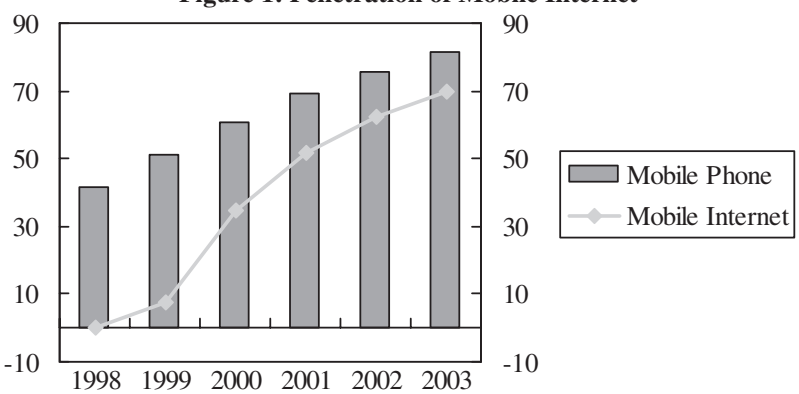
The Expanding Market and the Competition of the Third Generation Wireless Telecommunications Services in Japan[1]

by Tatsushiro SHUKUNAMI*

Overview of the Wireless Market in Japan

In 2003, the penetration rate of mobile phones became about 60% in Japan. It is said that maturity of this service may come soon. Especially, mobile Internet has grown very rapidly since 1999. Last year the number of subscribers increased by 8%. 48 million handsets are equipped with cameras as of March 2004.

Figure 1: Penetration of Mobile Internet



Source: 2004 White Paper, Ministry of Internal Affairs and Communications (MIC); p8

There is a high competition among three carriers, with four service brands: DoCoMo, au, Vodafone, and TU-KA. NTT DoCoMo, Inc.(DoCoMo) and Vodafone K.K.(Vodafone) use PDC, available only in Japan, for the second generation wireless services (2G), but they use global standard, W-CDMA, for the third generation wireless services (3G). Au uses cdmaOne for 2G and cdma2000 for 3G. TU-KA uses PDC for 2G, and it will not be likely to provide 3G.

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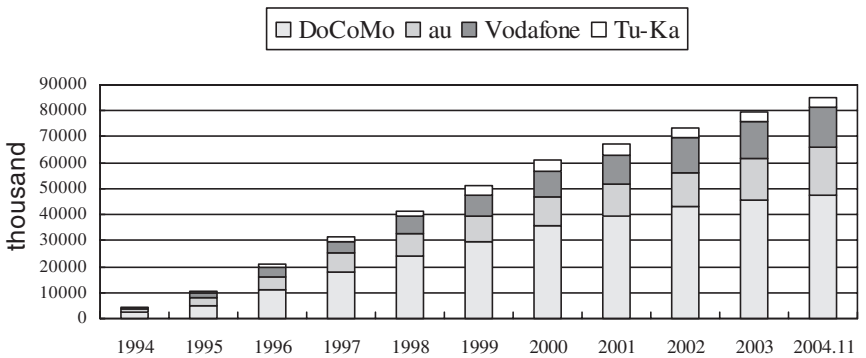
Figure 2: Number of Subscribers and Market Share

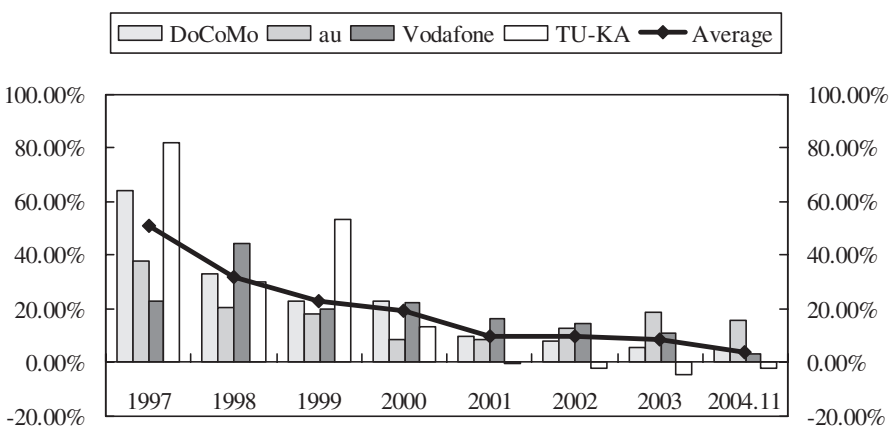


Source: Telecommunications Carriers Associations (TCA) (November, 2004)

DoCoMo has been dominant since IDO Corporation (IDO) and Kansai Cellular Telephone Company (KCT), the competitive carriers, entered the market in 1988 and 1989 respectively. KDDI Corporation (KDDI) has one nationwide brand "au" division, which merged with IDO, and another niche, secondary brand "TU-KA," specializing in a lower profile segment.

