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Technological Forecasting & Social Change xx (2005) xxx–xxx

Technological Forecasting and Social Change

The future of mobile shopping: The interaction between lead users and technological trajectories in the Japanese market

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Received 7 September 2005; received in revised form 8 November 2005; accepted 10 November 2005

Abstract

This paper uses the concepts of lead users and technological trajectories and the current status of mobile shopping in Japan to forecast the future of mobile shopping. In interviews with more than 100 Japanese and foreign firms between 2000 and 2005, the author investigated the impact of a number of technological trajectories on mobile shopping applications that are suggested to be promising ones based on the behavior of lead users. Push-based Internet mail and other key services that are not yet available in Western markets were the initial drivers of the market for mobile shopping in Japan between 2001 and 2003. Currently, the fastest growing market for mobile shopping in Japan involves the integration of mobile sites with other media such as magazines and radio and television programs where these other media compensate for the small screens of mobile phones. This paper forecasts the impact of improvements along a number of technological trajectories on the integration of mobile sites with other media.

1. Introduction

Electronic commerce via a mobile phone is growing steadily around the world. As shown in Tables 1 and 2, SMS (short message services) is a global phenomenon. In fact, the European market for messaging/mail is more than twice the size of the Japanese market on a per subscriber basis, partly since the price to receive a message/mail on a phone is about 15 times higher in Europe than in Japan [1]. The

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0040-1625/$ - see front matter © 2005 Published by Elsevier Inc.
doi:10.1016/j.techfore.2005.11.007

t1.1 Table 1
t1.2 Data as percent of revenues for selected mobile service providers

t1.3 Country	Service provider	Data as a percent of revenues		
t1.4		SMS/Mail (%)	Browsing (%)	Total (%)
t1.5 Europe	Vodafone	11.3–15.1	1.5–2.9	13.1–17.9
t1.6 Japan	NTT DoCoMo	3.6	22.4	25.9
t1.7	Vodafone	7.2	14.2	21.4
t1.8 Korea	SK Telecom	6.1	13.8	20.6
t1.9 U.S.	Verizon	<5.0	<1.0	4.7
t1.10	Cingular	<4.0	<1.0	4.1
t1.11	Sprint PCS	<8.0	<1.0	8.0

t1.12 Sources: Baskerville, service provider home pages.

larger market for messaging/mail in Europe than in Japan suggests that there is little merit to "cultural" interpretations of the growth in Japan's mobile Internet, such as low PC Internet usage or heavy commuting by trains.[1] The European market for messaging, which is more commonly called SMS (short message services), has been growing steadily since the late 1990s and actually started in Scandinavian countries, which had the highest level of PC Internet usage in Europe at the time. Furthermore, the ability to charge users for individual short messages have enabled other firms to offer third-party services such as ringing tones, screen savers, games, voting, and text-to-TV via SMS, which have been growing rapidly. Evidence of the rapid growth in the Western market for ringing tones can be found in the declining representation by Japan (25%) in the global market for ringing tones and games in 2004.[2]

Another reason for the growth in the Western market for entertainment content is the ability of Western service providers such as Vodafone, T-Mobile, and Verizon Wireless to copy Japanese service providers and define phone specifications, order custom phones, and introduce branded portals, third-party content, and micro-payment systems.[3] They had to define the phone specifications for mobile Internet services and order custom phones since phone manufacturers have been unable to agree on them in standard-setting organizations such as the WAP (Wireless Application) Forum. The micro-payment payment systems facilitate revenue sharing with third party content providers and, along with the greater consistent display of content across phones,[4] they are considered a major reason for the early success of mobile Internet services in Japan [6–8].

The current difference between the Western markets and Japan is primarily in more sophisticated mobile Internet applications such as shopping for physical products, retail, and mobile Intranet/enterprise [1]. As shown in Table 3, the mobile shopping market for physical products reached US$ 1.84 billion in 2004, which represented about 8% of all on-line sales of physical products in Japan in 2004 and about 15% of them in fashion-related products. As described below, key enablers of mobile shopping and more sophisticated services in Japan are push-based Internet mail and the ability to access sites via URLs.

[1] For example, see Markoff [2] and comments by Andrew Seybold (editor of Forbes Wireless Outlook) in 2000 (http://www.mobic.com/news/index.jsp).

[2] The global data is from Informa Telecoms and Media [3] and the Japanese data is from ECOM [4,5].

[3] Mobile service providers collect content fees from customers via the telephone bill and pass on a certain percentage of these fees to content providers.

[4] Since Japanese (and also Korean) service providers have always set the phone specifications, they have been able to ensure the consistent display of content across phones. This is described in more detail in ([1]).

t2.1 Table 2
t2.2 Mobile Internet markets (millions US$) in Japan and Western Europe in 2003

t2.3 Category	Sub-category	Japan		Europe	
t2.4		Total	Per Subscriber	Total	Per Subscriber
t2.5 Messaging (Internet mail or peer-to peer SMS) (includes packet charges)		3997 (US$)	51.4	19.745 (US$)	61.5
t2.6 Other packet charges		15,988	206	1217	3.79
t2.7 Digital Content	Entertainment content	1755	22.6	2000	6.23
t2.8	Other content	427	6.0	<100	<0.50
t2.9	Total content	2182	28.6	2000	6.23
t2.10 Physical products		1465	18.9	<100	<0.50
t2.11 Services		3409	43.9	<100	<0.50
t2.12 Total		27,041	348	22,960	71.5

t2.13 Sources: [4,5,21,22], company documents, and author's analysis. $1=110 Yen.

