Solving the Startup Problem in Western Mobile Internet Markets

by

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Forthcoming, Telecommunications Policy

Abstract

This paper describes the evolution of the mobile Internet in terms of three concepts: the startup problem, standard setting, and mental models. Products in which there is little or no value to the first users due to the existence of strong direct (e.g., telephone) or indirect (complementary products) network effects face a large startup problem. This paper divides the startup problem for the mobile Internet into two stages. Japanese and later other service providers solved the first startup problem with entertainment content that was supported by a micro-payment system (service providers collect and pass on content fees to content providers) and custom phones that displayed this content in a consistent manner.

Western service providers were slow to introduce micro-payment systems and entertainment content due to their initial focus on business users, which reflected their mental models. Mental models, which can also be thought of as shared beliefs or values, are typically based on historical experience as opposed to current knowledge of the environment and often prevent the development of new business models or new perceptions of foreign markets. Western service providers were slow to obtain phones that display content in a consistent manner because manufacturers were unable to agree on content and other standards in the WAP (Wireless Application Protocol) Forum and subsequently have been slow to provide service providers with custom phones.

Japanese service providers are the only ones to have solved the second startup problem with Internet mail that is modified for the small screens, slow speeds, and low processing power of phones (called “push-based Internet mail”) and non-entertainment sites that are formatted for the small screen of the phone and easily accessed via URLs

(Universal Resource Locators), which can embedded in this mail. Push-based Internet mail is similar to SMS (short message services) except that it is perfectly compatible with the Internet. Like SMS, it is automatically “pushed” to phones after it arrives on a service provider’s servers and it is restricted in size. The mail’s arrival on the phone causes the phone to beep and display an icon on the screen. Users merely click on the icon to access the mail and it is not necessary for them to open their mail clients or browsers as most people do when they access mail on their PC (personal computer).Western service providers are now moving slowly to introduce “push-based Internet mail” and promote site access via URLs in order to avoid cannibalizing their SMS revenues; this also reflects their mental models.

Acknowledgements

I would like to thank three anonymous reviewers and the editor for their many comments. The usual disclaimer applies.

1. Introduction

The variety of applications for the mobile Internet has grown and continues to grow at a much faster pace in Japan than in the rest of the world. While mail/messaging and to a lesser extent entertainment has experienced rapid growth in almost every country in the world, it is only in Japan where there has been substantial growth in more advanced applications. As shown in Tables 1, 2, and 3, mail/messaging, which is often called SMS (short message services) is a global phenomenon and the fact that the Japanese market represented less than 25% of the global market for ringing tones and games in 2004 suggests that entertainment content has become a global phenomenon[1].

Japan is the only country that has experienced substantial growth in advanced applications such as the sale of physical products and services (See Tables 2 and 4), mobile marketing, and enterprise applications in the mobile Internet. This is partly because Japanese service providers modified Internet mail for the small screens and low processing power of phones making it possible for anyone in Japan to send mail from a PC (personal computer) to a phone for free (recipients pay less than $0.01) since 1999 using what this paper calls "push-based Internet mail". Push-based Internet mail is similar to SMS except that it is perfectly compatible with the Internet. Like SMS, it is automatically "pushed" to phones after it arrives on a service provider's servers and it is restricted in size. The mail's arrival on the phone causes the phone to beep and display an icon on the screen. Users merely click on the icon to access the mail and it is not necessary for them to open their mail clients or browsers as most people do when they access mail on their PC. Anyone can send this mail from a PC to a phone and the use of embedded URLs (Universal Resource Locators) in this mail has helped create a critical

[1] The global data is from (Informa, 2005) and the Japanese data is from (ECOM, 2005).

mass of non-entertainment content that is formatted for the small screen of the mobile phone.

This mail enables Japanese firms to develop closer relations with their customers and improve communication with employees who do not spend much time in the office. For example, it is estimated that about 33% and 15% of Japanese firms have introduced systems that enable employees to access their PC mail and corporate data on their phone (without a laptop or PDA) respectively[2] while few employees do either of these on their phones outside of Japan. Just as the PC Internet has had a tremendous impact on a vast number of industries that goes well beyond the telecommunication industry, the mobile Internet is already having a similar impact in Japan and it is this impact that should be of the greatest concern to Western academics and policy makers.

Put Tables 1, 2, 3, and 4 about here

This paper describes the evolution of the mobile Internet in terms of three concepts: the startup problem, standard setting, and mental models. Products in which there is little or no value to the first users due to the existence of strong direct (e.g., telephone) or indirect (complementary products) network effects face a large startup problem (Economides and Himmelberg, 1995). This paper divides the startup problem for the mobile Internet into two stages. Japanese and Korean service providers solved the first startup problem with entertainment content (e.g., ringing tones, screen savers) that was supported by both micro-payment systems and custom phones where the latter enables the consistent display of content across phones. In the micro-payment system,

[2] Data is from 135 responses to an unpublished survey on mobile Intranet applications.

service providers collect content revenues from users via phone bills (after the users have purchased the content on the phone) and the service providers pass on about 90% of the revenues to content providers. The Japanese and Korean service providers were able to obtain phones that display content in a consistent manner because unlike Western service providers, they have always dictated phone specifications to the phone manufacturers (i.e., differences in standard setting) as part of having phones customized for their services (Funk, 2003, 2006).

Western service providers were slow to introduce micro-payment systems and entertainment content due to their initial focus on business users, which reflected their mental models. Mental models, which can also be thought of as shared beliefs or values, are typically based on historical experience as opposed to current knowledge of the environment and often prevent the development of new business models or new perceptions of foreign markets. They were slow to obtain phones that display entertainment and other content in a consistent manner because they have historically depended on general purpose phones that are not customized for service providers and the phone manufacturers were unable to agree on content and other standards in the WAP (Wireless Application Protocol) Forum. This failure to agree on standards caused some Western service providers to create their own standards and order custom phones that work with their mobile Internet services (i.e., display content in a consistent manner), beginning in late 2002, which is also when they began introducing micro-payment systems and entertainment content. Defining these standards and responding to them with custom phones requires new skills for Western service providers and manufacturers. Large manufacturers such as Nokia only began supplying these phones after their share of the market began to drop in 2003 (Economist, 2004,

2005). As for service providers, the largest ones can set these standards and obtain custom phones much easier than smaller ones and thus can use their market power to maintain high prices for SMS and retain most of the content revenues for themselves.

Furthermore, the combination of this market power and their mental models discourage the Western service providers from introducing and promoting inexpensive push-based Internet mail and easy access to general Internet sites via the input of a URL (Universal Resource Locator), which are needed to solve the second and most important startup problem. Western service providers have been slow to offer these push-based mail services because they do not believe these services will make up for lost revenues in SMS, which reflects their mental models. A key aspect of these mental models is a belief by Western firms (and even policy makers and academics) that the rapid growth in the Japanese mobile Internet is due to "cultural" factors such as low Internet usage and different methods of commuting.

