

ATTITUDE TOWARD THE ADOPTION OF
WAP BANKING SERVICES IN HONG KONG

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ABSTRACT

With the liberalization of the telecommunication industry, increasing competition has led to a strong growth in subscriber base in Hong Kong. As new network developments improve speed, security and user-friendliness of mobile Internet experience, users will begin to conduct more of online trades via mobile phone.

As Internet Banking has been fully launched and marketed for the past year, WAP Banking seems to be the next logical event to be promoted as another horizontal means to extend existing products and services. In order not to be excluded by the industry, bankers should be aware of what attributes are dominant in customers' intention to adopt WAP Banking.

A survey was conducted in Hong Kong to examine whether and how consumers' previous WAP usage and innovativeness would lead to a positive attitude towards WAP banking services. It was found that attitude toward using WAP banking is determined by perceived convenience, perceived security, and innovativeness where as perceived convenience is determined by both previous WAP usage and perceived information availability. In addition, the results, implications and industry outlook are also discussed.

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CHAPTER I

INTRODUCTION

After the advent of facsimile machine, mobile phone has been the most prominent means of communication in a modern society. While e-commerce has proved its success in turning around traditional business models, business through mobile phones, “m-commerce”, is destined to further strengthen its efficacy.

As cellular phones become necessity in people’s everyday life, its lethal advantage rests upon increased mobility, flexible control and time-constrained decision-making. Demonstrated successfully by Internet as to how broad people can see the world, Wireless Application Protocol (WAP) is set to change how versatile people can use their mobile phones. According to Merrill Lynch, m-commerce revenue will top \$45 million by 2005 in US alone (Swartz 2000). Other analysts predict worldwide transactions to generate more than \$100 billion in revenues by 2005 (Swartz 2000).

Problem

Mobile financial services will be one of the many beneficiaries in the wireless Internet market, although not long ago they were all heavily invested into fixed-line Internet Banking. According to Marlin (2000), while banks still trying to get their arms around online banking services delivered through ordinary PCs, executives are assessing the complex issues surrounding the wireless channel, including cost, customer demand and technology. Most established banks in Hong Kong such as

HSBC, Hang Seng Bank, Standard Chartered Bank have been actively promoting their online banking capabilities as another means to extend their current service. On July 1, 2001, the proposed final phase of interest rate deregulation will remove the interest rate caps on savings accounts and allow banks to pay interests on current accounts. All banks are now searching feasible methods to maintain market share, and coincidentally boost profitability. Will the introduction of WAP Banking be a solution to cut costs in retail banking while increasing consumer loyalty? What are the underlying factors that affect consumers' willingness to adopt this new technology? Which exclusive features a WAP phone possesses that existing Internet Banking cannot compare? Whichever banks can tap into this first-hand information will certainly gain significant competitive advantage in the industry in terms of delivering customized services and products to focused target market.

Objective of Study

With the above queries, the purpose of this research is therefore to identify the factors affecting users adoption towards WAP banking services and empirically test whether those factors would affect consumers' decision in adopting WAP banking services. Our findings should reveal important attributes to banks trying to extend this new technology to customers in terms of sales and marketing, positioning and pricing strategies. Justifications whether banks should launch WAP Banking as an extension to Internet Banking based would be recommended in terms of costs effectiveness, as well as security issues. The background of the mobile communications industry will be discussed in the next section. This will be followed by conceptual framework, research methodology, results and discussion. Finally, limitation, implications, future research directions and conclusion will be discussed.

CHAPTER II

BACKGROUND

Third Generation Communication Era

In the heat waves of bidding the licenses for third-generation “3G” cell-phones in Europe, all telephone-carrier gurus are betting phenomenal amounts of license just to step into the next generation wireless world. Vodafone, Deutsche Telecom and British Telecom bid an average of \$7 billion for their license. 3G is the futuristic platform of wireless Internet that guarantees faster data speed, enhanced graphic and video transmission. Although Europe will not launch 3G phones until 2002 and the United States until 2004, every big telephony companies simply cannot endure the risk of elimination by their subscribers and risk of elimination by the market.

