% of the population by March 2004, with a projected subscriber base of 6 million. The investment required for such an effort is estimated at JPY 1.1 trillion or US$ 9 billion (Box 5.1).

Box 5.1: IMT-2000 Deployment in Japan

The estimated cost for nationwide IMT-2000 network deployment in Japan is JPY 1.1 trillion per operator (or 9 billion US$).

The following table sets out the total cost for the deployment of IMT-2000 networks. The cost for software development and application services is in addition. It is predicted that in 2010, 570'000 staff will be employed in the 3G market.

	FY2001 – FY2005	FY2006 – FY2010	FY2001 – FY2010	Affected business
Network Construction	3.3	1.0	4.3	Equipment Manufacturers, Construction
Operation Cost	1.5	3.4	4.9	Operators
Service	7.6	20.4	28.0	Operators
Handsets	1.6	3.2	4.8	Handset manufacturers
Total Market Size	14	28	42	

(Unit: JPY trillion)

Source: TTC report, September 1999

Table 5.5 sets out the communications tariff structure for DoCoMo's FOMA Introductory service. For the commercial launch, DoCoMo plans to retain a three-tier tariff structure. The voice tariff will be equivalent to the existing PDC voice tariff. The per-packet fee will be less than the existing packet tariff (DoCoMo anticipates that increased data traffic with 3G). As with i-mode, the third component will relate to content and multimedia services. DoCoMo plans to offer diversified tariff packages.

Table 5.5: Outgoing Call Charges for DoCoMo Introductory 3G Service (in JPY/30 seconds)

	Call Destination							
	Cellular phone - DoCoMo group and other operators -and- FOMA phone			**Landline telephone**			**PHS-DoCoMo group and other operators**	
	Distance/Area	Standard time	Discount time	Distance/Area	Standard time	Discount time	Standard time	Discount time
Voice mode	Within DoCoMo's service area	14.5	10.0	Within DoCoMo's service area	13.0	9.0	19.0	13.0
	Outside DoCoMo's service area	16.0	11.0	Outside DoCoMo's service area	14.5	10.0		
64K digital mode	Within DoCoMo's service area	26.0	18.0	Within DoCoMo's service area	23.5	16.5	34.0	23.5
	Outside DoCoMo's service area	28.5	20.0	Outside DoCoMo's service area	26.0	18.0		

Notes: * Japan uses the Calling Party Pays (CPP) system, and thus the mobile user does not incur any charges for received calls.
* "DoCoMo service area" is located in Kanto, Koshinetsu region. DoCoMo's regional companies operate other areas.
* Standard time is from 00:00 to 01:00 and from 08:00 to 00:00 on weekdays. Discount time is from 01:00 to 08:00, all day on Saturdays, Sundays and holidays.
* The communication charges "Outside of DoCoMo's service area" is charged to calls received by other operators' cellular phones.
* "Inside of DoCoMo's service area" includes prefectures adjacent to the service area.

Source: NTT DoCoMo

6 Conclusions and Summary

The first round of licensing third-generation mobile services in Japan was a relatively simple matter. Although only the monopoly local fixed line operators, NTT East and NTT West, were excluded from the process, the government received only three applications for the three available licenses. Licenses were allocated at no cost to the three incumbent mobile operators, covering over 90% of the mobile market. It did not become necessary to invoke the criteria for comparative selection.

At every stage leading up to license allocation, the government emphasized transparency of process and public consultation. It was no less clear from the onset that there was to be little scope for new entrants. PHS operators were financially constrained and the larger digital PDC operators had been merged into one of the three incumbents. In an effort to ensure a certain degree of competition, the government did not allow the participation of the incumbent fixed-line operator, NTT. However, the spectrum for 3G in Japan seems for now to be the sole privilege of the incumbent mobile operators KDDI, J-Phone and DoCoMo. The only foreign presence stems from Vodafone's minority share of J-Phone. This is not uncommon in other jurisdictions. The allocation of licences in Europe, for instance, has tended to favour incumbents and limit market entry.