These "cultural" arguments ignore the fact that Western markets have experienced equal if not larger growth rates in messaging and entertainment content. For example, the market for messaging/mail in Europe is larger than the Japanese market on a per subscriber basis (See Tables 2), which suggests there is a greater demand for mobile Internet services in Europe than in Japan. Other portable products like radios, calculators, cassette and CD players, laptops, and even phones diffused very quickly in all advanced countries in particular in those with high penetration rates of their non-portable counterparts. Many Westerners ignore such facts because the initial emphasis on cultural factors by the Western press has made it hard for them to reassess their mental models towards Japan and thus understand the importance of the mobile Internet to economic growth and the factors that support it such as push-based Internet

mail and easy access to general Internet sites via the input of a URL.

This paper first discusses key concepts like the startup problem, standard setting, and mental models followed by a historical analysis of the mobile Internet including the initial strategies of European and U.S service providers and manufacturers in WAP (Wireless Automation Protocol), the success of and reactions to i-mode's success, and barriers to expanded services in the West. The paper concludes with a summary of the reasons for the greater success of the mobile Internet in Japan and Korea and needed changes in the Western mobile Internet markets.

2. Key concepts

Products in which there is little or no value to the first users due to the existence of strong direct (e.g., telephone) or indirect (complementary products) network effects face a large startup problem (Economides and Himmelberg, 1995). There must be a sufficient number of users (critical mass) for them to obtain value from the product either in terms of direct usage (e.g., telephone) or in terms of promoting the existence of complementary products such as software and content. While the term network effect (Shapiro and Varian, 1999) is much more widely used in the economics and business literature than the terms critical mass and startup problem, some products that display network effects also require a critical mass of users to exist before the startup problem is solved (Rohlfs, 2001).

For example, firms have been unable or have struggled to solve the startup problem in the picture phone (e.g., AT&T's service in the 1970s), digital audio tape, digital compact cassette, mini-discs, high-definition and digital television (Rohlfs, 2001; Grindley, 1996), and AM stereo (Shapiro and Varian, 1999) where a critical mass of users are needed before the users can obtain value from the product (Rohlfs, 2001). A

lack of content/software and an inability to agree on standards are major reasons behind the failure to solve the startup problem in many of these products/industries (Rohlfs, 2001; Shapiro and Varian, 1999). One reason for an inability to agree on standards is an inability to form coalitions (Sirbu and Zwimpfer, 1985; Weiss and Sirbu, 1990).

Firm decisions impact on standard setting, the formation of coalitions, and other factors affecting solutions to the startup problem. Following Herb Simon's Nobel Prize Winning Research in the 1950s on the bounded rationality of managers and their use of simplified representations of the world in order to process information (Simon, 1955); the strategic management literature has emphasized the role of cognition and mental models. Researchers have concluded that these mental models, which can also be thought of as shared beliefs or values, are typically based on historical experience as opposed to current knowledge of the environment (Kiesler and Sproull, 1982) and often prevent the development of new business models (Tripsas and Gavetti, 2000) or new perceptions of foreign markets. As senior managers work together over time they often develop a set of beliefs, or dominant logic for the firm based on their shared history (Prahalad and Bettis, 1986). Research on national innovation theory suggests that this dominant logic also exists at the country or regional level (Kogut, 1992).

There are two aspects of this research on mental models that are relevant to the startup problem in the Western mobile Internet. First, perceptions about foreign markets, including the reasons for market growth, are often shaped by a country's perceived cultural affinity for a foreign one in terms of shared beliefs or values (i.e., mental models) (Johanson and Vahlne, 1977). This paper argues that foreign perceptions of the growth in the Japanese mobile Internet service were shaped by the cultural affinity of foreign companies for Japan. Second, firms often over emphasize existing users,

particularly high-end ones, and ignore low-end users that will accept lower quality in return for lower prices. For example, incumbent computer manufacturers did not introduce a mini-computer or personal computer until 10 and 6 years after the first ones were introduced respectively (Christensen, 1997), and Microsoft has never changed its emphasis from existing PC applications to new ones that have proved more successful in PDAs (personal digital assistants) (Butter and Pouge, 2002) and mobile phones. This paper argues that most Western mobile service providers initially ignored low end users such as young people and their applications including SMS, entertainment content, and push-based Internet mail and instead focused (and to some extent still focus) on high-end business users.

3. Research Methodology

Between 2000 and 2004, the author gathered data and tested and revised theories numerous times using the case study approach (Eisenhardt, 1989; Yin, 1989). The initial research focused on how Japanese service providers solved the first startup problem and the rest of the world did not. As the market for SMS began to grow and Western service providers began to offer both mobile Internet services and phones that were customized for these services in late 2002, the research focused on the remaining differences between the services in Japan and the rest of the world and the lack of growth in advanced applications like retail, shopping, and enterprise in Japan (i.e., second startup problem).

Resources included published information and interviews. Published information was found in both English and Japanese language newspapers, industry journals, home pages, consulting reports, and weekly reports from Credit Suisse's telecommunications

analysts. The English-language sources include books by the creators of NTT DoCoMo's i-mode successful services (Matsunaga, 2001, Natsuno, 2003), an early academic analysis of the WAP failure (Sigurdson, 2001), and industry reports by J.P. Morgan Securities Ltd. (2000), Dundee Securities (2000), Credit Suisse (2002, 2003, 2004), Autorite de Regulation des Telecommunications (2004), and Informa (2005). Between 2000 and 2004, the authors interviewed more than 100 participants in the Japanese mobile Internet and more than 25 outside of Japan. The research reported in this paper represents only a small part of the data collected in the Japanese interviews. The author also listened to more than 50 presentations at industrial conferences during 2000 and 2001 and investigated the most successful mobile Internet services in the U.S. (Cingular, Sprint, Verizon) and Europe (Vodafone, T-Mobile, Orange, Hutchison Telecom) in 2004 and 2005 via their English home pages and interviews with five of these service providers.

4. A Brief History of the Mobile Phone and Mobile Internet Industry

Mobile phone services were started in the US, Japan, Europe and other leading industrialized countries in the early 1980s. By the end of 1999, most industrialized countries had phone penetration rates that exceeded 30%, growth exceeded 20% a year and the rapid diffusion of the mobile phone had become a global phenomenon with more than one billion mobile phone subscribers in the world by September 2002.

The growth pattern was similar in most countries. It began with business users in their 30s and 40s and gradually expanded such that in countries with penetration rates greater than 60% most people between the ages of 15 and 65 owned phones. As implied by the penetration rates shown in Table 5, mobile phones first diffused to young people

in Scandinavia followed by Korea, the rest of Europe, Japan, and the U.S.[3]. Furthermore, efforts to create a mobile Internet were also initially driven by similar goals. Firms noticed the parallel growth in mobile phone and Internet diffusion and realized the integration of phones and the Internet was a major opportunity.