Vodafone brand was not well-accepted by Japanese consumers. Called as J-phone before, it had gained the second position in the market in a short period, but by switching its brand name, Vodafone seems to result in running out of steam.

Figure 3: Growth Rate of each carrier

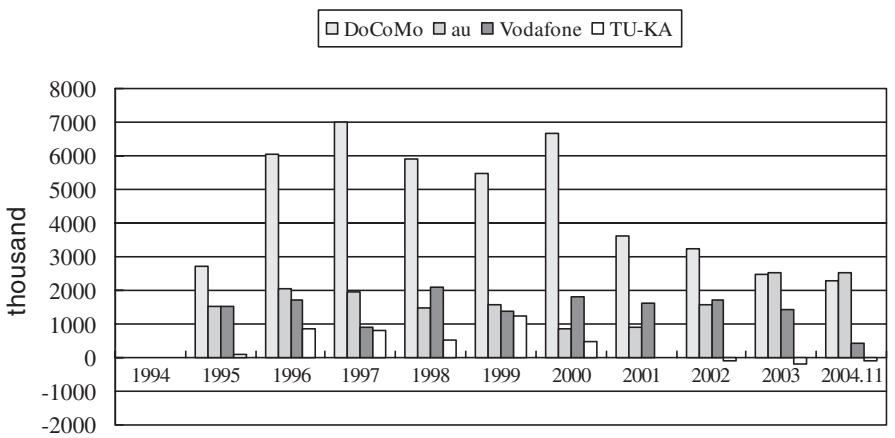


Source: TCA (November, 2004)

Price competition occurs in several ways: Handset price, monthly charge discount, and communications charge discount. Currently most of the marketing

efforts are concentrated on the functional enhancements of handsets and network. About 20% are frequent handset changers who don't want to wait for more than one year, when carriers offer some discount for loyal subscribers.

Figure 4: Annual Subscribers Additions

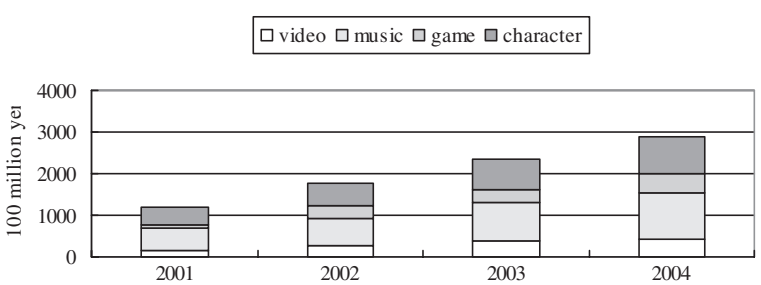


Source: TCA (November, 2004)

From 1996 to 2002, DoCoMo established market stability with the quality of handsets, network coverage, and brand power of the "i-mode." Vodafone was strong in 2002 with the aid of camera phone including photo mail function. From 2003 to present, the "au" of KDDI has captured the majority of new subscribers by the attraction of such 3G services as ringing-tone download, video mail, and walk navigation.

Mobile digital content market has grown in proportion to the increasing number of the mobile Internet subscribers. According to the White Paper, which was just released by the Digital Content Association of Japan, total digital content market reached 2.15 trillion yen in 2003, and mobile digital content market reached 235 billion yen, 34% larger than that of 2002.

Figure 5 : Mobile Digital Content Market



Source: News Release of Digital Content Association of Japan, June 18, 2004
http://www.dcaj.org/news/news040618/news0618.html.

Overview of 3G Market in Japan

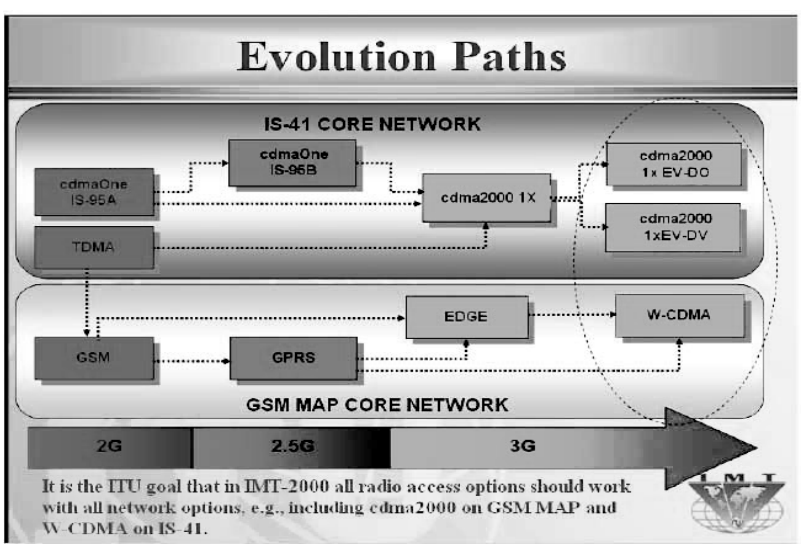
ITU (International Telecommunications Union) defines IMT-2000 (3G) as followings:

- 2 Mbps in fixed or in-building environment
- 384 Kbps in pedestrian or urban environments
- 144 Kbps in wide area mobile environments
- Variable data rates in large geographic area systems (satellite)

Recommendation ITU-R M.1457 specifies five interfaces as standards: W-CDMA, cdma2000, TD-SCDMA, EDGE, and DECT.

