

Adoption of the Internet and WAP-enabled phones in Singapore

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Abstract. The Internet, and more recently mobile phones have seen tremendous growth over the past few years. This paper examines the adoption of the Internet and WAP-enabled mobile phones in Singapore. Specifically, we compare users of WAP-enabled mobile phones and non-WAP-enabled mobile phones in terms of profile of Internet users, Internet activities and issues relating to WAP-enabled mobile phones. The results indicate that short messaging system (SMS) and caller ID are popular functions for mobile phone users. Respondent also use the mobile phone for buying cinema/concert tickets and accessing personalised news. These results provide researchers and practitioners with some insights on the adoption of the Internet and WAP-enabled mobile phones. For researchers, such insights would be useful in understanding the adoption phenomenon, while for practitioners, such insights would provide some basis for adopting certain policies to promote adoption.

1. Introduction

The number of Internet users has grown exponentially over the past few years, increasing from 40 million in 1995 to 580 million in 2002. Similarly, global mobile phone penetration increased from 91 million in 1995 to 1.16 billion in 2002 (ITU, 2003). Wireless Application Protocol (WAP) for mobile phones is perhaps one of the few technologies that come close to emulating the success of the Internet. Backed by the entire telecommunication industry (through the WAP forum), coupled with the fact that it combines two of the hottest innovations—mobile phone and the Internet (Mackenzie and O’Loughlin 2000), WAP is poised to succeed the Internet as the next big thing. The initial launch of WAP-enabled mobile phones (the early flag bearer of WAP), however, failed to capture the enthusiasm of consumers despite overwhelming coverage given to it by the media. From the initial hype, to hope and finally

disappointment, consumers have been taken on a roller coaster ride of emotions (Siew 2001, WAPworks 2000). WAP has arrived at a stage where its future remains uncertain.

Despite the hype generated by WAP, i-mode, the wireless technology pioneered by NTT Docomo, is thus far the only true demonstration of the potential of mobile Internet. With more than 40 million subscribers, i-mode is a showcase to the world on the many wonderful opportunities that exists within the wireless industry (Ratliff 2002). i-mode’s success has not just fuelled the expectations of industry players but also that of consumers. Together with the constant barrage of advertisements from WAP content providers and telecommunication service providers, the expectation of WAP has reached a dizzying height. Consumers have come to a conclusion that they can receive HTML-styled web pages on their mobile devices. Moreover, consumers are now expecting graphics, colour and even video on their mobile handsets (Mackenzie and O’Loughlin 2000). The great hype has turned into great hope for consumers so much so that it has now reached a stage of relative oversell (WAPworkz 2000).

As a result, early adopters of WAP-enabled devices (mainly mobile phones) experience cognitive dissonance which fuels the market with criticism on the new wireless protocol. Worse still, telecommunication service providers have wrongfully associated WAP with the Global Systems for Mobile Communications (GSM) network in their marketing campaign. Thus, early adopters of WAP-enabled devices have blamed WAP for its slow mobile Internet access speed, further tarnishing the image of WAP. With the announcement of General Packet Radio Service (GPRS) and 3rd Generation (3G) networks arrival in the near future, potential adopters

have adopted a wait-and-see attitude in the adoption of WAP-enabled devices in the near term.

1.1. *WAP—The Case of Singapore*

Singapore, compared to most countries in the region, has what it takes to succeed in mobile Internet. With a mobile phone penetration rate of 79.1% and an Internet penetration rate of 48.4% in February 2003 (IDA 2003), Singaporeans, undoubtedly, should face fewer inhibitions towards adopting mobile Internet using a WAP-enabled mobile phone. The high penetration rates, coupled with the deregulation of the telecommunication industry (which lowers the cost of wireless devices), have given the mobile wireless landscape a new lease of life. Singapore is therefore an ideal launch pad for mobile Internet.

In August 1999, MobileOne (M1) launched Singapore's first WAP offerings, the Mi World. This is followed shortly by Singtel (e-ideas in January 2000) and StarHub (iPower in April 2000). Thus far, the response to WAP-enabled mobile phone has been lukewarm at best. The failure of WAP-enabled mobile phones in the initial stage has taught early adopters a lesson about jumping onto the mobile Internet bandwagon and expecting the world to be at their fingertips.

Consumers' perception of WAP-enabled mobile phone is very much shaped by the media. And this perception has gone through a roller-coaster ride: from the initial hype, to hope and finally, disappointment with the reality. Beyond the hype, hope and disappointment, it is interesting to examine the adoption of the Internet and issues relating to the adoption of WAP-enabled mobile phones among WAP-enabled and non-WAP-enabled phone users. The results should be useful to both researchers and practitioners in understanding the adoption of the Internet and WAP-enabled mobile phones in Singapore.