Like other regulatory authorities such as OFTA (Hong Kong) and OFTEL (United Kingdom), the MPHPT is concerned with enhancing competition in the 3G market after the licensing process. It has been exploring the possibility of allowing market entry to mobile virtual network operators, an idea which has been endorsed by the Ministry's study groups. In order to allow new players to flourish in the 3G space, mobile operators have been encouraged to open up their platform for mobile Internet access and content provision.

There a number of lessons to be learned from the Japanese experience, notably on market structure. The strong development of locally relevant applications for mobile access and the synergies between handset manufacturing and service development have been Japan's key strengths. Transparency of licensing process together with the development of open and common standards are no less important.

The presence of Vodafone in the Japanese market has significant implications for the competitive landscape in Japan and for service innovation world-wide. Vodafone brings vast experience with international roaming and open platforms to Japan. Similarly, Japan's unique experience in mobile Internet technologies and services will be made more accessible to European markets. Given the large number of mobile data users, the focus in Japan has now shifted from increasing the take-up of mobile data to developing the multi-purpose and multi-functional handset: one which is most likely wearable and capable of machine-to-machine (M2M) communications. The growth of the 3G market, particularly in Japan, hinges less on network development and more on application development. In the future, mobile operators will have to be more and more imaginative about the purpose of the mobilephone. In this regard, Japan is ahead of most other countries.

Looking to the future, Japan has already begun its work on 4th generation services. This is not surprising, as DoCoMo began studying 3rd generation services in 1987, even before the deployment of 2G services. Very recently, Japan's Technology Council published its report on "Future prospects of New Generation Mobile System"[12]. The report estimates that in 2005, 3.5G systems allowing speeds of up to 30 Mbps will be made available. Around 2010, it postulates, 4G systems will provide transmission speeds of 50-100 Mbps. The main features anticipated include: software wireless technology, high-density moving picture transmission, the use of IPv6 networks and Bluetooth for short-distance wireless communications.

Since 3G services already include the capacity for high-speed transmissions, the big question that then arises relates to the type of applications to be made available. It is difficult to foresee the look and functionality of the next generation mobile, but one thing is certain. All those concerned with this field of human enterprise (e.g. regulators, operators, service providers) will be obliged to face a brave new world in which voice no longer dominates the mobile space.

[12] The report was released on 25 June 2001.

ANNEX A

Major Players in Japan's Mobile Market

1. Operator Profiles

Three mobile phone operator groups currently offer 2G services in Japan, all of them entitled to offer 3G services in the future (See Chapter 5): NTT DoCoMo, KDDI Group, and J-Phone.

NTT DoCoMo Group

NTT DoCoMo Group is the largest mobile phone operator in Japan. It was established in 1991 and has its origins in the NTT mobile phone department. The group has 9 regional operators. NTT's subsidiary PHS operator, "NTT Personal", was not able to reach their target subscriber base and for this reason, it merged with DoCoMo in 1998. At this time, the DoCoMo Group offers PDC mobilephone (800MHz, 1.5GHz) and PHS services. In April 2001, DoCoMo had a total of 36.6. million subscribers.

In 1999, it was the first to successfully launch an Internet connection service in Japan: in July 2001, its "i-mode" service boasted 25.3 million subscribers.

The most significant aspect of NTT DoCoMo's corporate strategy is the importance it gives to research and development. R&D has been instrumental in developing mobile technology in Japan, as has the close relationship the operator has maintained with equipment manufacturers (See Section 4.5).

KDDI Group and the "au" brand

Two fixed line operators (DDI and KDD) and one mobile phone operator (IDO) merged into KDDI in October 2000. At the time, IDO was offering its mobile phone service in the Kanto and Tokai areas. DDI had a subsidiary mobile operators group, "Cellular Phone Group" which offered mobile services in 7 other regions. With the exception of Okinawa Cellular Phone (in parts of the Kyusyu area), these Cellular Phone Group operators were merged into one operator, "au".

Today, KDDI offers its own mobile phone service in the Kanto and Tokai regions. Its subordinate company, "au", offers service in other regions (except Okinawa Cellular Phone service area). Both companies, KDDI and au, have branded their mobile services as "au". There were 11.25 million au subscribers in April 2001.

The KDDI group offers the whole array of mobile services: PDC, PHS as well as the cdmaOne system. Concluding that it could not compete with NTT DoCoMo's own PDC technology, KDDI adopted the cdmaOne system in 1998, banking on its high quality voice service. As a result, about 70% of KDDI subscribers now use the cdmaOne system.

