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ADOPTION OF THE INTERNET AND WAP-ENABLED PHONES: THE CASE OF SINGAPORE

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ABSTRACT

The Internet, and more recently mobile phones, has 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 examine the profile of Internet users, Internet activities and issues relating to WAP-enabled mobile phones. The 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.

INTRODUCTION

The number of Internet users has grown exponentially over the past few years. Similarly, global mobile phone penetration is expected to reach 1 billion users by end 2002 and 1.16 billion by end 2003 [5]. Wireless Application Protocol (WAP) for mobile phones is perhaps one of the few technologies that comes 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 [4], 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 [6] [8]. WAP has arrived at a stage where its future remains uncertain.

This study examines the adoption of the Internet and issues relating to the adoption of WAP-enabled mobile phones among Internet users. Specifically, we collected data on the following:

- Demographic profile of respondents;
- Information technology (IT) devices ownership;
- IT usage pattern;
- Internet activities;
- Mobile usage patterns;
- Perception of WAP services; and
- Other WAP-related issues.

The results should be useful to both researchers and practitioners in understanding the adoption of Internet and WAP-enabled mobile phones in Singapore.

METHOD

An online questionnaire was used to gather data for this study. 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 was carried out and the survey modified accordingly to improve clarity and ease of understanding. 1012 usable responses were received.

RESULTS

Demographic Profile of Respondents

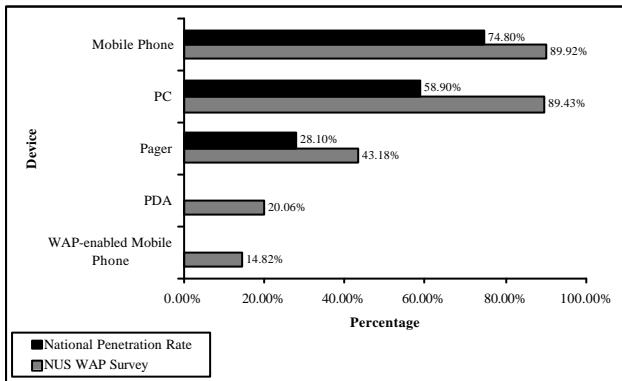
The demographic profile indicates that respondents were predominantly young people from the age group of 20 to 29 years (89%). This is higher than the 64.1% reported by Teo and Tan [7]. In addition, the respondents were mainly Chinese (93.0%). Also, males formed the dominant gender group (73.0%) in this research, while females made up only 27.0%. This figure is comparable to the 26% reported by [www.research](#) [9]. Moreover, respondents with at least a junior college certificate or polytechnic diploma made up 81.2% of the respondents. Respondents were also asked to indicate their current profession. Majority of the respondents were either students (45.0%) or working professionals (39.9%).

Last but not least, data about respondents' income indicates that majority of the respondents may be relatively new in the workforce given that majority of them have a monthly income of less than \$3000 dollars (52.6%). This figure is higher than the 33% reported by [www.research](#) [9].

IT Devices Ownership

This section tracks 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).

FIGURE 1
IT Devices Ownership



Both figures reported are higher than the national average of 74.8% and 59.5% for mobile phones [1] and the Internet [3] 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 technology would be those who have prior experience in surfing the Internet and who also currently hold a mobile phone.

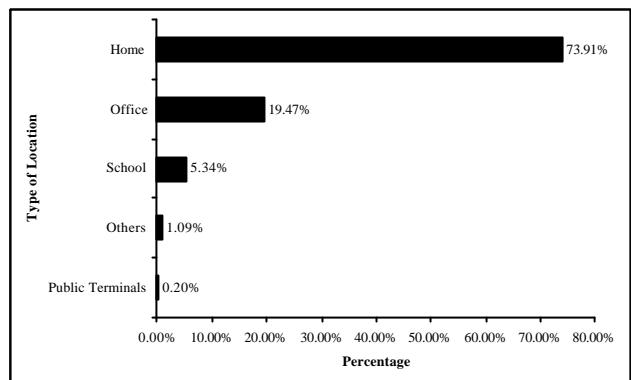
The pager penetration rate is exceptionally high given that the national average is only 28.1% while the penetration rate among the respondents is 43.2%. Such a phenomenon is baffling given that with the arrival of mobile phone, pager should be made obsolete. One possible explanation could be that pager complements mobile phone 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.