2. Method

2.1. *Instrument*

An online questionnaire was used to gather data for this study. The instrument was derived from an extensive review of published materials in academic and practitioner journals and periodicals pertaining to the Internet and WAP adoption. Specifically, we collected data on the following:

- demographic profile of respondents;
- information technology (IT) devices ownership;
- Internet usage pattern;

- Internet activities;
- mobile usage pattern;
- perception of WAP services; and
- other WAP-related issues (e.g., mobile advertising, cost of WAP services).

2.2. *Data collection procedures*

The URL for the survey website was promoted via advertisements in newsgroups, personalised emails to Internet subscribers and posting in technology-related electronic forums. Before actual administration, pretesting with Internet users were carried out and the survey modified accordingly to improve clarity and ease of understanding, 1012 usable responses were received.

3. Results

3.1. *Demographic profile of respondents*

The demographic profile indicates that respondents were predominantly young people from the age group of 20–29 years (89%). This is higher than 64.1% reported by Teo and Tan (2000). In addition, respondents were mainly Chinese (93.0%). Also, male is the dominant gender group (73.0%) while females comprise only 27.0% of respondents. This figure is comparable to the 26% reported by www.research (1998). Moreover, respondents with at least a junior college certificate or polytechnic diploma comprise 81.2% of the respondents. Majority of the respondents are either students (45.0%) or working professionals (39.9%). Respondents may be relatively new in the workforce given that majority of them have monthly income of less than S\$3000 dollars (52.6%) This figure is higher than the 33% reported by www.research (1998).

3.2. *IT devices ownership*

This section examines the IT devices ownership in Singapore. The findings show that both mobile phone and personal computer (PC) receive relatively high penetration rate among the respondents (around 89%, figure 1).

Both figures reported are higher than the national average of 79.1% and 48.4% for mobile phones and the Internet (IDA 2003) respectively. The high penetration rate of both mobile phone and personal computer makes the respondents ideal targets for this study. The rationale is as such: with the arrival of WAP-enabled mobile phone, those most poised to adopt the new

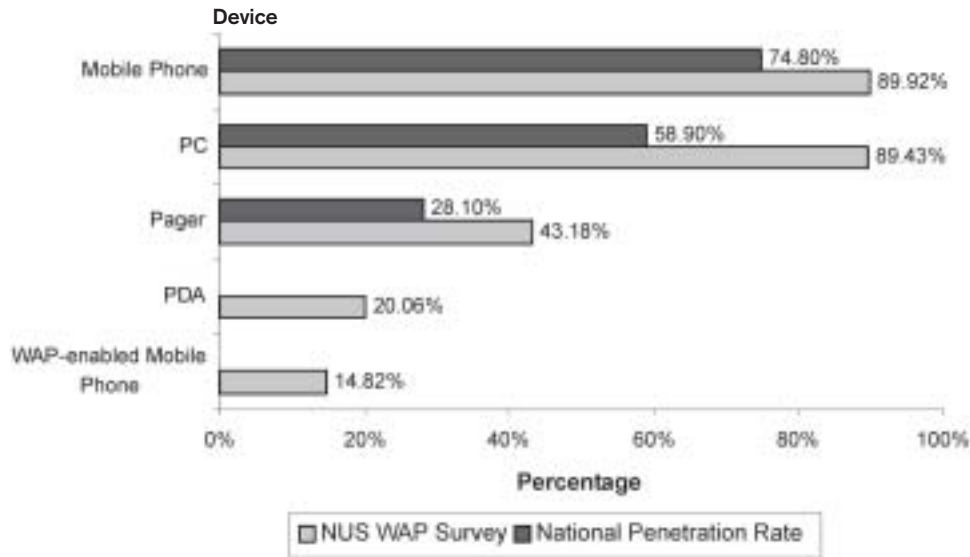


Figure 1. IT device ownership.

technology would be those that have prior experience in surfing the Internet and who also currently hold a mobile phone.

The pager penetration rate is exceptionally high given that the national average is only 28.1% while the penetration rate among the respondents is 43.2%. Such phenomenon is baffling given that with the arrival of the mobile phone, pagers should be obsolete. One possible explanation could be that pagers compliments mobile phones in that it gives users the option to return call (using their mobile phones) only when they deem necessary. In doing so, mobile phone users can save money from calls that are unnecessary as well as mitigate inconvenience in answering calls when busy.