Cdma2000 1x was first introduced by SK Telecom of the Republic of Korea in October 2000. 1x Evolution-Data Only (EV-DO), which offers faster service up to 2.4 Mbps, was also introduced by SK Telecom in January 2002. W-CDMA was first introduced by DoCoMo in October 2001[2].

Figure 6 : Technological Paths to 3G



Source: ITU, IMT 2000 Project
http://www.itu.int/osg/imt-project/docs/What_is_IMT2000-2.pdf

DoCoMo aggressively invested in the R&D for 3G, and it aimed to be the leader in the global 3G market. After its introduction in 2001, however, there were some technical problems found in network and handsets. Even loyal customers to DoCoMo are not eager to change their handsets to 3G easily. Although more than seven million subscribers signed up for 3G (FOMA), it is still less than one sixth of the total DoCoMo's subscribers.

DoCoMo still seems to believe that better technology may bring competitive advantage and customer satisfaction. Executives of DoCoMo often speak about the High Speed Downlink Packet Access in 2005[3] as well as 4G before 2010.

KDDI chose U.S.-made 3G technology, cdma 2000, different from the European technology, WCDMA, which DoCoMo and Vodafone chose. KDDI found that the cdma could make a smooth transition from 2G to 3G, because of the backward compatibility within the cdma technology family.

Vodafone is the least aggressive regarding the 3G introduction, probably due to its global strategy. The company keeps a minimal market share in the 3G.

TU-KA already gave up on the 3G, when they didn't apply to the competition for the 3G spectrum allocation in 1998.

Table 1: Types of 3G services in Japan

Carrier	Technical method	Service Nickname	Start of service	Maximum Speed
DoCoMo	W-CDMA	FOMA	Oct, 2001	384 Kbps
au	cdma2000 1x	cdma2000 1x	April, 2002	144 Kbps
Vodafone	W-CDMA	VGS	Dec, 2002	384 Kbps
au	Cdma2000 1x EV-DO	WIN	Nov, 2003	2.4 Mbps
DoCoMo	HSDPA	-	2005	14.4 Mbps

Source: NTT DoCoMo, KDDI, and Vodafone

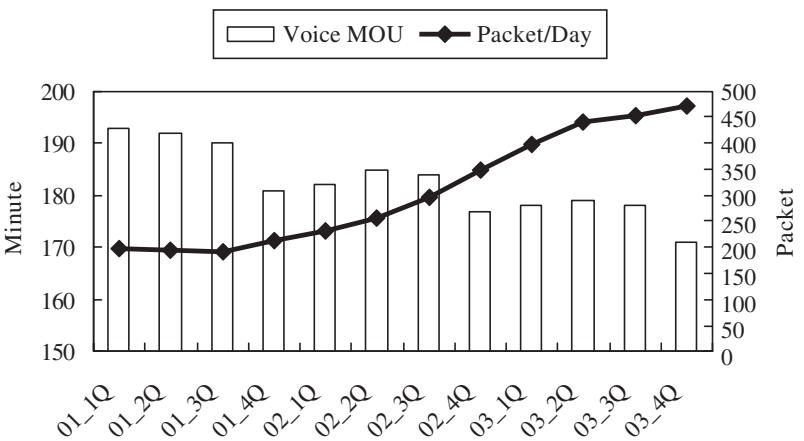
Some companies intend to enter the 3G market as early as next year, using a newly allocated spectrum in 2GHz band and 1.7 GHz band. One company, Softbank, demands that it seek multi-band spectrum allocation of 1.7Ghz in the combination with 800MHz, currently used by NTT DoCoMo and KDDI.

Let's look at the profile of 3G subscribers. Traditionally, KDDI and Vodafone attract the younger generation than DoCoMo. For example, 50% of DoCoMo's subscribers are more than 40 years old[4]. In contrast, 60% of 3G subscribers for KDDI are younger than 40 years old, and more than 60% of new EV-DO subscribers are younger than 30 years old[5].

KDDI's 3G subscribers have been using data services very often. While MOU (minutes of use per user) goes down by more than 10%, the packet use jumped up more than double in a couple of years. (see Figure 7)

Mobile commerce has become popular, too, especially in the field of ringing-tone download, ticket reservations, and goods for girls. KDDI recently announced that hundred million songs for ringing tone had been downloaded during the past 18 months[6]. The price per song and market size of the KDDI's ringing-tone service are almost as big as those of Mac's iTunes music store that attained 100 million downloads in early July 2004[7].