There were however, several differences between Japan, Korea and other advanced countries in terms of setting standards and phone specifications (summarized in Table 6) and the relative importance of business users. First, just as regulators began defining an open interface between phones and networks in wireline systems beginning in the early 1980s (Brock, 1981), regulators also did this in mobile services first in the U.S. and Scandinavia in the early 1980s and second in the rest of Western Europe with GSM (Global System Mobile) in the late 1980s (Funk, 2001, 2002; Fransman, 2002). As these open interfaces became more prevalent, Japanese and Korean service providers were the only ones to offer custom phones and thus retain control over the interface between mobile phones and the network particularly in the setting of phone specifications (Funk, 2003, 2006) and this was seen by many observers as a deficiency in these markets (Funk, 2002). They were able to do this partly because SIM cards are not used in Japan and Korea; SIM cards enable phones to be used with any GSM service provider (Garrard, 1998) and thus make it more difficult for GSM service providers to influence phone specifications.

Put Tables 5 and 6 about here

Second, higher levels of roaming and corporate users created a perception in the

[3] For example, according to Nokia and Ericsson, Scandinavia's higher overall penetration rate in the late 1990s was due to much higher penetration rates in people over 60 and under 20 than in other countries like Japan.

late 1990s that business users are a more important market in Europe and the U.S. than in Japan and Korea. Japan and Korea introduced national licenses and did not adopt GSM, the global standard for mobile phones. This caused roaming services, which are primarily used by business users, to emerge as a greater source of profitability in Europe and the US[4] than in Japan and Korea. Furthermore, Japanese and Korean service providers introduced much higher activation commissions than the US and European mobile phone service providers in the late 1990s. For example, the Japanese service providers were giving retail outlets more than 70,000 Yen ($580) to acquire a subscriber in the mid-1990s (Funk, 2002, 2003), levels that have never been reached in Europe or the US. These higher subsidies reduce the price of phones to users and thus enable Japanese phones to include newer and more expensive technologies then the same-priced Western phones.

4.1 WAP: European and US Approaches to the Mobile Internet (1997 – 1999)

These different standard-setting approaches and emphases on different users led to different approaches in the mobile Internet. In the West, Nokia, Motorola, and Ericsson attempted to copy the standard setting approaches used in the GSM Alliance and created the WAP forum in June 1997. There were almost 100 members by early 1999 and more than 500 by mid-2001 (Sigurdson, 2001).

The Western mobile service providers' emphasis on business users in voice made it easy for them to emphasize business users in applications and business models (e.g., transaction-based services like financial and travel services) and thus not consider

[4] In the US it was the lack of national licenses, which were available in Korea and Japan that primarily led to the high profitability of roaming services.

micro-payment services and entertainment content for consumers in their mobile Internet services[5]. Furthermore, the standard setting bodies that were created to set standards for the mobile Internet reinforced the emphasis on business users. Although the main purpose of the WAP Forum was to create the markup languages and key protocols needed to define content and transmission methods, the standards they addressed reflected their views of the appropriate applications and business models and reinforced the dominant logic of business users and services with the WAP members. For example, these standard setting bodies did not address standards for micro-payment systems, ringing tones, or screen savers.

The first WAP services were started by BT Cellnet in early 2000 and by the end of 2000 most European, Asian, and to a lesser extent US service providers had introduced WAP services and phones. However, in spite of the great buildup for these services, particularly in European newspapers and magazines, service providers were unable to create a critical mass of users and solve the startup problem (Hibberd, 2000) due to compatibility problems and the lack of a "killer application." The phone manufacturers were unable to agree on standards for displaying content on phones and instead the large ones promoted their own proprietary standards (Sigurdson, 2001). Furthermore, the ability to use GSM phones in every country, which is a major advantage in voice applications, became a disadvantage as every GSM service provider in the world faced these same problems with phones.

The lack of a "killer" application such as entertainment content also made it difficult to solve the startup problem. Given the current success of such content in all markets in the world, its availability in 2000 may have generated a critical mass of users

[5] For example, see (JP Morgan, 2000).

and solved the first startup problem. However, no Western service providers introduced a micro-payment system, which is needed to support entertainment content, until the second-half of 2002 and the lack of a critical mass of users caused support for the WAP Forum to largely disappear in 2000. Research on other products suggests that it is very difficult to recreate interest in a failed network product like the mobile Internet following an initial failure (Rohlfs, 2001; Shapiro and Varian, 1999; Grindley, 1995).

4.2 NTT DoCoMo introduces i-mode

NTT DoCoMo introduced i-mode in February 1999. It offered a semi-proprietary set of protocols including a markup language called c-HTML[6] that enabled the consistent display of text content on the phones, a micro-payment system for content providers on the official i-mode portal/menu, a method of accessing general Internet sites with the input of a URL or bookmark, inexpensive push-based Internet mail services, and packet services. In the micro-payment system, it passes on 91% of these content revenues to content providers of which 67 were initially on its official portal. Although banks initially made up the largest percentage of these official content providers, there were also several providers of entertainment content that charged between 100 and 300 Yen ($0.95 - $2.85) a month for their services (Natsuno, 2003).

These entertainment content providers and the micro-payment system played key roles in solving the first startup problem in 1999 and 2000 where a critical mass of users, phones, and services were needed (See Figure 1). Phones that could display text-based entertainment content (e.g., horoscopes) in a consistent manner were available from the beginning and ones that display screen savers and play ringing tones were available by

[6] c-HTML is a compact form of HTML, which is used to write Internet home pages.

the spring of 1999. In 1999 and 2000, about 40% of the i-mode data traffic was mail and about 60% was content of which more than 70% of the content traffic and more than 90% of the content subscriptions involved entertainment such as ringing tones, screen savers, and horoscopes (Natsuno, 2003). For example, about 20% and 8% of the early i-mode subscribers subscribed to Bandai's (screen savers) and Index's (horoscope) entertainment services respectively in early 1999 and information about this content largely spread via word of mouth (Nikkei Electronics, 2001). The success of this entertainment content also caused the total number of content providers to triple and the percentage of them that offered entertainment to rise from 9% to more than 50% between February and September 1999[7]. One of these new content providers was Giga Networks; it began offering music scores in June 1999. Although the phones included the chips and protocols needed to play these scores as ringing tones, the phones were not set up to directly download the ringing tones and thus users copied the text that represented the music scores onto paper and then re-input them via the keypad. By the end of September 1999, more than 150,000 or more than 10% of i-mode subscribers were also subscribing to Giga Network's ringing tone service (Nikkei Electronics, 2001).

This positive feedback was extended to phone manufacturers at the end of 1999 when the second generation of i-mode phones was released. The success of Giga Network's service caused manufacturers to release phones with the MIDI (Musical Instrument Digital Interface) protocol for the direct downloading of ringing tones; this protocol and annual increases in the number of chords for the protocol have made

[7] Presentation by contents manager of NTT DoComo Kansai on June 28, 2000. Kontentsu Bijensu no Tenkai (The Evolution of the Contents Business).

ringing tones the most popular type of content in every mobile Internet market in the world. The success of screen savers, horoscopes, and games caused manufacturers to introduce color displays, thus causing many content providers to release color contents.