Note that while about 90% of respondents have mobile phones, only 14.8% have WAP-enabled phones. We will next compare these two groups of respondents in terms of usage patterns and other issues.

3.3. Internet usage pattern

Figure 2 shows the location of Internet usage. Respondents usually access the Internet from home. This is not surprising given the high PC penetration rate among the respondents. The office is the second most popular choice among respondents. Once again, this information conforms to normal expectation and is consistent with Teo *et al.* (1997) findings. For full-time workers who spend most of their time in an office, accessing the Internet from the office sounds logical. Despite efforts by various organizations to bring Internet access to the general population in public places such as libraries, these locations are least

favoured among the respondents. This information, however, cannot be used as a counter-argument against the effectiveness of public terminals as it may be the result of the high PC ownership among respondents.

The majority of the respondents are frequent users of the Internet. On average, only 1% of respondents surf the Internet for less than 1 h per week.

3.4. Internet activities

In this section, respondents were asked to indicate the extent to which they have performed the following Internet activities (figure 3). Of the following five activities, using the Internet as a medium for communication emerged as the most popular activity. This is followed in descending order of popularity by accessing online news, cybershopping, accessing stock prices, and accessing calendaring services. The findings are consistent with the results obtained by IDA (2000) and Teo *et al.* (1997) which found that the use of email for communication is prevalent among Internet users. As expected, WAP-phone users are more likely to use the mobile phones for activities other than communication.

3.5. Mobile usage pattern

Of the various features offered to a mobile phone user, Caller ID and Short Message Service (SMS) are more popular (figure 4) than Call Waiting and Call Diverting. This is perhaps not surprising since caller ID is used to screen calls and SMS service is used for

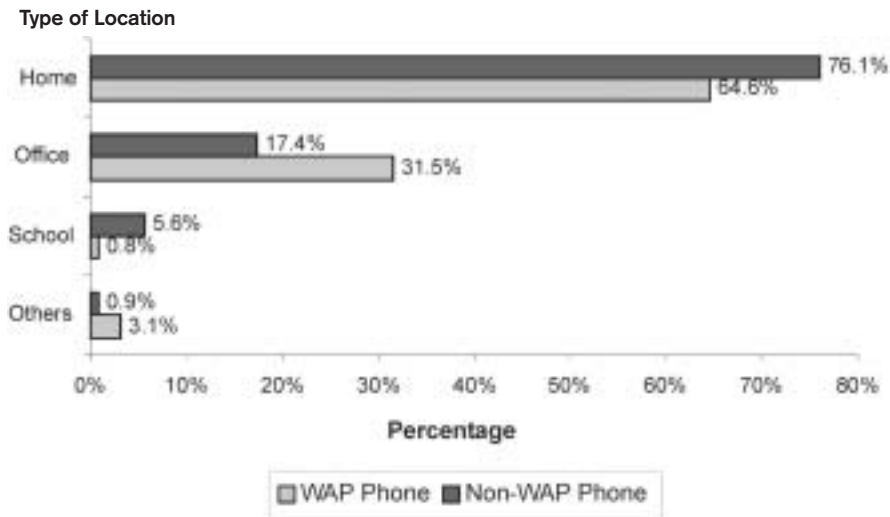


Figure 2. Internet access location.

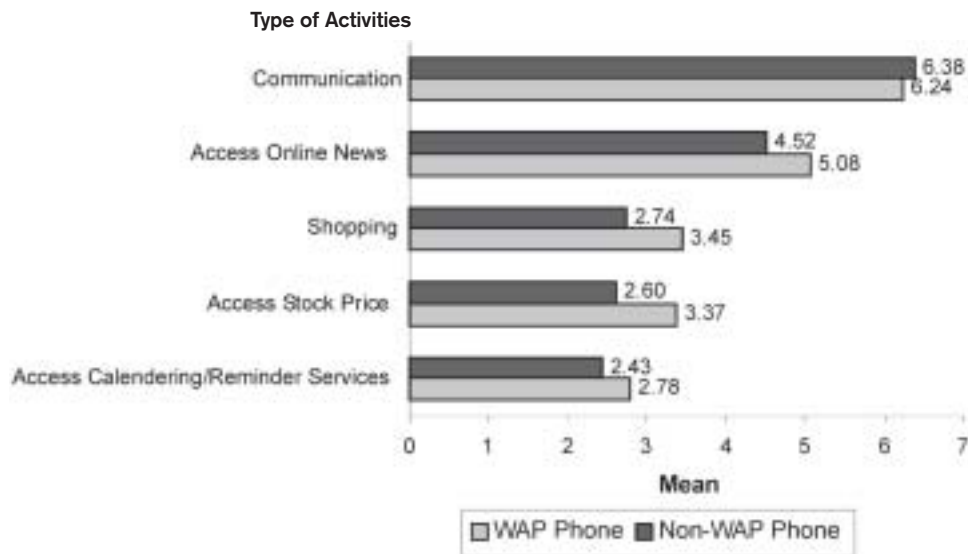


Figure 3. Internet activities.

