

Toward the Next-Generation Standard for Mobile Communications

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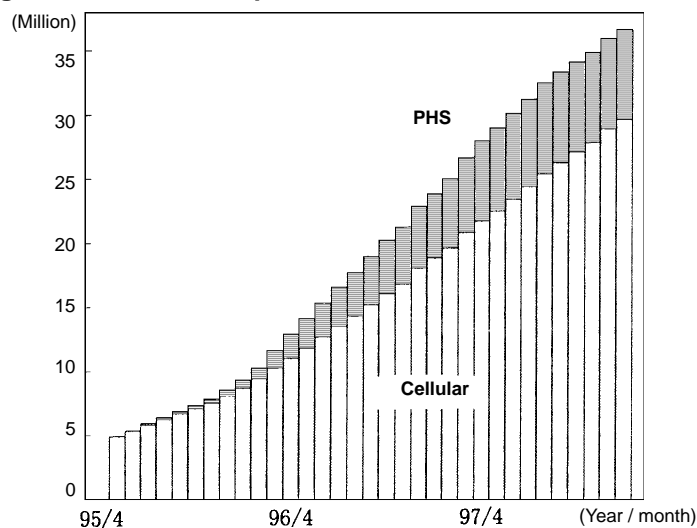
1. Slower Mobile Communications Market Growth Ahead

(1) Subscriber Base Reaches 35 Million

The mobile communications market - including cellular phones and PHS phones—has seen strong growth since the introduction of new common carriers (NCCs) in the late 1980s. As of the end of 1997, the cumulative subscriber base totaled 35 million users.

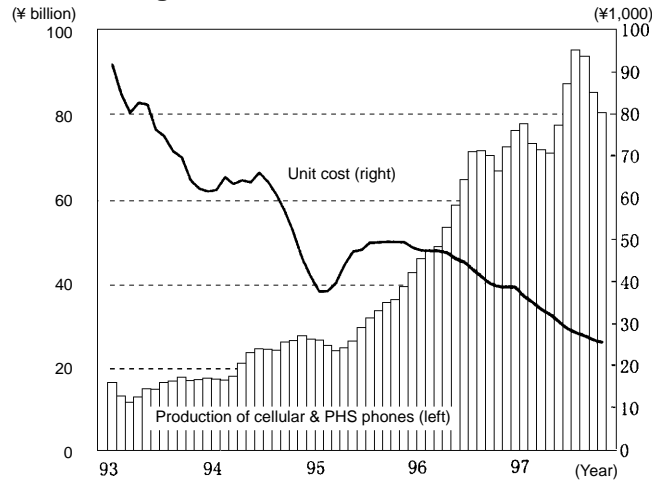
This figure corresponds to a 28 percent penetration ratio of the total population, or one in three persons. This amounts to one-half of the number of fixed-line telephones (approximately 61 million).

Figure 1 New Subscriptions for Cellular and PHS Phones



The pivotal factor triggering the rapid growth of the mobile communications market was the transition from phone rental system to sales in 1994. The unit cost per cellular phone (factory shipment basis) declined from approximately 90,000 yen in 1992 to 25,000 yen in 1997. This has encouraged growth by lowering the initial cost burden to new subscribers.

Figure 2 Unit Cost of Cellular Phones



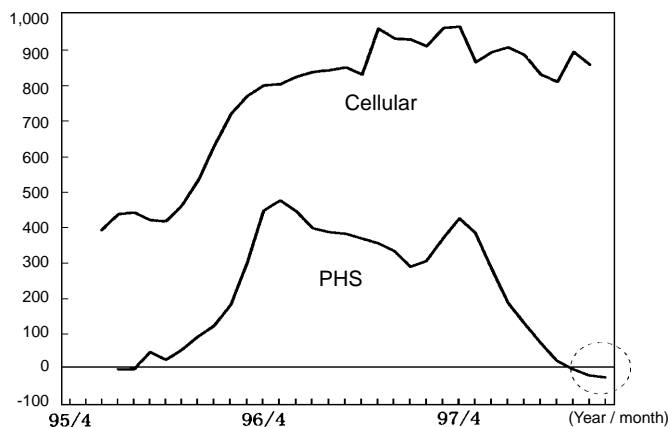
Source: MITI, *Machinery Statistics Monthly*.

