

**THE PARADIGM SHIFT IN WIRELESS PLATFORMS:  
FROM TRAFFIC BUSINESS TO TRANSACTION BUSINESS**

by

**AKIRA MATSUKI**

M.E., Tohoku University Graduate School of Engineering (1989)  
B.E., Tohoku University School of Engineering (1987)

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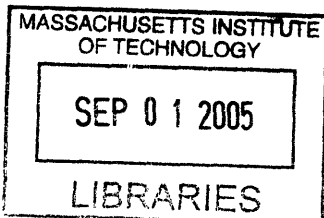
MIT Sloan School of Management  
May 6, 2005

Certified by: \_\_\_\_\_

Michael A. Cusumano  
Sloan Management Review Professor of Management  
Thesis Advisor

Accepted by: \_\_\_\_\_

Stephen J. Sacca  
Director, MIT Sloan Fellows Program in Innovation and Global Leadership



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# **THE PARADIGM SHIFT IN WIRELESS PLATFORMS: FROM TRAFFIC BUSINESS TO TRANSACTION BUSINESS**

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**AKIRA MATSUKI**

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## **Abstract**

The mobile communication industry in Japan is facing a constructive revolution that will be the industry to next-generation services. Most communication companies have competed aggressively to develop and offer e-mail or Web applications to their users in order to increase operating revenue. One approach was the introduction of flat rate plans, used primarily to acquire new customers; however, the profits achieved by relying on communication fees are diminishing. Nevertheless, mobile phones continue to be the point of contact closest to the customer.

In recent years, mobile phones have evolved from tools used primarily for talking to a tool that transmits and receives e-mail. But these are changes that alter the quality of communication rather than make a substantial change. To heighten its competitive position, in June 2004, NTT DoCoMo developed a new type of cellular phone that contains a built-in noncontact IC card called "FeliCa," which represents the next remarkable stage of progress.

This thesis first analyzes the structural transformation of the mobile phone business, and then discusses how it is influencing the financial and authentication businesses. First I present an overview of the mobile communication industry, showing its progress from a rapid growth to a mature market. Next, I show how wireless carriers are building a new wireless value chain by implementing the IC card function in mobile phone terminals. Then I describe the new wireless value chain and offer examples that illustrate the kinds of change that have been created in the industry structure. I conclude by describing a business strategy that utilizes the new platform, and the influence that the new platform will have on society.

Thesis Supervisor: Michael A. Cusumano  
Title: Sloan Management Review Professor of Management

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Akira Matsuki  
Needham, Massachusetts  
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*This thesis is dedicated to all the people of NTT DoCoMo.*

# Preface

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Before beginning, I would like to define the following words which appear frequently in this thesis.

## **FAMU Model**

In order to analyze the attractiveness of a new product, it is necessary to consider many elements, such as a price, function, and design. In this paper, I had adopted four key words that can be used to assess the attractiveness of a new product as a substitute for a product used frequently by customers. I call this the FAMU model, derived from the initials of each parameter:

- Frequency: The adhesion degree to a usual life
- Alternative: Necessity of a new product
- Merit: Convenience which a consumer and a supplier acquire
- Usability: Easy to understand interface and does not need complicated operation.

Although many elements are intricately related, the degree of attractiveness to the consumer of a new product is analyzed with these four axes, and then I am able to quantify the degree of attractiveness.

# CHAPTER 1

## Introduction

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The mobile communication market expanded throughout the world during the second half of the 1990s. It developed rapidly as a useful communication tool that is not tied to a specific location as is a fixed-line telephone. In Japan, the growth of the mobile communication market was especially quick, surpassing the number of fixed-line telephone subscribers in 2000, and now breaking through 60 million subscriptions. As of 2003, approximately 94% of all households in Japan possessed mobile phones, and today the market is obviously saturated.

The growth of the mobile communication market can be roughly classified into three phases. The first stage of growth was the “voice communication” period, from 1992 to 1998. Voice communication led the expansion of the market. The major applications were voicemail and call forwarding, which made voice communication much more convenient for consumers. The selection criterion for choosing a mobile phone is portability, and users tended to favor and buy small size, lightweight, thin mobile phones.

The second stage of growth was the “mobile Internet” period, from 1999 to 2003. NTT DoCoMo provided its mobile Internet service known as “i-mode” to the market. The service created a new market, in February 1999, which included Internet applications such as mail, access to the Web, and Java applications. NTT DoCoMo received positive feedback from content providers by adopting c-HTML (compact Hyper Mark-up Language), but did



not adopt the WAP (Wireless Access Protocol) which many vendors worldwide were promoting. Users bought the fold-up type mobile phone (so-called “flip phones”) with a large color liquid crystal screen that allowed browsing and access to the web and e-mail.

The third stage of growth is “personalization” which began in 2003. The mobile phone had already become an essential component of daily life. Then it moved into applications other than communication, such as a music player or a digital camera function. However, these functions have not led to an increase in communications traffic.

It is not clear whether mobile phone operators can maintain growth by offering such functions given the intensely competitive environment. The issue in the third stage is focused on whether a valuable customer can be retained over a long period of time by offering a sufficient variety of products and services to keep that customer in the third stage.

In July, 2004, NTT DoCoMo developed a mobile phone which has a built-in contactless IC card function called “FeliCa.” This new wireless platform is a trial that expands the contract term of a mobile phone by offering applications such as electronic money and electronic tickets.

The objective of this thesis is to analyze how the new FeliCa mobile phone platform, which is the newest application, will change a mobile communication operator's business model in the third stage. To carry out this analysis, I devised the FAMU model (tentative name) which will demonstrate whether the introduction of the FeliCa application is promoted or obstructed and by what kinds of factors. Four fundamental parameters will be used:

1. Frequency,
2. Alternative
3. Merit, and
4. Usability.

The speed with which the new service becomes popular can be predicted by applying past product and service data in my analysis. “Frequency” will show the degree to which the new service is used as well as its importance in daily life; “Alternative” describes other options and substitutes, which in turns illustrates the need for the new service; “Merit” and “Usability” measure the degree to which consumers find the new service attractive because of its benefits and capabilities. From an analysis of these four factors, the attractiveness of a new platform can be determined.

This thesis is composed of five chapters. Chapter 1 provides an overview and business model of the general mobile communication industry. In Chapter 2, I explain structural changes in the mobile communication industry, with special focus on the third stage. In Chapter 3, I analyze the value chain structure of the new wireless platform, and conduct FAMU analysis. In Chapter 4, I apply a FAMU analysis to some overseas examples, and clarify the factors required in order to succeed with a new platform. In Chapter 5, I conclude with my assessment of the key factors needed for successfully implementing a new wireless platform, as well as specific recommendations for NTT DoCoMo.

## **CHAPTER 2**

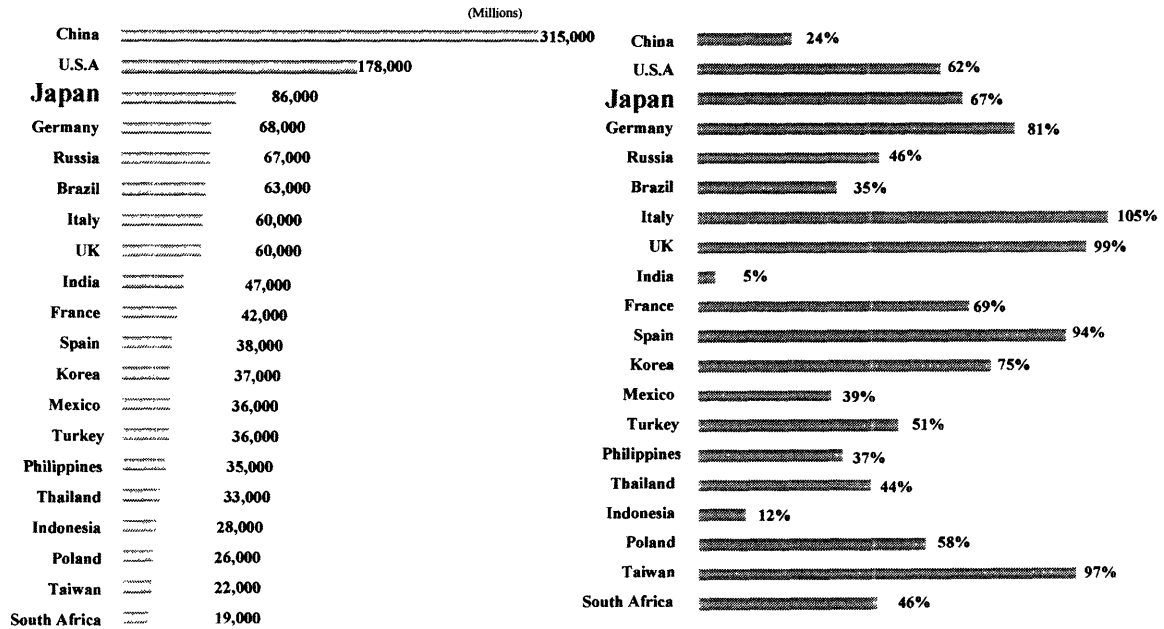
### **Industry Overview and Business Models**

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I begin this chapter with a brief overview of the present situation in the world mobile industry. Then I discuss changes in the Japanese mobile phone industry.

#### **2.1 The Worldwide Mobile Communications Market**

As Figures 2.1 shows, the world mobile communications market expanded rapidly during the second half of the 1990s. Especially in large countries with a vulnerable fixed-line telephone infrastructure (Brazil, Russia, India, China, collectively referred to as BRICs), the initial investment in the telecom infrastructure was relatively less expensive, so the mobile communication system infrastructure could be built more quickly.



Note: as of December 2004  
Source: EMC Database (2004)

**Figure 2.1 Top 20 countries by number of subscribers and penetration of wireless telephones in national markets**

The economic growth of BRICs was directly related to the rapid expansion of demand in the mobile communication market. With improvements that utilized data communications by a wireless network, a noticeable change from communicative “quantity” to “quality” took place simultaneously in Japan, the U.S., and European mobile markets (see Table 2.1).

**Table 2.1 Penetration of wireless data users by region**

	2000	2003	2005
Western Europe	23%	72%	91%
Japan	21%	62%	90%
United States	7%	44%	83%
Asia-Pacific	1%	4%	8%
Rest of the world	0%	4%	10%
Total	3%	12%	20%

Source: Wireless Data Service

Although the world mobile communications market maintained a growth rate of about 50% every year prior to 2000, after that the growth rate slowed to about 20%. However, in developing countries, a quantitative expansion continues, with the mobile communications market continuing to grow.

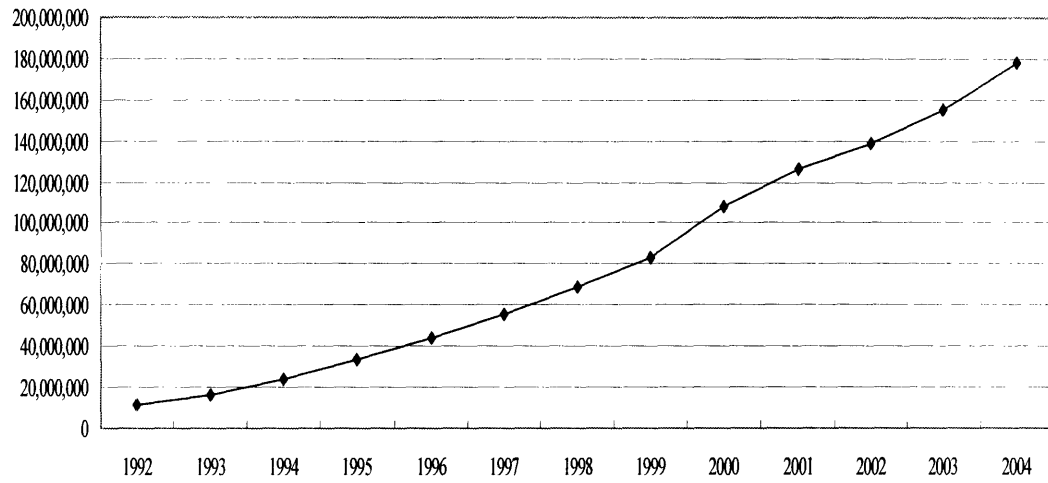
In the following, I describe the characteristic of the mobile communications market in Europe, the U.S., Asia, and emerging countries.

### **2.1.1 The U.S. Mobile Communications Market**

As Figure 2.2 shows, the mobile communications market in the U.S. has become almost totally stable, at a growth rate of about 11% annually since 2000 and thereafter.

The most distinctive trend in the U.S. market is that several different communications methods coexist in order to prevent a monopoly with a single carrier, as in Europe, where it is difficult to reduce network costs. Figure 2.4 shows the mobile communications market share in the U.S. as of the end of 2003.

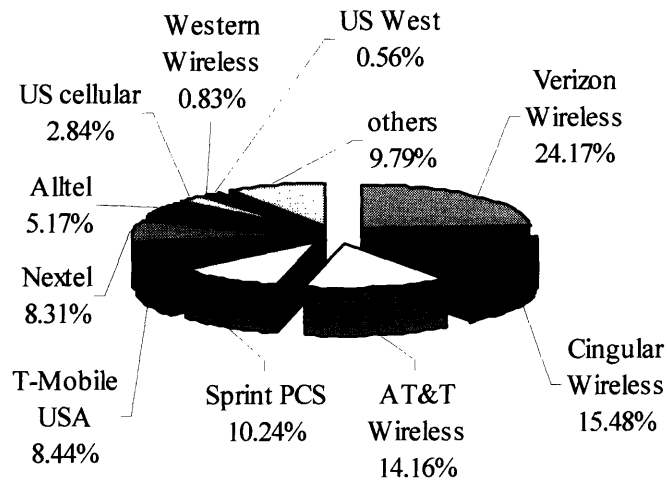
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
U.S.	11,032,000	16,009,000	24,134,000	33,785,000	44,043,000	55,310,000	69,209,000	83,000,000	108,467,000	125,841,000	139,217,000	155,213,000	178,000,000



Note: as of December 2004

Source: Informa Group Global Mobile (2004), EMC Database (2004)

**Figure 2.2 U.S. mobile communications market**



Note: as of year-end 2003.

Source: Informa Group Global Mobile (2004)

**Figure 2.3 U.S. mobile communications market share**

In the U.S., as the market becomes saturated, most carriers are now seeking further growth through mergers. Cingular Wireless purchased AT&T Wireless in 2004, as it competes ferociously for top market share with Verizon Wireless. Both Verizon Wireless and Quest Communication (a Baby Bell) are in a bidding war to acquire MCI Communications.

In such situations, investment in development for new communications service is less likely. Although Nextel Communication now offers Push-to-Talk service as a new application for voice communication, among data-communications applications, there are virtually no other services than the wireless messaging offered by Blackberry.

Another characteristic of the U.S. market is that, unlike Asia and Europe, there has so far been little need to introduce the newer technology of the 3G system since the requirement for additional frequency bandwidth remains lower and therefore has not forced the implementation of 3G technology. This scenario is very different from Asia, where EDGE started service late in 2003 and W-CDMA began service at the end of 2004.

### **2.1.2 The European Mobile Communications Market**

The European mobile communications market is characterized by the GSM system, the *de facto* global standard which spread widely as a result of its predecessor, the 2G system. Major European mobile phone operators first introduced GPRS, a 2G high-speed data-transmission system, and expectations are high for 3G, with its faster data communications ability.

In this environment, the governments of the U.K., Germany, and Italy carried out an auction for 3G licenses. However, the contract price went very high, which worsened the financial environment for mobile communications companies (in Germany, the contract price to six carriers increased to about \$60 billion). The Hutchison 3G brand known as “3”, whose 3G system is a new entry from Hong Kong, was expected to begin service in the U.K., Italy, and Sweden by the first half of 2003. While significantly behind similar schedules managed by major mobile communication companies that successfully developed 3G systems, “3” finally launched in Summer 2004.

Another function widely used in the European market is prepaid portable telephones. This market is far smaller in the U.S. and Japan (see Table 2-2). The penetration rate of



prepaid portable telephones in Italy, which first adopted this mode, is about 90%, and it is over 50% in Germany, the U.K., and France.

**Table 2.2 Penetration of prepaid mobile phones**

	Country	Total number of subscribers	Penetration	Prepaid subscriber
TIM	<u>Italy</u>	26,070,000	89%	23,202,300
D2 Vodafone	<u>Germany</u>	22,690,000	52%	11,798,800
AIS	Thai	13,230,000	85%	11,245,500
SMART	Philippines	10,080,000	98%	9,878,400
O2	<u>The UK</u>	13,050,000	65%	8,482,500
Vodafone	<u>The UK</u>	12,690,000	59%	7,487,100
KPN Mobile	<u>The Netherlands</u>	5,040,000	66%	3,326,400
Verizon Wireless	US	37,520,000	3%	1,125,600

As of December 2003

Source: Baskerville Global Mobile (July 28 2004)

The short messaging service (SMS) has also spread widely, along with mail with the use of photographs sent via multimedia messaging service (MMS). SMS is also widely used also as an information service, providing information about news, weather, etc. It utilizes “push” technology, which is similar to e-mail.

Since the European economic bloc has expanded to include several more countries, it is common that mobile phones can now be used throughout much of Europe using GSM technology. GSM has spread widely through most of the Asian bloc, except Japan and South Korea. Even in Asia, however, it is possible to use mobile telephones virtually everywhere through the roaming capabilities of GSM.

### **2.1.3 The Asian Mobile Communications Market**

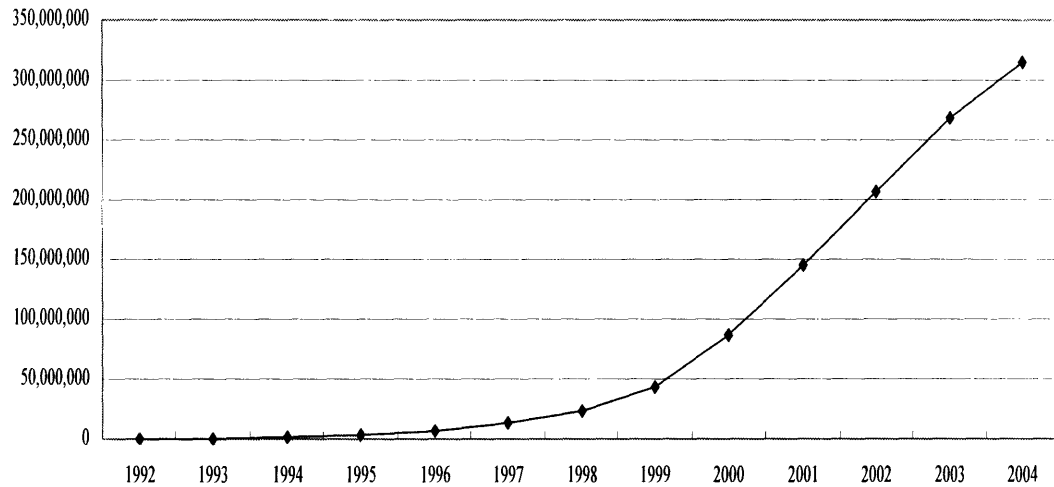
In Asia, the most concentrated mobile communications markets are in Japan and South Korea. I will discuss the Japanese market in greater detail in Section 2.2; in this section I discuss trends in Asian markets other than Japan.

As already explained, almost all Asian countries have adopted the GSM technology standard from 2G. From the outset, South Korea promoted the CDMA system, originally developed and patented by Qualcomm, and this service began almost simultaneously with the 3G system in Japan. South Korea comprises 25% of the entire world market for 3G subscribers—30 million as of June 2004. Japan has 18.7 million (17%) of subscribers (3G Today, January, 2005).

Although DSL has spread rapidly throughout South Korea, broadband wireless data communications are making inroads because the carrier offers a variety of different contents. Moreover, mobile phones with built-in IC chip for authentication in mobile banking, offered by SK Telecom and Korean Telecom, began service in March 2003. These phones offer various applications, such as electronic passes for passengers on commuter trains.

In Asia, China is world's largest mobile phone market. In 2001, it exceeded the number of U.S. subscribers (see Figure 2.4).