instant text messaging without the need to call. In contrast, call waiting and call diverting are more specialised services that cater to certain groups of people. Note that WAP-phone users are more likely to use the various features available compared to non-WAP phone users.

Respondent's monthly phone usage and respondents' monthly SMS usage are shown in figures 5 and 6 respectively. WAP phone users tend to have higher mobile phone usage than non-WAP phone users. The distribution of SMS usage tends to be fairly evenly distributed from < 50 per month to greater than 300 per month.

3.6. Perception of WAP services

This section solicits respondents' views on WAP services (figure 7). Respondents were asked to indicate (on a scale of 1–7) the extent to which they will like to access various services. The results show that respondents expressed significant interests as evident by the high mean scores over the following WAP services: buying concert/cinema tickets online, receiving appointment reminders, personalised news, personalised traffic updates based on user's preferred commuting route and global news update.

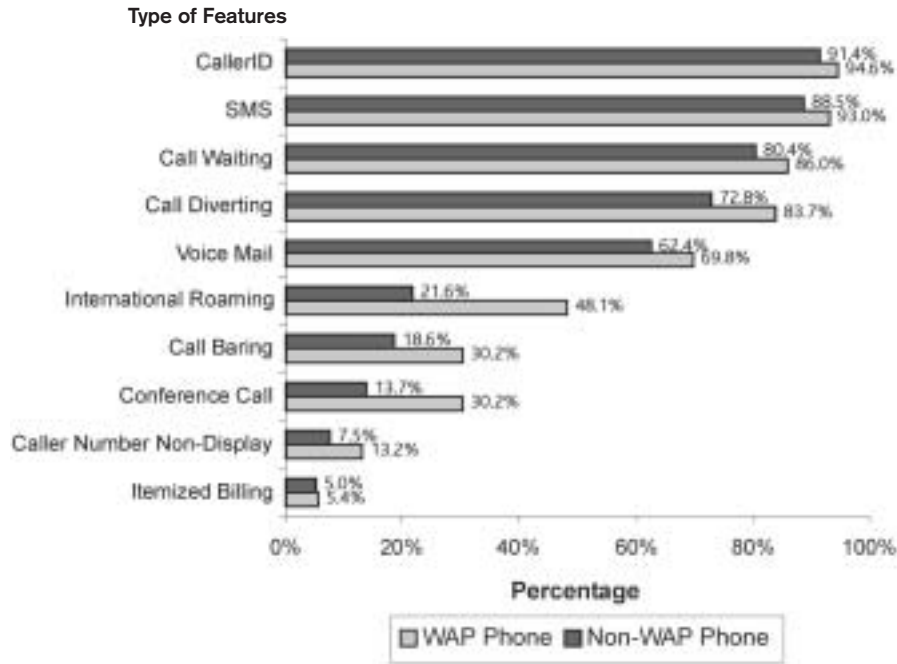


Figure 4. Popular mobile phone features.

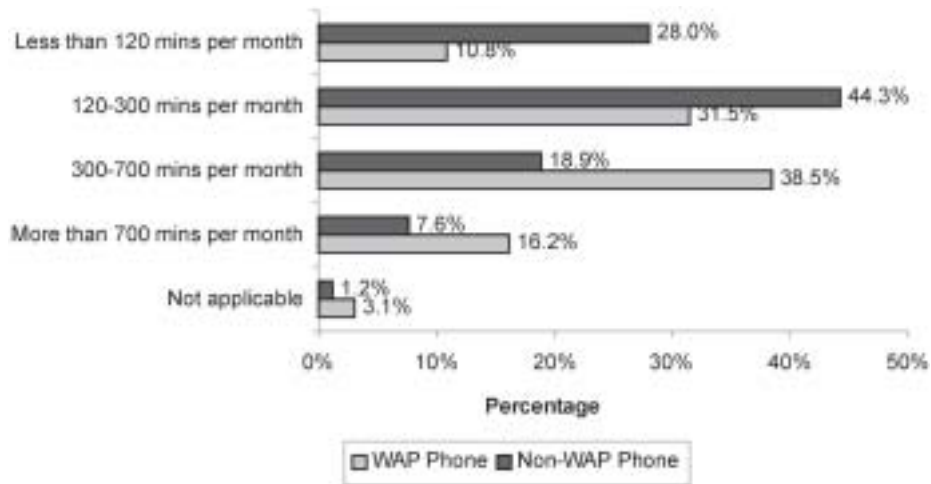


Figure 5. Mobile usage.