However, it was the ability to access general Internet sites via the input of a URL, particularly in combination with push-based Internet mail that has created a second critical mass of users, solved the second stage of the startup problem, and led to the largest economic benefits to Japan. Anyone can create these sites and they must merely format them for the size of the mobile phone display. Firms and individuals who could not or did not want to be on NTT DoCoMo's official menu created their own sites. The number of these sites increased dramatically in 1999 such that by the end of that year there were more than 10 times as many general Internet sites formatted for the mobile phone as official i-mode sites (See Figure 2). Traffic to the general Internet sites also rose from one-fourth the total traffic at the end of 1999 to more than 50% by September 2000 and it continues to grow faster than that of the official sites. The adoption of c-HTML by NTT DoCoMo and later by the other service providers facilitated the creation of these general Internet sites (Natsuno, 2003).

Put Figures 1 and 2 Here

While the most popular general Internet sites offer home page creation and mail magazine services, tens of thousands of PC content providers, retail outlets, manufacturers, and service companies such as restaurants have created sites and mail services for their customers and employees. These firms send mail from their PCs to registered users or employees where the mail message contains a site link via an

embedded URL partly since it is easier for users to access information via mail and a URL than via a portal or search engine. The result is that millions of Japanese have registered for mail services that send them information on thousands of different subjects. Through the embedded URLs, these push-based Internet mail services encourage browsing thus creating positive feedback between these mail services and browsing (Natsuno, 2003; Funk, 2004).

For example, retail outlets are using the mobile Internet to send discount coupons to mobile phones, link mobile mail and POS (point of sale) databases, and in general create new relationships with customers. Sending discount coupons via electronic mail to registered users cost far less than placing them in newspapers and mobile mail enables firms to reach a different set of customers than can be reached with the PC Internet. Furthermore, the ability to carry the information into retail outlets enables retailers to integrate mobile and POS information systems and use phones as mileage/point cards via several methods including smart cards embedded in phones (Funk, 2004). NTT DoCoMo released the first such phones in mid-2004 and most firms are moving their customers from smart cards (more than 25 million in use as of late 2005 for ticket and payment applications) to phones containing these cards.

Many firms have moved aggressively to combine mobile phones with other media like magazines and television and radio programs to create new forms of mobile shopping sites and contribute towards growth in mobile shopping. Unlike the PC Internet, which requires users to sit in front of their PCs, the fact that phones can be used anywhere enables mobile shopping sites to more easily integrate their sites with these other media and thus people's daily lives. The fastest growing sites are those that send mobile mail to registered users and combine their services with magazine

advertisements and television programs (ECOM, 2004, 2005; Funk, 2004, forthcoming1).

Manufacturers and other firms are using the mobile Internet to communicate with employees while they are out of the office. Most firms use push-based mobile Internet mail to communicate with their employees and it is estimated that 33% and 15% of firms have introduced systems that enable their employees to access their PC mail and corporate data respectively on their phones. The latter is typically done in combination with push-based mail services. For example, maintenance departments send information about the next customer to workers via mobile mail that often includes URLs for accessing more detailed information; this has increased the productivity of maintenance and call center employees. Other applications that use push-based mail services to send and also request a response/input from employees include delivery, construction, temporary work agencies, and home health care (Funk, 2004, forthcoming2).

Firms are also combining these push-based mail services with other phone functions such as GPS (Global Positioning System), and bar-code readers. More than 1000 firms have introduced GPS phones to improve the productivity of more than 100,000 employees (e.g., sales, maintenance, and other workers). Construction and other workers use the camera function to record work progress and plan to use phone-based bar code readers to more effectively record the arrival of raw materials at a construction site (Funk, 2004, forthcoming2).

Advances along key technological trajectories such as application processor speeds, capacities of internal and external memory, faster network speeds, lower packet charges, and better displays are driving the growth in these sophisticated applications. Faster processing speeds enable the greater use of client-side programs (e.g., Java), 3D

rendering techniques, multi-tasking, full PC mail access like that found on RIM's Blackberry, and voice recognition thus enabling improvements in the user interface, which is the major limitation of phones. These and other improvements in electronics also enable phone manufacturers to improve the performance of TV and radio tuners, smart cards, infrared, Bluetooth, and GPS devices in these phones (Funk, 2004, 2005; forthcoming1, forthcoming 2).

4.3 The Initial Reactions to i-mode's Success

Japanese, Korean, European, U.S. and other service providers have reacted very differently to the success of i-mode. Although KDDI, the second largest service provider in Japan, introduced its own form of WAP in April 1999, growth did not occur until the success of i-mode forced KDDI to introduce packet and micro-payment services in December 1999 and April 2000 respectively. J-Phone, the third largest service provider (its name was changed to Vodafone in 2003) introduced mobile Internet services that included micro-payment services, entertainment content, push-based Internet mail, a quasi-packet system, and its own standards for displaying content[8] in December 1999. KDDI and J-Phone were able to obtain phones that displayed content consistently across different phones because they have always dictated phone specifications to their manufacturers. They have always worked with a small set of exclusive manufacturers and their phones cannot be used with the services from other service providers (Funk, 2003, 2006).

Korean service providers also moved quickly to copy most aspects of i-mode. Like

[8] Its home pages were initially written in MML, which is closer to c-HTML than the markup language used in WAP.

the Japanese service providers, they were able to dictate content display and other standards to the manufacturers since they had always done this in the Korean market. The Korean service providers also moved quickly to introduce micro-payment systems and entertainment content partly because they did not perceive large cultural differences with Japan. SK Telecom introduced these services in October 1999 and LG Telecom and KTF Telecom did so in early 2000. The traffic breakdown was very similar to that of NTT DoCoMo during the early stages of their services (SK Telecom, 2001) and data revenues rose from less than $4 per subscriber in 2000 to more than $40 (1159 Won = 1$) per subscriber in 2004 (SK Telecom, 2004). The one key difference between the Korean and Japanese services is the reliance on SMS in Korea (albeit less than 15% the price in Europe) and the lack of push-based Internet mail services and thus the lack of retail, mobile shopping, and enterprise applications.

On the other hand, few service providers outside of Japan and Korea initially attempted to copy i-mode. Many Westerners attributed the success of the Japanese mobile Internet to unique aspects of the Japanese market such as the supposedly low PC Internet usage in Japan and the greater use of public transportation in Japan than in Europe and the US[9]. And this was in spite of the success of i-mode even in rural regions of Japan where most residents commute by car. Well-respected technological commentators like Andrew Seybold (editor of Forbes/Andrew Seybold's Wireless Outlook) made similar arguments including a stinging criticism of i-mode: "i-mode is a cultural success – not a wireless success" and a prediction that PDAs (personal digital assistants) would become the dominant form of wireless access[10].

[9] For example, see (Markoff, 2000) and (Economist, 2000).