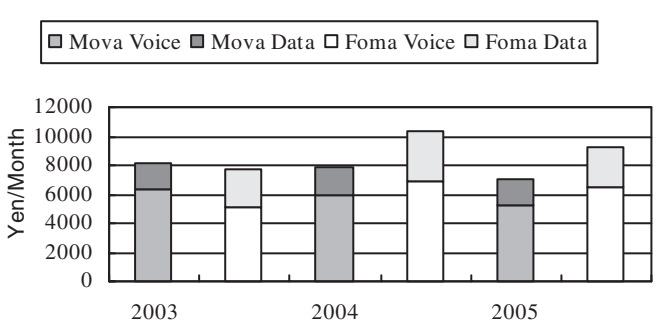
Figure 7 : KDDI's MOU and Data Use



Source: Investor Relations, 2004, KDDI
http://www.kddi.com/english/corporate/ir/presentation/pdf/kddi_040428_e_main.pdf

Although DoCoMo's 3G early adapters were not necessarily frequent users, they expect much higher ARPU (Average Revenue Per Unit) this year and next year. Since 2G (Mova) customers' Data ARPU is already about 25% of total ARPU, DoCoMo expects higher data usage by 3G customers.

Figure 8 : 3G ARPU of DoCoMo

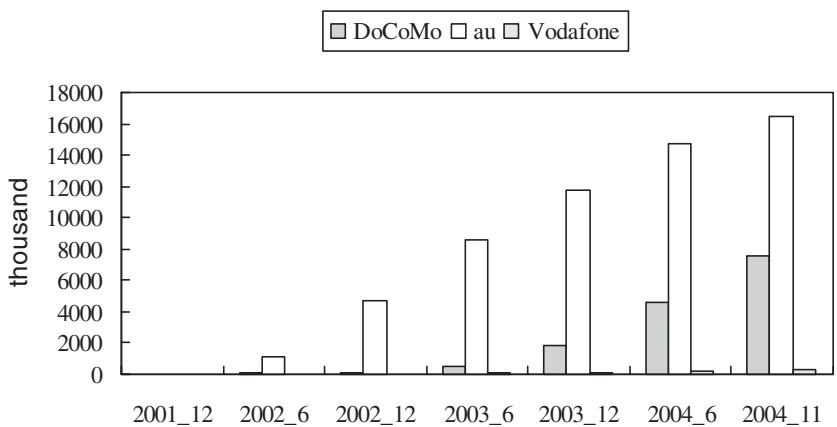


Source: NTT DoCoMo
http://www.nttdocomo.co.jp/english/corporate/investor_relations/business/fiscal_e.html

Leading Companies in the 3G Market

The following statistics show the KDDI's current market position. Although KDDI holds just above 20% market share in the subscriber base, it has 55% share in the 2004 subscriber addition, and it maintains 67% share in the 3G market, while dominant DoCoMo has been aggressively trying to catch up.

Figure 9 : 3G subscribers growth



Source: TCA (November, 2004)

DoCoMo and KDDI took different marketing strategies. While DoCoMo emphasizes its 3G's technical advantages, such as high speed up to 384Kbps and video phone, KDDI promoted innovative and friendly services, such as ringing-tone download and walk navigation. Since DoCoMo customers had to give up some of convenience associated with 2G, including best handsets with light-weight, small size, long battery life, and better camera, as well as one of the best quality network in the world, video phone function without enough receiving parties or 384Kbps speed sounds unsatisfactory.

Table2 : Difference of 3G Marketing Strategies

	DoCoMo	KDDI	Result
Area Coverage (Phone)	Not Perfect New facilities not compatible with 2G	The same as 2G, because of compatibility with 2G	DoCoMo users choose either 2 handsets, or stay in 2G
Area Coverage (Data, Video)	Not Perfect, sometimes worse quality than 2G	At least 64Kbps of 2G is guaranteed.	KDDI's service is more stable.
Key services for promotion	Video Phone Video Mail Video Download	Ringing-tone Song (Chaku-Uta) GPS EZChannel (Broadcast type)	Self-Access type services were accepted
Key target for internet access and key concept for promotion	PC High Speed up to 384Kbps Packet Discount for 3G only Flat-Rate for high end 3G	Regular Hadsets Packet Discount for 2G and 3G Flat-Rate for EV-DO	DoCoMo's 2G users are unhappy.

On the other hand, KDDI has been working with a market-oriented approach[8]. It has focused on informing their customers which applications they can provide. For example, KDDI doesn't emphasize that their handsets are GPS compatible but that customers can use walk navigation function with voice instructions. It had refrained itself from calling 3G before they named EV-DO as WIN. Mr. Onodera, CEO of KDDI, explained in a conference that KDDI intentionally avoided using technical words, either 3G or cdma2000 1x, for the 3G marketing promotion[9].