Findings in the previous section on Internet activities have shown that respondents are less enthusiastic in shopping online using a fixed terminal such as PC. In contrast, respondents expressed their willingness to buy concert/cinema tickets using a WAP-enabled mobile phone. One possible explanation could be that the decision to watch a movie may often be made on an impromptu basis where fixed terminals such as PC may not be readily accessible. Thus, the ability to order tickets anywhere, anyplace and anytime through a

WAP-enabled mobile phone makes it the ideal device for such transactions.

Likewise, accessing appointment reminders online through a fixed terminal such as PC does not generate as much interest as compared to performing the same activity using a WAP-enabled mobile phone. Since the likelihood of sharing a WAP-enabled mobile phone is low compared to a fixed terminal such as PC, respondents may feel that using it to retrieve personal information is more convenient.

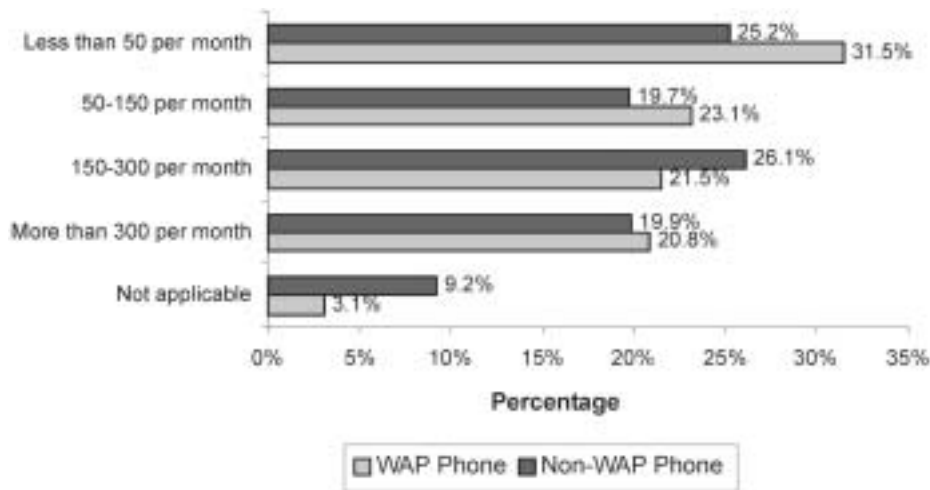


Figure 6. SMS usage.