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
China	85,000	638,000	1,437,000	3,612,000	7,000,000	13,500,000	23,569,000	43,240,000	86,470,000	144,767,000	206,620,000	268,649,000	315,000,000



Note: as of December 2004

Source: Informa Group Global Mobile (2004), EMC Database (2004)

**Fig. 2.4 Growth in the Chinese mobile communications market**

Since China is such a vast area, the return on investment of telecom infrastructures is very low, so the popularity of fixed-line telephones is not growing. In contrast, the growth rate of the mobile phone market is skyrocketing—from 2.5 million units in 1992 to 315 million in December 2004, surpassing fixed-line telephones in 2003. The market is flourishing, especially in the area of high-end user demand. According to the Chinese research firm iRsearch, China Mobile (66% market share), and China Unicom (34%) already hold more than 20 million customers. Moreover, the 3G technology has already been introduced. The Chinese government is promoting investment in 3G infrastructure in order to

resolve the “digital divide” that exists between the large cities and the inland agricultural areas. However, the inland market is maintaining a high growth rate, while the market growth rate among coastal cities has slowed down.

In Southeast Asia, the GSM network has been adopted virtually everywhere, a trend similar to the European market. Prepaid telephones are widely available, with 98% of 10 million subscriptions as prepaid subscribers using SMART Communications (Philippines). SMS has also spread widely, with the Philippines and Singapore leading the world in the use of SMS.

#### **2.1.4 The Mobile Communications Market in Emerging Countries**

The emerging countries, represented by BRICs, can expect growth in their respective mobile phone markets. It is predicted that the number of subscribers in these four countries will increase 50% more than the rest of the world by 2008. In Russia and India, the growth rate is very high, exceeding 100% more than at the end of 2003.

In Brazil, the number of subscribers has increased rapidly from the start of GSM service in 2002. Brazil has become the world’s sixth largest market in number of subscribers as of December, 2004.

The trend in these countries is to build networks cheaply by introducing the GSM infrastructure which has already become commoditized.

## **2.2 The Japanese Mobile Communications Market**

Japanese subscribers were the first in the world to use analog car telephones in 1979; the third generation of the W-CDMA system was developed and introduced to the world for

the first time in 2001. The number of subscribers to wireless Internet access via i-mode is about 90% in Japan, which leads the mobile Internet market; in fact, this market is so large that it can serve as a test market for new technologies.

To understand how Japan has accomplished such unique growth in the communications field, I explain below the course of growth for each generation of a system.

### **2.2.1 Second Generation System (2G)**

The Second Generation system (2G) was a narrow-band digital system popular in Japan about the time GSM became standardized in Europe in 1992, and then became a world trend. NTT DoCoMo started offering its Personal Digital Cellular (PDC) system in 1993, based on the 2G system.

Wide areas around major Japanese cities, such as Tokyo and Osaka, have a high population density, and at the time the frequency band for mobile communications was unable to completely cover its area without overlapping other systems. In addition, the capacity of rechargeable batteries was small in those days, so communication devices required low power consumption.

Japan developed its own system, one that was more efficient and its frequency band use was comparatively low. However, it was not compatible with other world systems. One lesson learned with the 2G system was that future systems must be standardized so they are compatible with other world systems. When KDDI introduced its own system, cdmaOne, in conjunction with NTT DoCoMo in 1999, competition accelerated on both sides.

Another milestone was “i-mode”, NTT DoCoMo’s mobile Internet service, which began service in February 1999. i-mode uses packet communication technology for mail and

Web access. The fees for i-mode use do not depend on connect time (unlike conventional circuit switching system, or dial-up systems); instead it depends on an amount of data downloaded via the Web browser. This service proved to very popular with consumers, and i-mode experienced explosive growth, recording 45 million subscriptions (about 90% of all NTT DoCoMo subscribers) by December 2004. With the advent of mobile phones in Japan, the change from telephone as “a tool for talking” to the telephone as “an ultra-small PC” for mail and Web browsing became possible.

### **2.2.2 Third Generation System (3G)**

Although the third generation system (3G) is broadband and was developed to use multimedia applications with a mobile phone, several systems utilize this system, as well as standardized processes in various industries.

There are two major systems in 3G. First is the W-CDMA system, developed by NTT DoCoMo and compatible with GSM. It gained approval by most carriers that had adopted GSM in 2G in Europe. The second was cdma2000 1x, developed by KDDI. It further extended cdmaOne in 2G. Many subscribers with this system were then able to switch from 2G to 3G for a small investment in new equipment—a tremendous advantage.

To enable the conventional 2G system to introduce equipment independently (unlike cdma2000), NTT DoCoMo invested ¥800 billion annually in W-CDMA. As of March 2005, the area covered by W-CDMA is almost equivalent to conventional 2G coverage. Now it is eyeing a fast move into the next stage: to advertise the attractiveness of new applications to users. Table 2-3 illustrates the changes of communication method from analog system (1G) to 3G.

**Table 2.3 History of mobile communication systems**

First-Generation Mobile Communications = Analog	<ul style="list-style-type: none"> <li>• First-generation mobile communications system employ analog system that were designed for voice transmission.</li> <li>• Each country carried out its own system development and standardization. The AMPS system was first introduced in the United States as the domestic standard and then widely adopted in Asian and Latin American countries.</li> <li>• Independent systems were introduced in Europe, including the NMT system standardized by Nordic countries, the TACS system in the United Kingdom, and other independent systems in France and Germany.</li> <li>• Even after the spread of second-generation digital systems, analog systems still remain in other counties, especially in the United States where charges are low as the analog networks have been constructed on a continental basis.</li> <li>• The history of mobile communications in Japan can be traced back to the introduction of NTT car phone service in December 1979. This was the world's first direct-dial cellular ear phone service. Cellular phones were introduced in April of 1987, at which time the market was very small, mainly corporate users, partly due to high call charges. Both the NTT system and the TACS system used mainly by the DDI-IDO group (the current KDDI group) were used. With the analog market size remaining small, Japan has rapidly shifted to the second-generation digital systems.</li> </ul>
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Second-Generation Mobile Communications = Digital	<ul style="list-style-type: none"> <li>• Second-generation mobile communications systems are digital and they enable the provision of voice, data, facsimile and various other value-added services.</li> <li>• The GSM system that has been the leader of second-generation mobile communications is used in Europe, Asia, Africa and Oceania and has enabled seamless communications through roaming across national boundaries. With the introduction of SIM (Subscriber Identity Module) technology, the GSM system has facilitated the personalization of cellular phones and the evolution of applications.</li> <li>• In the United States where digital users finally exceeded 50 percent in 2000, three systems TDMA(IS-136), CDMA (IS-95 cdmaOne) and PCS1900(GSM) - are used in parallel.</li> <li>• As all domestic carriers in Japan have adopted the PDC system developed by NTT, which is different from either the European or US systems, services offered were closed within the domestic market only. Subsequently, the DDI-IDO group (currently KDDI group) adopted cdmaOne (IS-95) in order to promote service differentiation from the NTT DoCoMo group, resulting in the same situation as with the first-generation systems in that two systems coexist. The DDI-IDO group (currently KDDI group) is providing global roaming by the cdmaOne system it has adopted.</li> </ul>
---	--

**Table 2.3 (continued)**

<b>Third-Generation Mobile Communications = Digital</b>	<ul style="list-style-type: none"><li>• <b>Third-generation mobile communications systems called IMT-2000 (International Mobile Telecommunications-2000) represent the next-generation mobile communications systems and are being developed under the leadership of ITU-R (International Telecommunication Union Radiocommunication Sector) .</b></li><li>• <b>ITU-R recommends the provision of multimedia service and seamless service by setting the following conditions for communications speeds: up to 144 kbps for high-speed movement, up to 384 kbps for low-speed movement and up to 2 Mbps for stationary usage.</b></li><li>• <b>With the aim to develop networks that can provide services on an internationally seamless basis, standardization efforts have been made through the participation of various countries, with major roles played by standardization organizations in Japan, the United States and Europe. As a result, five systems have finally been established. They include IMT-MC, IMT-SC, IMT-DS, IMT-TC and IMT-FT.</b></li><li>• <b>IMT-2000, which is the generic name for these five systems, is designed to convey two meanings by its name: one is that a 2000-MHz band is used and the other is that they are systems for the 2000s. The term FPLMTS (Future Public Land Mobile Telecommunication Systems) , which covers various systems that were advocated in the past, was renamed as IMT-2000 in 1997.</b></li></ul>
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Source: InfoCom Research Inc. Information & Communications in Japan (2004)

### **2.3 Next-Generation System (4G)**

Although the next-generation system is generally called 4G, at the International Telecommunications Union (ITU) wireless communications general meeting in June 2003, a recommendation was put forth to develop a framework that defines future advancements in system beyond IMT-2000, or the 3G system (ITU-R M.1645). According to recommendation, 4G is the expression used to define the “system beyond IMT-2000,”

The 4G systems has the following indicators:

- Commercialization will occur in 2010 and general use around 2015.



- A maximum access speed of up to 100Mbps will be available in low-speed movements like walking; 1Gbps in half-fixed environments like office use.
- Integration with of IMT-2000, its development system, and other radio access methods will be carried out seamlessly.

It is assumed that integration from 2G and 3G systems into 4G will progress gradually from now on. That is, present systems may develop and become a part of the 4G system.

In 2003, NTT DoCoMo developed the world's first transmission system that will exceed 100Mbps in a mobile communications system. This system is based on VSF-OFCDMA which brought further improvements to the Orthogonal Frequency Division Multiplexing (OFDM) system, which was developed to complement the disadvantages of CDMA. Although this system is a major part of the 4G wireless transfer system, there is one other contender: IEEE-802.11n. The U.S. will be the leading user of this system, which is expected to be standardized around 2007. It is expected that it will also be compatible with 3G in Japan, the U.S. and Europe. Furthermore, the IEEE-802.16e standard, which builds all networks using wireless from a mobile phone to connection between base stations, is scheduled to become available in 2005.

The construction of infrastructure in a large developing country which will allow adoption of a mobile phone system may be speeded up as a result of using the 4G system. NTT DoCoMo is proceeding with development of a high-speed-data-transmission system known as 3.5G, which will extend 3G as a complementary system until 4G is released. Data communication using High Speed Data/Downlink Packet Access (HSDPA) with a maximum of about 14 Mbps of download speed, will become possible early in 2006 (see Fig. 2-5).



and in the future market expansion will come as a result of qualitative features rather than quantitative.

In Chapter 3, a growth strategy is developed by observing the Japanese market which since 1999 has already shifted to qualitative growth, and has shifted to a newer business model since 2003.

## **CHAPTER 3**

### **Changes in the Japanese Mobile Communication Industry**

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In this chapter, I discuss the mobile communications market in Japan, which has entered the qualitative change phase. Mobile communications companies have attempted to break away from an earnings model that is dependent on traffic, instead seeking different combinations that do not necessarily include conventional business partners. Such combinations might include either or both bricks-and-mortar companies and links with the broadcast industry.

#### **3.1 Structural Changes**

Most mobile communications companies are generally dependent on volume of communications traffic. Operating revenue depends on charges that include monthly fees and communication time or amount of data transmission. In the U.S., mobile communications have used a monthly fixed charge since the early days of the industry. But a comparative analysis finds that operating costs for the mobile communication business are higher than costs for the wired-line communication business, specifically because increased mobile communications traffic require new base stations and investment in exchange control units. Especially in the Tokyo area, there are many obstacles to introducing a flat-rate charge for mobile use because many high-traffic zones exist in the Tokyo area.

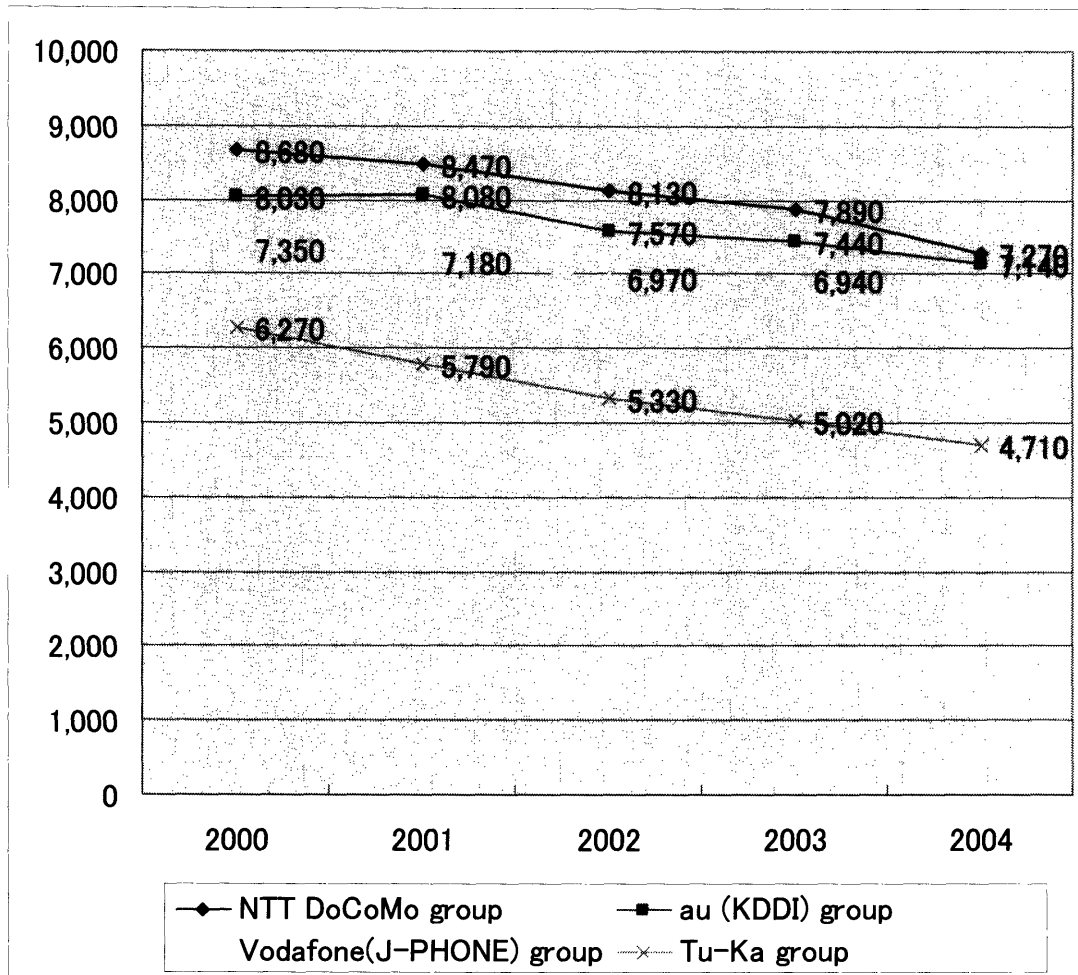
As of 2004, a large portion of the equipment costs for mobile communications will be for the cost of a wireless network, which consists of a radio base station for communicating directly to a mobile phone, and a dedicated-line network that connects to an exchange node. In a high mobile traffic region like Tokyo or Osaka, the wireless network for a cellular communication system includes many radio base stations. There are many small cells, each covered by one base station, so each cell has a great deal of traffic. Although many frequency channels can be obtained in a small coverage area, the more traffic there is in the limited frequency band, the more base stations are required. Moreover, the circuit cost for each base station to connect to an exchange node also increases depending on the number of base stations. Therefore, it is possible that investment costs will go up even though sales do not increase, especially in overcrowded communications traffic regions like Tokyo and Osaka.

But there are some customer seeking a flat rate, and they do not care about the charge so long as they can use a mobile phone. In November 2003, KDDI introduced a flat-rate charge for data communications, which immediately threw the mobile communications market in Japan into a new competitive stage.

In the following sections, I explain the changes that have occurred, considering both profit and expenses in the Japanese mobile phone market.

### **3.1.1 Reduction in Income**

The monthly profit per subscriber (ARPU) for the major mobile communication companies in Japan is shown in Figure 3.1.



Note: figures as of 2001  
 Source: Informa Group Global Mobile (2004)

**Figure 3.1 ARPU for major Japanese communications companies**

Compared with the average rate of US\$36 among OECD member nations, ARPU among Japanese companies is still very high, more than double (OECD Communication Outlook, 2003). It is clear that profit for mobile Internet use constitutes the largest ratio. But it turns out even the number of those subscribers is decreasing gradually flat rates for data communication are being introduced, as explained earlier.

### 3.1.2 Spread of Package Charge and Flat-rate Tariff

In November 2003, KDDI began offering “EZ flat,” a flat rate for Internet access to its EZWeb service in Japan. Shortly thereafter, NTT DoCoMo introduced the same flat-rate called *Pake-Hodai*, in late June 2004, and Vodafone introduced “Packet Free” in November 2004. Suddenly the mobile communication industry had rushed into the flat-rate era (see Table 3.1).

**Table 3.1 Flat rate packages for data transmission by mobile phone**

Carrier	KDDI group	NTT DoCoMo group	Vodafone group
Service brand	EZ flat(Double Flat Rates)	Pake-Hodai	Packet Free
Service start date	November, 2003	June, 2004	November, 2004
Monthly charge (Include tax)	¥2,100 – 4410	¥4,095	¥4,095
Basic plan (voice)	CDMA 1x WIN	FOMA 67, 100, 150 or Business plan	Value pack or Business pack (more than 5,900yen pack)
Available applications	EZ web, E-mail	i-mode, E-mail	Vodafone live!, E-mail
Number of subscriber (thousand)	960 (as of September, 2004)	1000 (as of August, 2004)	N/A
Notes	Except for data transmission via PC	Except for data transmission via PC	

Source: Informa Group Global Mobile (2004)

Although the flat-rate fee plans offered by each company have some differences, the common feature is that a flat-rate fee is applied only to service connected to the Internet and only with a mobile phone. In the U.S., the flat rate fee applies not only to data

communications via mobile phone but also to data transmission that connect a mobile phone to a PC. In the U.S., a PC communications card is put into the PC for business use, which can also be used for data communications as well. Because the problem of crowded frequencies has not occurred yet, I assume that U.S. companies are offering these strategic rates to encourage greater demand.

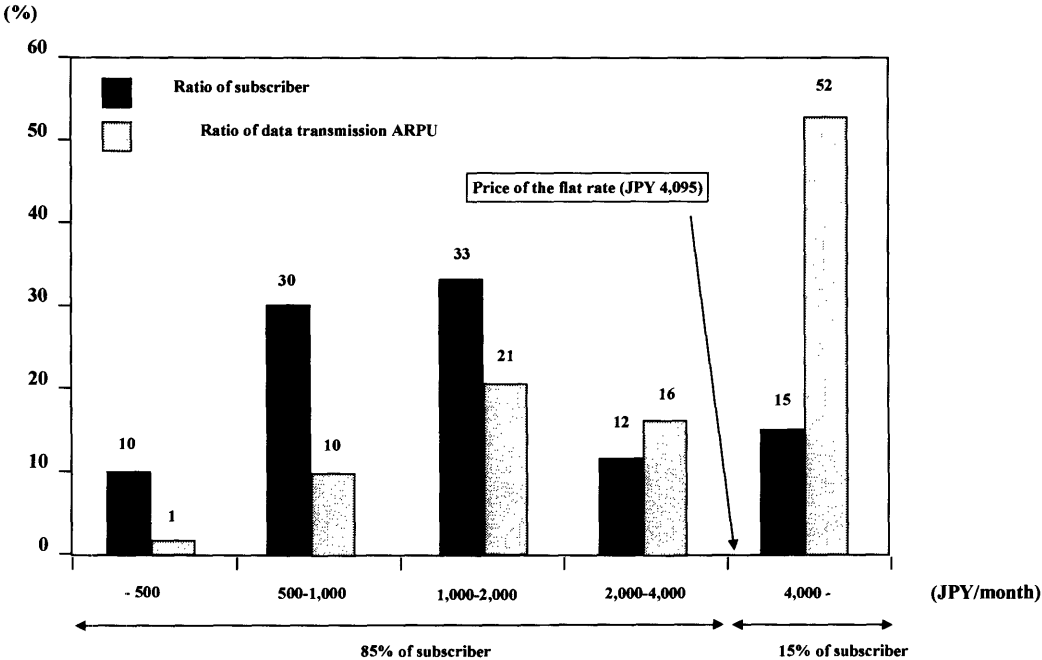
In Japan, most users utilize mobile communications for personal use, and those without a PC mainly connect to the Internet from their mobile phone. For users who have in the past paid upwards of ¥100,000, the introduction of a flat-rate fee is welcomed. Internet connectivity from a mobile phone has already turned into a communications lifeline for many users. A flat-rate fee is also more desirable for the following applications where it is simply not practical to use the conventional meter-rate system charge:

- downloaded music distribution service
- on-line games
- company server connection to a mobile phone which an individual owns

A hot new market has been created for music distribution services like Apple's "iTunes" which is enabled with a mobile phone. It is quite possible that a new user segment with low ARPU, which previously did not feel the need for a flat-rate fee, will shift to a preference for flat-rate in order to use new applications. Therefore, we should not evaluate only the decrease-in-income factor that accompanies the shift of a high-priced user to a flat rate. Figure 3.2 shows the distribution of ARPU and the rate of income for NTT DoCoMo just before the introduction of a flat rate. The table assumes that if the top 15% of users (who



pay ¥4,000 or more and account for 52% of income) shift to a fixed-rate system, and if 85% of users do not shift to flat rate at all, there will be an approximate 25% decrease in income.