DoCoMo was not successful in introducing 3G, although it had one-year advantage initially. Since DoCoMo had to invest in completely new base stations, communications network, handsets, i-mode servers, and other facilities, its 3G service quality and coverage were not good enough for quality-sensitive customers. Mr. Tachikawa, CEO of DoCoMo, admitted that they were working to overcome three major defects of 3G — area coverage, terminal functions, and service applications[10]. DoCoMo has been working hard to get 10 million 3G subscribers by March 2005.

Vodafone has been a real loser, due to its "wait and see" strategy. The reason Vodafone was inactive in this important market segment can be attributed to either UK headquarters' strategy or the negative impact from DoCoMo's failures in the earlier stage.

Killer Applications of 3G

Many people think or ask which applications drive 3G market best. No clear answers are yet to be found. There are two ways to reach the hypothesis of killer applications. One possibility is through an innovation or revolution. If something that was considered to be impossible has become possible, people may jump into them. However, this is risky, because the value may not be recognized before innovators presented the price tag. Another way is through an imitation from the similar world. For example, mobile e-mail had a strong possibility because of the proliferation of PC e-mails.

Let's look at the possible killer applications in both ways. A good example of a typical innovation is video phone. Three years have passed since DoCoMo introduced video phone in 2001. According to the research done by InfoPlant Inc., about half of the latest DoCoMo's 3G handset users never used video phone, and only 12% use video phone regularly, at least more than once a week[11].

While DoCoMo was successfully ahead of other carriers in the field of web/e-mail and Java functions, it was less aggressive in introducing such innovative services as camera, GPS and ringing-tone songs. If consumers think the applications amazing or convenient, those applications would have bigger possibility of success.

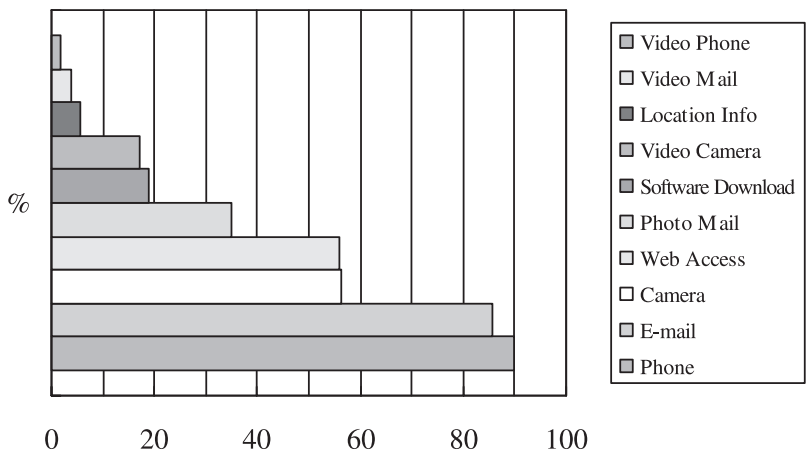
Table 3: Customer Base of High End Functions

Carrier/ Function	Photo Mail	Video Mail	Java	GPS	Ringing-tone songs	Web/E-mail
DoCoMo	33.5 million	N.A.	27.1 million	N.A.	N.A.	42.6 million
au	14.8 million	13.4 million	6.7 million	10.1 million	13.3 million	15.3 million
Vodafone	12.2 million	3.6 million	8.4 million	N.A.	N.A.	13 million

Source: *IT Media* (2004), "DoCoMo ga Toppuni -10 Gatsu Keiyakushasuu, [Mobile Market Report in October], November 8.
http://www.itmedia.co.jp/mobile/articles/0411/08/news075.html

Actively-utilized functions are still basic ones. Frequently-used functions include mail (e-mail, photo-mail, and video mail), web access, and download (music, and game), although carriers provide their customers more innovative functions.

Figure 10 : Used functions during the past one month



Source: Mitsubishi Research Institute, 9th Mobile content/service research report, 2004
http://www.mri.co.jp/PRESS/2004/pr040616_icd01.html

Characteristics of applications are the followings:

(a) Video Mail

Video mail is one of the most popular applications, a natural evolution from photo mail. Although some of the video files have problems of transmission compatibility, usually it can be used easily anytime and anywhere. DoCoMo supports up to 100KB video file attachment, whose fee is 2 dollars at most. Video clips can be seen on PCs with the QuickTime version 6.5 installed. KDDI supports three types of 15-second video mails. A medium size of video can be sent by 50 cents.

(b) Video Clips

DoCoMo provides three types of video clips called "i-motion." First one is a streaming type with the 384Kbps-packet switching network charged by the volume of information. Second one is a downloading type with 384Kbps. Third one is a streaming type with the 64Kbps-circuit switching network charged by minutes. Communication fees may be very expensive, especially with the packet switching, as they are written in a catalogue.

KDDI provides 30-second video clips for 1x (regular 3G) customers and 3-minute video clips for 1x EV-DO (high speed 3G).

(c) Video Phone

On the Internet, some early adapters talked via PCs using special headsets and microphones. A video conference system has become useful, particularly in the

global business meetings or e-learning systems.