Wireless Application Protocol

Before Asia proceeds to third generation (3G) phones in 2002 the earliest, we are in a transitional 2.5G era where short messages can be sent and limited graphics can be downloaded from our tiny-winy mobile screen. Wireless Application Protocol (WAP) is the first telephone introduced during this era to converge the two fastest growing technological phenomena– the Internet and mobile telephony. WAP is simply an enabling technology, or a set of rules for transforming Internet information so as to be displayed on the tiny screen of a cellular phone or other portable device. The working definition of WAP Banking for the purposes of this report is any banking transaction that is conducted via a mobile telecommunications network.

Therefore, regular SMS messages from one person to the banks or vice versa are not included in the definition of WAP Banking. Services mainly consider for offering through WAP banking including but not limited to: checking exchange rates and interest rates, inquiring account and credit card balances, reviewing last transactions, transferring funds, paying invoices, etc.

Hong Kong's Current Mobile Stance

TABLE 1

HONG KONG CELLULAR SUBSCRIBER, 1999-2004

1999	2000	2001 ^a	2002 ^a	2003 ^a	2004 ^a	CAGR (1998- 2003)
3,779,500	4,150,300	4,484,000	4,797,000	5,186,000	5,540,000	8%

Source: International Data Corporation, 2000

^a Estimated figures

TABLE 2

HONG KONG CELLULAR PENETRATION

Population	Subscriber Base	Penetration Rate
6,500,000	4,150,300	64%

Source: International Data Corporation, 2000

Hong Kong's penetration rate is among the highest in world in comparison with Finland's 73% and China's less than 10%.

TABLE 3
HONG KONG CELLULAR MARKET BY OPERATOR, 1999

Operator	Network	Subscriber Bas	Market Share
Sunday	PCS 1800	260,000	7%
PCCW-HKT	DAMPS	264,000	7%
	GSM 900/1800	616,000	16%
Hutchison	CDMA	546,000	14%
	GSM 900/1800	625,000	17%
New World	PCS 1800	493,500	13%
Peoples	PCS 1800	315,000	8%
Smartone	PCS 1800	140,000	4%
	GSM 900/1800	520,000	14%
	Total:	3,779,500	100%

Source: International Data Corporation, 2000

Hutchison is the market leader in Hong Kong's operator business, which commands more than 31% of the cellular market. The company appeals to middle to low market segment where competes on price and range of services with other operators. PCCW-HKT, whose leadership was stolen by Hutchison, still upholds 23% of Hong Kong's cellular subscribers. PCCW targets on networks and quality, and it therefore charges the highest price among all operators. Whereas, New World, Peoples and Smartone solely focus on price while their networkings are considered to be second-tiered.

Value-added Services

The cellular services in Hong Kong attempt to provide services inclined to their target customers' demand. Services to meet subscribers' interests such as horse racing are offered free. In trading the teenagers' segment, operators provide a choice to either pay monthly fee, or charge based on usage (message/picture sent). Orange (Hutchison Telecom) has been prominent in offering mobile banking and secretarial services. The cost for the various value-added services is provided below:

TABLE 4
VALUE-ADDED SERVICE CHARGE – GSM

Services	Price (HK\$) ^a	Frequency
Voice Mail	50.0	Per month
Fax Mail	510.8	Per month
Mobile Email	0.9	Per email sent
Mobile Email	0.3	Per email received
Picture Message, Logo & Ringing Tone Download	0.3-0.4	Per picture
Internet MobileNet	34.9	Per month
Voice Info	Free	
Horse Racing World	Free	
Live Radio Service	Free	
Text info	0.5	Per message
Message Express	10.0	Per month
Mobile Banking Service	28.0	Per month
Paging Secretary	167.6	Per month
Executive Paging	197.5	Per month
Call Forward Services	34.9	Per month
Mobile Fax and Data	199.5	Per month
Call Number Display	34.9	Per month

Source: International Data Corporation, 2000

^a Average prices are indicated unless range is indicated.

Monthly fees for WAP service and downloading logo and picture message were free until March 2000 where a month fee of HK\$35.0 will be charged for WAP users.

CHAPTER III

CONCEPTUAL FRAMEWORK

TAM Model

Technology Acceptance Model (TAM) was developed by Davis (1986) to explore other exogenous variables that influence people's attitude toward the adoption of technology (Davis 1986; Davis 1989). TAM is considered the most widely applied model of user acceptance and usage, which is derived from the Theory of Reasoned Action. It asserts that two external variables, perceived usefulness (PU) and perceived ease of use (PEOU) are the primary constructs determining attitude toward information technology, intention to use and actual usage (Davis 1986; Davis 1989).