[10] For example, see a summary of his comments in: http://www.mobic.com/news/index.jsp and

This view began to change as the growth in SMS started in Europe. Although SMS was part of the early GSM standard and thus was available in all phones from the start of GSM services, growth did not accelerate until 1999 (See Figure 3) as mobile phones became popular with young people. The unexpected growth in SMS usage has paralleled the growth in mobile Internet subscribers in Japan (Compare Figures 3 and 4) and reflects the same needs of young people. The growth started first in Scandinavia, which had the highest PC Internet usage in Europe in 1999 (See Figure 5), and then spread to other European, Asian countries, and finally the U.S. The U.S. did not experience growth in SMS until the compatibility problems between GSM, CDMA, and TDMA were solved in 2002. Furthermore, the ability to charge users for individual short messages has enabled third parties to offer "premium" SMS services such as ringing tones and screen savers via partnerships with the service providers. The success of this entertainment content and the early success of SMS in countries with high PC Internet usage like Scandinavia suggests that mobile Internet usage in Japan has little do to with low PC Internet usage and commuting by trains.

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The growth in both peer-to peer and premium SMS revenues caused many Western firms to reassess the potential for the mobile Internet. The largest service providers began defining their own standards for displaying content, attaching their own brands to the phones and services that include official menus, micro-payment services, and entertainment content, and obtaining phones that are customized for their standards and

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http://www.mobic.com/oldnews/2000/08/ntt_docomo.htm

services by late 2002. Successful services include those from Vodafone, T-Mobile, Cingular Wireless, Verizon Wireless, and Sprint. For example, Vodafone introduced Vodafone Live! in late 2002 and this service had obtained more than 15 million subscribers outside of Japan (almost 30 million in total) by the end of 2004, or more than 10% of its total subscribers outside of Japan. These and other services in the UK were recording more than one billion page impressions per month at the end of 2004. Similar to Japan, entertainment dominated the content traffic again suggesting that culture has little to do with the growth in mobile Internet services in Japan.

4.4 Barriers to Expanded Services in the West

In spite of the strong growth in these branded services there are still several barriers to growth in the Western mobile Internet content markets. First, Western service providers are still learning how to set mobile Internet standards and Western manufacturers are still learning how to customize phones for the service providers. The large service providers are in some ways trying to return to the wireline days of the 1970s when they determined all the specifications in the system, had the strongest brands, and the manufacturers merely followed their orders. The manufacturers, particularly the large ones, have naturally resisted these changes. This is why Nokia did not begin offering custom phones until after its share had dropped in 2003 at the expense of Korean and Japanese manufacturers (Economist, 2005, 2004; Reinhardt and Ihlwan, 2005) who have many years of experience in providing custom phones in their domestic markets. While it is likely that a dominant design (Anderson and Tushman, 1990) will at some point in time emerge that eliminates the need for custom phones, in the meantime the diffusion of mobile Internet services will depend on how well service

providers determine standards and manufacturers provide custom phones.

Second, it is currently much easier for large than small service providers to obtain custom phones in the Western markets since manufacturers are still more likely to customize them for large than small service providers. For example, as of early 2006, more than ten relatively small GSM service providers have licensed NTT DoCoMo's i-mode service; the first one started services in mid-2002. Unfortunately, NTT DoCoMo's Japanese phones do not work outside of Japan and few phone manufacturers have been interested in supplying phones for these small service providers whose subscribers (60 million) represented less than 6% of the GSM phone market at the end of 2004 particularly when these service providers each request different phones. This is why there were only four phones available at the end of 2004 (up from two at the end of 2003) and these phones were far less sophisticated than the phones available from the other service providers in the same GSM markets.

Third, while Japanese and Korean service providers give more than 80% of the content revenues to content providers, few U.S. and European service providers give more than 50% of the revenues to content providers. Greater revenue sharing gives content providers greater incentives to develop content, which is particularly needed for non-entertainment content that currently has a smaller market than entertainment and requires constant updating. For example, Vodafone Live! had less than 10% the number of content providers on its official menu and takes three times the percent of content fees outside of Japan as inside Japan in early 2005. As some of the leading analysts (Credit Suisse, 2004) have argued: "We believe that operators must still address issues of walled gardens or open content and also how they charge for WAP access." They continue: "i-mode operators have adopted a very open approach to content, giving users

easy access to any sites. By contrast, Vodafone, Orange, and T-Mobile have a much closer control over content, allowing them to control quality but also restricting the opportunities for content providers."

Fourth, the high prices and profits from SMS have been a barrier to the implementation of push-based Internet mail and the promotion of access to general Internet sites via the input of a URL or bookmark. The average price of a short message in Europe at the end of 2003 was about 15 times the price of receiving Internet mail in Japan[11] and analysts have argued that the profit margins exceed 80% on such messages even when fixed costs are included. Messaging revenues represented more than 15% of total revenues and more than 50% in revenue growth in 2003, there were few rate reductions until 2004 (Credit Suisse, 2004), and the subsequent rate reductions are still small (as of late 2005) compared to those in Japan. The situation is slightly better in the U.S. where the rates in the U.S. were only between 5-10 times those of Japan in early 2005[12]. Although U.S. service providers have been faster to provide mail services on special devices and enable users to send an SMS to a phone from a standard PC mail client in 2002, it was not until late 2004 that some European service providers have offered the same services. These services will eventually stimulate more sophisticated applications particularly if service providers also reduce the price of SMS and promote easy access to sites via the input of a URL.

The low revenue sharing, the lack of inexpensive push-based Internet mail services,

[11] For example, NTT DoCoMo charged 1 Yen (0.008 Euros) to receive a short Internet mail message (http://www.nttdocomo.co.jp/english/p_s/charges/mova/f/imode.html) in early 2005 and it and other Japanese service providers offer free mail in some plans (http://www.vodafone.jp/english/live/mail/skymail.html). The average price of an SMS in Europe at the end of 2003 was 0.136 Euros (Credit Suisse, 2004).

[12] See the home pages for Cingular, Sprint, and Verizon Wireless.

and the lack of easy access to sites via the input of a URL or bookmark (which can be called an "open" policy) reflect the mental models of the service providers. Like the incumbent computer firms that were slow to introduce and thus have largely failed in mini-computers, PCs, and PDAs, Western service providers initially ignored push-based Internet mail services because they focused on business users and thus providing them with access to their PC mail via special devices. The unexpected growth of SMS partly filled this segment that service providers initially ignored, although push-based Internet mail would fill this segment better than SMS does. Currently they do not pursue a more "open" policy largely because they do not believe it will lead to increased profits, and they may be right. NTT DoCoMo has had lower profits than Western service providers for a long time (Credit Suisse, 2003) and it is hard to argue that large Western service providers can increase their profits by cannibalizing their SMS revenues with inexpensive push-based Internet mail services or even by allowing users to send an SMS from their PC for free.

Competition will eventually force them to do so but it will probably take many years for "open" policies to become the norm. For example, even if small service providers were to introduce a more "open" policy than large service providers, users would probably choose the superior services from the large service providers that come from better phones over the lower prices and "openness" of the smaller service providers. In this sense, the mobile Internet in Europe and the U.S. resembles that of the PC Internet in Europe and Japan in the late 1990s when a lack of competition in these markets slowed reductions in access charges (Waesche, 2002; Kogut, 2003). The greater ability of large mobile service providers to obtain custom phones reduces the amount of competition in the mobile Internet and thus the pressure on them to pursue a more open

policy.