KDDI group has other mobile phone operators, e.g. Tu-ka Group. Tu-ka launched its services in 1994 and was originally owned by Nissan, the second largest car manufacturer in Japan. But in 1998, Nissan sold its stock to DDI. DDI was offering 1.5GHz mobile phone services in Kanto, Tokai and Kinki areas. The frequency was different from that of au (800MHz). KDDI intends to sell Tu-ka stocks to concentrate its resources on the "au" brand.

Mobile phone operators of the KDDI group – au and Tu-ka –offer an Internet connection service called "EZ web". In April 2001, there were 6.1 million au and 1.1 million Tu-ka EZ web subscribers.

KDDI also has a subsidiary PHS operator offering the "DDI pocket" service. DDI Pocket has the highest share of the PHS market. KDDI plans to merge with au in the autumn of 2001.

J-Phone Group

The J-Phone group was established in 1992 and launched its services in 1994. It is subsidised by Japan Telecom, one of the major fixed line telecommunication operators in Japan. The group offers 1.5 GHz mobile phone service. It does not have a PHS operator. In April 2001, it had 10.2 million subscribers.

Originally, this group consisted of 9 regional operators. In 2000, operators in east Japan (Hokkaido, Tohoku, Kanto) were merged into "J-phone East Japan" and those in west Japan (Kyushu, Chugoku, Shikoku, Kansai, Hokuriku) were merged into "J-phone West Japan".

J-Phone's Internet connection service is named "J-Sky". There were 6.7 million J-Sky subscribers in April 2001.

The main stockholder of J-Phone is Vodafone, the largest mobile operator in the world. Vodafone announced its purchase of all BT owned J-Telecom and J-phone stocks in May 2001. By August 2001, Vodafone will own 45% of J-Telecom stocks and 46% of J-phone stocks (J-Telecom will own the other 54%).

Figure A.1: Geographical Regions in Japan

Note: Kinki region is also known as Kansai.

Hokuriku region is the northern part ofte Chubu region and Tokai region is the southern region of the Chubu region.

Figure A.2: Service Area of Mobile Phone operators in Japan

Geographic Area	Kyusyu	Shikoku	Chugoku	Hokuriku	Kansai	Tokai	Kanto	Tohoku	Hokkaido
Population %	12	3	6	2	16	12	34	10	6
NTT DoCoMo Group									
PDC 800MHz									
PDC 1,5GHz									
PHS									
KDDI Group									
PDC 800MHz			("au" Group)			(KDDI)		("au" Group)	
PDC 1,5GHz					(Tu-ka Group)				
cdmaOne			("au" Group)			(KDDI)		("au" Group)	
PHS				(DDI Pocket Group)					
J-Phone Group									
PDC 1,5GHz									
ASTEL Group									
PHS									

Source: MPHPT

2. The Equipment Market

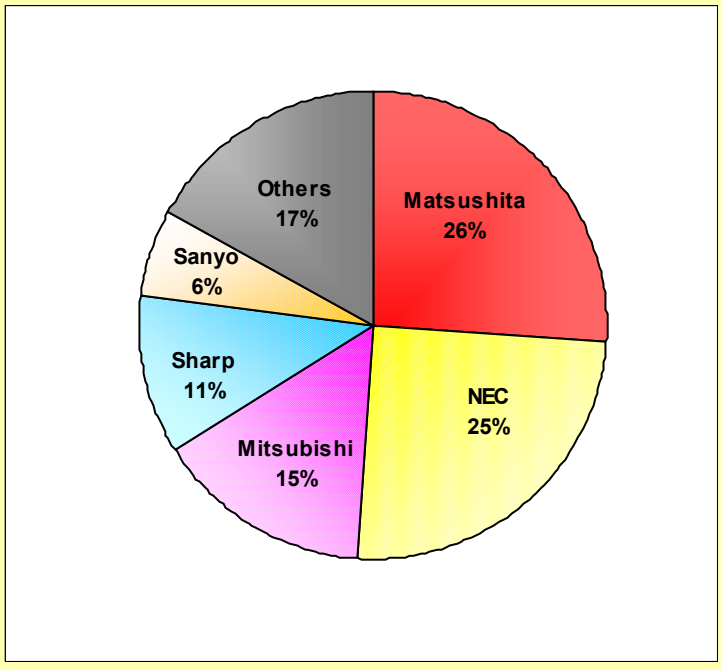
The top three equipment manufacturers in Japan are Matsushita (Panasonic), NEC and Mitsubishi. These three companies are profiled below.