In addition, competition among mobile carriers has led to lower basic service and toll charges, while the abolition of initial fees has spurred new subscriptions. In 1997, the number of new subscribers exceeded 10 million for the second consecutive year. By comparison, the only other country which has had more than 10 million new subscribers per year is the U.S.

(2) Net Decline in PHS Subscribers

However, the growth pace has declined sharply from the second half of 1997. The number of new PHS subscribers in particular began slipping in early fiscal 1997, and since October cancellations have surpassed new contracts.

Figure 3 New Subscriber Growth Rate for Mobile Communications



Source: Telecommunications Carriers Association

The increase in PHS cancellations is occurring amid a maturing market and shrinking price advantage vis a vis cellular phones. Even high school students, among the most stable PHS users, are being lured to cellular phones by price cuts and discount services.

PHS operators have cut high-speed data transmission (32kb/s) fees by half to emphasize the differences between cellular and PHS concepts. However, the data transmission advantages of PHS have yet to be recognized by the market, as data transmission accounts for only 10 percent of total traffic.

On the other hand, while the number of new cellular phone subscribers manages to increase at approximately 800,000 per month, the vigorous surge seen in fiscal 1996 has completely disappeared, and the growth rate is unchanged.

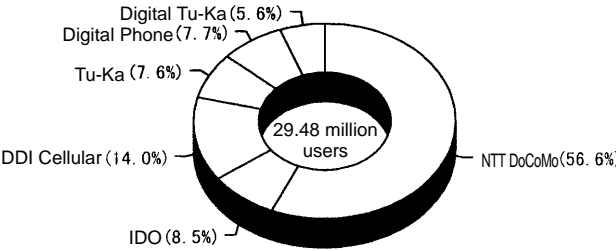
2. Poor Earnings Situation of Mobile Carriers

Amid the sluggish growth in new subscribers, mobile carriers are competing more aggressively to maintain if not expand market share by offering incentives to their sales agents. While new subscriptions have recovered slightly, operating profits of all carriers are deteriorating as incentive payments grow in size.

(1) NTT DoCoMo Maintains a Wide Lead in Cellular Phones

In the cellular market, NTT DoCoMo holds a commanding 57 percent market share on a cumulative basis, and continues to expand its lead by attracting over 65 percent of new subscribers every month.

Figure 4 Market Shares in the Cellular Market (End of Jan. 1998)



Source: Telecommunications Carriers Association

NTT DoCoMo’s dominant position can be attributed to several factors:

- (1) it was the first to build a nationwide network,
- (2) it leads in value added services and price competition,
- (3) it introduces new cellular phone models before its competitors, and
- (4) it enjoys NTT’s brand recognition.

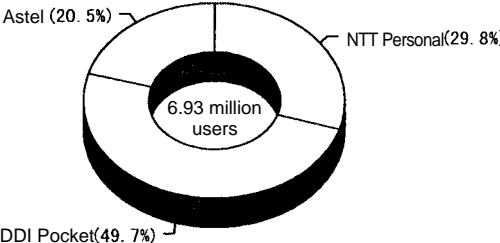
Perhaps NTT DoCoMo’s decisive advantage lies in having developed and monopolized the PDC digital technology presently used by cellular phones, allowing it to introduce new cellular phones before its competitors.

Some of the other carriers have managed to post single-term profits, and some have even managed to erase their cumulative losses. However, with market shares of only about 10 percent, their survival over the long term is questionable, especially considering the massive investments necessary to upgrade to the next generation cellular phones. Thus consolidation among the smaller carriers seems inevitable by 2000 at the latest.

(2) Even Top PHS Carriers Post Large Losses

Among PHS carriers, DDI Pocket enjoys a virtually unshakable lead with a 50 percent market share. Its dominance can be attributed to an aggressive marketing strategy which successfully attracted subscribers from the start, and to superior service quality from using base stations with a higher output (500mW) than competitors, thereby receiving fewer complaints regarding PHS connectivity.