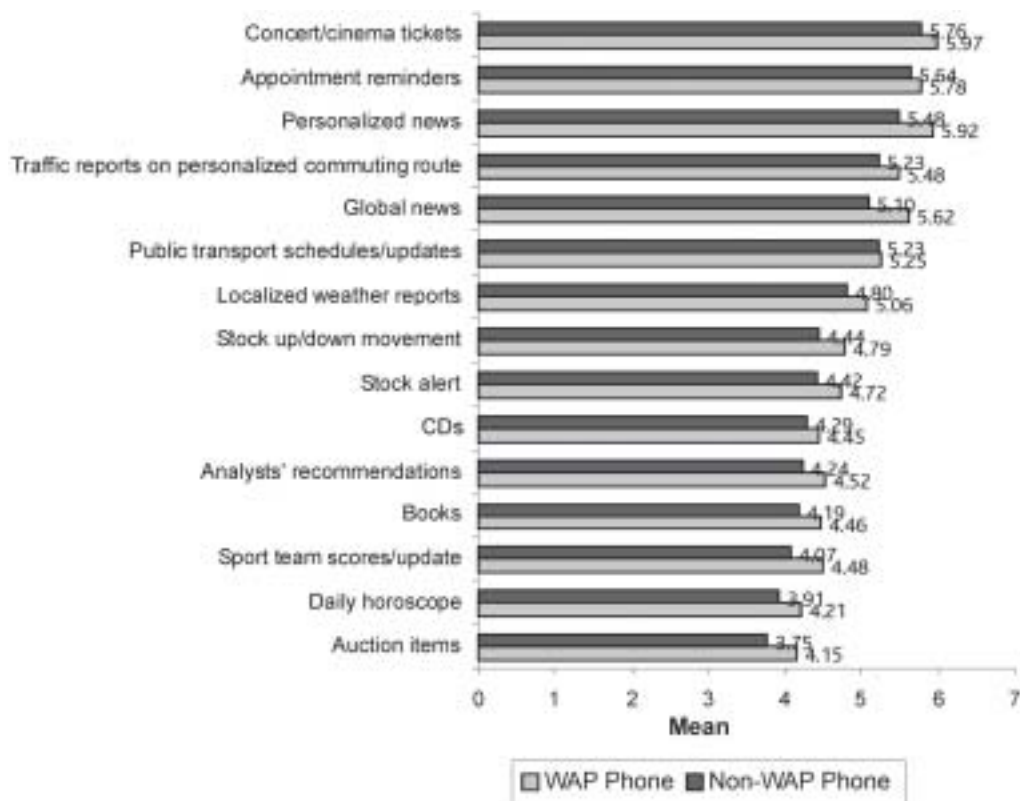


Figure 7. Perception of WAP services.

Of all the WAP services, respondents are least interested in using WAP-enabled mobile phone to auction items. This could be attributed to respondents' lack of interest in auction. Another reason is the small user interface of mobile phones that make such activities inconvenient and time-consuming.

3.7. Other WAP-related issues

This section serves to examine respondents' perception on several popular WAP-related issues such as mobile advertising, expected cost of WAP services and preferred cost model. In general, WAP-phone users tend

to expect costs of WAP services to be lower than non-WAP phone users (figure 8). About 42% WAP-phone users expect the cost to be lower than normal phones compared with 19% for non-WAP phone users. This information may serve as a useful guide to mobile operators and content providers when they formulate their pricing strategy.

Though WAP services could be charged using a variable cost scheme, majority (about 60%) of the respondents (figure 9) preferred a monthly fixed rate

instead. The simplicity of a fixed rate model coupled with respondents' familiarity with such a pricing scheme (commonly used in Internet subscription) may be a possible explanation for this phenomenon.

Finally, about 60% of the respondents will not reject mobile advertisements provided that the advertisements are personalised and accessing these advertisements will subsidise the user's phone bill (figure 10) The findings show that the advertising model that will eventually be used in mobile Internet might differ fundamentally from

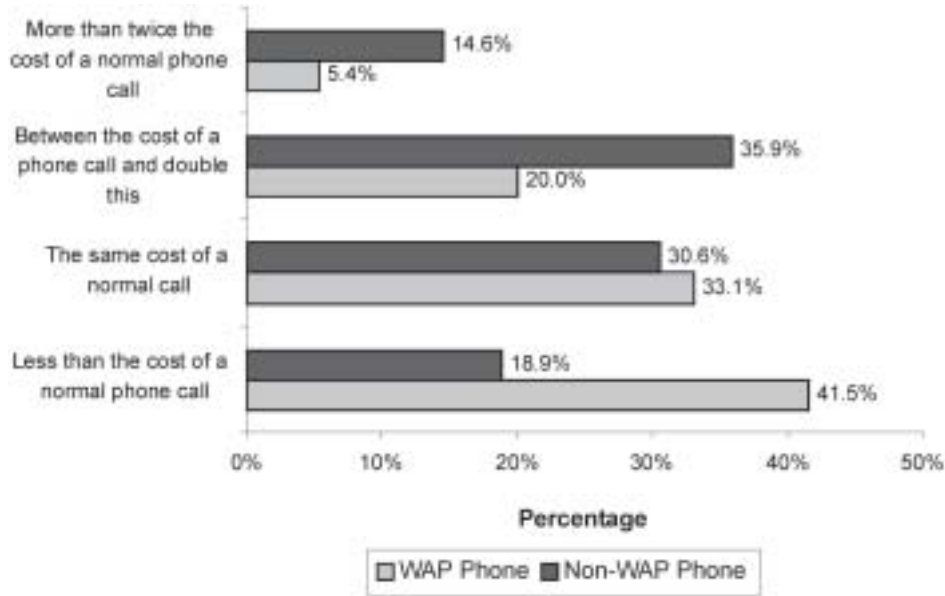


Figure 8. Expected cost of WAP services.