Japanese service providers automatically push mail to phones after it arrives on their servers and the mail's arrival 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 browsers.

Western service providers do not offer push-based Internet mail for a variety of reason including differences in market segmentation/strategy and a desire to avoid cannibalizing their SMS revenues.[5] A major advantage of Internet mail over SMS is that anyone with a PC can send mail to phones and, in Japanese mobile shopping and other sites, send mail to registered users where the mail contains information about products and embedded URLs (Universal Resource Locators). Users can access more details about the products including pages for placing orders by clicking on the URLs. In addition, since the Japanese service providers offer access to web pages via URLs and bookmark functions on their top menu, it is very easy for users to access sites via URLs; in fact, there is more content traffic via URLs than via so-called official sites in Japan [8].

This paper focuses on mobile shopping applications (see Table 2) and assumes that problems restricting growth in the Western mobile Internet markets will be solved over the next few years.[6] It uses the concepts of lead users and technological trajectories, which have been applied to other mobile Internet applications [9], and the current status of mobile shopping in Japan to forecast the future of this market. Lead users often tell us about the latent needs of general users and thus how the market evolves as performance rises and prices fall [10]. Technological trajectories have been used to describe the paths of problem solving and market expansion in many industries [11,12]. Data was collected on lead users [10], the activities of the lead users, the relevant technological trajectories, and the interaction between these technological trajectories and the market [13,14] via published information and interviews. Published information was found in both English and Japanese language newspapers, industry journals, and consulting reports. Between 2000 and 2005, the authors interviewed more than 100 participants in the Japanese mobile Internet and somewhat smaller numbers of representatives from foreign companies.

For mobile shopping, interviews were conducted with service providers, mobile shopping sites, magazines, television and radio broadcasters, and phone manufacturers. By asking firms about the lead

[5] More details can be found in Funk [1].

[6] Other problems include insufficient revenue sharing and little promotion of site access via URLs. For more details, see Funk [1].

t3.1 Table 3
t3.2 Mobile commerce in Japan (millions US$)

t3.3 Category	2004	2003
t3.4 Digital contents		
t3.5 Entertainment (including music and digital books)	2082	1755
t3.6 Other digital content	464	427
t3.7 Total digital content	2546	2182
t3.8 Physical products		
t3.9 Books and music (including concert tickets)	290	218
t3.10 Fashion	1140	810
t3.11 Food and beverages	208	255
t3.12 Other physical products	248	182
t3.13 Total physical products	1840	1465
t3.14 Services		
t3.15 Financial	19	155
t3.16 Real estate	25	227
t3.17 Travel	57	500
t3.18 Gambling and other services	3437	2527
t3.19 Total services	4445	3409
t3.20 Total	8827	7056

t3.21 Sources: [4,5] and author's analysis. $1 = 110 Yen.

users, I could address a variety of different methods of mobile shopping and thus avoid the problems associated with defining lead users. This is particularly important since lead users in the mobile Internet appear to differ by shopping application. The research reported in this paper represents only a small part of the data collected in the Japanese interviews.

This paper first discusses the early applications for mobile shopping in which push-based Internet mail has played a critical role. Second, it discusses the impact of technological trajectories for network speeds and capacity, camera phones, 2D bar codes (sometimes called QR codes), RFID (radio frequency identification device) tags, application processors, internal and external memory, infrared, full browsers, Java programming, and digital phone tuners on these applications. Some trajectories, for example, those for transmission speeds and capacity and full browsers impact on all types of mobile Internet applications. The increasing transmission speeds and capacity that are available with third generation systems have caused service providers to introduce flat rate plans while full browsers enable users to more easily access sites that are designed for the screens of personal computers (PC). Other trajectories are interdependent; for example, increasing processing speeds and memory sizes enable the use of larger resolution cameras, bar code and RFID recognition software, full browsers, larger Java programs, and digital television tuners. And many of these technological trajectories impact on the integration of mobile Internet sites with other media like magazines and radio and television programs.

2. Early mobile shopping

Early mobile shopping in Japan was driven by sales in packaged music and videos and fashion, where the latter includes clothing, jewelry, cosmetics, accessories, furniture, and health-related products. The first site to achieve sales greater than $1 million a month was Tsutaya Online. Tsutaya is the largest video

and CD rental chain in Japan and Tsutaya Online is its fully owned online subsidiary. Tsutaya Online became one of the most popular sites in 2000 through its music information services and discount coupon services. By 2002, consumers were redeeming more than one million discounts coupons per month in Tsutaya stores [6].

Tsutaya Online promoted these discount coupons, music information, and later the sale of physical products in both browsing and in mail services. Millions of young people registered to receive mail on specific types of music, movies, and books where the mail contains entertainment, product and store information, and advertisements. By mid-2002, Tsutaya Online was sending about one million mail messages per day to its 2.4 million members and more than 60% of Tsutaya's mobile sales were made through these mail messages. Users found it far easier to find information about products in these mail messages than via keyword searches, which are difficult to do with the small screens and keyboards found on mobile phones. Purchases made via search engines also ranked well below purchases made of products recommended at the top of the site or in product rankings [6].