However, video phone needs more efforts to remove technological and psychological obstacles. The compatibility of video phone terminals is not guaranteed. In addition, most people have some psychological barriers to show their faces, because video phone may reveal more privacy than regular phone. Some people say that video phone may be attractive only for business usage or among intimate friends or family members.

On the other hand, Mr. Natsuno of DoCoMo predicts that video phone will be very popular soon, while a real-time TV tuner will not be very popular[12].

(d) Broadcasting Type Video Programs

KDDI provides semi-broadcast type channels for entertainment exclusively to 1x EV-DO customers. Video programs are automatically transmitted depending on the customers' subscription during the night, when KDDI's network rarely becomes busy. The programs include news, movies, magazines, and educational materials.

(e) Walk Navigation

Most high-end handsets of KDDI have GPS capability. The first version of the service merely provided simple location information on the map. A new version, called "EZ NaviWalk," offers the functions similar to those of car navigation equipments. The service includes a route map on the screen, automatic voice instruction, and automatic map scroll during walking. A few months ago, the MIC (Ministry of Internal Affairs and Communications) reported that they would promote an enhanced version of emergency call function with the GPS-capable phones. Other carriers will have opportunity of utilizing this technology soon.

(f) Ringing-tone song (Chaku-uta)

Chaku-uta (ringing-tone song/Master-tone), a trademark of Sony Music, is a service that enables users to download the master music into their mobile phones to set up the music as a ringing tone. It is the first service in the world that allows users to download a song from a CD and set it up as the ringing sound[13]. Yet, there are several problems to be solved. 1) Artist line-up is not enough. 2) Selection of songs is limited. 3) Sound quality is not as good as that of an original CD.

This service has been one of the driving forces for KDDI that attract new customers and make its 3G the most popular one in Japan. It took only 18 months for 100 million songs to be downloaded into mobile handsets[14]. Currently, 60,000 songs are ready to be downloaded on 134 sites.

This function was further extended into a convergence of radio and mobile. Songs can be downloaded from a music server with one click, when customers with FM receiver handsets find interesting songs on the FM program they are listening to.

(g) High Speed Internet Connection

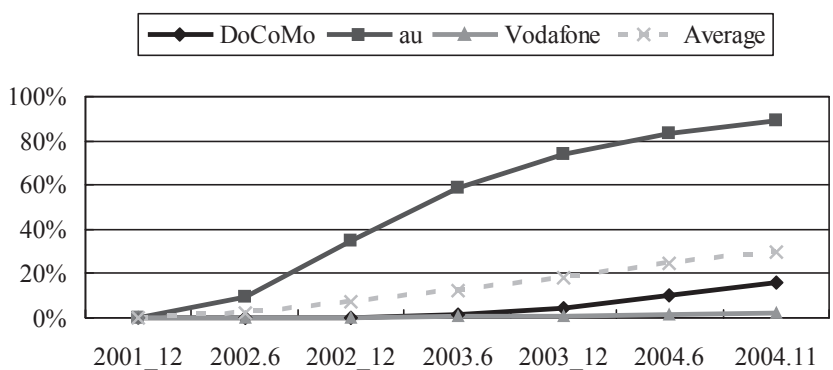
DoCoMo provides two types of Internet access cards: a regular PCMCI card and a stamp- size one for PDA. Their maximum speed is 384Kbps. DoCoMo will have developed a faster service by the end of next year. According to the company, the maximum speed will be 14.4Mbps, faster than an average DSL. KDDI began to offer higher maximum speed up to 2.4Mbps within 1x EV-DO service area. Because the flat-rate fee doesn't include the Internet access via PCs, individual customers prefer the flat-rate PHS data cards.

It is very difficult to predict which applications will be the best for the 3G. However, key factors for a better service will require the balance of innovation, acceptability, and reasonable price. According to the June Report of the Mitsubishi Research Institute on Mobile Users, video-related functions have good potential when customers decide to choose the flat-rate subscription.

New Factors on 3G Market Competition

While DoCoMo needs to make efforts on network infrastructure, service development, and enhanced handsets, KDDI can concentrate on developing new services and handsets, as 3G penetration nears 90%. DoCoMo and its manufacturers still have at least a few years to maintain equipments and handsets for both 2G and 3G.

Figure 11: Penetration of 3G in each carrier



Source: TCA

The 3G technology itself is not necessarily a competitive advantage. Most of the customers are still waiting for their best 3G services that provide better qualities of network, more functions of handsets, lower charges, and reasonable access speed.

Probably that's why only 16% of DoCoMo customers signed up for the 3G, and only 7% of KDDI's 3G customers signed up for new EV-DO. The urgent issue for DoCoMo will be how it can identify their customers' real needs, and KDDI's issue will be how to keep its dominant position in 3G by upgrading its services and handsets.

Several new services and functions may become technically possible within a few years. The first type is to enhance communications capabilities, and the second type is to enhance terminal functions which are not necessarily related to communications.