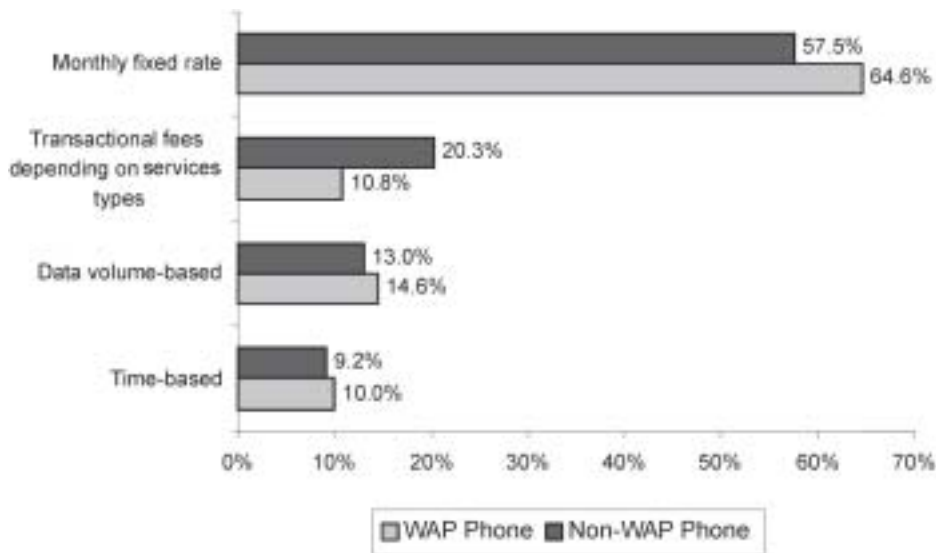


Figure 9. WAP cost model.

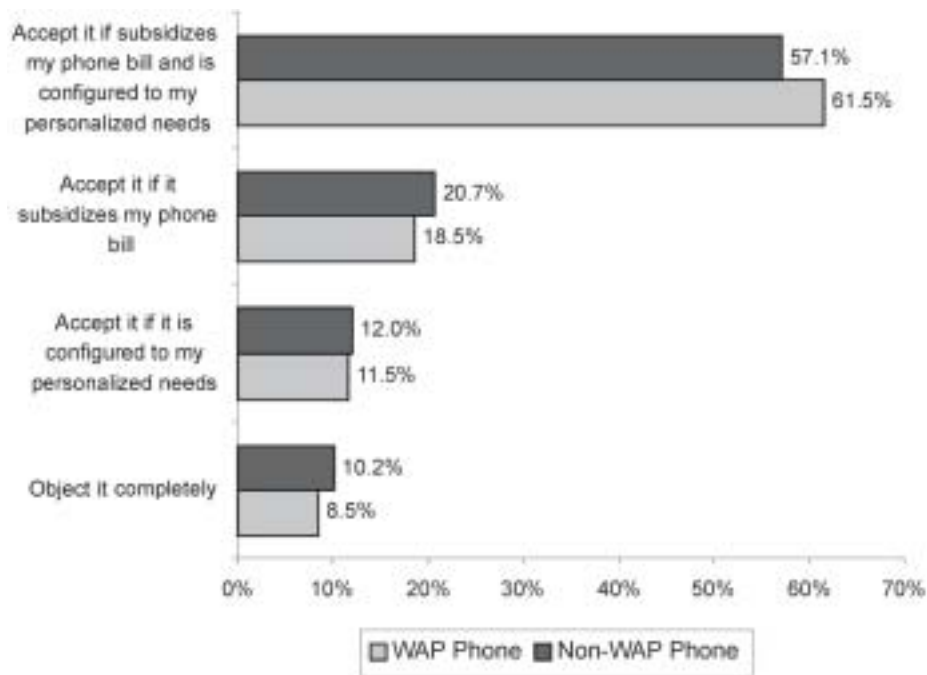


Figure 10. Perception of mobile advertising.

the conventional model employed in the physical world. The need for personalised advertisements changes the unique relationship that exists between the advertisement provider and the recipients; from that of a push relationship in the physical world to that of a pull relationship where the initiatives now fall on the recipients. More importantly, mobile advertising has created a new phenomenon where advertisement recipients are rewarded explicitly for viewing an advertisement.

4. Implications

The findings of this study hold important implications for the telecommunication industry. What started out as great promises have now turned into disappointments for early adopters of WAP-enabled mobile phones. Worse still, WAP is wrongly accused as the culprit that causes the unpleasant user experience. The marketing campaign that so successfully created the initial hype has no answers for the subsequent backlash. On top of that, the introduction of newer and better technology such as GPRS and the impending arrival of 3G further deteriorate the image of WAP.