Matsushita Communication is a member of Matsushita Electronics Group and has the largest share of the Japanese mobile handset market, i.e. over 30%. Its "P" series DoCoMo handsets are small in size and quite popular among users. Recently, Matsushita has combined its hardware experience with mobile application development and established a joint company with DoCoMo, "Air media", offering music distribution services to PHS and mobile users. Since the Japanese handset market will soon reach saturation, Matsushita plans to expand its share of the global handset market to reach 10% in 2003. In 1999, it exported 7 million handsets, giving it the fourth largest share of the global market. Having withdrawn from the North American handset market in 1997, it re-entered in January 2001, this time with TDMA handsets.

NEC has kept a close relationship with the NTT group since the time when NTT was a Public Corporation. Not only is NEC involved in the manufacturing of handsets, but it also constructs mobile base stations, circuit switches and network operation systems. NEC's handsets include flip-top covers and large colour displays. Since mobile Internet users tend to prefer larger displays, NEC's share of the market has been on the rise.

Mitsubishi has the third largest share of the Japanese market after Matsushita and NEC. However, with respect to the export of GSM handsets, Mitsubishi has the second largest share after Matsushita. Its GSM handset brand is known as "Trium" in Europe. The company manufactures more handsets for export than for domestic use. Figure 4 provides the handset market share of the various manufacturers in the first quarter of 2000.

Figure A.3: Handsets Market Share in 2000 (First quarter)



Source: Gartner; http://www.gartner.co.jp/

ANNEX B

Highlights of the MPT Re-Structuring

The Ministry of Posts and Telecommunications and two other ministries were merged into the Ministry of Public Management, Home Affairs, Post and Telecommunications (MPHPT) in January 2001.