A second site that has relied heavily on mobile mail is Net Price. Partly based on its previous business as an on-line mall in the PC Internet, it began sending mail to the phones of registered users in 2001. The mail contains information about brand name products such as clothing, ladies handbags, watches, jewelry, and other accessories at a price that depends on the quantity ordered. Members are given one week to attract multiple buyers and thus obtain a larger discount; the maximum discount is typically about 30%. The use of mobile mail facilitates finding friends to make a cooperative purchase [6]. Net Price works with about 700 firms and it expected mobile shopping sales of 62 M$ and profits of about 5 M$ on these sales in the fiscal year ending in September 2005 [15].

A third site that has relied heavily on mail is called Girl's Walker. Started by a venture formed in 1999 called Xavel, this site began offering mail magazines for women in April 2000 and used viral marketing to promote the creation of the mail magazines. Every mail magazine contains a link to the place in the Girl's Walker site where people can propose new mail magazines. By mid-2002, the site was offering 17,000 types of mail magazines that are written by 1700 different writers. The writers are responsible for writing mail and getting advertising income, although most of the writers are doing it as a hobby. The site merely screens the mail magazine proposals and classifies them by genre and popularity [6].

Girl's Walker has used its strength in mail magazines to also create a successful shopping site for fashion-related products within its mail magazine portal. Advertisements for various fashion-related products are included in the mail magazines and users can access the site to purchase the product through a URL that is embedded in the mail message. Although less than 1% of the 7.5 million registered users have actually purchased products, the low cost of Internet mail has made this site profitable since 2002. It had almost the same sales and profits as Net Price in the fiscal year ending in September 2005 [16]. The success of Girl's Walker has also caused its owner, Xavel, to open a number of stores in fashionable areas of Tokyo where shoppers can access product details on their phone by inputting a URL that is printed on the physical product in the store.

Improvements along several technological trajectories are increasing these synergies between the physical and virtual worlds. Instead of requiring consumers to input the URL and search for the appropriate page on a menu, many consumers now photograph the URL or a 2D bar code with their camera phones and the URL is recognized by pattern recognition software that is in the phones. One Japanese newspaper article [15] estimated that 90% of phones sold in 2005 in Japan would contain a camera and 60% of these camera phones can read 2D bar codes. Increases in the number of pixels in the camera phones and the phone's application processor speed (both are related to Moore's Law) will

improve the performance of this technological solution. These 2D bar codes are already printed on many packaged food products[7] and in fashion magazines, posters, and maps.

The increasing placement of RFID (radio frequency identification) tags on products will also increase the synergies between physical and virtual worlds where Moore's Law is driving down the cost of these tags and their readers. It is expected that Japanese phones containing these readers will appear in the next few years and they will enable consumers to read these RFID tags with their phones and thus more easily access details about the product. And as these devices become commonplace in clothing and other products, consumers may access (perhaps even secretly) information about another person's clothing or other belongings that could include the URL for a mobile shopping site. After all, many people probably make portions of their purchasing decisions as they look at the clothing worn by other people and their belongings.

3. Cross-media integration

The fastest growing part of the mobile shopping market in Japan involves the integration of mobile sites with other media like magazines and radio and television programs. While many Internet-related books argued that the Internet would largely replace these types of media, this has not happened. Furthermore, other media help make up for the small screens and keyboards of phones and the portable nature of the phones makes it easier to use the mobile Internet than the PC Internet with these other media.

3.1. Catalogues and magazines

Catalogues and magazines provide much larger pictures than can be displayed on a mobile phone screen and more importantly they allow mobile sites to tap into established consumer behavior. Catalogues have evolved into a multi-billion dollar industry since Sears Roebuck first introduced them in the nineteenth century. Consumers have become accustomed to looking through catalogues and their providers have learned to design the catalogues in a way that facilitates searches and purchases.

Mobile Internet sales in combination with magazines probably represent an even larger market than for those in combination with catalogues. Most of the world's consumers read far more fashion and other magazines than catalogues, and thus sites that are integrated with the contents of magazines can tap into a much richer consumer behavior than those sites that are integrated with catalogues. Consumers are accustomed to searching for magazines in bookstores and searching for information in those magazines. Bookstores and magazines are designed to facilitate these searches and in particular facilitate the purchase of magazines and the viewing of and acting on advertisements.

A new business model is already emerging for magazines in Japan as some brand name advertisers expect more than just a pretty picture of their clothing, cosmetics, or accessories in a magazine. They have begun to also expect Internet sales from these advertisements and these sales are beginning to support a significant part of a magazine's income. For example, Net Price, which was described above, works with 120 magazines [18] and the total number of magazines that include links to mobile sites may exceed 1000.

[7] One newspaper article [15] estimates that 28.5% of food producers now place 2D bar codes on their products.