Figure 5 Market Shares in the PHS Market (End of Jan. 1998)



Source: Telecommunications Carriers Association

However, even a dominant market share has not spared DDI Pocket from financial difficulties. The DDI Pocket Group has been unable to post single-term profits, and expects to have accumulated 140 billion yen in losses by the end of fiscal 1997. NTT Personal, ranked second after DDI Pocket, also posted a loss of approximately 100 billion yen in fiscal 1997, bringing its cumulative loss to 240 billion yen.

NTT Personal thus plans to stop conducting business on its own and merge (or transfer management) to NTT DoCoMo. Third ranked Astel is also expected to post accumulated losses of approximately 200 billion yen.

The primary reason PHS carriers have not met initial projections and accumulated huge losses has been excessive competition, leading to payment of massive sales incentives that defy common sense.

Since mobile operators entrust their application procedures for new subscriptions to sales agents and retail stores, the real competition for new subscribers takes place at the store display where competing products are lined up. As the competition for market share intensified, carriers continued to pay sellers 30,000 to 40,000 yen in incentives for each new subscription.

In contrast, sales incentives for cellular phones have not gone out of control because the cellular market has continued to grow. The PHS market's late start made incentives more difficult to contain.

From the perspective of sales agents, they found they could openly hand out PHS phones for free because the incentive payment from PHS carriers was profit enough. As a result, the number of cancellations by short-term users who used the phones for free surged from the second half of 1997, leading to a net decline in subscribers.

To remedy this operating structure, PHS carriers began limiting their incentive payments in April 1997. But due to the direct impact on market share, the attempts have not been very serious.

Even so, DDI Pocket Group has managed to contain its incentive payments to an extent, and fiscal 1998 could be profitable. Still, its cumulative loss will remain substantial. NTT Personal's future is uncertain, despite its plans to restructure by merging with (or transferring management to) NTT DoCoMo. The number three player, Astel Group, is in even worse condition than the top two.

Judging from the performance of PHS carriers as a whole, the continued existence of the PHS system itself seems in doubt.

3. Competition in Next-Generation Systems

(1) Competition in Next-Generation Standards

Japan's cellular phone market has grown to approximately 30 million subscribers since its inauguration almost a decade ago. Even if the growth rate declines, the market is almost certain to reach 50 million by 2000.

However, under the present PDC format (a digital cellular phone system unique to Japan), the physical constraints of line capacity will be reached in the near future. For the mobile communications market to reach the same scale as fixed-line telephones (61 million subscribers), the cellular phone network will need to be upgraded and radio frequency reallocated.

For the next-generation mobile communications system and frequency reallocation, the Ministry of Posts and Telecommunications has in large part decided to conform with international standards set by the ITU. Thus the present cellular phone system is likely to be rebuilt according to international standards as early as 2001.

Cellular phone carriers who lag behind NTT DoCoMo under the present system see the next-generation standard as a chance to level the field and compete on an equal basis. Competition among carriers is thus shifting to the next-generation standard.

(2) Significance of the Next-Generation Standard

The guiding principle behind the ITU's next-generation standard for mobile communications is to set a uniform global standard allowing cellular phones to be used anywhere in the world. The new standard is being called IMT-2000 (International Mobile Telecommunication) in reference to both the targeted date of implementation (2000) and central frequency bandwidth (2000 MHz, or 2 GHz).

The basic concepts underlying the ITU standard are: (1) global uniformity allowing cellular phones to be used anywhere in the world, (2) quality comparable to fixed-line telephones, and (3) diversity of services.

However, details of the new standard have yet to be determined. The ITU plans to deliberate on national proposals presented by June 1998, and decide on the global standard by 1999.

The impact of the new global standard will spread beyond the carriers. Equipment makers who participate in developing the specifications stand to gain a significant edge in the production of base stations and cellular terminals, reaping enormous profits. Thus the standards deliberation process will see intense competition involving equipment makers in Japan, the U.S. and Europe.

(3) The Global Context

Japan, who faces a shortage of frequency for cellular phones by the end of the century, has been the most aggressive nation in the bidding competition for the next-generation standard.