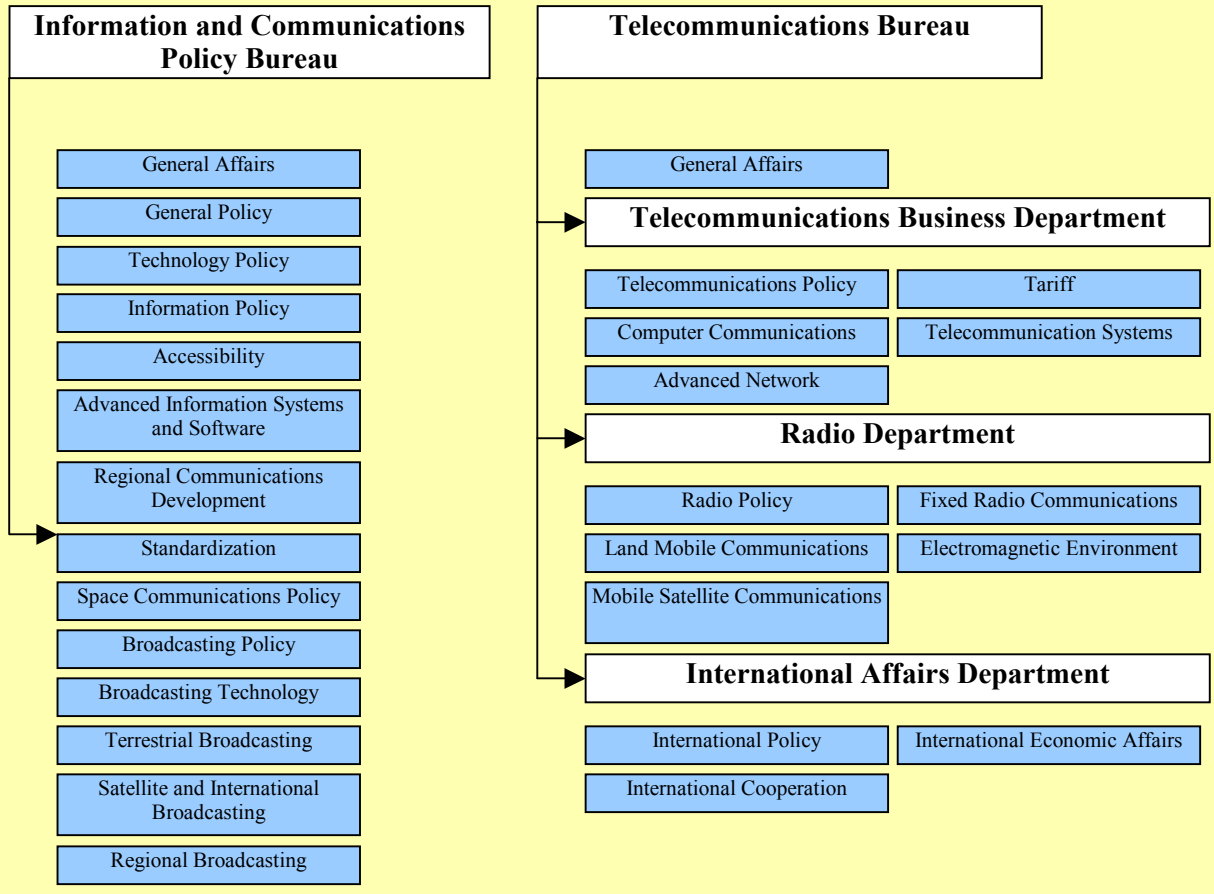
> "The Central Government Reform reorganises 1 Office and 22 Ministries into 1 Office and 12 Ministries, one of which is the Ministry of Public Management, Home Affairs, Post and Telecommunications that is set up as part of the strengthening of the administrative leadership of the Cabinet and Prime Minister. The Ministry of Public Management, Home Affairs, Post and Telecommunications is responsible for handling such issues as management of basic administrative systems; management of local autonomy systems; administration of telecommunications, broadcasting and postal services; and execution of office duties that are irrelevant to the other ministries or agencies having their own missions."(*Reorganisation*, MPHPT Homepage: http://www.mpt.go.jp/eng/)

To meet these objectives, the new Minister's Secretariat and ten bureaus were established within the MPHPT. Two of these bureaus are related to information and communications. In reorganising the information and communication bureaus, the following policies were followed:

(1) The present functions of the MPT were to be assumed without change by the MPHPT.

(2) Three of the existing bureaus (Communications Policy Bureau, Telecommunications Bureau, and Broadcasting Bureau) were to be reorganized into two bureaus (Information and Communications Policy Bureau and Telecommunications Bureau) within the new ministry (See Figure 2.1).

Figure B.1: New Structure of MPHPT Information & Telecommunications Bureaus (since Jan. 2001)