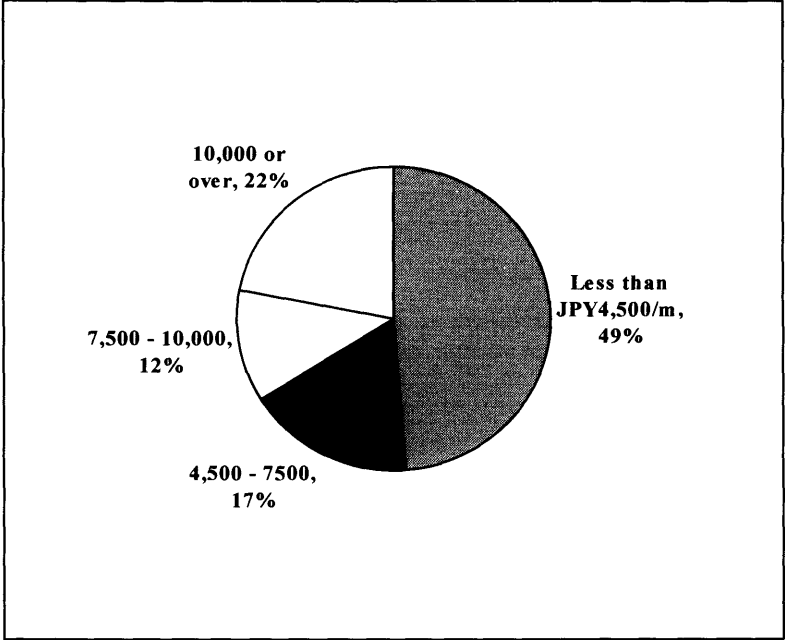


Source: JP Morgan survey (June 18, 2004)

**Fig. 3.2 Ratios of subscriber and data transmission ARPU**

Indications are that there will be no more than a 33% decrease in income if users who pay less than ¥4,000 shift to a fixed-rate plan. And such a change has not occurred yet. According to KDDI, which introduced its “EZ flat” rate package in November 2003, the data communications ARPU distribution of users prior to switching to a flat-rate fee subscription can be seen in Figure 3.3. A reduction of profit does not seem to have occurred among under-¥4,500 users who switched to flat rate. Although few applications exist that require a flat-rate

fee, the increase in number of subscribers occurred because other users have opted to join the flat rate. I believe this is because potential heavy users who used to worry about high fees for their heavy use now feel more secure with a flat rate.

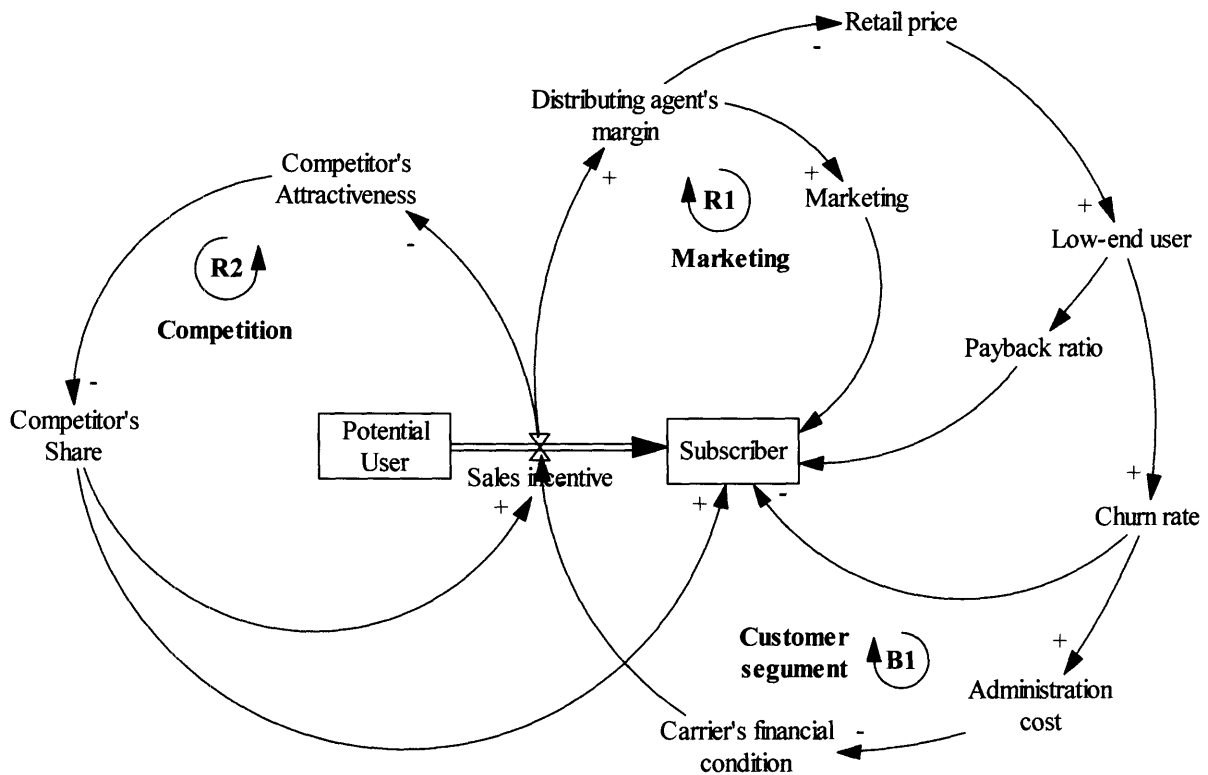


Source: KDDI (2004)

**Fig. 3.3 Profile of EZ flat users (before subscription)**

**3.1.3 Sales Incentive**

In addition to changes in profit level, it is also necessary to monitor changes in the expense structure of a mobile communications business. Sales incentives, which are a major part of expenses, can change market share depending on the amount of the incentives. Changes in sales incentive also have a major influence on the qualitative alteration of a user layer. Figure 3.4 is a system dynamics causal diagram that shows changes in a mobile communications business as a result of sales incentive.



Source: Author, 2005

**Fig. 3.4 Causal diagram showing impact of sales incentives**

In this figure, the biggest loop is the Marketing Reinforcing loop (R1), which is the main determinant by which a carrier sets sales incentives. If a sales incentive is increased, a distributor will increase its motivation to promote sales, and sale will accelerate. Price advantage against a competitor's products can be advertised by setting a high sales incentive compared to a competitor, as shown in the competition reinforcing loop (R2), which makes market share go up.

However, the effect of sales incentives on the mobile communications company is more complicated. The selling price of a mobile phone falls as the sales incentive increases, as indicated in the customer segmentation balancing loop (B1). As a result, the churn rate becomes higher, low communications traffic users will increase, and the profitability of the

mobile communications company becomes lower. Thus, this loop hangs on a very exquisite balance. If a single element changes, the balance collapses and the profitability of the mobile communications company changes drastically. Mobile communication companies always face the pressure to offer incentives in order to increase their high communications traffic and acquire customers with long subscription contracts.

## **3.2 Changes in the Competitive Environment**

In this section I explain transitions in the competitive environment as a result of changes in the external environment. The communications industry was originally a government-regulated industry. But especially in the mobile communications business, deregulation is the name of the game, and there is positive feedback that competition has accelerated. In this section I discuss two important events that will change the competitive environment in 2005 and into the future.

### **3.2.1 Number Portability**

In Japan, Mobile Number Portability (MNP) will begin in 2006. MNP means that every subscriber retains his/her unique mobile cellphone number, even if that user changes mobile communications company. Such a system has been introduced in many other countries as another way to accelerate competition between companies. The environment into which MNP is introduced in each country varies significantly by region or country.

In Europe, introduction of MNP is imposed on mobile communications company by law. In the U.K., MNP was introduced in January 1999. In the beginning several weeks were needed to the implement procedures that enabled a user's telephone number to function

properly with a new mobile communication company. Hence, many customers opted not to make a change. By 2001, however, authorities and mobile communications company had improved the process. In the end, improvements to a routing system take place as a result of more users.

In the U.S., MNP began in November 2003. In order to prevent customers from moving to other operators, some mobile operators offered new service and enhanced sales promotion activities. According to an FCC report, about five months after MNP service began, about 3.5 million users had taken advantage of MNP service and switched to another mobile communications company.

In the U.S., although it is also possible to utilize MNP to move a number from a mobile phone to a wired telephone, in practice 93% of the switches occurred between mobile phone service providers (InfoCom Research, 2004). Although there were many potential customers before MNP began, about 7,040 complaints occurred when users could not use their mobile phone because of system troubles, and about 40% were with AT&T Wireless customers. As a result, the number of AT&T Wireless subscribers declined by 367,000 in Q1-2004. In contrast, Verizon Wireless increased its market share by 1,387,000 subscriptions.

The MAP introduction case in South Korea is also interesting. MAP started in January 2004. At the time, it was an asymmetric regulation, meaning that only SK Telecom customers could port their numbers to other two operators. This was allowed because SK Telecom holds 52% of the market share.

However, KT Freetel (KTF) began number porting in July 2004, and LG Telecom started porting in January 2005. Within three months, SK Telecom's market share fell from 54.3% to 52.7%. At the same time, KTF expanded its market share from 31.1% to 32.3%,

and LG Telecom's market share rose from 14.4% to 15.1%. In spite of the introduction being only one way, there was little share reduction for SK Telecom, for what I assume are the following reasons:

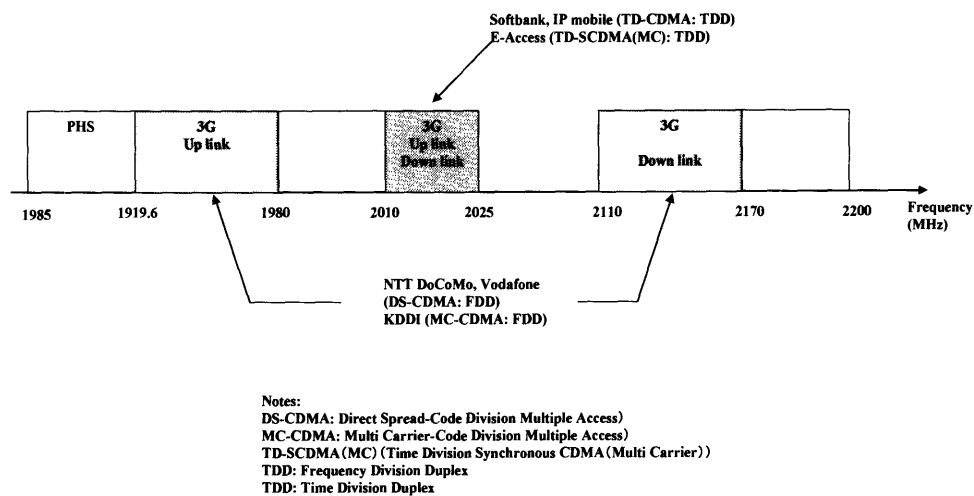
- Customer like the telephone speaking quality of SK telecom
- SK Telecom is developing a program that will give discounts at a family restaurant or a retail store. So the company provides both attractive service and high speech quality.

The South Korean situation offered some important ideas when MNP was being considered in Japan. When there is little difference in the applications offered by mobile operators and no dissatisfaction with telephone speech quality or quality of service, it is difficult to estimate whether many users will take advantage of MNP. But when customers are provided with service that is clearly better than other companies, as was the case with SK Telecom, most users will not take advantage of MNP and switch to another company.

### **3.2.2 New-Entry Entrepreneur's Movement**

In advanced countries, declines in the fixed-line telephone market have already begun, and new entrants into the mobile communication business are increasing. The same is true in Japan. In 2003, the Ministry of Internal Affairs and Communications announced the release of frequency bands for third-generation (3G) mobile phones. Four companies—Softbank, E-Access, NTT Communications, and IP mobile (a communication venture business), showed an interest in the new bands.

The new frequency band is a 15MHz single-frequency band, as shown in Figure 3.5. Therefore Frequency Division Duplex (FDD), which uses separate frequency bands for downlink and uplink—used by three existing operators—can no longer be used on the new frequency band. Now the operators are trying to enter the market by using Time Division Duplex (TDD), which the International Telecom Union Radio-Communication Sector (ITU-R) has recently recommended as the standard for 3G.



Source: Author (2005)

**Fig. 3.5 Japanese 3G frequency bands for new entrants**

The characteristics of TDD are the following:

- In order to divide the communications time slots between downlink and uplink, and to communicate on the same frequency like a transceiver, two-way communication is possible at a narrow frequency bandwidth

- It is possible to upload a simple message to a communication partner while simultaneously downloading video by mobile phone, since the download bandwidth is widely guaranteed by changing the ratio of downlink and uplink.
- The speed of data transmission and reception can be changed with the development of new applications.

Each new common carrier (NCC) is in the process of building a network with IP (Internet Protocol) technology. This will allow voice communication by VoIP (Voice over IP), which transmits voice over the IP network. VoIP will apply a flat rate to both data communications and voice communication, similar to what DSL already offers with its wired communication.

NCCs began field tests in Tokyo in early in 2004. One company, e-Access Inc., has adopted TD-SCDMA/MC (Time Division Synchronous CDMA/Multi Carrier) which is an extension of TD-CDMA. The NCCs complained to the MIAC that limited or no access to the high-frequency bands (800MHz, 1700MHz) is the reason for their inability to respond to demand. In recent press releases, e-Access has declared it will begin service in 2006. Many hurdles remain, such as improvement of service areas, offering attractive mobile phone terminals at an appropriate price. Providers of services like Wi-Fi, which is completely flat-rate and can be used nationwide, will be a big competitor for existing mobile operators.

### **3.3 Trends and Analysis**

Although new entrants are becoming more active, at present the mobile communications business is dominated by NTT DoCoMo, KDDI, and Vodafone. The



combined number of subscribers is about 80 million and revenues are ¥8,700 billion among the three companies (based on FY2004 company information).

The mobile communications market is a highly competitive environment, and each company has gone through repeated separations, independence, merger, or business transfer, which has resulted in the three current group structures.

NTT DoCoMo Group operates its mobile communications business through a regional unit which divides Japan into nine blocks.

KDDI emerged in October 2000 as the outcome of a three-way merger. KDDI group operates in the mobile communications business with two service brands called “au” (a nationwide service) and “Tu-Ka” (Tokyo, Osaka, and Nagoya region service).

Although Vodafone originally developed its service under the brand name “J-PHONE,” it came under the influence of Vodafone Group PLC following a major investment by Vodafone UK in May 2001, and in 2003 was unified under the brand name of Vodafone.

This section explains briefly the characteristic of each mobile operator with a brief discussion of each company’s future strategies.

### **3.3.1 NTT DoCoMo Group**

NTT DoCoMo is a worldwide mobile operator with its own R&D division. It is a pioneer the field of mobile communications, having commercialized the car telephone as part of the world’s first cellular system in 1979. NTT DoCoMo is part of NTT Group, which enjoyed the world’s highest revenue as of 2004.

NTT DoCoMo is the company which the mobile communications operating department spun off from NTT in 1992. Its stock market capitalization in March 2004 was

approximately ¥9,300 billion (\$83 billion), and following a market capitalization of ¥14,800 billion yen (\$130 billion) with Toyota, it is now in second place in market capitalization.

NTT DoCoMo has also worked to make its data communication services high value-added through its mobile Internet connection service known as i-mode which began in 1999. At the end of March 2005, NTT DoCoMo had around 48 million subscribers, including over 44 million i-mode subscribers. The number of i-mode subscriptions significantly exceeds the 17 million subscriptions held by second-place KDDI.

However, in the second half of 2003, NTT DoCoMo lagged behind KDDI as a result of that company's marketing strategy, and it is almost equivalent to KDDI in the number of customers. The 2004 annual accounting recorded the first decrease in income and decrease in profits since the start of business in 1992. Growth has slowed in the mobile phone market.

### **3.3.2 KDDI Group**

In October 2000, IDO and DDI merged to form KDDI . Since KDDI the two previous systems differed, there were no synergies. J-PHONE (part of Vodafone Japan), which holds third place in market share, released a new mobile phone with a digital camera, and it quickly took market share from KDDI in 2001. Although it has waged a hard fight to stay competitive, KDDI's market share has fallen to third position.

But market share among young adults has surged with the development of a new service that can use personalized music as a ring tone and the development personally designed mobile phone terminals in 2003. Since KDDI's strategy suited this trend among new users, KDDI has reestablished its status in second place.

KDDI has also adopted an aggressive policy toward innovations, such as being the first company to introduce flat rate fees in Japan in 2003. In addition, since they handle both mobile communications and fixed-line telephone business, the business is still able to offer wired-line broadband service.

“au” is the brand name of KDDI’s mobile communications business. The “Tu-Ka” brand is its mobile phone business limited to Tokyo, Osaka, and Nagoya regions, and its major selling point is inexpensive service. But in response to strong price competition in the entire market, that selling point is no longer as important, and market share continues to fall.

In the second half of 2004, KDDI released a mobile phone for seniors that is a simplified, basic telephone with no additional functions. As a result, from January 2005, the downward tendency has resulted in a drop in share price. I believe the success of the phone for seniors proves that there is a definite senior market for mobile phones, and this phenomenon hints at further products that can be deployed in the mobile phone market.

### **3.3.3 Vodafone Group**

Vodafone Japan is the mobile operator in Japan that is part of the parent British Vodafone Group PLC.

Vodafone Japan was formerly “J-PHONE,” a division of the mobile communications business that was part of Japan Railway Group. J-PHONE developed the mobile phone with digital camera (a product made by Sharp) in November 2000, which expanded Vodafone’s market share at the time. But the company lost its dominance when the same function was mounted in mobile phones in 2002. Consequently, Vodafone’s market share at the end of March 2005 puts the company in third place behind NTT DoCoMo and KDDI.

In addition, Vodafone lags behind in its market entry using the 3G system, and as a result, network enhancement is not progressing. Since the head office in Britain sets policy for marketing mobile phones, a 3G terminal that is suitable for the Japanese market is not yet supplied, and consequently Vodafone sales have remained low. Vodafone is aiming to stage a comeback following management reform in December 2004.

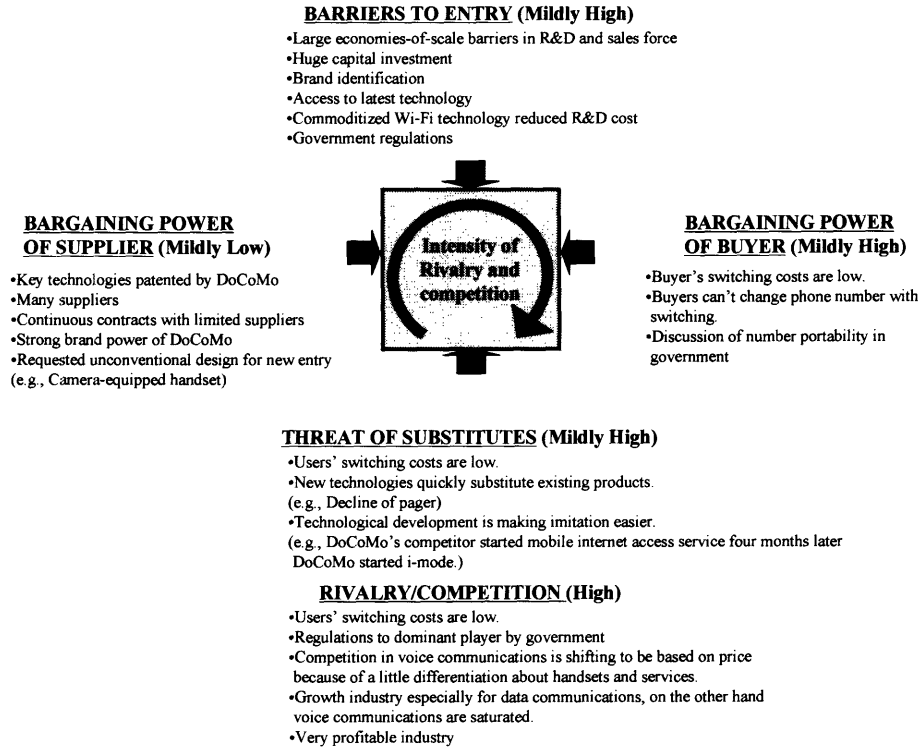
### **3.4 Summary**

For people who are accustomed to using a mobile phone frequently, the psychological barrier of high-priced rate charges was removed by the introduction of the flat rate for data communications. I estimate that among the Japanese the use of mobile phones like Europeans and Americans use PCs will soon take place. Unlike PCs, however, mobile phones can always be carried with a user, bringing closer to reality the time when everyone will use mobile phones as the single device for all functions.