Presently, Japan's de facto proposal is W-CDMA (wideband code division multiple access), a format championed by NTT DoCoMo. Following an unsuccessful attempt to have the present domestic PDC format adopted as the global standard, NTT DoCoMo changed its strategy and pursued joint research with Japanese, European, and U.S. manufacturers. W-CDMA is presently is the leading candidate for adoption as the global standard.

However, DoCoMo's proposal is based on CDMA, a format originally developed and patented by Qualcomm of the U.S. Four North American companies—Qualcomm, Lucent Technologies (a spinoff of AT&T), Motorola, and Northern Telecom of Canada—have formulated a competing W-CDMA proposal.

Meanwhile in Europe, Alcatel of France and Siemens of Germany had advocated a TD-CDMA format based on Europe's GSM standard (which is the present de facto global standard and

adopted not only in Europe but Asia). This competed with the DoCoMo format supported by Nokia of Finland and Ericsson of Sweden. However, in January 1998 NTT DoCoMo reached a compromise with the French and German manufacturers, so that the European proposal now supports NTT DoCoMo's format.

As a result, the competition has narrowed to Japan and the U.S. Not only does the North American proposal lack concrete specifications, but the U.S. appears unlikely to unify its domestic standard for mobile communications from among the several standards including analog ones. On the other hand, the DoCoMo proposal already entered the experimental stage in late 1997.

However, considering the massive business implications behind the global standard, the North American group is unlikely to give up easily. In fact, they have put pressure on the ITU by declaring that North America will adopt its own standard regardless of what the ITU decides.

Since North America is the world's largest mobile communications market, if it adopts a format other than the ITU standard, the ITU standard will lose its relevance. Thus the final decision effectively rests in the hands of the North American group. Recognizing this, DoCoMo is apparently now negotiating a compromise with the group. Whatever the outcome, there appears to be no guarantee that the ITU deliberation process will work in DoCoMo's favor.

Table 1 Competing Next-Generation Wireless Access Formats

	Japan's proposal	U.S. proposal
Basic format	Wideband CDMA	Wideband CDMA
Max.transmission speed	2 Mbps when still, 384 kbps when moving	Undecided
Frequency allocation	2 GHz band	Undecided (2 GHz band already in use)
Service start	Spring 2001	2002 or later
Basic policy of standards group	Radio Industry Association will make adjustments to DoCoMo proposal and present to ITU as Japanese proposal.	U. S. Telecom Industry Association will not unify a domestic standard. Intends to recognize multiple domestic standards.
Companies supporting standards (incl. participants)	NTT DoCoMo, Japan Telecom (Tokyo Digital Phone), Nissan Motor Co. (Tu-Ka), NEC, Nokia, Ericson, etc.	Qualcomm, Motorola, Lucent Technologies, Northern Telecom
Carriers planning to adopt standard	NTT DoCoMo, Japan Telecom, Tu-Ka, etc.	U. S. domestic carriers, DDI Cellular Group, IDO
Basic strategy to establish international standard	Following failure to establish international standard for PDC, seeks compromise with Europe, the largest anti-U.S. camp, and ultimately to reach agreement by negotiating with U.S. proposal.	Aims to take leadership in global market for mobile telecommunications by neutralizing current lead of Japanese proposal and reaching a favorable compromise.

(4) Domestic Complications (DDI and IDO)

The domestic situation regarding the next-generation standard is being complicated by a rift between NTT DoCoMo on the one hand, and DDI Cellular Group and IDO (Toyota and electric power companies), two carriers who entered the mobile communications market in 1988 after NTT. NTT DoCoMo quickly captured and retained the lion's share of the market by virtue of its monopoly over the technology, which enables it to introduce new cellular phones first. Based on this experience, the two carriers have decided against supporting NTT DoCoMo's next-generation standard.

DDI Cellular and IDO are supporting the N-CDMA format (narrow CDMA, also known as IS-95 and the cdmaOne brand name) developed by Qualcomm. They have announced plans to start telephone services under this format in April 1998 and April 1999 respectively. The total capital investment by the two companies is expected to exceed 500 billion yen.