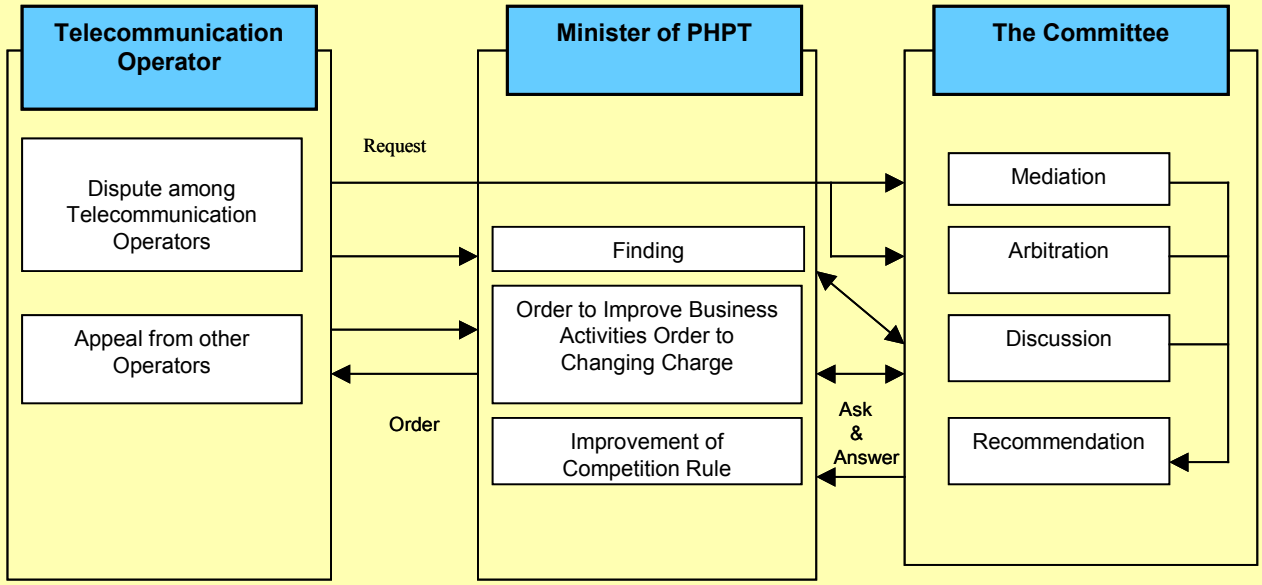


Source: MPHPT

Telecommunication Business Dispute Settlement Committee

A number of amendments to the *Telecommunication Business Law* were passed by the Diet in June 2001. One of these amendments calls for the establishment of the "Telecommunication Business Dispute Settlement Committee", a new committee of which the main objective is resolution of disputes between operators. This committee will be independent of the telecommunication market regulation sections, and is to consist of five commissioners appointed by Minister in agreement with the Diet. The Committee will offer mediation and arbitration services and if necessary, will give advice to the Minister of PHPT (Figure 2.2).

Figure B.2: New Dispute Settlement System



Source: MPHPT

ANNEX C

Main Policy Documents concerning IMT-2000

Basic Guidelines for Introducing Third Generation Mobile Communications Systems (July 1998)

When will the IMT-2000 be introduced?

Considering huge demands on mobile phone and multimedia services including high speed data communications, and the progress of the international standardization activities, MPT is going to establish the technical regulations for IMT-2000 in Japan to enable to start the services in the year of 2001.

Radio Transmission Technologies

The systems should be subject to standards in ITU as the IMT-2000. The technical condition of the system should also be reported by the Telecommunications Technology Council in Japan.

Radio Frequency Assignment

Radio frequency assignment to IMT-2000, considering technical requirement, is as follows;

– Frequency bands for IMT-2000:

- 1920-1980MHz (From Mobile Station to Base Station)
- 2110-2170MHz (From Base Station to Mobile Station)

– Each band is divided into three equivalent frequency blocks, which means three 20MHz bandwidths paired spectrum with 190MHz separation. Each paired spectrum (20MHz x2) should be allocated to one operator in one business area.

Operator

Both incumbent operators and new comers could apply for IMT-2000 licenses.

To maintain a fair and effective competition in the mobile communications market including IMT-2000 market, operators which own local telecommunication networks can not provide IMT-2000 services by themselves.

The number of operators will be less than three, considering the promotion of competition in the market and technical requirements for the system, including frequency allocation.

The operators are requested to have technical capabilities required by the related laws and ordinances, and are expected to equip know-how for technologies and system operations on the IMT-2000 systems, from the view of a smoother start up and expansion of IMT-2000 services.

Geographical Business Areas

Operators should be licensed by each geographical regional area, in view of a smoother expansion of services in each region. Coverage obligation and other requirements will be provided by MPT.

However, considering the possible world wide features of IMT-2000, operators can apply for licenses in plural regions, i.e. all Japan at most, in conjunction with the coverage obligation in each region.

Roaming between each regional carriers should be secured, for the reason that equal service should be supplied to customers throughout the country.

Notes :

IMT-2000: International Mobile Telecommunications – 2000

If there are more than three applicants for the licenses, MPT may select three carriers by comparing several aspects of each application or using frequency auction system. However, introduction of the auction system may take a reasonable time to prepare the regulatory framework.

Source: MPHPT, http://www.joho.soumu.go.jp/mpt_eng/Releases/Telecommunications/news980729.html

ANNEX C (cont'd)

MPT's Draft Policies for Introduction of IMT-2000 (Feb/March 2000)

The System

The system should be standardized by the International Telecommunication Union (ITU) as IMT-2000 and should consist of radio stations for code division multiple access mobile radio communication prescribed in Article 7, (9), iii of the modified Ordinance for Regulating Radio Equipment. Each radio station should consist of radio equipment prescribed in Article 49, (6), iv of the ordinance.