On the other hand, introduction of MNP and the move toward market structure changes caused by the move to low-cost among NCCs are having a major impact on the market. Existing mobile communications companies, including NTT DoCoMo, have not engaged in price competition in vain, but I believe that developing true customer value is an issue that should be resolved.

Porter (1980) analyzed the five external factors that influence a competitor's dominance.: barriers to new entrants, the bargaining power of buyers, the bargaining power of suppliers, the availability of many choices and substitutes at the time of purchase, and rivalry among competitors. I believe one of the best methods for analysis is one that compares the predominance of the industry in a competitive environment. Figure 3.6

summarizes the structural changes in the mobile communications business, based on the factors utilized in Porter's Five Forces model (Porter, 1985, 1998).



Source: Takagi K, 2004

**Fig. 3.6 An analysis of the mobile industry in Japan using Porter's Five Forces model**

In addition to this analysis, I also evaluated the Japanese mobile phone industry in Chapters 2 and 3. That analysis found that for a mobile phone operator to sustain predominance in 2005 and thereafter, the following factors must be taken into consideration:

### **Barriers to Entry**

It has become possible to cover a service area widely through the use of a few base stations by using new technologies such as Wi-Max, which will become standardized in 2005 in the U.S. , constrained only by the amount of capital investment that is likely to be made. However, even if a new common carrier efficiently adopts the characteristics of a new radio system in order to provide nationwide coverage, I believe the barrier to entry will remain as high as it has ever been.

### **Bargaining Power of Supplier**

Because communication network equipment and a mobile phone manufacturers still function in an intensely competitive environment, a mobile phone operator's price-negotiation power is still strong. Moreover, part of the backbone network includes the TCP/IP protocol, and dramatic price decreases may result with the entry of IP network vendors such as Cisco. Although the 2G and 3G wireless network are dependent on Qualcomm's CDMA technology for development of new radio protocols that extend Wi-Max technology in the future, the competitive environment among vendors will intensify and the purchasing power of mobile operators is highly likely to rise.

### **Threat of Substitutes**

Since an infrastructure that is better than the current one (which is the most important characteristic of a mobile phone) has not appeared, I estimate that huge changes or other alternatives will not appear in the near future. Many PHS operators have already withdrawn from the service area despite the fact that the communication fee is cheaper.

### **Bargaining Power of Buyers**

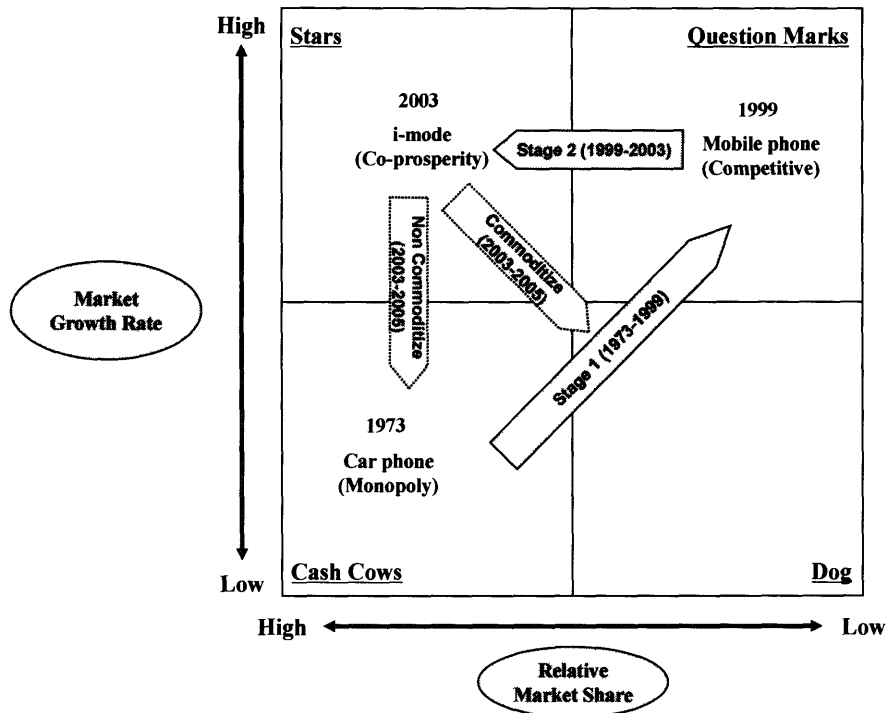
As described earlier, when MNP (Mobile Number Portability) is introduced in 2006, customer switching will become easy. Thus, from 2007 onward, when a new common carrier enters the mobile phone business, investment in equipment sufficient to cover 10 million customers (corresponding to the area currently covered by existing operators) will be needed, and price reductions will become a necessity for carriers in order to remain competitive.

### **Rivalry/Competition**

Even though it is dependent on the strategy of new common carriers, it is clear that the competitive environment will be severe, at least temporarily. In order to sustain market share in such a competitive environment, the immediate variable is price. But a general price reduction will result in lower profitability, with the danger of falling into a low-profitability spiral.

Overall, even though the dominance of established operators remains high, profitability is falling because of the intense competitive environment. Furthermore, the influence of the strategic variables has decreased because mobile services continues to become commoditized. Reducing the price in order to expand the market – the last strategic variable before attaching new value – is sure to result in additional profitability decline. That phenomenon is already apparent when one considers the growth process of other industries.

Therefore, I believe that 2005 will mark a turning point in the commoditization of the Japanese mobile phone industry. Figure 3.7 illustrates the market growth rate and market share for mobile phones in Japan.



Source: Author, Boston Consulting Group, 2005

**Fig. 3.7 Growth Share Matrix in Japanese Mobile Phone Industry (1973-2005)**

In Chapter 4, I will analyze the new wireless value chain “i-mode FeliCa platform,” which is considered to be one of the leading solutions for the Japanese mobile communications market.



## CHAPTER 4

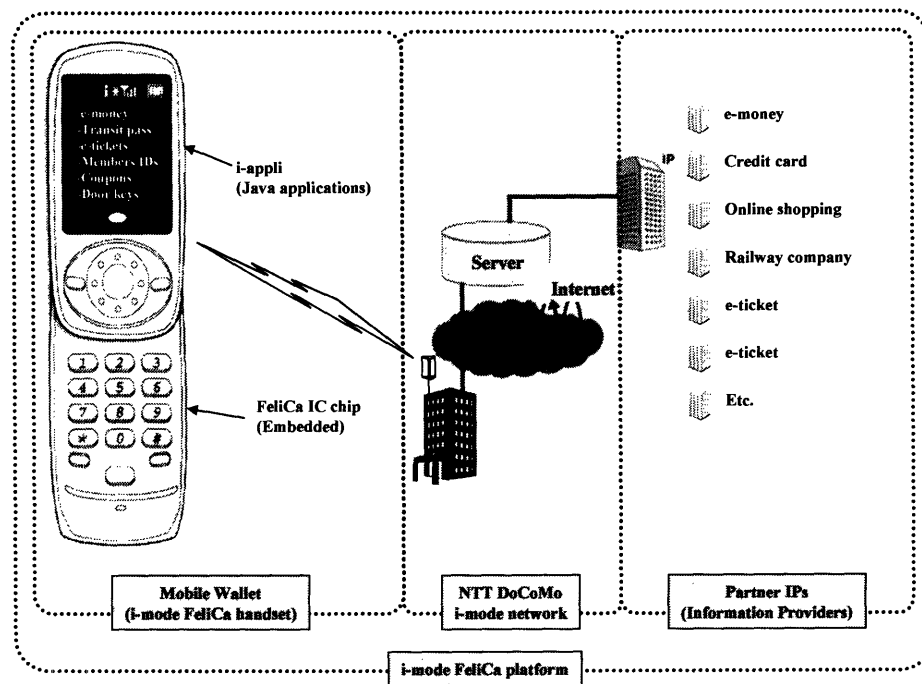
### New Wireless Value Chain

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The mobile communications market in Japan achieved a qualitative conversion when NTT began to offer its i-mode service in 1999. Thereafter the entire market began a rush to find new applications—part of the growth process in Stage 2, as explained in Chapter 3. In the summer of 2004, the mobile communications market in Japan entered the new growth stage, while NTT DoCoMo expanded further into the new market by cultivating the mobile Internet market with i-mode. In this chapter, I will discuss the new wireless value chain which NTT DoCoMo has successfully utilized.

#### 4.1 i-mode FeliCa Platform

On July 10, 2004, NTT DoCoMo began its service known as “i-mode FeliCa,” a new wireless platform. i-mode FeliCa uses a mobile phone which has built-in the contactless IC card function “FeliCa” in a “Mobile Wallet” as a user terminal. I will discuss key components of this platform, including FeliCa and Mobile Wallet. Figure 4.1 shows the platform of i-mode FeliCa.



Source: Author (2005)

**Fig. 4.1 i-mode FeliCa Platform**

#### 4.1.1 FeliCa

The FeliCa technology is one of the most important key components in this new platform. FeliCa is a complete wireless smart card system developed by Sony Corporation. The name was derived from the word “felicity,” suggesting the system was created to make daily living easier and more convenient. The card is difficult to forge or reconstruct, and it allows users to send/receive data at high speeds and with high security. The system is also environment-friendly since the card can be used repeatedly, with no finite life cycle, by rewriting over existing information. It is also user-friendly, as would be expected from a

contactless card, since there is no longer a need to insert and remove the card for each use.

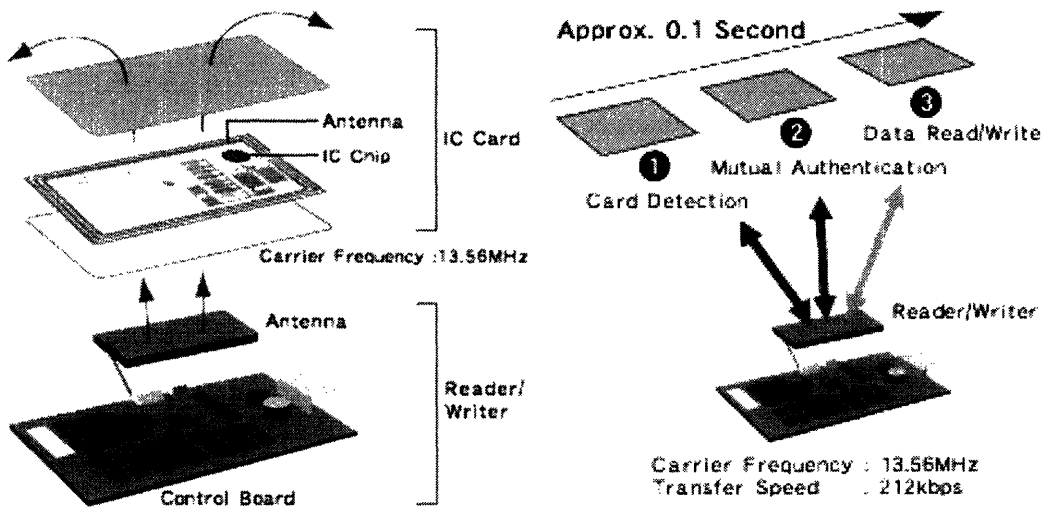
In total, the system is rational throughout, since one card fulfills a wide range of needs.

At the core of FeliCa is the smart card, which has the following features:

- Contactless communication between the reader/writer. The card is activated by electromagnetic waves that radiate from the reader/writer using a standard frequency of 13.56 MHz and a speed of 212 kbps based on the international near-field communication standard (NFC-IP1) protocol ISO/IEC 18092.
- The FeliCa operating system allows card issuers to execute multiple applications on a single card in a secure environment.
- With an efficient mutual authentication method and advantageous transmission system, the transaction process between the reader/writer and the IC card is completed within 0.1 sec, including secure encryption, using high-speed encrypted wireless communication between the embedded chip and the card reader/writer.

The key functions of FeliCa are that there is no necessity to insert anything in a card slot, it can run multi-applications via a single card, and processing can be done at extremely high speeds with complete security.

FeliCa is already widely in use in the Asia-Pacific region (Japan, Singapore, Hong Kong, India) for contactless transaction payments, e-cash applications, secure online credit card payments and low-security applications such as loyalty programs, and club membership cards. Its estimated total usage in January 2005 was about 70 million. Figure 4.2 illustrates the basic specifications for FeliCa and the FeliCa reader/writer



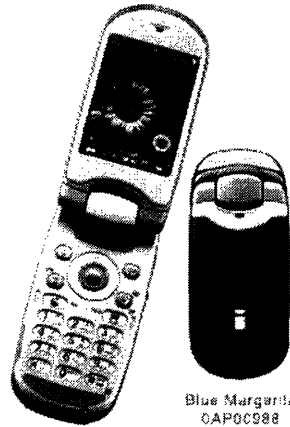
Source: Sony Corporation (2004)

**Fig. 4.2 Basic specification of FeliCa and FeliCa reader/writer**

#### 4.1.2 Mobile Wallet

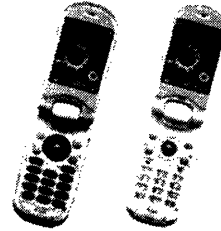
“Mobile Wallet” is the name of the FeliCa and i-mode applications embedded in a mobile phone. FeliCa’s non-contact technology allows DoCoMo mobile phones to be used for new services such as electronic cash payments at retail stores and e-passes for transportation. FeliCa also allows existing credit card and bank card functionality to be incorporated into mobile phones. Figure 4.3 shows the first model of NTT DoCoMo’s Mobile Wallet.

P506iC



Blue Margarita  
0AP00988

Color Variations



Black Tornado 0AP00975  
Silver Martin 0AP00962


i-mode FeliCa

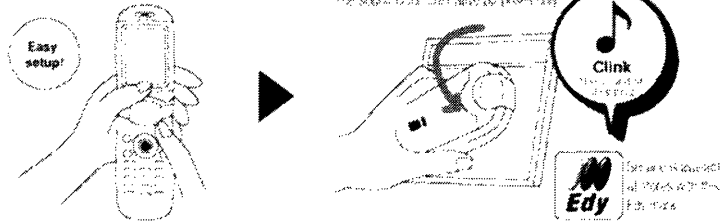


Not just your bills and coins, but all the other things — your membership cards, point cards, tickets, and employee IDs — everything fits into your phone! That's DoCoMo's Mobile Wallet. This wallet phone will make your lifestyle more simple, effortless, and fun.

**Mobile Wallet: Just try it!**

For example, pre-installed Edy e-money

- 1** Activate the i-apply to make initial settings.
- 2** Just hold up the  mark on the mobile phone to the center of the reader/writer detector.  
\*The sound of the FeliCa is approximately.



Easy setup!

Clink

Edy

Source: <http://www.nttdocomo.co.jp> (2005)

**Fig. 4.3 Mobile Wallet (NTT DoCoMo P506iC)**

Mobile Wallet has the following key components:

- Built-in FeliCa multi-application smart card with space for approximately 40 secure (SSL encryption) applications, and a low-security area for applications that do not require high security.
- i-mode network connection and browser for secure SSL connection to application servers.

- JAVA script needed for specific applications (e.g., commuter passes) are loaded into the mobile phone with secure SSL encrypted access to a server.
- A network of partners are developing specific applications (e.g., railway companies for ticket purchases; airline reservations; electronic money)
- i-mode FeliCa mobile phone's contactless readers/writers equipment, if installed in a store, a railway station, or an airport, has complete compatibility with the existing FeliCa system and new infrastructure investment will be unnecessary.

NTT DoCoMo carried out field tests with 5,000 monitors in the period from December 2003 to June 2004, and service began in July 2004 using the following four models:

- P506iC (2G model Manufacturer: Panasonic Mobile Communications)
- SH506iC (2G model Manufacturer: Sharp)
- SO506iC (2G model Manufacturer: Sony)
- F900iC (3G model Manufacturer: Fujitsu), including fingerprint recognition chip and remote locking functionality in case of loss or theft)

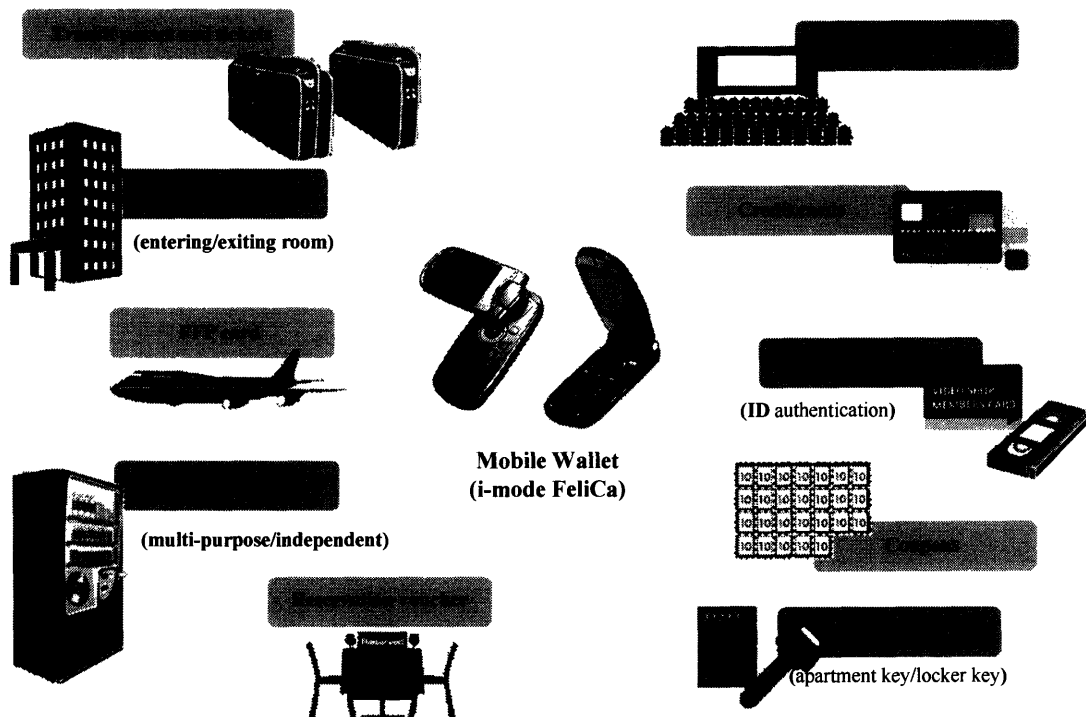
Mobile Wallet released two million sets on February 12, 2005, with four 2G models, and three 3G models released in March 2005. NTT DoCoMo is planning to release ten million sets by the end of March 2006.

KDDI has accepted FeliCa from the beginning. However, Vodafone was scheduled to adopt a different system (using a removable IC card). But Vodafone announced that it would adopt the FeliCa platform as of February 2005. Both Vodafone and KDDI are due to

release a mobile phone with built-in FeliCa in fall 2005. This means that all mobile communication companies in Japan will utilize FeliCa.

## 4.2 Impact of the New Value Chain

This new platform offers distinctive possibilities for every industrial field. As shown in Figure 4.4, FeliCa offers coverage across diverse platforms. I will discuss its impact on five typical industrial areas below.