5. Discussion

This paper has described the evolution of the mobile Internet in terms of three concepts: the startup problem, standard setting, and mental models where the startup problem is divided into two stages. Entertainment content, its consistent display across phones, and a micro-payment system supported the emergence of a critical mass of users and thus a solution to the first stage of the startup problem. The existence of inexpensive "push-based Internet mail" and of non-entertainment sites that are formatted for the small screen of the phone and easily accessed via URLs (Universal Resource Locators) in this mail solved the second startup problem.

5.1 Reactions to i-mode

We can classify the initial reactions by other Japanese, Korean, European, and U.S. service providers to the success of i-mode (See Figure 6) in terms of their ability to obtain phones that display content in a consistent manner (i.e., standard setting) and their perceived cultural affinity with Japan (i.e., mental models). Japanese and Korean service providers quickly copied the i-mode approach due to their ability to obtain custom phones and their perceived cultural affinity with the Japanese market. And they did this before they realized that consumers were willing to pay much higher prices for messaging/mail and entertainment content than NTT DoCoMo was charging.

On the other hand, it has been difficult for Western manufacturers to agree on content display and other mobile Internet standards partly since manufacturers do not want to forgo differentiation, a problem that has occurred in many new industries

(Grindley, 1995). In addition, we can say that the mobile Internet was a form of "architectural" innovation (Henderson and Clark, 1990) that required stronger coordination between the phones and network than was needed in the voice services. The greater control over the phone specifications by the Japanese and Korean service providers enabled them to more effectively provide this coordination than the Western standard setting bodies were able to do.

Put Figure 6 Here

European and U.S. service providers were also slow to copy other aspects of i-mode such as micro-payment systems and entertainment content due to a lack of cultural affinity with the Japanese markets. The Western media and firms initially attributed i-mode's success to unique market conditions thus supporting previous research where historical experience (Kiesler and Sproull, 1982) and a dominant" logic (Kogut, 1992) play key roles in the formation of mental models. The unexpected emergence of a critical mass of SMS users including successful third party services like ringing tones has led to some changes in mental models as shown by the introduction of branded services that include micro-payment systems and entertainment content. Fortunately for the Western service providers, they learned about the value of SMS and entertainment content before they set low prices for SMS and offered most of the revenues to content providers like the Japanese service providers do. The ability to maintain high SMS prices and keep most of the content revenues continues to shape their mental models. Furthermore, the fact that the Western media and academic community largely ignore these issues and continue to present the Japanese mobile Internet as a culturally-based

phenomenon reflects to some extent a continued adherence to the initial mental models.

I have also included several Asian service providers in Figure 6 in order to further demonstrate these concepts. Trains are widely used for commuting in both Japan and these countries thus suggesting that service providers from Taiwan, Singapore, Hong Kong, and China would not interpret the success of i-mode in terms of cultural factors, and thus would perceive high potential revenues from the i-mode approach. However, it has been difficult for many of them to obtain custom phones due to their small size (a recent exception is Hong Kong's Hutchison Telecom). It is predicted that local manufacturers will eventually provide many of the custom phones for the Chinese service providers as this country's economy continues to grow.

5.2 A Market Failure?

The greater ability of large service providers to obtain custom phones easier than small service providers enables them to resist introducing a more "open" policy in the form of higher revenue sharing, inexpensive push-based Internet mail services, and greater promotion of site access via the input of a URL or bookmark. Even if small service providers offer a more "open" policy, large service providers can use their advantages in obtaining custom phones to resist becoming more "open."

In some ways, the mobile Internet resembles that of the PC Internet in the late 1990s. Countries such as Germany, France, and Japan were slow to introduce competition in their telecommunication sectors and thus experienced a slower diffusion of Internet usage than in the U.S. (Waesche, 2002; Kogut, 2003). In the mobile Internet, it is the advantages that large service providers have in obtaining custom phones that reduces the competition in the market. The major difference between the PC and mobile Internet

is the need for custom devices in the mobile Internet and thus differences in standard setting between Japan, Korea, and other countries have impacted on growth rates only in the mobile Internet. The PC was a data device before the Internet started and most software standards for handling data in the network and on the PC were established long before large incumbents realized that the Internet was an important market (Kogut, 2003; Waesche, 2002).

It is possible that Western service providers will not introduce a more "open" policy until they are forced to do so by new entrants or by governments. Most accounts of the computer industry suggest that incumbents such as IBM and DEC may never have introduced PCs if new entrants had not done so (Christensen, 1997). In the mobile Internet, new licenses or new technologies like WiFi ((Lehr and McKnight, 2003) might cause changes but the investments are large and it will be hard for them to obtain phones that display content in a consistent manner.

Governments could apply the concept of universal access to mobile Internet mail, micro-payment systems, and Internet access via URLs on mobile phones just as they have applied the concept of universal access to wireline telephones (Mueller, 1997). For example, governments could require mobile service providers to provide push-based Internet mail services at reasonable prices, to promote easy access to Internet sites via URLs, and to provide greater revenue sharing with content providers. Just as easy access to Internet mail and sites on PCs has been seen as a prerequisite to economic growth since the late 1990s in most advanced countries, we have probably reached the time for countries to consider the same arguments for mobile phones.

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Table 1. Data as Percent of Revenues for Selected Service Providers

Country	Service Provider	Data as a Percent of Revenues		
		SMS/Mail	Browsing	Total
Europe	Vodafone	11.3% - 15.1%	1.5% - 2.9%	13.1% - 17.9%
Japan	NTT DoCoMo	3.6%	22.4%	25.9%
	Vodafone	7.2%	14.2%	21.4%
Korea	SK Telecom	6.1%	13.8%	20.6%
U.S.	Verizon	<5.0%	<1.0%	4.7%
	Cingular	<4.0%	<1.0%	4.1%
	Sprint PCS	<8.0%	<1.0%	8.0%

Sources: Baskerville, service provider home pages

Table 2. Mobile Internet Markets (Millions US$) in Japan and Western Europe in 2003

Category	Sub-Category	Japan		Europe	
		Total	Per Subscriber	Total	Per Subscriber
Messaging (Internet Mail or Peer-to Peer SMS) (includes packet charges)		3,997 (US$)	51.4	19.745 (US$)	61.5
Other packet charges		15,988	206	1,217	3.79
Digital Content	Entertainment content	1,755	22.6	2,000	6.23
	Other content	427	6.0	<100	<0.50
	Total content	2,182	28.6	2,000	6.23
Physical Products		1,465	18.9	<100	<0.50
Services		3,409	43.9	<100	<0.50
Total		27,041	348	22,960	71.5

Sources: Japanese Ministry of Economics and Industry, Company Documents, (Credit Suisse, 2004; Telecommunications 2003) and author's analysis. $1=110Yen