Compared to NTT DoCoMo's format, while N-CDMA's transmission speed is too slow for moving images, the format already has a track record in the U.S. and Korea, is technologically stable, and able to achieve cost advantages through mass production. However, several months after DDI Cellular and IDO announced their investment plans for cdmaOne, the North American group announced its W-CDMA proposal (wideband cdmaOne brand name) for the global standard. Thus DDI Cellular and IDO had committed themselves to a format that has no chance of becoming the global standard.

However, their investment will not be completely wasted. Since the earliest that a global standard can start service in Japan is January 2001, DDI and IDO will have a three-year lead in which to gain significant advantages. In addition, even if the DoCoMo is adopted as the global standard, a substantial amount of redundant investment can be avoided because the switching and subscriber data control equipment can be used, although the wireless base stations cannot.

In any case, to recover the 500 billion yen investment, the two companies will need to gather as many new subscribers as possible. A key part of this success will be the new services and pricing introduced by DDI Cellular in April 1998.

As we have seen, the competition over the next-generation cellular phone system has already begun.

4. Prospects for Next-Generation Standard and the Mobile Communications Market

(1) Impact of the Next-Generation System on PHS

PHS carriers, who belong to the same business groups as cellular carriers, maintain that the next-generation cellular system will not hurt the PHS business. Perhaps it would be more accurate to say that in expanding the next-generation cellular system, each group's business plans will consider the impact on its PHS business.

However, cellular carriers not affiliated with PHS carriers have declared that depending on the next-generation cellular phone system, PHS may lose its business rationale. Indeed, the technical specifications for the next-generation systems exceed those of today's PHS system in high-speed transmission of audio, video and other data. The only way PHS can survive is by offering low-priced services based on lower network investment costs. However, since the next-generation system is designed to take advantage of economies of scale in equipment production, the price advantage of PHS is not likely to last for long.

Thus when the IMT-2000 standard is decided, the present PHS system will undergo ruthless scrutiny. At the very least, PHS will no longer be able to compete with most cellular services, and will need to develop new uses that focus on its original concept as cordless telephones.

(2) Return on Investment of the Next-Generation System

Regardless of whether they operate fixed-line or wireless networks, all carriers are stepping up their response to the growing demand for computer communications and multimedia. In the mobile communications sector, the next-generation standards emphasize advanced services such as high-speed data transmission. However, non-telephone demand does not necessarily ensure profitability for mobile carriers.

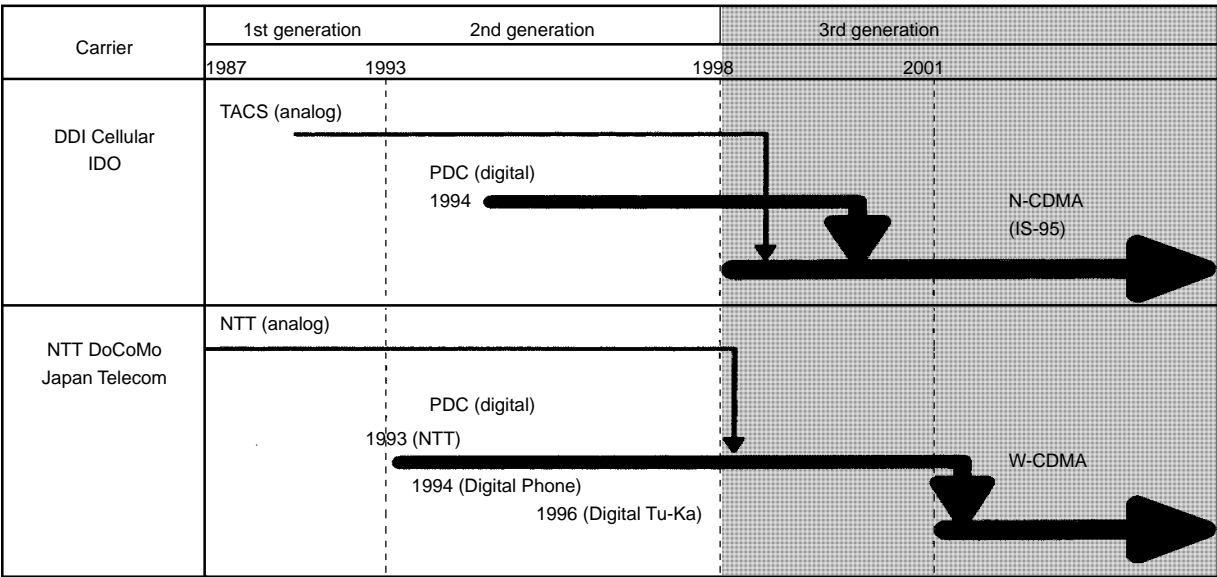
Although mobile communications in the next century will carry a traffic volume comparable to the fixed-line communications network, multimedia may not be the core demand of mobile communications. When next-generation services begin, voice communications (telephone) demand will comprise the bulk of demand, while non-telephone demand such as transmission of data and moving images will be rather small. Meanwhile, the next-generation system will require massive capital investments, with NTT DoCoMo alone committing over 1 trillion yen. Thus the next-generation system could turn into a very expensive white elephant, in which case carriers would see their return on investment sink below present levels.