Internet Usage Pattern

Figure 2 shows the location of Internet usage. Respondents usually access Internet from home. This is not surprising given the high PC penetration rate among the respondents. *Office* is the second most popular choice among the respondents. Once again, this information conforms to normal expectation. For full-time workers who spend most of their time in 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 favored among the respondents. This information, however, cannot be used as a counter-argument against the effectiveness of public terminals as the phenomenon may be due to the result of the high PC ownership among respondents than the effectiveness of public terminals.

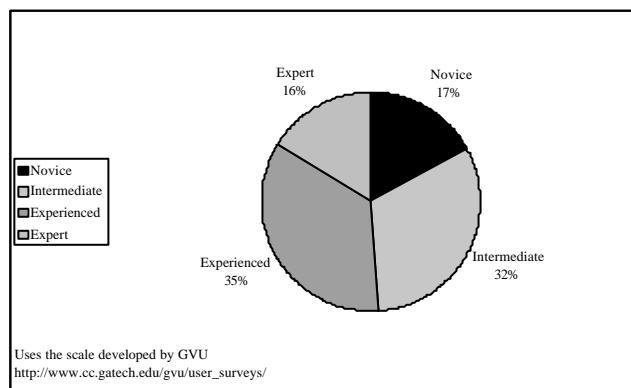
FIGURE 2
Internet Access Location



Majority of the respondents are frequent users of the Internet. On average, only 1% of the respondents surf the Internet for less than an hour per week.

Finally, in terms of Internet skill level, about 30% of the respondents fall into the intermediate and experienced categories. The rest of the respondents are equally distributed between the novice and the expert categories (Figure 3).

FIGURE 3
Internet Skill Level (GVU Scale)

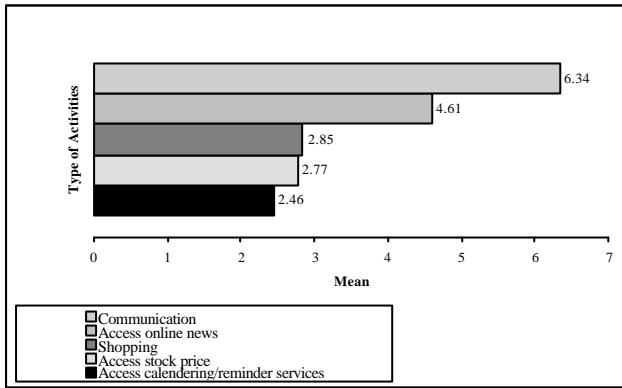


Internet Activities

In this section, respondents were asked to indicate the extent to which they have performed the following Internet activities (Figure 4). Of the following five activities, using the Internet as a medium for communication emerged as the most popular activity. This is followed by – in descending order of popularity – accessing online news, accessing stock

prices, cybershopping and accessing calendaring services. The findings are consistent with the results obtained by IDA [2].

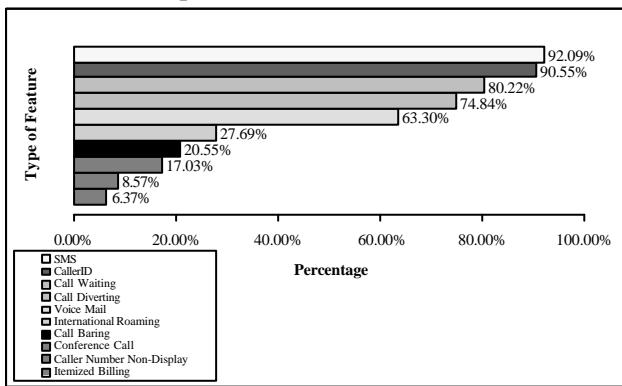
FIGURE 4
Internet Activities



Mobile Usage Pattern

Of the various features offered to a mobile phone user, SMS emerged as the most popular one (Figure 5). The fact that SMS, being a data-centric feature, exceeds in popularity over voice-centric features (Caller ID, Call Waiting and Call Diverting) will serve to augur well the potential of data-centric services in the future.

FIGURE 5
Popular Mobile Phone Features



Respondents' monthly phone usage and respondents' monthly SMS usage are shown in Figures 6 and 7 respectively.