Table 3. Applications as a Percentage of Data Revenues in European Market

Application	2001	2003	2005 (est)
Peer to Peer SMS	88.0%	81.6%	55.1%
Ringing tones, screen saver SMS	2.7%	3.5%	2.6%
Other SMS	7.7%	5.3%	3.7%
Games and other Java programs		2.2%	7.2%
Other messaging (e.g., MMS)		2.2%	14.0%
WAP Browsing	1.8%	2.4%	3.1%
Internet mail		0.93%	5.0%
Other		2.0%	9.3%

Source: Credit Suisse, 2004

Table 4. Mobile Commerce in Japan (Millions US$)

Category	2004	2003
Digital contents		
Entertainment (including music and digital books)	2,082	1,755
Other digital content	464	427
Total digital content	2,546	2,182
Physical products		
Books and music (including concert tickets)	290	218
Fashion	1,140	810
Food and beverages	208	255
Other physical products	248	182
Total physical products	1,840	1,465
Services		
Financial	19	155
Real estate	25	227
Travel	57	500
Gambling and other services	3,437	2,527
Total services	4,445	3,409
Total	8,827	7,056

Sources: Japanese Ministry of Economics and Industry, Company Documents, (Credit Suisse, 2004; Telecommunications 2003) and author's analysis. $1=110Yen

Table 5. Selected Data during Initial Introduction of Mobile Internet Services

Item		Japan	Korea	Scandinavia	U.S	Europe
Phone Penetration	1999 2001	38% 53%	50% 68%	55% 76%	29% 44%	39% 79%
Digital Standard		PDC CDMA	CDMA	GSM	CDMA, TDMA, GSM	GSM
Roaming Revenues		<1%	<1%	10%	11.4%	10%
Corporate Users		10%		30% - 40%		
PC Internet Penetration (1999)		21%	27%	41%	42%	19%

Mobile phone penetration from (Mobile Communication International, 2000 - 2002), roaming revenues from (CTIA's home page: Credit Suisse, 2002) and author's interviews, and Internet penetration from (USIC, 2000).

Table 6. Technological Change and Evolution of Standard Setting Approaches

Technological Generation	Determination of Interface Between Network and Phone	Determination of Phone Specifications
Fixed Wireline	Service providers determined everything until early 1980s	
First generation mobile (analog air interface)	Open process introduced in US and Scandinavia	Phone manufacturers (only in US and Scandinavia)
Second generation mobile (digital air interface)	Open process expanded to all parts of Europe and many parts of Asia	Phone manufacturers in most of the world (except in Japan and Korea)
Third generation mobile (air interface)	Open process expanded to most parts of the world and dominated by manufacturers	Phone manufacturers in most of the world (except Japan and Korea)
Mobile Internet	In transition: failure of WAP Forum caused Western service providers to copy Japanese and Korean methods of determining phone specifications & other interface standards	

Source: Adapted from (Brock, 1981; Fransman, 2002; Funk, 2002)

Figure 1. Solutions (a) and Improvements (b) to Applications in the First (1) and Second (2) Startup Problems in the Japanese Mobile Internet

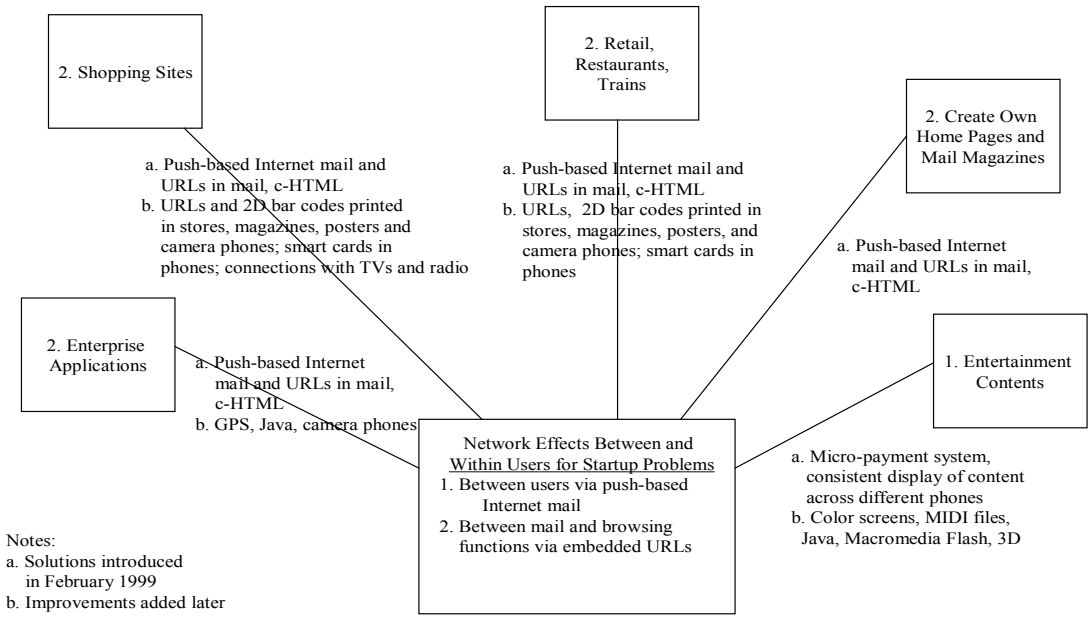
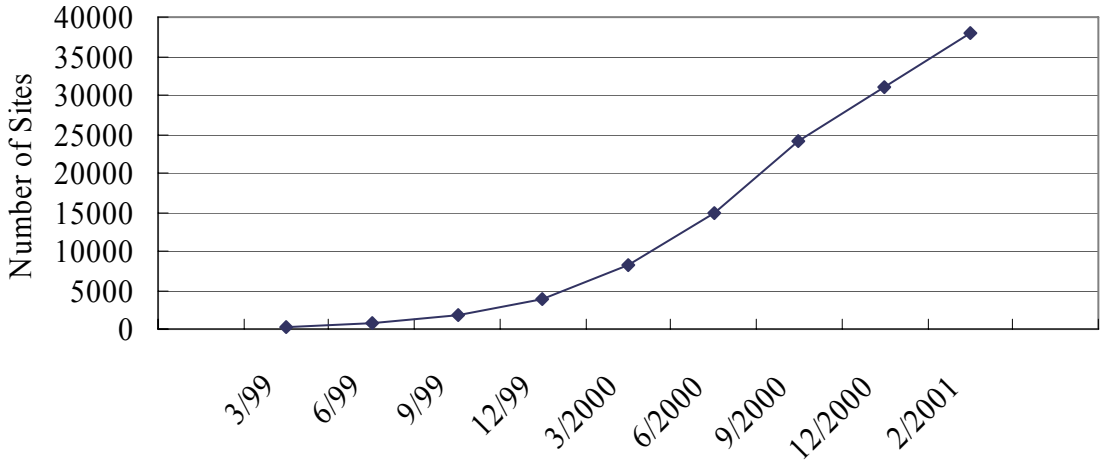