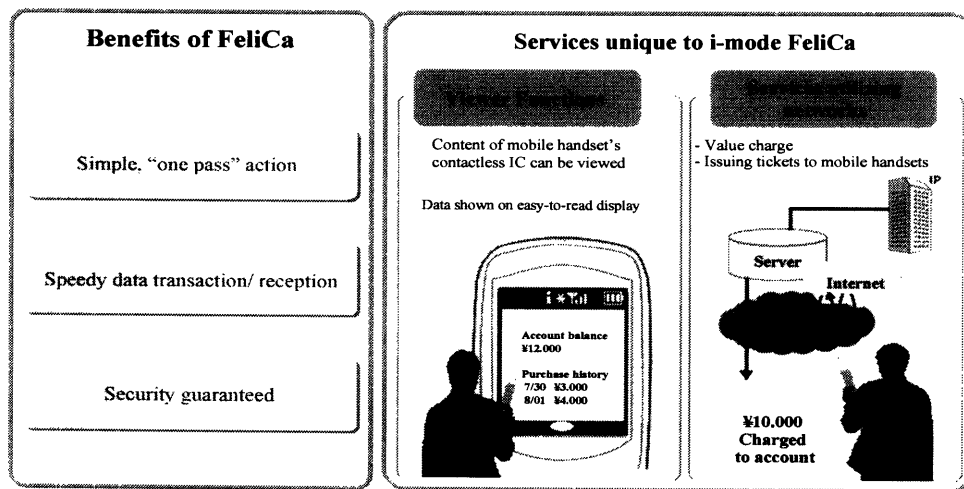


Source: NTT DoCoMo Presentation Material (June 6 2004)

**Fig. 4.4 Mobile Wallet application fields**

Every day, people leave home carrying their mobile phone and several other low-tech items, including train tickets or a commuter pass; cash, credit cards and bank cards; keys, access cards and ID cards; driver's license; club membership cards, loyalty cards, coupons and vouchers; and maybe even cinema and concert tickets. Now, however, Mobile Wallet integrates all these items, and adds information technology tools, Internet connectivity, and greater security.

The specific advantage of using Mobile Wallet on an i-mode FeliCa platform is that it is installed in one device and several IC cards can be integrated into one. An added value is electronic money which is downloadable to FeliCa via an i-mode network. Furthermore, one can confirm bank balances easily using Mobile Wallet. Equipping i-mode with FeliCa makes it possible for users to enjoy not only the usual benefits of FeliCa, but also the unique services of i-mode (see Fig. 4.5.)



Source: NTT DoCoMo Presentation Material (June 16 2004)

**Fig. 4.5 Benefits of i-mode FeliCa**



Although there are many applications in an i-mode FeliCa platform, I will explain how it is typically used in four industries.

#### **4.2.1 Retail Industry**

In the retail industry, two of the most important applications are clearing functions such as electronic money or credit cards, and a customer marketing tool such as a membership card.

Electronic money is a payment system in which a cash value is converted into electronic data. Even with small payments—unlike a credit card—if it is used with criminal intent, the amount of damage is minimal. In Japan it is especially popular among youth for its simplicity and safety.

Electronic money can be classified into two types: a scratch card and an IC card. A scratch card is generally disposable once the value of the card has been used. A specified amount of electronic money is paid for and added to the card before the user purchases it. This type of card is generally used on websites which deduct the specified amount of money after a user's purchase. "WebMoney", "BitCash", "NET CASH", etc., are among the popular versions. They are often used when one buys software, such as music or a game, from a network. In FY2004 the market size was ¥23 billion. This is a relatively small market size because the card is used mainly for settlement of Web shopping purchases, and such a scratch card system is hardly ever used for settlement at a physical store.

An IC card writes the data equivalent to the monetary value in an IC chip built into the IC card. An IC card is settled by writing in the balance after settling accounts at the time goods are purchased. "Edy," which became available via BitWallet in 2001, is the most

popular IC chip card in Japan. Edy is a product of the FeliCa platform. An issue will be 7 million sheets as of April 2005; it can be used at about 20,000 stores and approximately 5.4 million transactions occur every month (BitWallet, 2005). Unlike a credit card, Edy does not require a credit check. Edy is anonymous at the time of use because a signature is unnecessary. But if the card is lost, the monetary value, just like cash, is also lost.

In addition to Edy, there is also “Suica” put out by East Japan Railway. Although Suica contains an electronic train ticket, in 2004 an electronic money function was added which can be used to purchase food at station restaurants. The number of monthly uses of Suica and Edy in FY2004 is 2.4 million and 5.1 million, respectively. The typical transaction amount is about ¥500. For FY2004, the total utilization amount for both Edy and Suica is likely to amount to ¥70 billion. Both are expected to expand to several trillion yen in three years (*Nihon Keizai Shimbun*, 2/4/05). Both Edy and Suica use the FeliCa platforms, and are payment systems in a Mobile Wallet. A user does not need to have separate IC cards when installing Edy or Suica in a Mobile Wallet.

The advantage of IC card electronic money is the following:

- Electronic money transactions take about one-tenth of a second, much faster than traditional cash transactions, and no change is required
- Counting errors are reduced
- Fraud and theft are reduced
- The cost of handling cash is reduced, and the savings can be used to improve service or for loyalty programs and discounts
- Electronic money is “smart,” that is, many functions can be programmed into it. It can be combined with loyalty programs. For example, All Nippon Airways

(ANA) offers conversion of frequent flyer miles into electronic money or frequent flyer miles that can be used for Edy purchases, to encourage users to try Edy payments.

It is possible that electronic money may affect governmental financial policy as it quickly becomes more popular. The amount of issued currency was about ¥80 trillion at the end time of 2004 (Dept. of the Treasury, 2004). Although there are still many more cash transactions in Japan as compared with Europe and the U.S. (where credit card use is more popular), the cash settlement system in Japan may be forced to change with the growing popularity of electronic money.

The Bank of Japan buys maximum-length, long-term government bonds from financial institutions for the outstanding currency balance of issue amount. Although the Bank of Japan has announced that “The effect on financial policy will not be apparent in the near future,” another view is beginning to show: “The purchase margin of a long-term government bond will be decreased if it becomes popular, and the term of a policy may be shortened” (Goto, February 4, Nikkei News Paper special issue).

In addition to electronic money, another important retail application is customer relations management. Although the key-ring type of member ID is generally found in the U.S., in Japan a plastic ID card for members is more typical, and customers store many membership cards in their wallet. The retail industry has distributed customer cards in order to build a larger base of customers who use the card regularly. Almost all customers carry a plastic card for every store, and a customer’s wallet becomes stuffed with plastic cards. This is a classic use for Mobile Wallet since it can install 40 applications simultaneously,


enabling the customer to carry electronically their membership IDs for 40 stores. The typical introductory case and typical effect in a retail industry are shown in Fig. 4.6.

### Retail industry case -Food Center Asano-

#### Asano "Wallet Card" overview



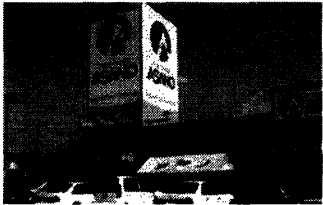
-Food Center Asano is a supermarket chain with seven branches in Miyagi prefecture.  
 -Edy-equipped wallet cards are issued at five stores  
 (Approximately 9,200 members)

discount ranging from 1 to 5% depending on their previous month's purchase amount.



Information on recommended items, discounts etc. is sent out by email.

The same service is available for i-mode FeliCa

#### Benefits of Wallet Cards

<p>20% increase in average spending per customer</p>	<p>- Wallet Card members spend ¥300 more than non-Wallet Card members</p>
<p>Reduced time spent waiting line</p>	<p>- Reduced time spent waiting in line                      - Eliminates chance of handing customers wrong amount of change</p>
<p>Attract customers</p>	<p>- Attract customers with incentives depending on their overall purchase amount                      - Timely advertisements via e-mail (has greater effect than flyers)</p>

Source: NTT DoCoMo Presentation Material (June 16 2004)

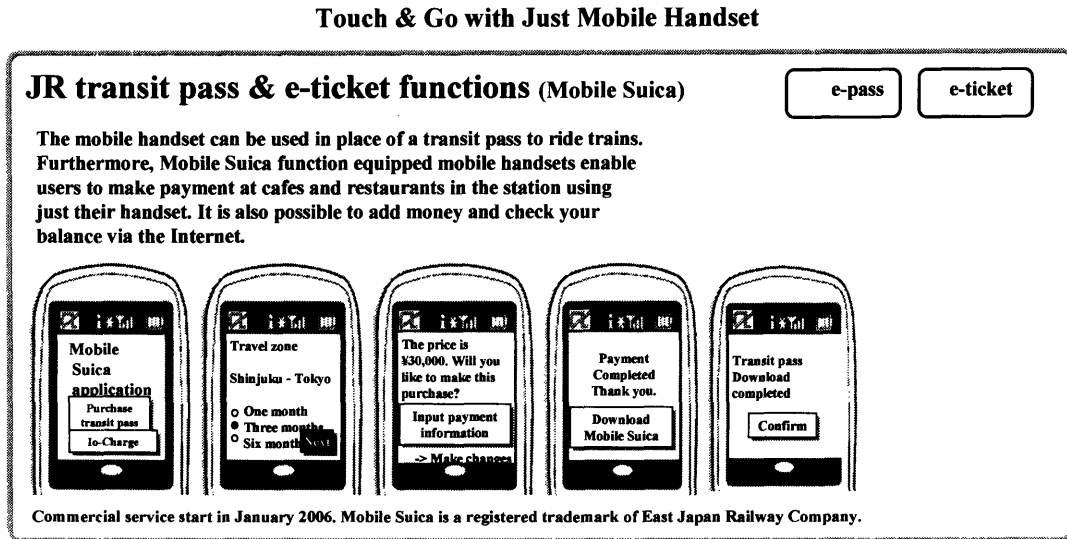
**Fig. 4.6 Retail industry example**

#### 4.2.2 Transportation Industry

In the transportation industry, benefits are available to both operators and users by simplifying procedures issuing a ticket, or at a ticket gate, and for making fare adjustments.

For a railway company, an electronic ticket helps prevent a loss in profit from people who would try to steal a ride without paying. Or, a profitable retail store can be opened in space previously occupied by a ticket machine or ticket window, thereby

generating additional revenue. As mentioned earlier, Japan Railway Group added an electronic money function to Suica, which is the company's e-pass/e-ticket, and has expanded the business to include other types of payments.

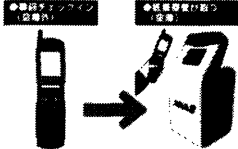
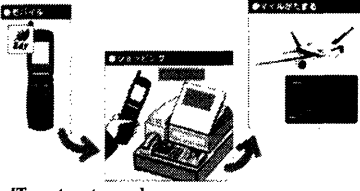



Source: NTT DoCoMo Presentation Material (June 16 2004)

**Fig. 4.7 Railway company example**

A new revenue source has emerged for airlines. In addition to issuing airline tickets via the Internet, which is already generally utilized among all the airlines, and automated check-in, airlines can offer a program that exchanges frequent flyer miles for electronic money (see Fig. 4.8)

## Check in with Just Your Handset

<p><b>ANA International E pre-check in</b> <span style="border: 1px solid black; padding: 2px;">Check in</span></p> <p>After using i-mode to check in prior to arriving at the airport, receive your boarding pass at the airport by simply passing your Mobile Wallet over the reader.</p> <p>[Participating airports] Narita Airport Kansai International Airport</p> <p>[Target customers] ANA Mileage Club Members with e-tickets</p> 	<p><b>Mobile de Edy mileage</b> <span style="border: 1px solid black; padding: 2px;">Accumulate points</span></p> <p>You can accumulate mileage by paying with Edy through i-mode.</p>  <p>[Target customers] ANA Mileage Club Card Members</p> 
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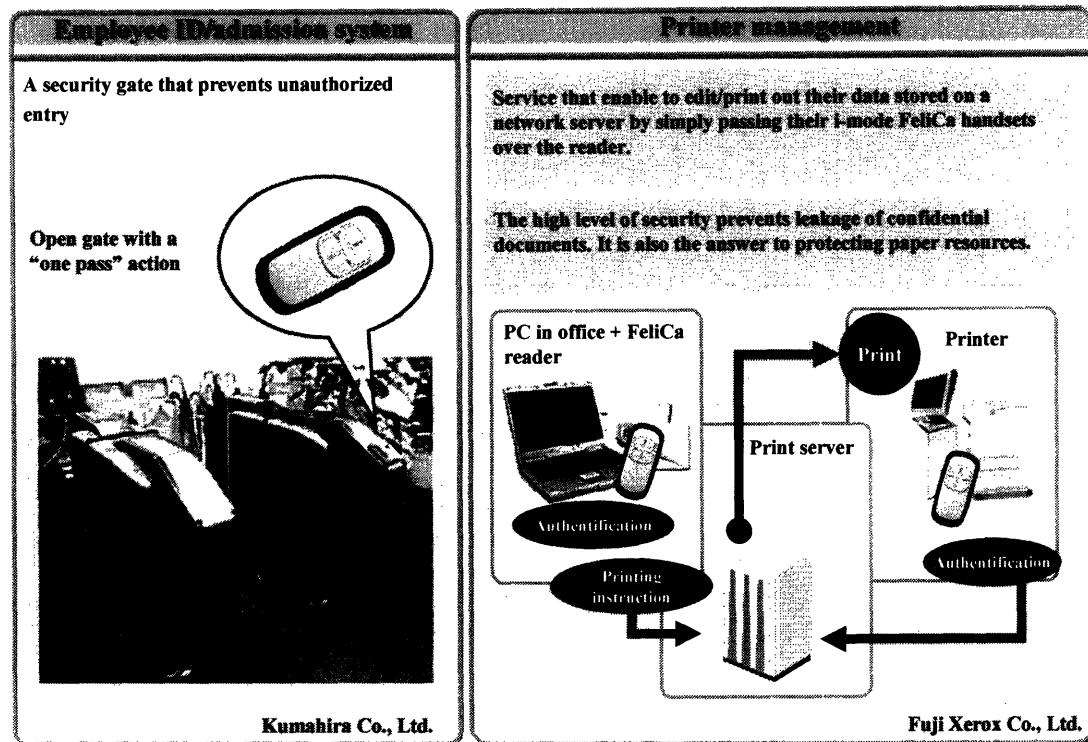
Source: NTT DoCoMo Presentation Material (June 16 2004)

**Fig. 4.8 Airline company case**

### 4.2.3 System Solutions

There are several examples of system solutions: employee ID for entering a secure building; gaining entry to an apartment or house security system; and a security system for printing in an office (see Fig. 4.9).

#### i-mode FeliCa in Business Scenes



Source: NTT DoCoMo Presentation Material (June 16 2004)

Fig. 4.9 System solution case

A Mobile Wallet reduces the risk of loss by collecting physical keys and ID cards into a single unit. If a user misplaces his/her Mobile Wallet, he or she can lock the handset remotely to prevent unauthorized use of information in the FeliCa. Using this solution for

entry into an apartment or house has become common (see Fig. 4.10), and the costs associated with lost keys and replacement is greatly reduced.

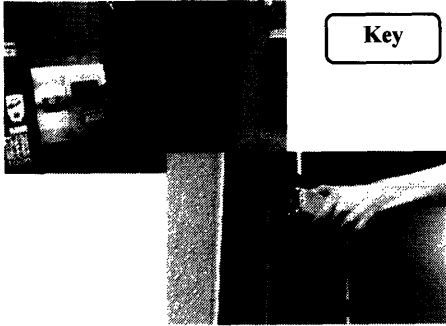
**As an Apartment Key**

**Apartment key**

Users can lock/unlock auto-locking entrances and front doors with i-mode FeliCa

- Apartments offering this service -

- IYO building  
Hakata-ku Fukuoka-shi 2 shop/offices, 12 apartments
- Joynas Yoshizuka  
Hakata-ku Fukuoka-shi 2 shop/offices, 148 apartments



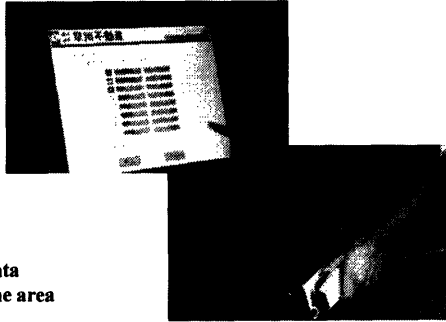
**Possible future services**

**- Paying for Utilities**

Users can utilize the Kiosk terminal in their entranceway to check their unpaid balance and/or pay with Edy

**- Terminals with area Information**

There are plans to set up information terminals containing data about the local community such as information on stores in the area



Source: NTT DoCoMo Presentation Material (June 16 2004)

**Fig. 4.10 E-key solutions for apartments and houses**

Since FeliCa Networks offers a Software Developer's Kit (SDK) for FeliCa application to a business enterprise, it can build a system solution without needing a special investment. The probability that a mobile phone user will sign up for a long-term agreement as a result of all these additional applications is greatly increased.



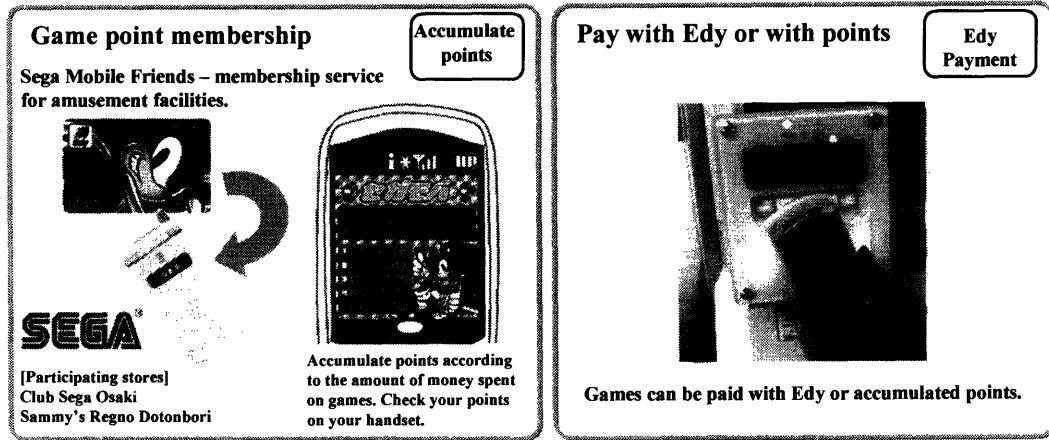
#### 4.2.4 Entertainment Industry

Electronic money has several unique uses in the entertainment industry, including ticket sales and amusement facilities.

PIA is one of Japan's largest event reservation systems. "Denshi Ticket PIA" (PIA e-ticket) offers the following functions:

- Reserve and purchase tickets online via PC or mobile phone
- Use discount coupons when purchasing e-tickets
- Download e-tickets to FeliCa in a Mobile Wallet
- If required, print out paper tickets from the downloaded e-ticket at convenience stores
- Use the e-ticket stored in the Mobile Wallet to enter an event. When entering the hall, the user touches a wireless reader/writer at the entrance which reads the e-ticket stored in FeliCa in the Mobile Wallet.

A solution that combines membership IDs and electronic money in amusement facilities is shown in Figure 4.11.



Source: NTT DoCoMo Presentation Material (June 16 2004)

**Fig. 4.11 Amusement facilities case**

Such use allows amusement facilities to increase the number of customers by introducing Mobile Wallet and continually increasing the amount of money available.

### **4.3 FAMU Model**

Having introduced examples of several industries that utilize the i-mode FeliCa platform and Mobile Wallet. I will now discuss whether these solutions are likely to become popular in the future.

The characteristics of i-mode FeliCa platform and Mobile Wallet can be summarized by the following three points:

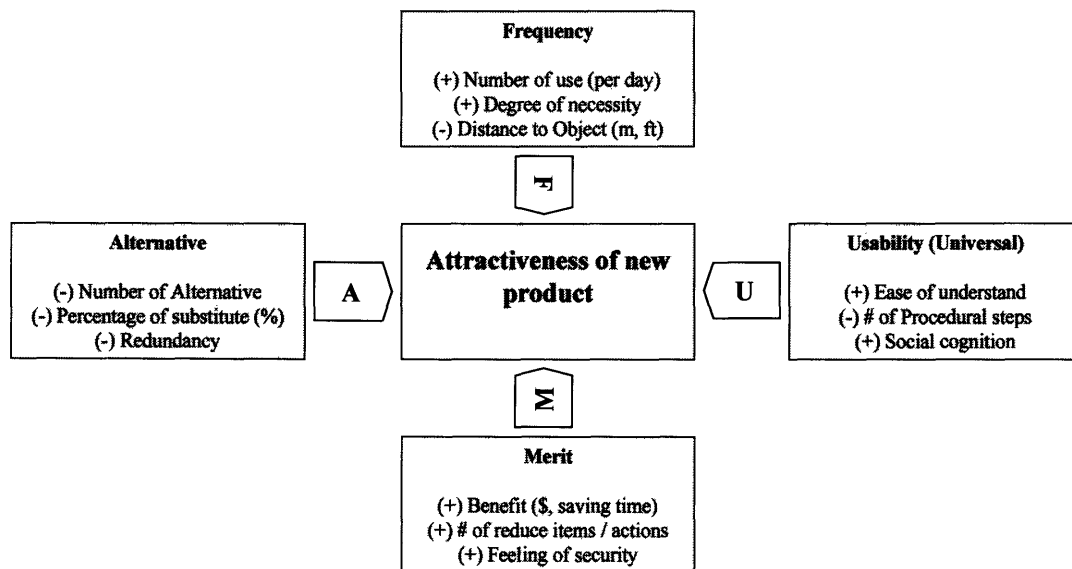
- they utilize the platform of the existing IC card

- physical media, such as existing IC cards and plastic cards, are replaced and service can be used via Mobile Wallet
- value added by connecting with network

When thinking about new solutions that replace a product that already exists, I compared how it would differ from the existing product from four viewpoints.