The success of mobile Internet remains uncertain. On one hand, the telecommunication industry could take immediate remedies to address the backlash caused by the overselling of WAP. By doing so, the industry could

perhaps win back adopters' confidence in mobile Internet thus improving current situation. On the other hand, the telecommunication industry could abandon WAP in favour of GPRS and 3G. Electing GPRS and 3G as the heralds of mobile Internet not only gives new hopes to current disgruntled adopters but also gives the industry a second opportunity to fulfil its past promises. Either way, the key to future success lies in rebuilding potential adopters' confidence in mobile Internet which has taken a severe beating in the aftermath of WAP.

At this juncture, the second option seems to be the one preferred by many. Why? In an ironic twist of fate, the backlash of WAP may actually facilitate the diffusion of GPRS and 3G. With the arrival of GPRS and the impending arrival of 3G, potential adopters have doubted the benefits of adopting a technology (WAP) whose existence is short lived. This has, inevitably, complicated the efforts needed to rebuild WAP's reputation. Thus, it might not be worth the effort for the telecommunication industry to cling on a seemingly lost cause. As such, what turns out as a complete marketing failure (for WAP) may in fact be a blessing in disguise (for GPRS and 3G). Hence, it is perfectly logical for the telecommunication industry to forsake WAP for GPRS and 3G.

Mobile operators have always taken every opportunity to promote the relative advantages of using a WAP-enabled mobile phone in accessing the Internet over a fixed terminal such as PC. However, without compli-

mentary mobile applications, the promise of WAP-enabled mobile phone's relative advantages will never be fulfilled. Thus, mobile operators and content providers should seek to deliver these complimentary applications, known commonly as 'killer applications' in the telecommunication industry, to improve the adoption rate.

As of now, to qualify as killer application, the service must fulfil two basic criteria: personalization and convenience. First, it must be flexible enough to be personalized to suit individual needs. For instance, as shown in our findings, accessing news using a WAP-enabled mobile phone alone does not confer the service the status of 'killer application'. Only when users can customize the news selections to their liking will the tag of killer application be justified.

Second, a killer application must offer utmost convenience to the users. The ability to access the Internet *anywhere, anyplace* and *anytime* will only be useful if doing so serves a purpose such as meeting a specific time schedule. For instance, findings indicate that potential adopters may have no qualms buying movie tickets using a WAP-enabled mobile phone but is likely to be less than enthusiastic when the object is changed to that of books. Though both activities are similar in nature, one (buying movie tickets for a particular show at a particular time slot) is more sensitive to time than the other. Thus, the convenience offered by WAP-enabled mobile phone will be much more appreciated by the person buying movie tickets rather than the one buying a book. Hence, selling the relative advantages of WAP-enabled mobile phone alone is not enough to entice potential adopters. The availability of complementary applications is equally important.

To further increase the adoption rate of WAP-enabled mobile phone among potential adopters, mobile operators could offer different pricing models to attract different segments. From our findings, there is a preference for pricing scheme that offers a fixed monthly rate. One possible explanation could be that potential adopters are used to the fixed pricing scheme commonly offered by ISPs.

5. Concluding comments

In conclusion, the results show that Internet users are generally young, male, and educated. The majority own mobile phones and personal computers. As expected, they usually access the Internet from home and office, and engage in activities such as communication, accessing online news and stock prices, and cybershopping. In terms of use of mobile phone, SMS and caller ID are popular functions compared to call waiting, call

diverting, etc. This indicates that mobile phones help users to make use of niche time. In other words, users can accomplish simple tasks like SMS while waiting for a bus, while taking the subway system, etc. This niche time would otherwise be unavailable or wasted if they do not have a mobile phone for sending and receiving short messages.

Respondents also express significant interest in using WAP-enabled mobile phones for various time-sensitive activities such as buying concert/cinema tickets, receiving personalised news, receiving appointment reminders, etc. In addition, the value of personalisation is evident because mobile phones are usually designed for use by only one person, compared to a PC. The receptivity of respondents to mobile advertising is dependent on the degree of personalisation and benefits of receiving such advertisements.

Overall, the results should be useful to both researchers and practitioners in better understanding the adoption of the Internet and various issues relating to WAP-enabled phones. Researchers can extend the study to GPRS phones or other mobile devices such as Personal Digital Assistants (PDAs). Practitioners can use the findings as a basis for better formulation and implementation of strategies to encourage adoption.

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