The first type includes IP telephony, music download, and video distribution. IP telephony will be supported either by inside of a company or by hot spots outside. Music download is a natural extension of music-related functions. Video distribution will be done either through on-demand download of video programs or through the multi-cast distribution of videos.

KDDI recently announced that they would introduce new EV-DO handsets which are capable of full music downloading in November.[15] Their handsets have an inside memory for 20 full songs to store. Additional storage cards are available, too. It may be able to compete with the very popular iPod.

DoCoMo seems to like the video distribution approach. In May, DoCoMo began the experiment of a satellite TV program distribution using 300 monitors with its 64Kbps-circuit switched service. In Norway, a public broadcaster offers free TV programs to mobile operators, while mobile operators charge downloading fee of between 30 to 50 euros to the customers[16] SK Telecom in Korea may begin to offer a direct satellite TV tuning function.

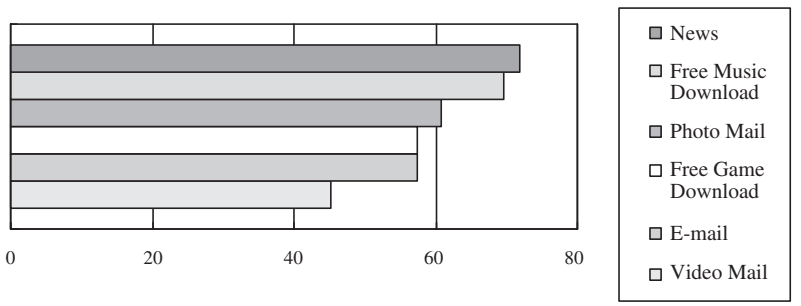
The second type includes IC card, Digital TV tuner, and file viewer. In July, DoCoMo predicted electronic money functions as the killer applications for the coming five years. Electronic money has a history of failures, mainly because it is not as convenient as real money. A digital TV Tuner may work as stand-alone equipment or an interactive communication tool.

Although an analogue TV tuner was already supported by Vodafone, its reception is not good enough, especially while in motion. In 2005, Digital TV may overcome such technical defects, and it will probably become one of the best functions ever installed of killing time, when it will have a nationwide coverage.

KDDI and NHK announced that they developed a mobile phone terminal that receives digital terrestrial TV broadcasting[17]. A handset weighs 140 grams, and a battery can support two-hour of TV programs.

Lastly, let's look at the next step of the flat-rate pricing. Some mobile carrier executives, especially financial officers, are not supportive for the flat-rate pricing. They believe that the flat rate decreases their revenue. However, the flat-rate fee has two positive effects.

Figure 12: More frequently used services in case of flat-rate charge



Source: Mitsubishi Research Institute (2004). 9th mobile content research report.

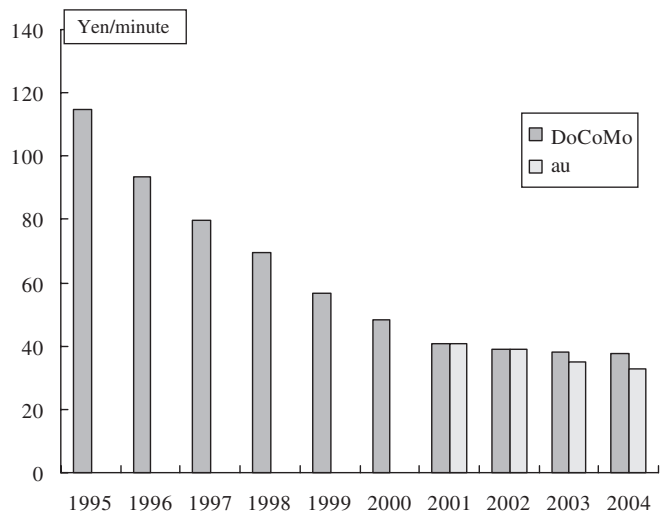
First, with the flat-rate fee, customers will use mobile handsets more often. That may lead to more transactions through mobile Web, one of the objectives of the handsets with IC card capability. In addition, the flexibility of handsets software will increase by free downloading.

Second, the flat-rate fee will liberate the customers from frustration on cost and time. KDDI says that the flat-rate plan users subscribe more paid-content than volume-sensitive plan users. This means that flat-rate pricing may create a win-win business model for customers, content providers, and carriers.

Issues on Competition Policy

Some issues remain to further develop the 3G market. One is how to evaluate current competitive situations. The MIC (Ministry of Internal Affairs and Communications) has set the mobile market analysis as one of its policy objectives this year. Incumbent carriers claim that they have decreased their charges as much as possible because of the competitive pressure. However, the CPI (Consumer Price Index of mobile phone, published by Bank of Japan) shows just above 10 points decline from 64.9 in 1998 to 54.1 in 2003[18]. As a proxy of the price level, the average voice revenue per minute (AVRPM)[19] can be used as a proxy of the price level, too. Figure 13 shows the ten-year trend of the AVRPM in Japan. In 2001, price per minute decreased to almost one-third of that in 1995, while its 2004 prices per minute are only 10 to 20 % less than those in 2001.