For example, Index, which is one of the leading providers of entertainment content in the Japanese market, acquired a publisher of youth-oriented magazines in 2002. One of these magazines features silver jewelry for men, admittedly a special market, but exactly the kind of market that is difficult to reach with either mobile browsing or the kind of mail services that are discussed above. One advantage of Index's services is that it does not have to advertise its shopping site or carry inventory. The magazine itself is the advertisement for the shopping site since the order process is described in each issue. Users can access sites by either manually inputting or photographing the URL or 2D bar code with the camera phone. The magazine also out-sources the distribution function to another company, which combines products into a single order and then contracts with a delivery company.

3.2. Radio programs

The mobile Internet is becoming an important part of the total entertainment package of radio programs in Japan. A participative environment has always been an important part of radio programs, and both the PC Internet and mobile Internet increase the level of consumer participation possible in these programs. Many Japanese radio stations have been receiving more music and concert ticket requests from mobile mail than from any other source since mid-2002 and many radio stations encourage their listeners to visit their mobile and PC sites in order to better support their sponsors. The linkages between radio programs and independent mobile shopping sites, such as those described above, are also increasing. For example, Net Price, Xavel, and Index have created alliances with radio stations and all sell products that are introduced on radio programs. For example, consider music.

Music is currently attracting the most attention. Many radio stations already offer information on their sites about the music being played on their radio programs and provide links between their sites and CD shopping sites. Although these sales are still low, radio stations have high hopes for such sales as the service providers offer music downloading services.[8] The easier move from 2G to 3G with Qualcomm's technology has enabled Japan's second largest service provider, KDDI, to expand its successful vocal ringing tone service (15- to 30-s songs) in the fall of 2004 to downloads of full CD-quality songs.[9] The first phones were able to save 28 songs (80 songs on an external memory device)[10] and these numbers will likely double every 1–2 years according to Moore's Law. Other Japanese service providers such as NTT DoCoMo and Vodafone Japan are expected to offer similar services beginning in 2005 in Japan.

Like the integration of mobile sites and magazines, new technologies are also improving the linkage between the radio programs and the mobile sites. KDDI began offering phones containing radio tuners in late 2003 and the falling cost of these radio tuners (driven by Moore's Law) will probably make them standard items in phones in the future. Improvements in batteries will increase the amount of time that radio programs can be accessed before the phones need recharging. Users with these phones can connect to the radio station's site with the push of a single button. Furthermore, infrared technologies (see below)

[8] Although these downloading services represent digital content as opposed to physical products, we use them as an example of how mobile shopping and radio programs can be integrated.

[9] About 115 million 15- to 30-s songs were downloaded between April 2004 and March 2005 and 20 million full-length songs had been downloaded by September 28, 2005. Sales of full-length songs started in December 2004 and 3.94 million handsets compatible with the full-length music service were in use as of September 28, 2005.

[10] "Chaku Uta – iPod ni taiko, 1 kyoku marugoto haishin – KDD, taio keitai hatsubai (KDDI expands its Chaku Uta music service to full songs and aims at iPod with the sale of handsets)," October 14, 2004, Nikkei Shinbun, p. 15.

in combination with slight changes in the radio broadcast (e.g., including the radio station's identification in the broadcast) may enable automatic connections between mobile sites and the radio programs even when they are received on a stand-alone radio.

3.3. Television programs

The integration of television with the mobile Internet probably represents a much larger potential market than the integration of radio with the mobile Internet. Television viewing and the television advertising market far exceed their counterparts in the radio industry. For many people, television represents their main form of home entertainment and source of information.

While subsequent sections discuss the technical issues associated with integrating mobile sites with television programs, this section (see Table 4) summarizes a number of mobile contents that could complement television programs. These contents were being implemented on an experimental basis in Japan between 2003 and 2005 and versions of them were being implemented as of late 2005. Table 4 also summarizes the potential benefits for broadcasters and content providers (service providers may also be able to take some portion of these revenues). Voting via mobile mail is popular in many Japanese programs (and also European ones through SMS). Between 20 and 30 Japanese programs including sports, news, and game shows offer voting. In some cases, the voting is done in real time while in other cases users are given more than a week to vote.

One example is a game called Owarai, which literally means laughing. The game consists of a number of comic skits and plays. Viewers can vote for their favorite comedian on the show and this information

t4.1 Table 4
t4.2 Methods of and benefits from integrating the mobile internet with television programs

t4.3 TV programs	Mobile Internet activities	Benefits for	
t4.4		TV broadcasters	Content providers
t4.5 Game shows	Voting	Improved ratings	
t4.6 Sports	Voting	Improved ratings	
t4.7	Tickets	Commissions	Increased ticket sales
t4.8	Statistics	Commissions	Information charges
t4.9 Talk shows, News	Books	Improved ratings, commissions	Increased book sales
t4.10	Site information	Improved ratings	More page views
t4.11	Voting	Improved ratings	
t4.12 Dramas	Vote on different endings	Improved ratings, increased video sales	
t4.13	Sell alternative endings or scenes	Additional revenues	
Gourmet t4.14	Restaurant info including maps	Improved ratings	New advertising channel for restaurants
t4.15	Discount coupons	Commissions	
t4.16 Ads	More information	More advertising income	More visitors to sponsor's site
All shows t4.17	Shopping for clothing, perfume, fashion	Commissions on sales or information loading fee	Additional sales and advertising channel
t4.18	Accessing ringing tones, screen savers based on program	Content sales	Content sales

t4.19 Source: Author's interviews and analysis.

is used to choose the next week's comedians. Another example is a quiz game called IQ supplement. In this show, viewers vote on whether they are convinced by the argument. The first show received more than 100,000 responses and one show received 300,000 responses. Television broadcasters, Index, Cybird, and other firms are adding the capability of voting to other programs. As shown in Table 3, these include voting in sports events, on talk shows, and in dramas.