- How frequently is it used?
- How many other solutions exist?
- Is there any concrete economic effect?
- Is it easy for users to understand and easy to use?

These four factors are diagrammed in Fig. 4.12.



Source: Author (2005)

**Fig. 4.12 FAMU model**

I will explain the implications of the four parameters and conduct an analysis using the FAMU model applied to an existing successful case and an existing case of failure.

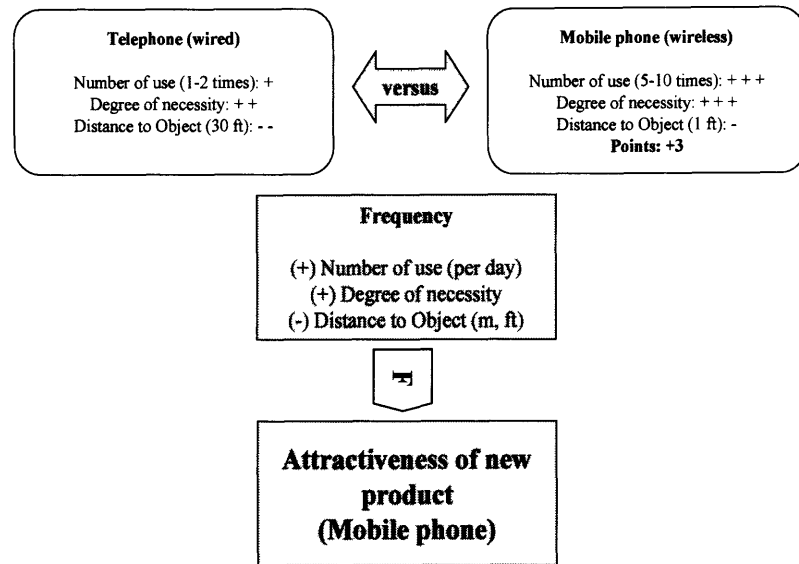
#### **4.3.1 Frequency Parameter**

Frequency of use relates to use on a daily basis, not just the number of times a new solution is used. A detailed evaluation index includes the following three items:

- number of uses (per day): positive parameter
- degree of necessity: positive parameter
- distance of object: negative parameter

Although the first two indices are obvious, the third parameter (distance of object) requires some explanation. Generally, an item that people often use is put in a familiar place. But if the item cannot be implemented for a technical reason, or an installation space does not exist, or it has been put in a distant location, or it has to be shared with others – this will impact the frequency of use. For example, a wired telephone is installed in a common space in a house, the physical distance that separates it from an individual is about 30 feet (in a typical house). A user's usage time may be shortened by his/her inability to find private space. The distance between the telephone and the user was shortened with the appearance of the cordless phone, so frequency of utilization became higher. But it could not be used outdoors so no dramatic change in the frequency of utilization occurred.

With the appearance of small mobile phones, frequency of utilization changed dramatically as the distance of the body from the telephone was shortened to inches. It is clear from this example that this parameter is an important element. A comparison of a wire telephone and a mobile phone is shown in Figure 4.13.



Source: Author (2005)

**Fig. 4.13 Comparison of utilization frequency between mobile phone and fixed-line phone**

### 4.3.2 Alternative Parameter

Alternative refers to the ability to substitute an old for a new product. It is generally accepted that if there are many alternatives, a new product is less attractive. When a mobile phone and a wired phone are compared, a mobile phone is an alternative product to the home telephone, or a company telephone, or a public telephone.

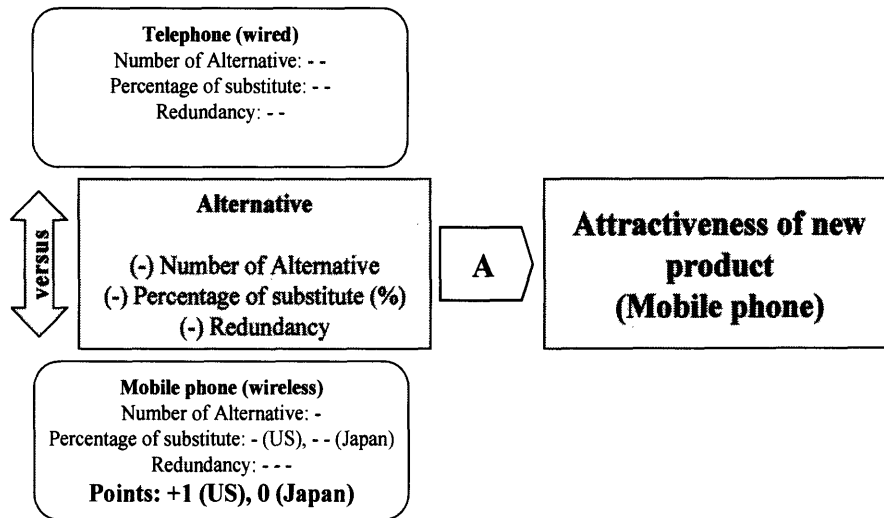
Summarizing the functions that mobile phones implement, they are:

- mobile phones can communicate from places where there is no wired telephone installed
- mobile phones can receive incoming calls in real time.

Although public telephones and general telephones constitute acceptable alternatives, since the only alternative is a pager, the mobile phone is overwhelmingly advantageous compared to a wired telephone.

“Redundancy” refers to whether a new product can completely replace a conventional product. For example, since a mobile phone has a clock function, a wrist watch could be considered unnecessary; however, wrist watches have a fashion role and are slightly more convenient. So a mobile phone is not likely to substitute for a wrist watch. But the wrist watch is redundant as a means of learning the time because although the mobile phone is overwhelmingly popular, the wrist watch market remains relevant.

Comparing a mobile phone and a fixed-line telephone, since a mobile phone can completely substitute for a fixed-line telephone, then from a redundancy standpoint the fixed-line telephone is redundant among users. However, when the telephone number systems of mobile phones and wired telephone are different, as they are in Japan, then the mobile phone cannot totally substitute for a fixed-line telephone. The area code shows the installed location of only fixed-line telephones, so when an area code is required as a proof of the user’s residence, then a mobile phone cannot substitute for a fixed-line telephone. The comparative example of a wired telephone and a mobile phone is shown in Figure 4.14.



Source: Author (2005)

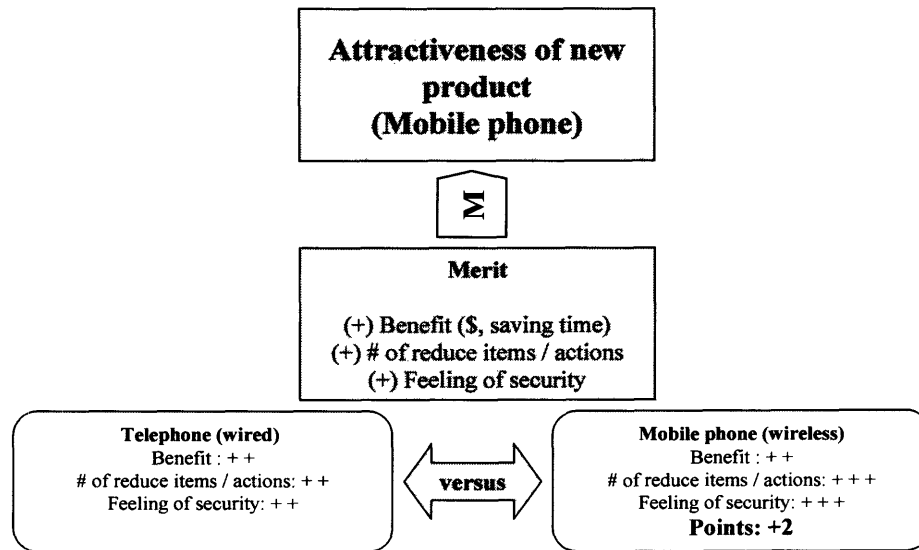
**Fig. 4.14 Comparison of a mobile phone and a fixed-line telephone as alternatives**

### 4.3.3 Merit Parameter

Although Merit obviously includes monetary benefit, it is also necessary to consider other advantages, such as cost reduction, time reduction, and the effective use of real estate.

A new product reduces the number of items of an existing product. And a new product usually reduces the number of user operations. Furthermore, it is necessary to consider factors like sense of security. I think all these factors should be evaluated as part of Merit.

Monetary benefit is attractive to a user. But a new product that is complicated for the user to operate may not become popular despite its monetary benefit. Moreover, a product that generates a feeling of insecurity will not be used over the long run regardless of monetary benefit or ease of operation. These comparisons as they relate to a wired telephone and a mobile phone are shown in Figure 4.15.



Source: Author (2005)

**Fig. 4.15 Comparison of merit between a mobile phone and a fixed-line telephone**

#### 4.3.4 Usability Parameter

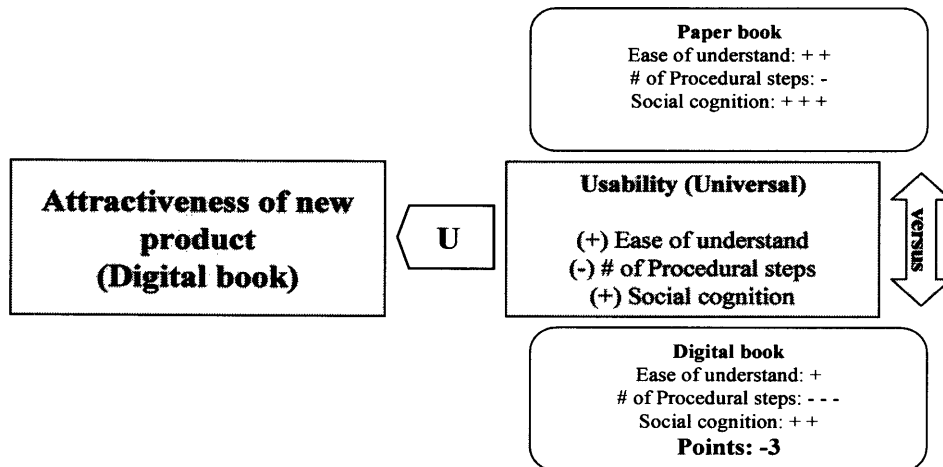
Usability evaluates the number of times an action is required in order to use a new product. This applies not only to the simplicity of the user interface of a new product but also to the complexity of the installation. Furthermore, it considers whether a new product is a framework that is easy for a user to understand.

When comparing a mobile phone and a fixed-line telephone, since both are almost the same interfaces except for a cord, a usability evaluation for both results in almost the same score.

If one compares a digital book to a paper book, in order to read a digital book it must be downloaded to some memory source and then can be browsed using an LCD viewer. If both are compared only on the act of browsing, a digital book and a paper book will receive roughly similar scores. But the unquestionable difference among both is the disadvantage of



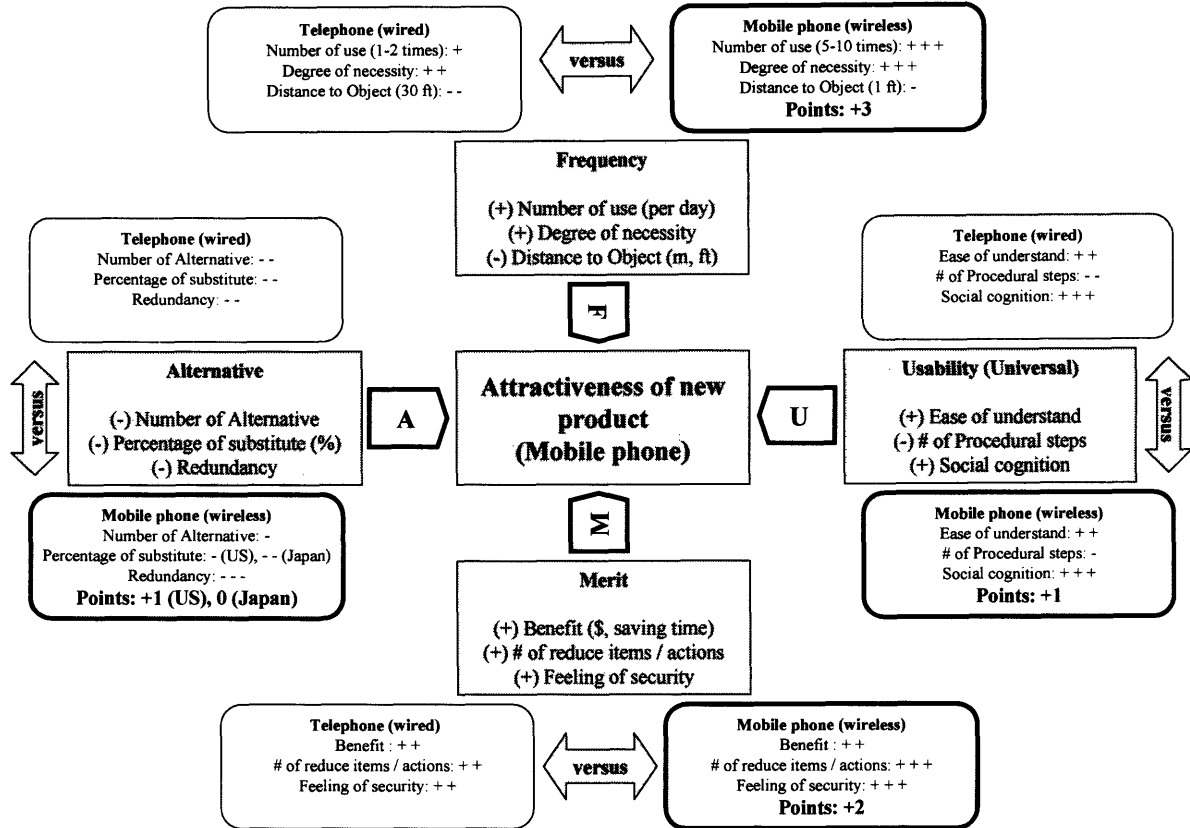
download by PC for a digital book and the intuitive interface of writing its contents, compared to the ability to purchase paper books easily via a website or in bookstores. The comparative example of a e-book and a paper book is shown in Figure 4.16.



Source: Author (2005)

**Fig. 4.16 Usability comparison between a digital book and a paper book**

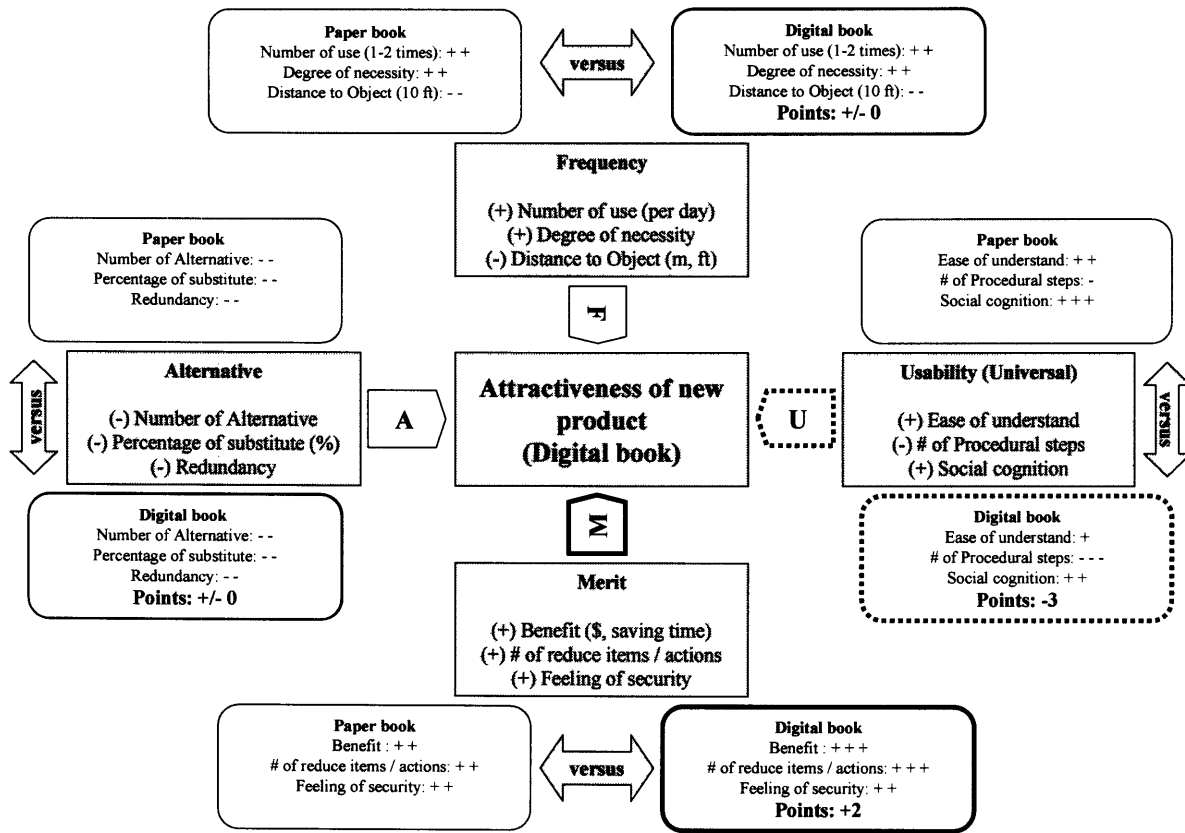
In comparing a mobile phone and a fixed-line telephone, the score of the mobile phone exceeds the fixed-line telephone in the all parameters. Therefore, I estimate that mobile phones will overwhelm the market for fixed-line telephones (see Fig. 4.17).



Source: Author (2005)

**Fig. 4.17 FAMU model comparing mobile phones and fixed-line telephones**

When comparing a digital book and a paper books, although many merits exist for digital books, I think that the score is overwhelmingly low in U, so usage of digital books is not yet generalized (see Fig. 4.18).



Source: Author (2005)

**Fig. 4.18 FAMU model of a digital book and a paper book**

#### 4.4 Case Study using the FAMU Model

By applying the FAMU model to an existing product, I can evaluate the possibilities of the i-mode FeliCa platform. For the case of a successful existing product, I will evaluate iPod from Apple Computer; and for the case of failure, I will evaluate Network Walkman by Sony.

#### **4.4.1 iPod (Apple Computer)**

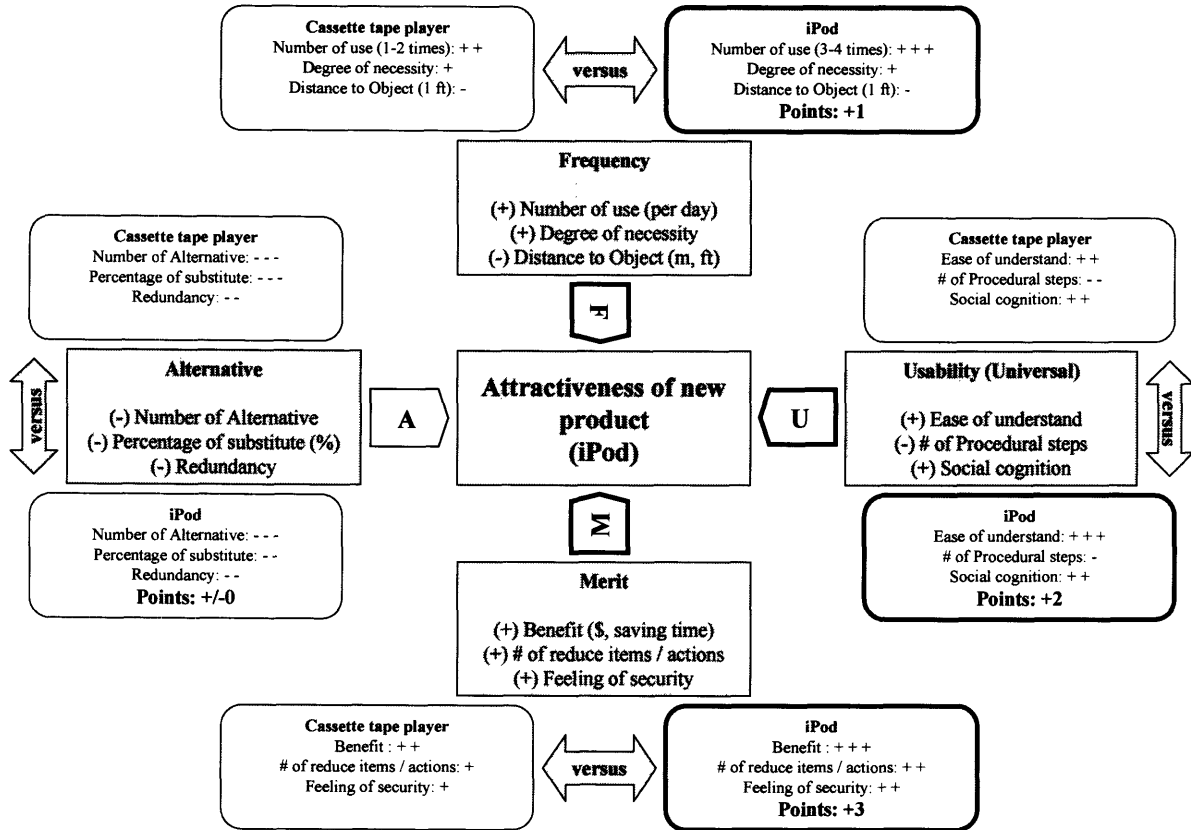
iPod is a portable music player with a built-in hard disk manufactured by Apple Computer. Released in October 2001, iPod very quickly accumulated sales of over 10 million units worldwide (Nikkei Business, 3/28/05). iPod also makes it possible to synchronize with the music on a personal computer by connecting via Macintosh using “iTunes2” software. iTunes2 is a manageable integrative software that allows users to download a music purchase for playback or transmission to iPod or a PC. Users can download a piece of music for 99 cents through the “iTunes Music Store” which is Apple’s music distribution service. The iTunes Music Store has quickly become the number one Internet music distribution service, with over 300 million pieces of music downloaded as of March, 2005 (Apple Computer Press Info, 3/2/05).