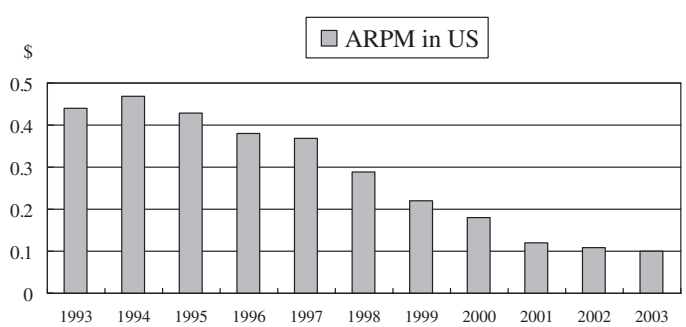
Figure13: Average Voice Revenue Per Minute in Japan (AVRPM)



Source: Annual Reports, NTT DoCoMo and KDDI

TU-KA, which has provided the cheapest options, is the only one service brand that has lost customers. This indicates that Japanese consumers prefer better products and services to cheaper yet worse products and services. However, other three carriers may have effectively secured their customers, possibly through the family discount plan, point program, as well as phone numbers. Carriers could avoid the price war by these high switching-cost factors. New technologies used in the 3G should be less expensive than that of the 2G, at least in the long run, since the data charges of the packet discount plan of the 3G are already down to one-fifteenth of 2G data charge.

Figure14: Average Revenue Per Minute in the USA



Source: FCC (2004). *9th Annual CMRS Competition Report*.

According to the 9th Annual Commercial Mobile Radio Services (CMRS) Competition Report[20] of Federal Communications Commission (FCC) in the U.S., a similar price decline curve can be seen as above, while the price level in the U.S. is much less than that of Japan. The differences of the prices between two countries mainly come from the fact that U.S. carriers usually give their customers unlimited use of minutes, especially night and weekends as well as mobile-to-mobile phone calls among their own customers.

Second issue is the spectrum allocation policy. Simply put, there are three types of spectrum. One is 800 MHz and 1.5 GHz band, mainly used for the 2G services by the incumbents. Another is 2 GHz band, exclusively assigned for the 3G services to three incumbents — NTT DoCoMo, au, and Vodafone. The other one is 1.7 GHz and 2 GHz band, which will be allocated to either incumbents or new entrants.

Table 4: Allocated Bandwidth and Spectrum Use Efficiency

Service			NTT DoCoMo	au	Vodafone	Tu-ka
2G	800MHz Band	Allocated Bandwidth	58MHz	30Mhz	—	—
		Number of Subscribers	38 million	18 million	—	—
	1.5GHz Band	Allocated Bandwidth	11MHz	—	23MHz	20Mhz
		Number of Subscribers	N.A.	—	15 million	4 million
3G	2.0GHz Band	Allocated Bandwidth	30MHz	30MHz	30MHz	—
		Number of Subscribers	7 million	N.A.	26 thousand	—

Source: Current Spectrum Allocation to Mobile carriers, MIC, October, 2004

Several issues are under discussion in the study group of the Spectrum Usage Development, established in October and finished in next January. Currently, all of the new entrants and incumbents request an additional spectrum, particularly new 1.7Ghz band and currently used 800 Mhz band. New entrants request spectrum exclusively for themselves, because an allocation of spectrum is crucial for their business as well as their promotion in a competitive market. In contrast, incumbents request more spectrums because the customers want upgrading to the 3G services, which will create more traffic of data and videos.

Softbank already sued the MIC for its favors to incumbent carriers on the spectrum allocation[21]. USTR (Office of the United States Trade Representative) seems

to support the Softbank's position in order to promote competitions in the mobile sector, emphasizing the technological neutrality[22]. One of the issues is the efficient usage of the current allocated spectrum. Although Vodafone claims that most of their customers will shift to the 3G services soon, only 2% of total subscribers actually use 3G phones. Au doesn't use 2GHz band for voice communications even for 3G subscribers. Only NTT DoCoMo may use up the allocated 30MHz spectrum for 3G soon. Since there is no specific obligation of the 3G spectrum efficiency, either a reallocation of spare spectrum, a secondary use framework, or an obligation of MVNO (Mobile Virtual Network Operator) support, should be considered, in order to save the scarce resources and to promote a healthy competition. This decision and the introduction of number portability scheduled in 2006 are crucial to the wireless industry and consumers in Japan.

In addition to the competition policy issues, a convergence between broadcasting and telecommunications may need a new regulatory and legal framework. Broadband service carriers are transmitting broadcast-like services to households using optic fibers. As the digital broadcasting will begin as early as the end of 2005, mobile phones will be used as video terminals, regulated by both broadcast laws and telecommunications business laws. The balance of power on copyright issues will become important between of the right of fair use and the fine mechanism to prevent unwarranted copy of audio and video contents.

NOTES

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