A more sophisticated example involves the determination of a program's outcome. In a popular drama called Kamen (Masked) Rider shown by one of Japan's largest television broadcasters Asahi TV, viewers were asked to choose from two endings that had been prepared in advance by Asahi TV. Like the Lone Ranger and other classic U.S. Westerns, the viewers had to choose whether the Masked Rider would continue fighting for justice or not. The most votes received by a single ending were 540,000 ballots.

Japanese broadcasters and content developers like Index believe that some consumers will pay to download on their phones the endings or scenes that are not broadcasted in the actual program. These fees would be collected via the micro-payment services offered by the service providers. For example, Index and Gonzo Digimation Holdings offer short videos based on popular animation programs that can be used as screen savers; the users can activate them at any time or set them to be activated when a call comes in. These firms have started with popular satellite and cable television animation programs like "Peace Maker" and "Last Exile." They expect 50,000 subscribers to pay 350 Yen ($3.10) a month to access these short videos.

Japanese broadcasters and content providers are also trying to sell both digital and physical products that are related to the television programs. Currently the majority of these products are digital content such as ringing tones (e.g., theme songs for programs), screen savers, and games. Leading Japanese television broadcasters such as Asahi TV and Fuji TV are trying to strengthen the connections between the programs and the sale of this mobile content via mail messages that are sent to registered users during the programs.

Television broadcasters are also selling physical products that are related to the content of television programs. For example, Fuji TV sells character and greeting card downloads that are introduced in a children's program called Gotchappin. It sells toy buses and cars that are featured in a children's program called i-nori. Several sites are selling millions of dollars a month in perfume by including the choice of perfume by leading female entertainers. And a large percentage of the sales for Net Price, which is described above, are for items that actresses have recently worn on television programs. Manufacturers have always donated such items to television programs but the mobile Internet provides a more direct link between these donations and sales.

In the future, Japanese broadcasters and the Japanese government believe that the number and variety of these examples will increase. It is believed that, in the future, consumers will be interested in purchasing sports tickets while they watch sporting events, movie tickets while they watch movie previews, books while they watch talk shows, and clothing, perfume, and fashion while they watch a variety of different programs. It is also believed that users will be interested in acquiring discount coupons and maps for retail outlets and restaurants that are featured in programs; consumers can also use phones containing GPS (Global Positioning System) functions to find these retail outlets, restaurants, and movie theaters. By enabling more local processing of GPS data, faster processors in the phone improve the performance of these GPS functions; this is another example of Moore's Law.

Camera phones containing GPS functions also supports news programs that solicit information from the public. The diffusion of camera phones has already increased Japanese and Westerners' broadcasters' usage of photos taken by viewers and the use of GPS provides additional information for the news

programs. The location of the picture can be registered using the GPS function when the photo is taken. Users can send the picture to a news program as an attachment to a mail message. The program content of a detective/criminal show in Japan is focused on photos taken by viewers and the show is particularly interested in photos that contain the GPS coordinates.

A particularly promising market is sports data. While televised sports events frequently show individual and team statistics during the broadcasts, many sports junkies are interested in more detailed statistics and the integration of mobile sites with these broadcasts make it possible for these junkies to access this data. For example, Index acquired a company called Data Stadium that owns the rights to this data in Japan. Index has started to provide this data to users through various content sites and it has developed a special Java program, which is described below, that makes it easier for users to access data while watching television. For example, viewers can access batting averages and other batting statistics including such details as the batter's performance against specific pitchers and specific pitches (low vs. high and inside vs. outside) and the directions of the batter's home runs. For pitchers, viewers can access the frequency and outcome of different pitches (e.g., fastball, curve ball, and slider) and for specific batters.

4. Digital television phones

One way to technically integrate the mobile Internet sites and the television programs is to place a digital tuner in a phone. Japanese service providers are considering the use of ISDB-T (Integrated Service Digital Broadcasting Terrestrial), mobile satellite broadcasting, and BCMCS (Broadcast–Multicast Service) of which ISDB-T is expected to be the most widely used method. Because Japanese service providers determine the specifications for phones in Japan, they will determine to a large extent the types of digital tuners that are placed in phones.

Mobile phones with ISDB-T digital tuners will be introduced in 2006 and it is estimated that seven million of such phones will be sold in 2006 [16]. As the cost of digital tuners drop, driven by the same forces behind Moore's Law, it is expected that the digital TV tuner will become a standard feature on phones thus causing their usage to accelerate. Digital tuners are expected to add 10,000 Yen ($90.90) to the cost of the first phones with digital tuners [16].