Apple recently increased its market share even more with the release of a smaller iPod version called the “iPod Shuffle,” which records music in flash memory and plays music in random sequence.

I consider the success factors for iPod as the following:

- Thousands of pieces of music can be saved on iPod’s large-capacity hard disk, thus eliminating hassles of media exchange.
- Users can purchase specific favorite pieces of music for 99 cents
- In general, peripheral PC products require more complicated operations but iPod’s music transmission method from computer is very easy

It is clear that iPod is superior in three FAMU parameters: F, M, and U (see Fig.4.19).



Source: Author (2005)

**Fig. 4.19 Comparing cassette tape player with iPod**

#### 4.4.2 Network Walkman (Sony)

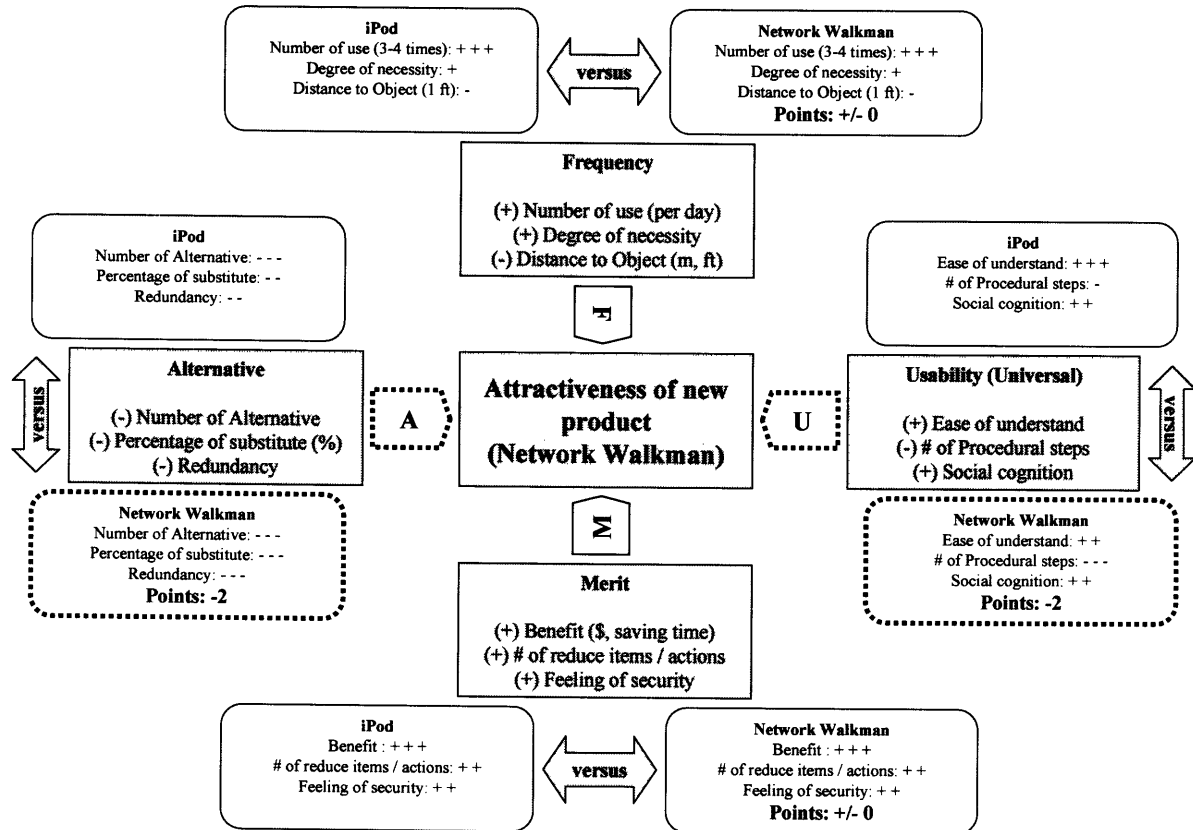
The Network Walkman manufactured by Sony is a hard-disk type portable music player with the same function as iPod. The cassette tape and MD type Walkman was released in July, 1979, and sold 1,100 models and 335 million sets in 25 years. Sony utilized the hugely popular Walkman brand and released Network Walkman in the U.S. in April 2000. But as of March 2005, total sales of Network Walkman is only 2 million sets compared with iPod at more than 10 million.

The failure of Network Walkman is completely contrary to the usual success of other Walkman products. The Walkman was a simple, easily understood concept for carrying music on cassette tapes wherever the user went, and Sony gained overwhelming market share with this product at the time. But with Network Walkman, because Sony persisted in using the music compression technology “ATRAC” which they had developed and owned, they did not realize the potential of the MP3 music format which was making rapid inroads in the market. There is no incentive for a user to convert their MP3 music library into the Sony ATRAC format, and then purchase Sony products.

My evaluation for why Network Walkman was defeated by iPod is the following:

- To use Network Walkman, the user needs to re-convert their music files
- User operability is complicated compared with iPod
- There are few music files offered by music distribution services in the ATRAC format compared with what is available at the iTunes Music Store

If these factors are applied in a FAMU model, the outcomes is clearly shown in Figure 4.20. Network Walkman is inferior to iPod in both parameters A and U. Sony was defeated by using a pattern that went contrary to their original success with Walkman. I believe the failure derived from having built a business plan not from the customer’s viewpoint but from the supplier’s viewpoint.



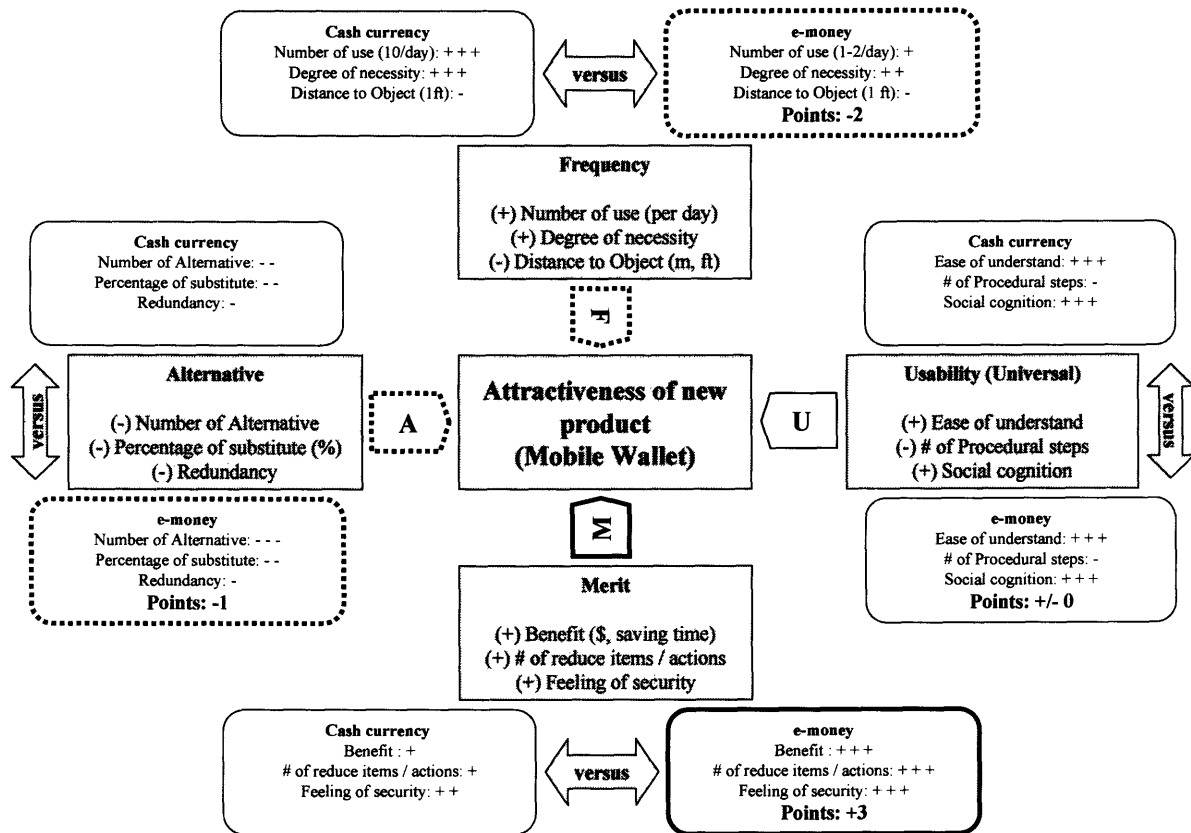
Source: Author (2005)

**Fig. 4.20 Comparing Network Walkman with iPod**

#### 4.4.3 i-mode FeliCa Platform (NTT DoCoMo)

I applied the FAMU model to Mobile Wallet in i-mode FeliCa Platform. The objects for comparison are the existing media, such as cash, paper tickets, plastic cards, and keys.

First I compared cash with Mobile Wallet electronic money. Since the number of stores where electronic money can be used is relatively fewer, frequency of use is inferior compared with cash. However, there are advantages with electronic money such as ease of handling, rewards, and rebate checks. Therefore, the key to increasing popularization is to expand the number of stores in which electronic money can be used (see Figure 4.21).



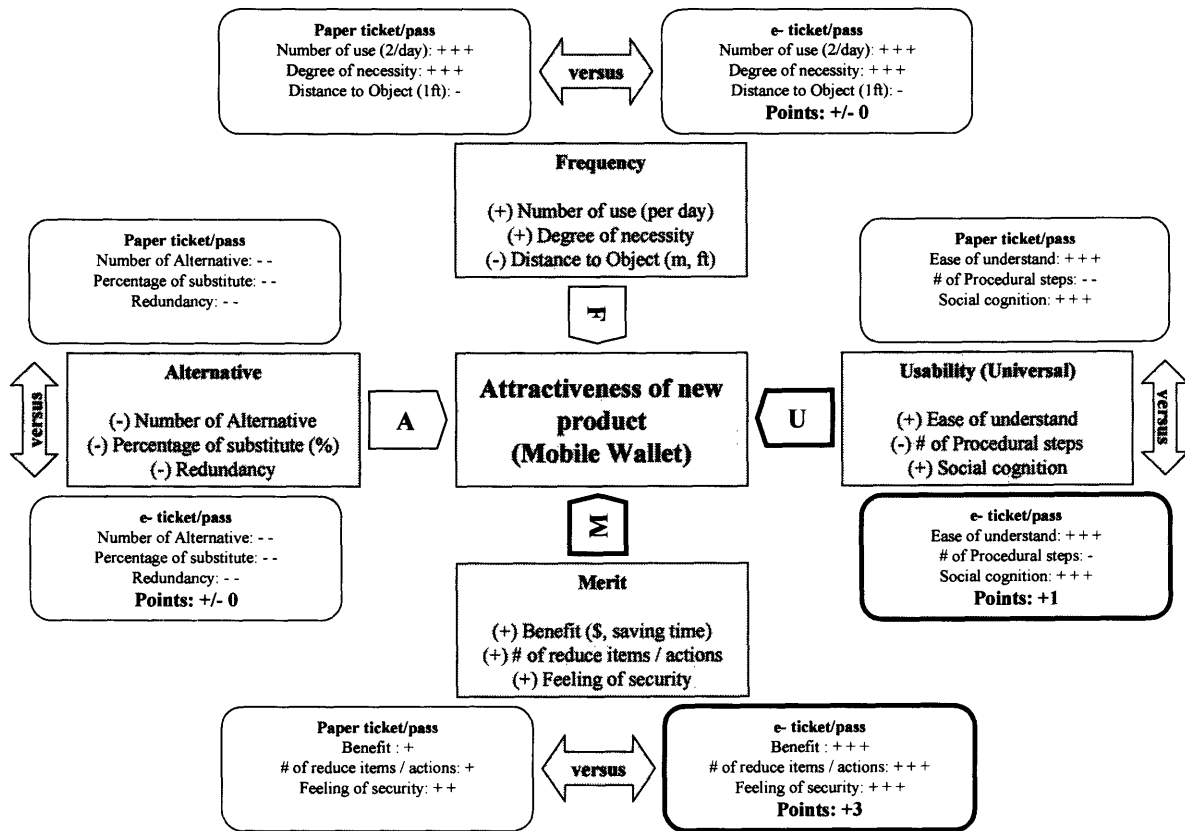
Source: Author (2005)

**Fig. 4.21 Comparing Mobile Wallet e-money with cash**

It is not necessary to consider the number of usage locations in order for railroad companies to introduce e-tickets and e-passes. If someone uses a transportation system every day, the benefits of using e-tickets to save time is high. Furthermore, reissuance of lost commuter passes, and a sense of security are additional benefits. With e-tickets/passes it is also possible to introduce frequent traveler programs for railways, buses, or taxis, like similar programs used by the airlines, which offers a new marketing opportunity to



transportation companies. Therefore, I estimate that the key to popularization is added value such as saving time by using Fast Lane and frequent flyer programs (see Figure 4.22).

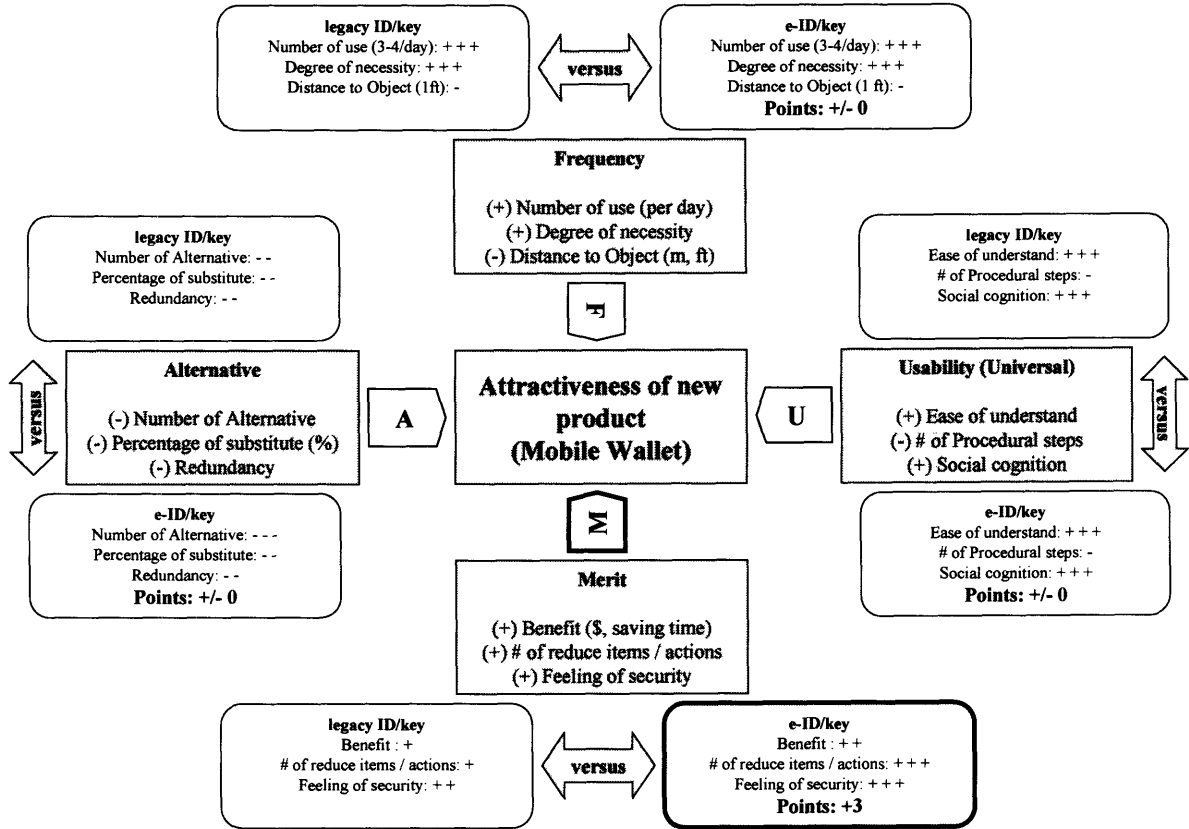


Source: Author (2005)

**Fig. 4.22 Comparing Mobile Wallet e-ticket/pass with paper ticket/pass**

With regard to electronic employee ID cards or entrance keys, these are not only simple to operation but result in improved security and reduced management costs. They is effective for reducing feelings of insecurity if the user loses them. While a physical key is easy to lend to others, a mobile phone contains so much personal information so to make it far more difficult to consider loaning one's mobile phone, so the psychological resistance is

high. Equally so, there is a large psychological hurdle if one considers lending one's mobile phone to others if it has electronic money installed. Because it is an integrated tool, the net effect is improved security (Figure 4.23).



Source: Author (2005)

**Fig. 4.23 Comparing Mobile Wallet e-ID/key with legacy ID/key**

## 4.5 Summary

I evaluated the features and benefits of i-mode FeliCa and Mobile Wallet from several viewpoints. The possibility of popularization became obvious when I applied the FAMU model analysis.

In Chapter 5 I will analyze similar types of cases in countries other than Japan, which will verify the FAMU model even further.

## CHAPTER 5

### Uses of FeliCa in Other Countries

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In Chapter 4, I analyzed the use of the i-mode FeliCa platform business in the case of four industries. Then I applied the FAMU model to determine the success factors or possibilities for expansion in the future.

In this chapter, I will verify the FAMU model by introducing a business case that uses a non-contact IC platform in countries other than Japan.

#### 5.1 Case Analysis of Each Country

A mobile payment system (Pay box) which makes real-time payments using a mobile phone was introduced in Germany, the U.K., and Sweden in 1999. But the market quickly contracted in 2003 because Deutsche Bank withdraw 50% of its investment money.

Subsequently, in February 2003, France's Orange, Spain's Telefónica Móviles, Germany's T-Mobile International, and the U.K.'s Vodafone launched the Mobile Payment Services Association (MPSA), a system used by communications carriers and banks to accelerate standardized mobile phone payments—although as of March 2005 service had not yet started.

A European mobile payment system is characterized by debit payments that use wireless short messaging service (SMS), and when paying, the transaction message

communicates by SMS. Therefore, such a system cannot be applied for uses such as tickets for transportation systems..

In east Asia and southeast Asia including Japan, contactless IC card payments using FeliCa technology became popular in 1997. It was developed as a payment system that processes many transactions efficiently in a densely populated region. I believe this systems has grown beyond “nice-to-have” and into “must-have” as it has become in Europe. FeliCa is becoming the *de facto* standard for the contactless IC card market in the Asian region. With a total of 50 million issues of FeliCa worldwide as of September 2004, 26 million (including Mobile Wallet at 2 million) are in Japan; 13.5 million in Hong Kong, and 8.5 million in Singapore.