The Object of the Introduction of the System

The system shall comply with demands for mobile telephone and multimedia communications including high-speed data communications.

Acceptance of Applications for the Licenses

Starting on the date of enforcement of the modified Ordinance for Regulating Radio Equipment, MPT shall accept applications for the Type I telecommunications business authorization and radio licenses related to the system, complying with laws.

The Policy on Radio Spectrum Allocation

Based on the "Principles on Radio Station License" announced in December 10, 1999, radio spectrums for this system are allocated as follows:

(1) To prevent harmful interference with PHS, spectrum band between 1920MHz and 1925MHz (5MHz in total) shall not be allocated until it becomes clear that the interference is avoidable by, for example, appropriate technologies developed. For the time being, to secure fair utilization of radio spectrums, each licensee shall be allocated up to 15MHz X 2 from each spectrum block.

(2) Spectrum allocation for each base station shall avoid harmful interference with existing fixed stations because some fixed radio stations will continue to use these spectrums in some areas until November 30, 2002 at latest.

Business Entities

(1) Both incumbent Type I operators and new comers could apply for IMT-2000 licenses.

(2) To maintain a fair and effective competition in the mobile communications market including IMT-2000 market, operators which own local telecommunication networks can not provide IMT-2000 services by themselves.

(3) The number of the operators in each business area shall be three at most, considering the promotion of competition in the market and regarding technical requirements such as spectrum allocation.

(4) The operators are requested to have technical capabilities required by the related laws and ordinances, and are expected to equip know-how for technologies and system operations on the IMT-2000 systems, from the view of a smoother start up and expansion of IMT-2000 services.

Business Units

Operators should be licensed by each geographical regional area (*), in view of a smoother expansion of services in each region.

The operators shall make efforts to expand their service areas, for both telephone and data communication, to achieve more than 50% population coverage in each regional block within five years after commencement of the service.

Considering the possible world wide features of IMT-2000, operators can apply for licenses in plural regions, i.e. all Japan at most, in conjunction with the coverage obligation in each region.

Roaming between each regional carriers should be secured, for the reason that equal service should be supplied to customers throughout the country.

*Hokkaido, Touhoku, Kanto, Shinetsu, Toukai, Hokuriku , Kinki, Chu-goku, Shikoku, Kyu-shu, Okinawa.

Source: MPHPT, http://www.joho.soumu.go.jp/mpt_eng/Releases/Telecommunications/news000214.html

ANNEX D

List of Acronyms and Abbreviations

3G	3rd Generation
3GPP	3rd Generation Partnership Project
CATV	Cable TV
CDMA	Code Division Multiple Access
cHTML	Compact HTML
EDGE	Enhanced Data GSM Environment
FDD	Frequency Division Duplex
FOMA	Freedom of Mobile Multimedia Access
FTTH	Fibre to the Home
GDP	Gross Domestic Product
GMPCS	Global Mobile Personal Communications by Satellite
GPRS	General Packet Radio Service
HDI	Human Development Index
HLR	Home Location Register
HTML	Hypertext Markup Language
ICT	Information and Communication Technology
IMT-2000	International Mobile Telecommunications – 2000
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ITU	International Telecommunication Union
KDD	Kokusai Denshin Denwa
MML	Mobile Mark-up Language
MPHPT	Ministry of Public Management, Home Affairs, Post and Telecommunications
MPT	Ministry of Posts and Telecommunications
MRA	Mutual Recognition Agreement
MVNO	Mobile Virtual Network Operator
NCC	New Common Carrier
NTT	Nippon Telegraph and Telephone
OFTA	Office of the Telecommunications Authority (Hong Kong)
OFTEL	Office of Telecommunications (United Kingdom)
OHG	Operators Harmonization Group
PC	Personal Computer
PCMCIA	Personal Computer Memory Card International Association
PDC	Personal Digital Cellular
PHS	Personal Handy Phone System
PIAFS	PHS Internet Access Forum Standard
PSTN	Public Switched Telephone Network