4.1. Japanese standards

Japanese broadcasters, manufacturers, and the government created the ISDB-T standard for digital home televisions and 22 TV stations launched digital television services for home televisions in Tokyo, Osaka, and Nagoya in December 2003. 3.2 million digital televisions had been shipped by the end of February 2005[11] and it is expected that these sales will accelerate as the government-mandated end of analog broadcasting in 2010 approaches.

Due to this relatively late development of digital TV technology in Japan (at least as compared with Europe), Japanese firms also considered the use of portable televisions and digital tuners for phones as they were developing the ISDB-T standard. This standard was developed in Japan's ARIB (Association

[11] For more recent numbers, see: http://www.dibeg.org/news/news-3/news-e3.htm#dn038e.

of Radio Industries and Businesses) by broadcasters and manufacturers. ARIB allocated one channel of the allocated digital television frequency to mobile devices of which mobile phones are expected to be the major device.

The standard includes the video coding technology (AVC/H.264), the markup language, the format for sending data, and the method of changing from images to data on the mobile device screen. Due to the lack of timing information in the X-HTML standard, broadcasters modified this markup language to create BML (Broadcasting Markup Language). The data, which will be broadcast simultaneously with the images, will be sent using a format called Datacast. Users can simultaneously view both data and images on a split screen, they can determine the percentage of the display that is devoted to both, and they can choose to only view either the data or the image.

4.2. Motivations for Japanese firms

Japanese broadcasters, service providers, and phone manufacturers have different reasons for supporting the introduction of digital broadcasts that can be received by phones. Broadcasters hope to sell the content and other products that are discussed in the previous section and also increase their ratings and thus advertising revenues through greater television program viewing via a mobile phone. In particular, Japanese television broadcasters hope that young people in their late teens and 20s will increase their television viewing once they have access to the television programs through their mobile phones. They believe that young people currently watch less television than older people (see Fig. 1) only because they are in their homes less than older people.

Broadcasters are particularly interested in increasing viewing times during the day, when it is the lowest (see Fig. 2). However, it may be difficult to do this since daytime programs in Japan and most countries are aimed at house wives and in the afternoon school age children. Creating new daytime programs for teenagers and other young people in their 20s would require extensive investments and might not lead to increased TV watching by young people since many of them are in classes or working. Instead, it might be easier to increase the viewing time of these young people during the evenings when many of them are in restaurants, bars, or commuting.

Japanese broadcasters are also motivated by the increasing usage of the mobile Internet by young people (see Fig. 3). On one hand, broadcasters are worried that young people are watching less television and in particular commercials even when they are sitting in front of the television because the young people are looking at their phones. It is very popular for viewers to send mail just as a television program

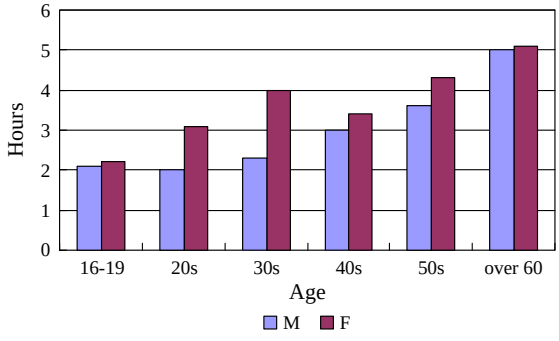

Fig. 1. Hours per day of TV watching. Source: Adapted from [20].

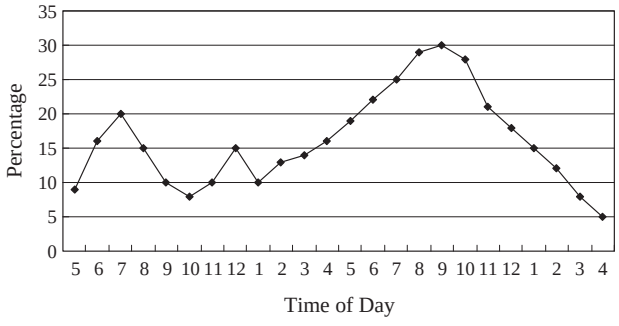

Fig. 2. Percent of homes watching television vs. time of day. Source: Adapted from [20].

is completed thus ignoring the commercials that follow the program. On the other hand, the broadcasters recognize that the high mobile Internet usage by young people represents the new revenue opportunities discussed in the last section.

For the Japanese service providers, competition to obtain and retain subscribers motivates their support for phones that contain digital tuners. Competition to obtain new and retain existing subscribers is very fierce in the Japanese market and service providers believe that some consumers will choose their service based on the availability of phones containing digital television tuners. Service providers are also interested in receiving free promotions from television broadcasters once programs are available on mobile phones. This has already happened with phones containing radio tuners and a much larger effect is expected from phones containing digital tuners. One of Tokyo's largest radio stations promotes the phone containing the radio tuner on their radio station hoping they can attract more radio listeners.

One issue for Japanese and other service providers is the extent to which they are willing to subsidize phones containing digital tuners. Although most service providers in the world subsidize the sale of phones for their services, Japanese services providers appear to subsidize them more than non-Japanese ones due partly due to their control of phone specifications and the lack of SIM (subscriber identity modules) cards in Japanese phones. Japanese service providers currently subsidize the purchase of phones, including replacement phones, at levels between 30,000 and 50,000 Yen ($290 to $480) and many of them are trying to reduce these subsidies. Making digital TV tuners a standard item on phones would probably require higher subsidies and would most certainly make it more difficult to reduce these subsidies in the near future.