In the following, I discuss the use of contactless IC in Hong Kong and Singapore.

### **5.1.1 Hong Kong (China)**

In Hong Kong, Octopus Cards Ltd. produced its “Octopus” card in September 1997 and it became instantly popular. Octopus Cards Ltd. is entrusted with the card issuing business for MTR, the operator of Hong Kong’s transportation system, which currently operates a railway network of 87.7 km. with 50 stations and a daily ridership of over 2.3 million passengers. The number of cards in use is 13 million or more (MTR website, 2005). This number is approximately double the total population of Hong Kong, so it is clearly an indispensable infrastructure for those who live in Hong Kong.

Cashless payment is possible at all major transportation systems except for taxis, including railway (KCR), subway (MTR), bus, streetcar, ferry, and cable car. Moreover, it can be used as electronic money in facilities other than transportation systems, such as

convenience stores, coffee shops, restaurants, vending machines, automatic photograph machines, and public telephones (see Table 5.1).

**Table 5.1 Examples of Octopus Card Use**

<b>Places used</b>	<b>Stores (convenience stores, supermarkets, fast food restaurants), public transportation (trains, buses, taxis, ferries), parking lots, vending machines, phones, copy machines, and theaters</b>
Number of participating companies	More than 253*
Number of cards issued	13 million (Hong Kong's total population is 7.3 million)
Installed base of reader/writer equipment	About 15,000 (as of June 2002)
Type of card	Non-contact IC card allows people to pass through turnstiles with the card in their wallet or purse Available as cards; also watches with FeliCa IC modules (Octopus watch)
Advantages of use	0% discount on train tickets Over-limit allowance of HK\$35 (when the required amount exceeds the remaining balance) (card can no longer be used until it is recharged)

Source: Company materials

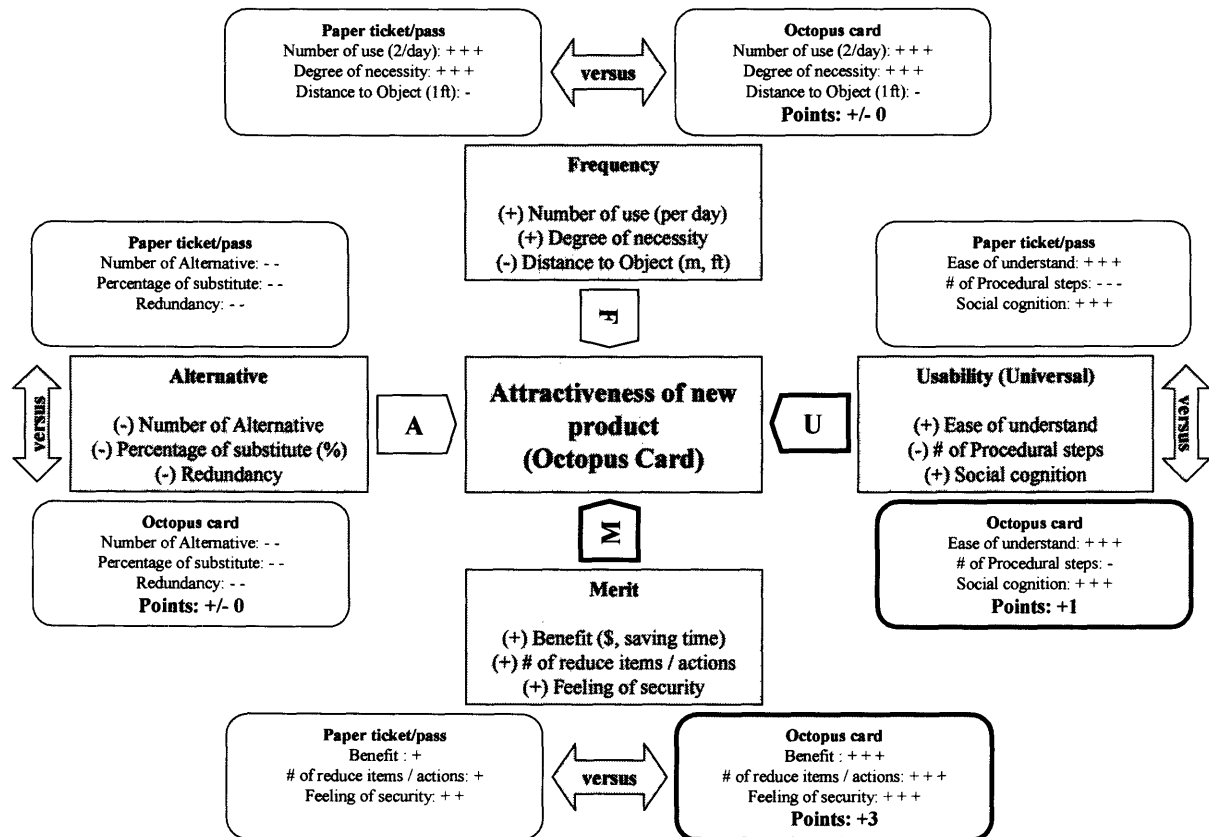
\* Figures from MTR official websites

The Octopus Card has many features and benefits:

- Passengers can conduct membership registration, check bonus points and redeem rewards in the “MTR Club,”
- Passengers can get a single journey ticket redemption coupon in the “Ride 10, Get 1 free” section.
- Because the fee structure of the transportation system is so complicated, using the Card makes it much easier to travel.
- If a passenger pays with cash and needs change, none is available, so passengers always need to have exact fare

- There is no railroad commuter pass, so the Octopus Card quickly became popular as a substitute for a ticket.
- Charging to the card can be done by charge machine or at the ticket office of the subway or railway station, convenience stores, etc.
- Balance checks can be done at special-purpose machines or at the ticket gate machine when riding a train (the display shows the ten prior entries).

In a FAMU evaluation, M (Merit) and U (Usability) are high, which satisfies the essential requirement as a payment system for a transportation system (see Figure 5.1).



Source: Author (2005)

**Fig. 5.1 FAMU evaluation of the Octopus Card**

### **5.1.2 Singapore**

In 1995, Singapore Land Transport Authority (SLTA) planned to change its charge collection system from the existing magnetic card to a contactless IC card. In Hong Kong, field trials had begun in November 1995, and commercial service started in September 1997, which accelerated the introduction of the EZ-Link card in Singapore. In 1999, Mitsubishi Corporation (Japan) accepted an order of about 5 million cards, and about 20,000 readers/writers from SLTA, and commercial service began in April 2002.

EZ-Link Pte Ltd, which SLTA founded as a subsidiary in August 2002, operating the EZ-link cards, which offer clearing and payment functions for transit and non-transit (i.e., retail and merchant) applications. There were over 6 million cards in circulation as of September 2004, and over 4 million financial transactions processed daily. The system is growing constantly with the EZ-link card moving into the non-transit payment arena as well (EZ-Link, March, 2005).

Singapore's public transportation network consists of Mass Rapid Transit (MRT) and its affiliated Light Rapid Transit (LRT) and buses. Although the management companies for MRT/LRT and the buses are separate, all the companies introduced EZ-Link at once. The traveler can use the transportation system with a single EZ-Link card that is classified into adult, student, children, and seniors. According to the card classification, the card reader calculates the charge automatically.

The EZ-link card is effective for reducing time spent in traffic. For example, if an EZ-link card is used to pay the fare, approximately 50 people can board a bus in one minute. If cash is used to pay the fare, only 12 people can board in one minute. Similarly for



MRT/LRT, if an EZ-link card is used, 40 persons can pass through the turnstile in one minute; if conventional tickets are used, only 25 persons can pass through the turnstile. For Singaporeans, who respect time efficiency, this is an important point.

Cashless payment is possible for subway (SMTR), buses (SBS Transit), and other major transportation systems. EZ-Link can be used not only for electronic money at convenience stores, coffee shops, restaurants, and government organizations, but it can also be used for public school payments. The product is currently offered on a keychain with stick-on buttons coming in the future.

In a FAMU model evaluation, M (Merit) and U (Usability) are expensive in both Singapore and Hong Kong. Furthermore, a substantial alternative method (cash) is highly inconvenient, so the evaluation for A (Alternatives) is also high.

## **5.2 Summary**

Common success factors for Hong Kong and Singapore are the following:

- Urban public transportation systems are a necessary lifeline, and a majority of the population uses them every day
- The benefits to both user and service provider are clear
- The interface is user-friendly.

The combination of necessity and merit act somewhat like the proverbial “carrot and stick.” These factors are very effective as a governmental policy, and they are suitable for opening the door onto a mega-market. But these methods only replacement the existing system and do not create new business.

JR East Japan is carrying out a field test of the compatibility of the FeliCa standard in Japan, Hong Kong, and Singapore. If a common payment system is implemented, the transportation systems of the major cities in Japan, Hong Kong's Special Administrative Region, and the major coastal cities of mainland China and Singapore would become available with only one IC card.

Moreover, a Mobile Wallet could become an international common platform as well as a contactless IC card.

In Chapter 6, I describe recommendations to NTT DoCoMo based on these scenarios.

## CHAPTER 6

### Conclusions and Recommendations

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In this chapter, I give my conclusions regarding the keys to success for the New Wireless Platform, followed by specific recommendations for the i-mode FeliCa and Mobile Wallet businesses at NTT DoCoMo.

In Chapter 5, I investigated the uses of these businesses in Singapore and Hong Kong. In both cases electronic tickets for transportation are very helpful, and the benefit for users and providers is clear. Even though electronic tickets are an essential item in Japan, a benefit such as a discount rate has not been added, and therefore the speed of generalization lags behind the other two countries. A comparison of the electronic ticket use in the three nations and the electronic ticket as an application of Mobile Wallet, is shown in Table 6.1.

**Table 6.1 Comparison of transportation e-tickets and e-ticket application of Mobile Wallet**

	Hong Kong	Singapore	Japan	
Service name	Octopus	Ez-link	Suica	Mobile Suica (Application of Mobile Wallet)
Service start year	1997	2002	2001	2006
Number of subscriber	13,000,000	8,000,000	11,000,000	N/A
Penetration	191%	184%	9%	N/A
Available applications	e-money	e-money, IDs	e-money, debit card, credit card	e-money, credit card, IDs, Keys, e-tickets, Coupons, etc.
Frequency	++	++	+++	+++
Alternatives	++	+++	+++	+++
Merit	+++	+++	++	+++
Usability	+++	+++	+++	+++

Sources: Author and company websites, as of March 2005

In Japan, Mobile Wallet was released before the electronic ticket for transportation became popular, unlike in Singapore and Hong Kong. Therefore, I estimate that it is highly likely that Mobile Wallet—which has a high score of four FAMU items, will become popular as a substitute for an IC-card type of electronic ticket.

## 6.1 Conclusions

Evaluations of customer value are always changing, and as markets grow a new product soon faces obsolescence. NTT DoCoMo succeeded in providing value by

transmitting and receiving mobile e-mails and web browsing using i-mode. Customers can play games over a mobile phone when just three years ago home video game machines were the hot item.

So, is there a change in the value chain of such technologies? The answer is no. For mail or on-line web transactions, the value comes in contracting the distance to the user and the time required to make a transaction. The benefit for a telecom carrier is the fact that contents and client distance are contracted. However, these can only be achieved through a substantial increase in traffic and a huge investment.

A new business model gives value to customers from a different standpoint. Customers want to access web content, but they also want convenience at the point where the content is downloaded. Customers want to get on a train without needing coins. Employees need to be able to enter the office even if they do not have an ID card, and they need to feel they can work safely. Unless the person who ordered the print job keeps a mobile phone at the printer, the printed output will not use the latest application. The smart card chip of the mobile phone acts to ensure security and the correct program.

Up to this point, wireless carriers have received communication charges by carrying simple communications. But a different earnings model is now being required. In the past customers were satisfied if the price was cheap and the telecom carrier's communication quality was good. In such a case, the strategic variable was price. Therefore, telecom carriers were always focused on the price trends of competitors. However, NTT DoCoMo cooperates with real business partners, and this business model shows that customer value is being provided and NTT DoCoMo can keep providing value for its client for a long time.

It is clear that customers are continuing to expect greater value from their mobile phones. The mobile phone has become virtually indispensable, so adding other functions that add value to the original product while keeping the phone lightweight and usable will induce positive feedback from customers.

In searching for the key success factor, there are various approaches. I took the approach of using the four factors identified in the FAMU model. There, the common factors in many success cases are as follows:

### **F (Frequency)**

The production includes a function that is used every day; the product is located just a short distance from the body; indeed, it is preferable that the new product is always carried by the user.

### **A (Alternative)**

The product has become a “must have” instead of “nice to have.” It is difficult or impossible to implement the product’s function by other methods or using other products. It is important that the user does not need to carry other products that have the same function (backup solutions, like a security tool, are the exception).

### **M (Merit)**

There is a concrete, clear benefit for both the supplier and the user. Especially with electronic solutions, security is guaranteed, and it is essential that the user does not have feelings of insecurity. Moreover, setup costs should be within the user’s tolerance level compared to cost and perceived benefit.

## **U (Usability)**

It is easy to understand a user's interface in the case where a user uses a new product, and the installation procedures are clear and simple. The resources of existing products (including operating procedures) can be utilized; furthermore there is social recognition or little sense of incongruity.

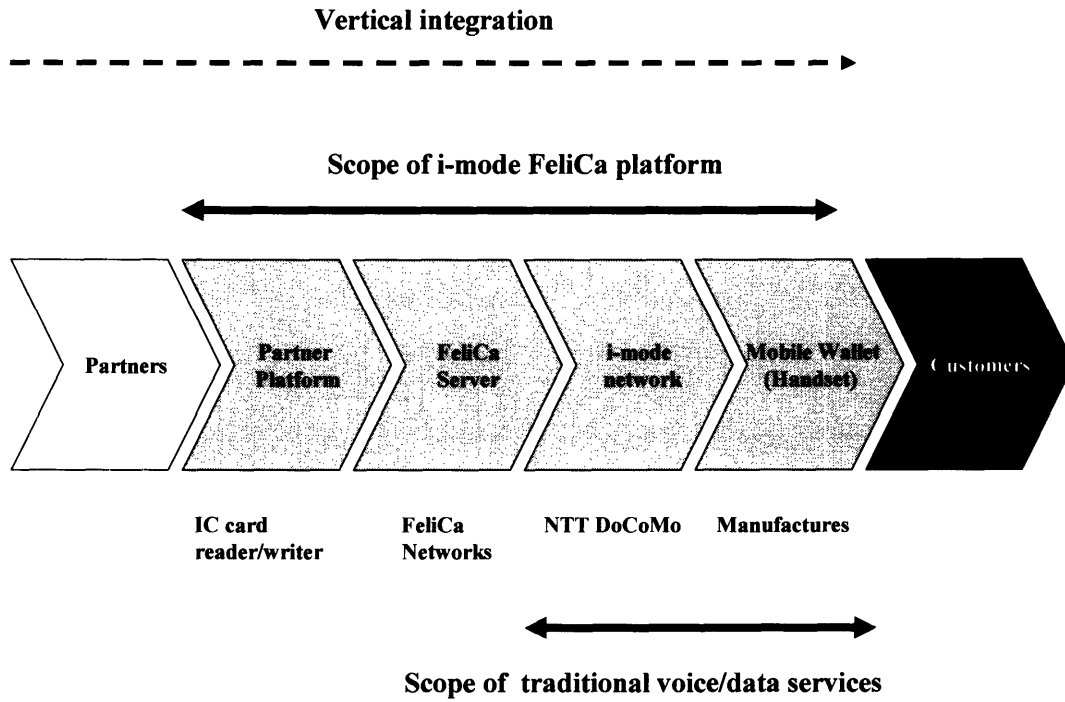
There are at least two more dominant points, and there are no disadvantages about any of the above four items as compared with a conventional product.

In addition, I believe positive feedback from the synergistic effects of increasing the number of users and having a partner have a major effect. And while the tipping point is different for every industry, the application that fulfills the four above-mentioned factors will find it easy to enact the increasing returns effect (network externality) if/when the number of users exceeds a critical mass point.

## **6.2 Recommendations for NTT DoCoMo**

NTT DoCoMo's value chain is shifting to one that is becoming increasingly complex as its i-mode FeliCa business progresses. As shown in Figure 6.1, the scope of the i-mode FeliCa business covers more than just traditional voice services.

I used Porter's Five Forces Model to analyze NTT DoCoMo's new wireless value chain. I have conclude that maintaining the simplicity of its value chain and continuing to make the best use of well-developed, win-win relationships with partners is another important requirement for NTT DoCoMo.

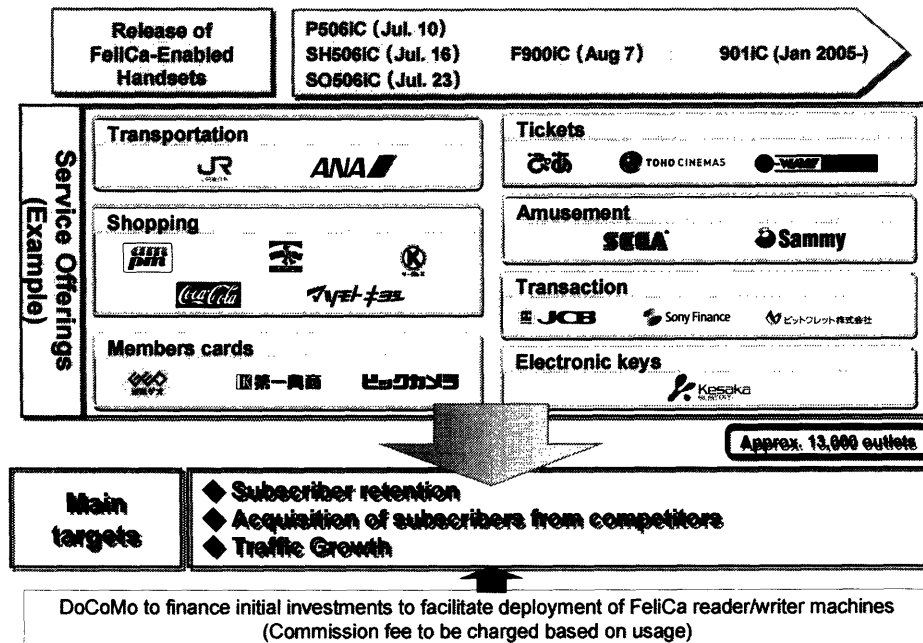


Source: Author, 2005

**Fig. 6.1 Assessment of i-mode FeliCa platform business using Porter's Five Forces Model**



As for the i-mode FeliCa platform business, it depends on whether many partners ride in the same ship in this business model (see Figure 6.2).



Source: NTT DoCoMo (2005)

**Fig. 6.2 Linking bricks-and-mortar services with i-mode FeliCa**

This is similar to the relations between software vendors in the game business and hard vendors. The key for success with i-mode is the same. There is not much risk compared to developing a new model machine because many contactless IC card business vendors already possess many client in the Japanese market. For example, a railway company like Japan Railway (JR) group can issue a commuter pass and a ticket via a customer's mobile

phone. JR passengers can purchase tickets via the network without lining up at the IC card ticket vending machine. Typically, the reduction in a supplier's cost will correspond to greater convenience for customers.

Finally, I will summarize the growth process of NTT DoCoMo in the past, and consider its future possibilities.

The first big paradigm shift is a breakaway from the business model which is dependent on communication traffic. The service content promoted by a flat-rate plan changes drastically with a wireless carrier. DoCoMo adopted a strategy that coped in a competition environment by changing to a handset that can be used even if a mobile phone is the customer's electronic wallet by building in FeliCa in the mobile phone. DoCoMo is expecting that improving the customer churn rate by using this business model will be successful. The mobile phone market has already exceeded 70% of the population index, so it is becoming more difficult to find good customers. In addition, reducing the new customer acquired cost will contribute to improving profitability.

The expansion of profitability through a license business can be expected in the future. DoCoMo and Sony established the FeliCa networks through joint capital investment which supplied the Smart card chip license to the handset vendor. The FeliCa network will establish a license grant to a competitor. Deployment to the global market will become possible by *de facto* standardization in mobile electronic commerce and authentication technology.

Will this strategy succeed as expected? I think it is clear as of 2005. Most of the mobile phones that DoCoMo sells will build in FeliCa in 2005. Customers recognize the

convenience of having many functions in their mobile phone, and they will never return to carrying many cards as they did previously.

I cannot deny the possibility that progressive new technologies will appear. But I believe that the game will be settled within two to three years. DoCoMo can increase its enterprise value fully if it can find ways to identify sources of greater profit in that short period.

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