RRC	Radio Regulatory Council
SIM	Subscriber Identity Module
TC	Technology Council
TDMA	Time Division Multiple Access
TELEC	Telecom Engineering Centre
TTC	Telecommunication Technology Council
UNDP	United Nations Development Programme
URL	Uniform Resource Locator
VLR	Visitor Location Register
W-CDMA	Wideband CDMA
WML	Wireless Mark-up Language
WRC	World Radio Conference
xDSL	Digital Subscriber Lines (e.g . ADSL)
YRP	Yokosuka Research Park

ANNEX E

List of Organizations Interviewed

(From 24 March 2001 to 1 April 2001, Tokyo)

Organization	Position
ARIB	Senior Managing Director, Secretary General
	Managing Director
KDDI	General Manager, Planning and Coordination section Business Planning Dept.
	Assistant Manager, Planning and Coordination Section System Development Dept., Mobile Communications Engineering Division
	Manager, DION Group Service Development Department, NW Sales Division
FUJITSU	Director, 3G Standardization Project Department Mobile & Wireless Systems Division Network Systems Group
	Manager, Global Marketing & Strategic Planning Department, 3G Mobile Phone Division
	Manager, Global Marketing & Strategic Planning Department, 3G Mobile Phone Division
	Vice president, Chief Scientist Network Systems Group
	System Engineering group
	Manager, Strategic Marketing Department Business, Administration Division Mobile Phone Group
FUJITSU Laboratories	Senior Researcher
JAPAN TELECOM	Public Relations Dept.
	Assistant Manager, Advanced Mobile Communications Information and Communication Laboratories
	Manager, Mobile Convergence Group Net Business, Department Data Communications Business Headquarters
J-PHONE	Deputy General, Manager Corporate Planning Dept.
	Deputy General, Manager Research & Development Dept.
	Marketing Communications and Research Group Sales Planning Dept.
	General Manager Corporate Planning Dept.
	Deputy Manager Service Planning Department
Matsushita	Manager, Product Planning Section, Planning Dept.
	Marketing Communications and Research Group Sales Planning Dept.
	Manager, Corporate Engineering Division

ANNEX E (Continued)

Organization	Position
Merrill Lynch Japan	International Equity Business Corporate and Institutional Client Group
	Director, Global Sector Specialist Sales Equity Sales Department Corporate and Institutional Client Group
	Director, International Equity Business Corporate and Institutional Client Group
	Vice president, Yen Equity Sales Department Institutional Client Division
	Vice President, International Equity Business Corporate and Institutional Client Group
	Vice President, Equity Sales Department Institutional Client Division
MPHPT	Director , Multimedia Mobile Communications Office Telecommunications Bureau
	Assistant Director, Land Mobile Communications Division Telecommunications Bureau
	Deputy Director, Telecommunications Policy Division, Telecommunications Bureau
Mitsubishi Trust and Banking Corporation	Director International Equity Business Corporate and Institutional Client Group
	Fund Manager, Asset Management Division II
Mitsui Life Global Asset Management	Director
	Assistant Director
	Deputy Director
	Assistant Director
	Deputy Director Telecommunications policy Division
	Telecommunications Bureau
NEC	Department Manager, Systems Development Department, Mobile Communications Networks Division
	Senior Manager, Mobile terminals 3g Business Promotion Div.
	Vice President
Nifty-Serve	Chief Fund Manager
	Fund Manager
Nomura Research Institute	Chief Consultant, Visiting Professor, Kyoto University Center for Knowledge Exchange & Creation Research & Consulting
	Industrial Analyst, Information Communication Industry Consulting Dept. II Research & Consulting
	Senior Manager
NTT DoCoMo	Manager, Spectrum Planning
	Senior Manager, IMT-2000 Network Office Network Division

ANNEX E (Continued)

Organization	Position
TTNET	Chief Consultant
	Industrial Analyst
	Senior Manager
	Manager, Spectrum Planning
	Manager, Astel Wireless group Technical Engineering Dept.
	Manager, Tokyo Denwa Internet Sales Planning Group Planning & Coordination, Dept. Customer Sales Division
	Manager of Corporate Planning Dept.