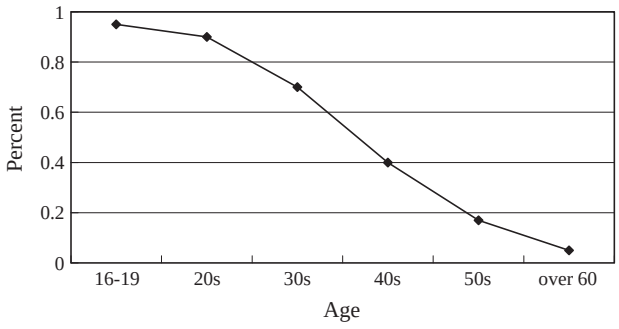

Fig. 3. Mobile Internet usage. Source: Adapted from [20].

5. Integrating the mobile internet with home televisions: technological alternatives

There are several technological alternatives for integrating the Internet with television programs. One option is to use the Internet access that is available in digital televisions. Users can access the Internet from their digital television while watching a program and they can switch the display from programs to home pages or watch both simultaneously on a split screen. As mentioned earlier, the possibility that television viewers may look at home pages instead of television programs and in particular the commercials has reduced the TV broadcaster's interest in this alternative.

On the other hand, alliances or mergers between TV broadcasters and Internet firms (e.g., service or content providers or portals) might promote this alternative. Internet service or content providers or portals could offer a payment system and contents that would complement television programs. This is one reason why Japan's leading Internet service provider, Live Door, and leading content provider, Rakuten, are currently (as of late 2005) trying to acquire television broadcasters.

A second option is to look at both television programs and home pages on the phone, which will be possible once phones containing digital tuners are available as discussed in the previous section. For broadcasters, one advantage of this approach is the availability of the micro-payment systems offered by mobile service providers and thus the possibility of additional income. On the other hand, broadcasters have some of the same concerns about content control (they want viewers to watch the commercials) and the difficulties of programming in BML with this approach as they do with television viewers accessing the Internet on a regular digital television. In addition, they are also concerned that mobile phone displays may be too small for users to simultaneously view the program and home pages.

A third option is to access the data on the phone (view home pages) while watching the program on the home television, which could be a digital or analog television (see below). This provides broadcasters with access to the micro-payment systems from the mobile service providers and it leaves the program and commercials on the television screen while the user accesses data on the phone. Although current users are expected to access the sites via menus or by inputting URLs, new technologies are being developed that will likely facilitate the integration between mobile content and television programs. Two of these approaches are discussed here. It should be emphasized that the purpose of discussing these two approaches is to illuminate some of the technological possibilities as opposed to promoting a specific firm.

Two of Japan's leading content providers, Index and Cybird, are developing and promoting similar approaches. Both approaches are written in Java and infrared technology is used to connect the phones with televisions. Phones capable of running Java programs first appeared in Japan in 2001 and all new Japanese phones have had this capability since the year 2002, albeit several versions of Java (and a similar technology called BREW[12]) co-exist in the Japanese market. Faster application processors, which are driven by Moore's Law, enable the use of more sophisticated Java programs and reduce the time to activate the programs. IrDA Control, which is used for television remote control devices, first appeared in Japanese phones in 2002 and more than 20 million or about 30% of Japanese phones contained this technology as of late 2004.

The major advantage of Index's Java-based approach, which is called Nabichan, is that it can be used with both analog and digital televisions. Television viewers can use the Java program as a TV guide and

[12] Japan's second largest service provider, KDDI also uses a technology solution from Qualcomm called BREW (Binary Run Time Environment for Wireless) that is similar to Java.

the phone as a remote control through the use of infrared technology. The Java program defines the functions of the phone buttons and displays these functions on the phone's screen.

One button enables users to switch between remote control mode and data mode. In the remote control mode, users can turn the television on and off, choose channels, adjust volumes, and control other parameters. In the data mode, only five buttons are used to select data and these buttons are highlighted on the screen via different colors. One button is used for selection and the other four buttons are used for directional movements. Since these five buttons are located on the lower half of the keypad, changing to data mode causes a menu for the program being watched to be displayed on the upper half of the phone's screen. Thus, the user can simultaneously see both the menu and the functions for the four keys when they first enter the data mode. Additional accesses in the data mode cause the entire screen to display data.

The TV broadcasters control the information that can be accessed in the Nabichan Java program. Although users can still access mobile Internet mail and contents through normal procedures (e.g., the service provider's menu), when they are using Nabichan, they can only access content that is provided by the TV broadcaster. This provides the TV broadcaster with a significant amount of control over what the user views. For example, TV broadcasters can make it difficult to access content during commercials, unless the content is related to the sponsor of the commercial.