FIGURE 6
Mobile Usage

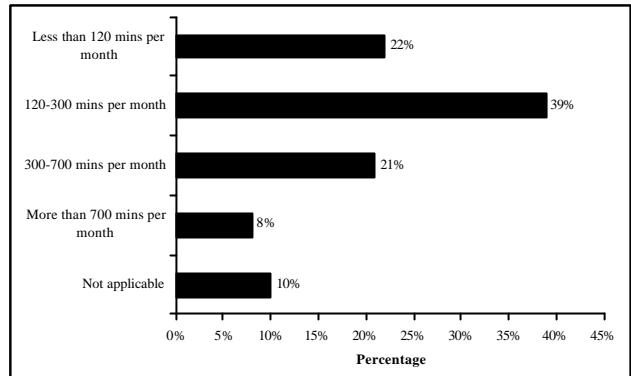
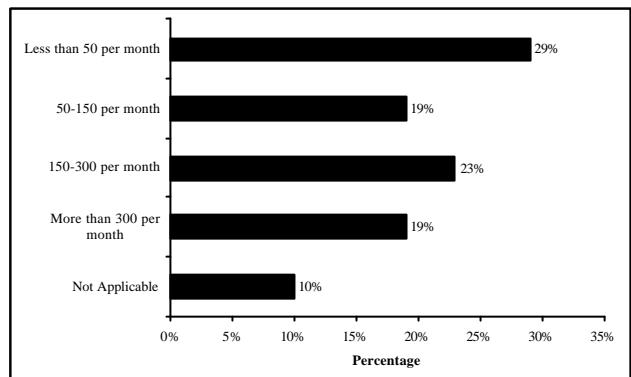


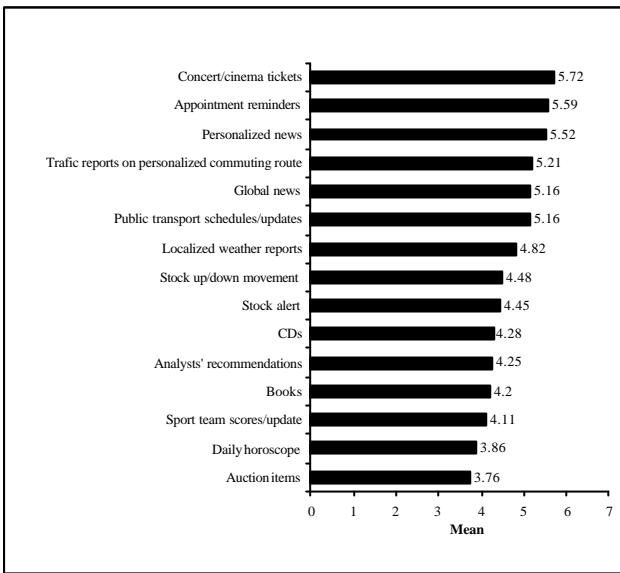
FIGURE 7
SMS Usage



Perception of WAP Services

This section solicits respondents' views on WAP services (Figure 8). WAP services were classified into four categories: financial services, news, information and purchase (mobile shopping). Respondents were asked to indicate (on a scale of 1 to 7) the extent to which they will like to access various services.

FIGURE 8
Perception of WAP Services



The results show that respondents have expressed significant interests as evident by the high mean scores over the following WAP services: buying concert/ cinema tickets online, receiving appointment reminders, personalized news, personalized traffic updates based on user's preferred commuting route and global news update.

Findings in the previous section on Internet activities have shown that respondents are less enthusiastic in buying movie tickets online using a fixed terminal such as PC. In contrast, respondents have expressed their willingness to perform the same task using a WAP-enabled mobile phone. One possible explanation could be that the decision to watch a show is often 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.

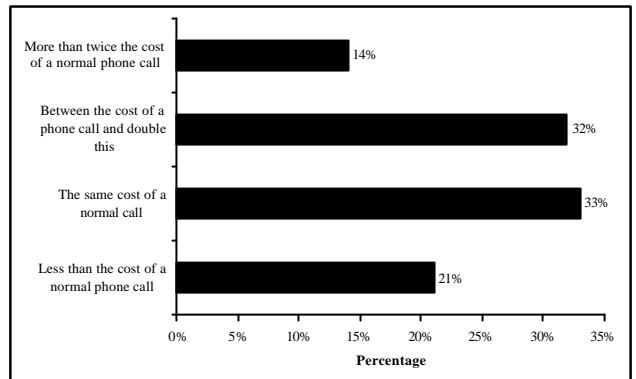
Likewise, accessing appointment reminders online through a fixed terminal such as PC does not generate as much interest compared to performing the same activity using a WAP-enabled mobile phone. Since the likelihood of sharing a WAP-enabled mobile phone is low compared to a fixed terminal such as PC,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

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. Thus, the mode of delivery of such a service is of indifference to potential adopters.