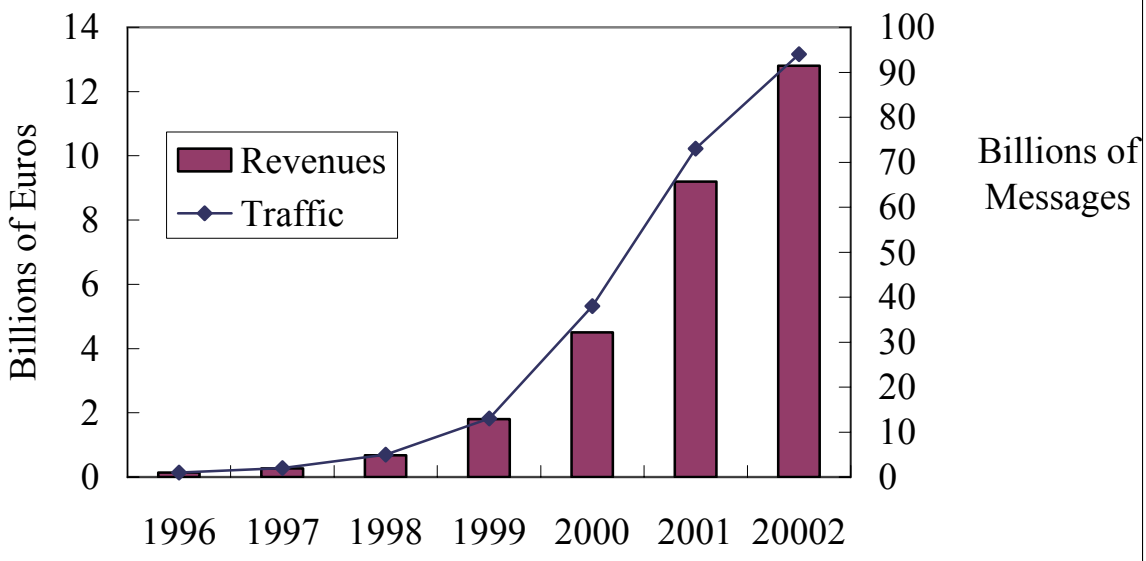
Figure 2. Number of Unofficial i-Mode Sites (1)



Source: NTT DoCoMo

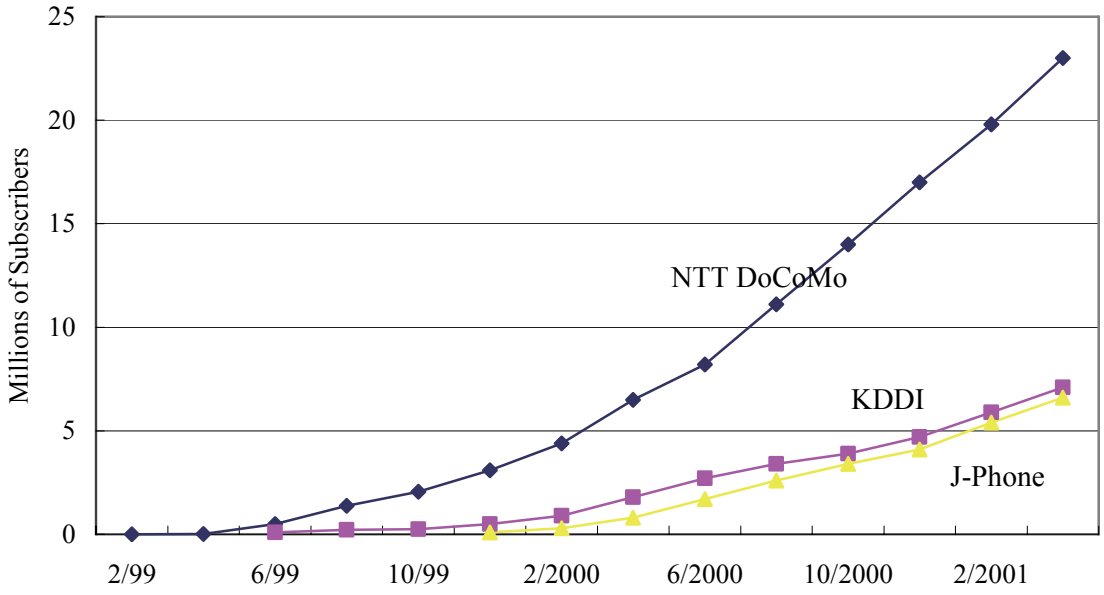
(1): the number of unoffical sites is defined by the number of sites registered on Digital Street's search engine and thus underestimates the number of sites particularly after the search engine stopped registering all sites beginning in late 2001.

Figure 3. Growth in SMS Messages and Revenues



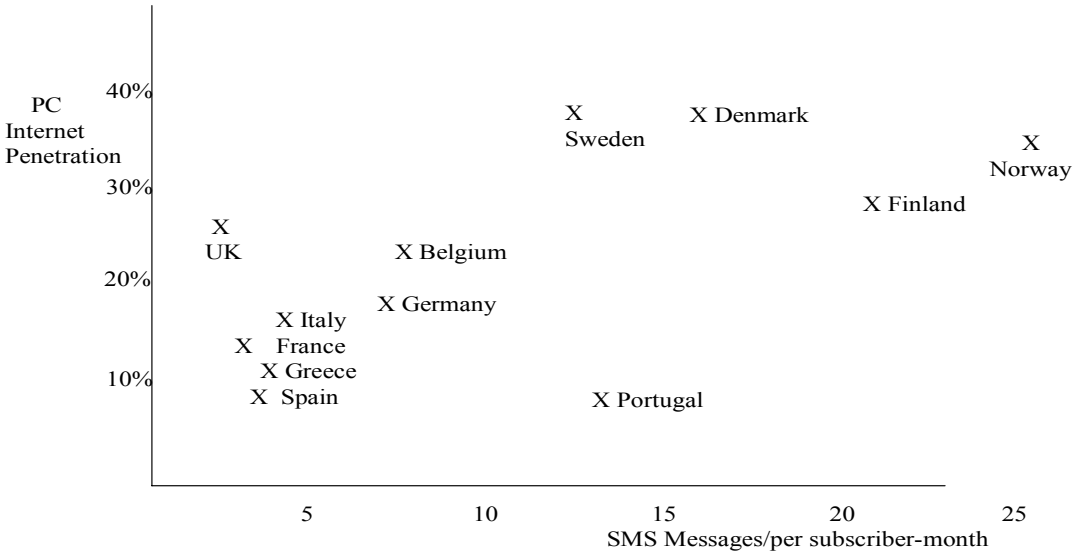
Source: (ART, 2004)

Figure 4. Number of Mobile Internet Subscribers by Service Provider



Source: Japanese service providers

Figure 5. Internet Penetration (1999) Versus SMS Usage/Mobile Subscriber (2000) in Europe



Sources: (Baskerville; USIC, 2000)

Figure 6. Costs of Providing Consistent Display of Content across Phones and Perceived Potential Revenues from Adopting the i-mode Approach