Cybird has developed a system called One Push, which is summarized in Fig. 4. Users can push a designated button on their mobile phone when they see a One Push symbol (e.g., within a commercial as shown in Fig. 3) on the TV screen in order to obtain specific information. This causes the relevant URL for a mobile website to be sent from the TV via the Internet (digital televisions contain this connection) to the user's pre-registered email address. Two barriers to the use of One Push are that users must pre-register their mobile or PC mail address and they must own a digital television.

The major advantages of One Push over Nabichan include user stimulation with the One Push symbol and fewer timing problems. While Nabichan relies on the user to look for content on the mobile phone, the One Push symbol reminds users of the information they can access via their mobile phones. Broadcasters can determine those points in the television program when they want to stimulate user accesses to the Internet.

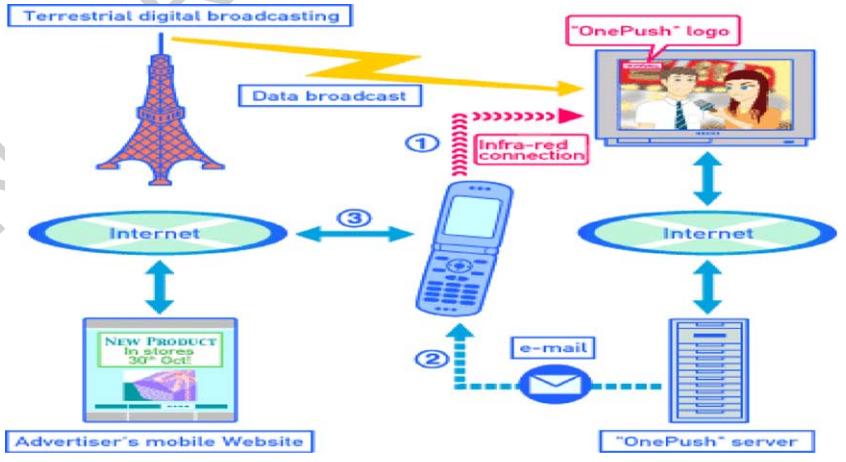

Fig. 4. One Push system diagram (showing use with a TV commercial). Source: Cybird's homepage.

6. Discussion

This paper uses the concepts of lead users and technological trajectories and the current status of mobile shopping in Japan to forecast the future of mobile shopping. Push-based Internet mail and access to URLs in this mail, which are still not widely available in Western markets, were the initial drivers of the market for mobile shopping in Japan between 2001 and 2003. An analysis of these successful services and the lead users for them suggest that the integration of mobile sites with other media is a major driver of mobile shopping. For example, a growing fraction of Net Price's, Xavel, and Index's sales are for products that are introduced in television programs and magazines respectively. Furthermore, Xavel has used the success of mobile shopping to open stores and begin connecting the virtual and physical worlds with 2D bar codes and phones that read these 2D bar codes with cameras and bar code recognition software.

This suggests that, as opposed to replacing other media as some argued in the late 1990s the PC Internet would do, the mobile Internet will likely draw on the advantages of these media and the established consumer behavior in them. Integrating mobile sites with magazines and radio and television programs enables the mobile sites to draw on existing consumer search processes in other media. The potential integration of mobile Internet sites with other media also suggests that we can expect increasing numbers of mergers and alliances between firms from the mobile Internet and other media. For example, Japan's largest mobile Internet content provider, Index, has already acquired magazines and television content developers and has made alliances with television and radio broadcasters. Cybird has also made alliances with television broadcasters, Net Price has done so with magazines and radio stations, and Xavel has done so with television broadcasters and fashion shows and begun creating its own chain of fashion stores.

This paper also identified the technological trajectories that are impacting on the integration of mobile sites with other media such as magazines and radio and TV broadcasting. Improvements in the number of pixels in camera phones and speeds of application processors are driving the integration of mobile Internet sites and print media such as magazines and catalogues. Improvements in batteries, radio tuners, and infrared technology are driving the integration of mobile Internet sites and radio programs. Improvements in digital tuners, infrared, and Java programs are driving the integration of mobile Internet sites with television programs. It will be interesting to see whether the consideration of these technological trajectories, in combination with the concept of lead users, can improve the accuracy of forecasts.

Some people may find this paper's conclusions about the mobile Internet surprising since the U.S. media has emphasized the low PC Internet use in Japan as a reason for the fast growth of the mobile Internet in Japan. However, a look at other products that have both fixed and mobile counterparts suggests that this paper's conclusions are not surprising. Fixed and mobile products co-exist in radios, PCs (both laptops and PDAs), entertainment players, game players, and even phones. The experience of these products and the current popularity of SMS in countries with high PC Internet usage suggest that many Westerns will purchase products on their mobile phone once the proper services are introduced. Thus, the trends seen in Japan are likely to occur in Western countries as these countries introduce push-based Internet mail services, promote Internet access via URLs, and introduce other key enablers of the mobile Internet.

Furthermore, the idea that new media such as the mobile Internet end up complementing in addition to or rather than replacing existing media should also not be surprising. Radios did not eliminate music

players or newspapers, televisions did not eliminate radios, and the Internet has also not eliminated these other media. Instead, these media interact in a complex and interesting way that academics from many fields continue to study. The mobile Internet, in particular mobile shopping, appears to be headed in a similar direction and, hopefully, this paper will stimulate further research on it.

7. Uncited references

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