Other WAP-related Issues

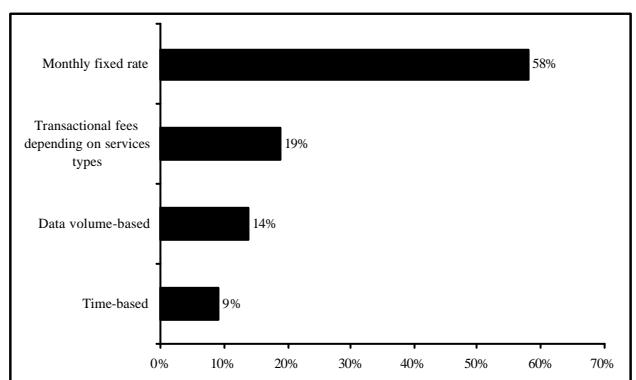
This section serves to examine respondents' perception of several popular WAP-related issues such as mobile advertising, expected cost of WAP services and preferred cost model. On average, 80% of the respondents expect the cost of WAP services to minimally match the cost of a normal phone call (Figure 9). In comparison, only 20% of the respondents expect the cost of WAP services to be less than that of a normal phone call. This information will serve as a guide to mobile operators and content providers when they formulate their pricing strategy.

FIGURE 9
Expected Cost of WAP Services



Though WAP services could be charged using a variable cost scheme, majority (close to 60%) of the respondents (Figure 10) 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.

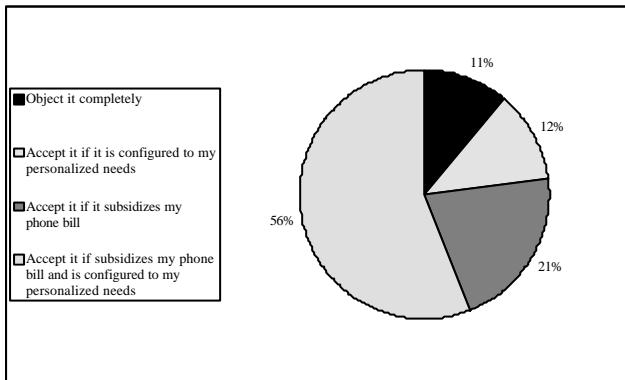
Figure 10
WAP Cost Model



Finally, on average, 55% of the respondents will not reject mobile advertisements provided that the advertisements are personalized and accessing these advertisements will subsidize the user's phone bill (Figure 11). The findings have shown that the advertising model that will eventually be used in mobile Internet might differ fundamentally from

the conventional model employed in the physical world. The need for personalized 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.

FIGURE 11
Perception of Mobile Advertising



IMPLICATIONS AND CONCLUSIONS

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 impending introduction of newer and better technologies such as GPRS and 3G further deteriorates 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. Doing so, the industry could perhaps win back adopters' confidence in mobile Internet, and thus improve the current situation. On the other hand, the telecommunication industry could abandon WAP in favor 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 impending arrival of GPRS and 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 onto a seemingly lost cause. As such, what turned 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.

If, in any case, the telecommunication industry opts for the first option, the findings in this research will help policy makers in formulating remedies to improve the diffusion of WAP-enabled mobile phones. For instance, instead of focusing on the functionalities of a WAP-enabled mobile phone, the marketing campaign should emphasize the compatibility of WAP phones (and their assorted services) with one's lifestyle. In addition, practitioners may consider using opinion leaders as spokespersons for their WAP-enabled mobile phones. In the context of WAP-enabled mobile phones, an effective opinion leader must be trendy, youthful and technologically savvy.

Working with the intuitive assumption that mobile Internet users should first be users of the Internet, the importance of cyber reference groups should not be neglected. Cyber reference groups such as forums and newsgroups may be crucial in disseminating information to individuals. Since members of these groups are technologically more advanced than their peers, their opinions may go a long way in shaping the adoption intentions of others by skewing their perceptions of WAP. Hence, it will be prudent for practitioners to monitor such groups to either correct any misconceptions about the technology or gather feedback from this group to further fuel the adoption process.

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 complimentary 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 a killer application, the service must fulfill two basic criteria: personalization and convenience. First and foremost, 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 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 from this research have shown that potential adopters have no qualms buying movie tickets using a WAP-enabled mobile phone but are less than enthusiastic when the object to be purchased is changed to 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, from the above illustrations, we can see that 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, of the four pricing schemes that exist in the market today, potential adopters seem to have a preference for a pricing scheme that offers a fixed monthly rate. One possible explanation could be that potential adopters are used to the fixed pricing schemes commonly offered by ISPs.

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