The shift from telephone demand to non-telephone demand will depend on how much telephone usage can be substituted by non-telephone methods such as e-mail. Despite any growth in mobile demand, which is centered around e-mail, the impact on earnings would be totally unclear; greater e-mail demand could even reduce telephone demand. Thus we should not hastily assume that the next-generation system will improve the earnings of carriers.

(3) Industry Structure Under the Next-Generation System

Given the unclear profitability of the next-generation system, mobile carriers confronted with the need for new investment face increasingly severe pressure.

Figure 6 Transition to Next Generation Standard for Domestic Mobile Communications



The MPT will supposedly reallocate bandwidth for mobile communications when the next-generation system is introduced, and limit licensing to three carriers. Thus to obtain sufficient bandwidth, carriers seeking to expand business are under pressure to start investing in the next-generation system regardless of their actual profit projections.

However, considering that the DoCoMo format is the leading candidate for global standardization, and that DoCoMo’s PDC format now wields an overwhelming market share of almost 70 percent, DoCoMo stands poised to seize the dominant position in the next-generation system. Even if the next-generation system proves less profitable than present due to telephone-centered demand, DoCoMo’s business foundation should remain rock solid as the market reaches 60 million subscribers early in the next century.

(4) Potential of WLL (Wireless Local Loop)

If the next-generation cellular phone becomes the mainstream of the telecommunications industry, the demand arising from the replacement of local telephone networks should be greater than multimedia demand in the near term, and would create a WLL (wireless local loop).

NTT, who currently retains a monopoly in the local telephone network, is required to open this network to long-distance NCCs (new common carriers), for which it collects massive access charges. From the viewpoint of promoting competition, access charges have been reduced yearly, but continue to profoundly affect the earnings of NCCs.

Following the "Communications Big Bang" begun in October 1997, long-distance NCCs seeking to become full-service carriers are striving to reduce their dependence on NTT's local network. However, the barriers to entering the local network market are prohibitively high in terms of cost and time. While NCCs have entered the local network market for corporate services by offering partially wireless networks, the consumer market remains prohibitively expensive. However, NCCs have a chance to challenge the monopoly structure of the NTT Group (which will be split in two in 1999) by replacing the local network with a mobile communications network. This possibility explains why long-distance NCCs are clinging to their mobile communications subsidiaries despite the large cost burdens.

Since NTT DoCoMo dominates the mobile communications industry, breaking the NTT Group's monopoly hold will not be easy. However, following the communications big bang, NCCs the ability to provide end-to-end service will determine profitability, NCCs have no choice but to use WLL.

Increased capacity and bandwidth reallocation will enable the next-generation mobile system to replace fixed-line networks. If mobile terminals become personal terminals where each person has their own, and market share determines the competitiveness of end-to-end services, WLL will have a greater impact on the communications industry than multimedia demand in the near term.

The next-generation mobile communications market should become the main arena of the communications industry. To succeed, major carriers will need to develop new services and have the financial strength to bear massive investment burdens and survive price competition.