Jackson et al. (1997) build on the TAM model to study users' behavioral intention to use a new or innovative information system. They have added user involvement constructs, and incorporated several theoretically supported psychological factors including prior usage, situational involvement, intrinsic involvement, and argument for change in addition to the TAM model to construct a TAME model. They conclude that many factors beyond situational involvement (participation) play an important role in explaining behavioral intention to use an information system.

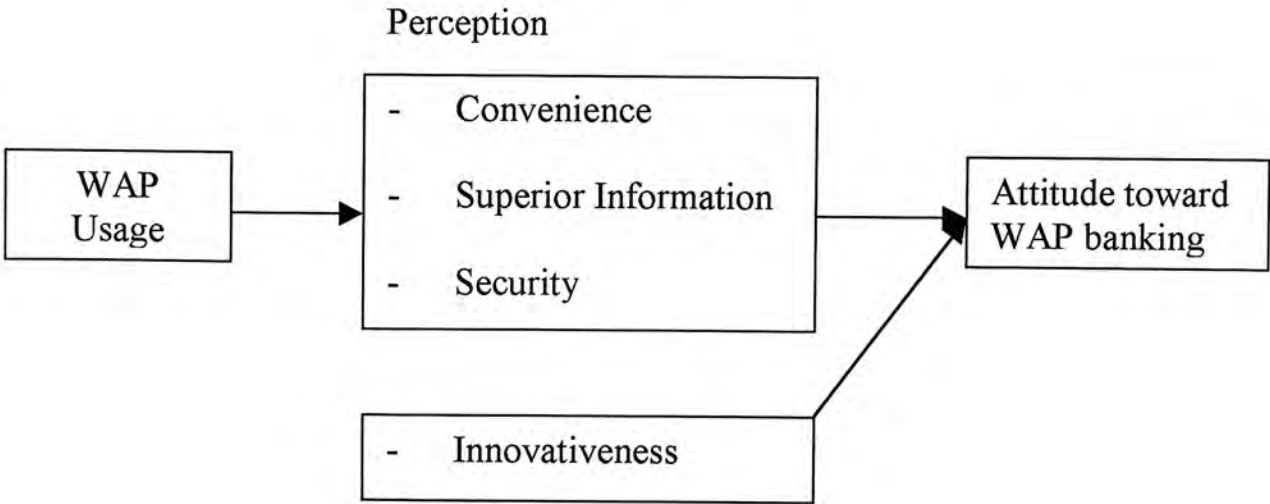
Viewing IS development as an instance of Social Exchange Theory (SET), Gefen and Keil (1998) also extend the TAM model to identify the antecedents of PU

and PEOU, namely developer responsiveness. They conclude that developer responsiveness strongly influences both PU and PEOU, but only indirectly affects actual behavior – IS use – in accordance with the predictions of SET.

Conceptual Model

The guiding premise is that WAP banking is an innovative product to consumers. As such, TAM provides a suitable framework for conceptualizing attitude toward WAP banking adoption behavior. Based on the TAM, the conceptual model for this study is developed. Figure 1 depicts the conceptual model used in this study. According to the model, WAP usage has a direct impact on perception factors such as perceived convenience, perceived superior information, and perceived security. These perception factors, in turn, affect attitude toward attitude toward WAP banking. Other factors including personal characteristics and innovativeness have also cast a direct impact on attitude toward WAP banking.

FIGURE 1
THE BASIC CONCEPTUAL MODEL



The Effect of WAP Phone Usage on Consumers Perceptions

Not only WAP banking services, but just WAP services itself is an innovative product to the market. Therefore, in the literature, the effect of WAP phone usage on consumer perceptions has never been investigated. However, according to our focus group interview conducted in the early stage of the study, we found that the three major areas concern with respect to WAP are perceived convenience, superior information and security respectively.

We believe that convenience is the most obvious advantage of WAP banking services since mobile phones are always at hand and are increasingly easy to use. Using a WAP phone, it will be easier and faster to access information on the web without starting a PC or connecting a call. WAP banking services provide the convenience for both for real-time information and for communication anywhere, independent of the user's location.

WAP banking services would not be able to provide as much information as other banking services such as Internet banking services. On top of that, users have to view information on a mobile phone with a tiny screen. However, we believe that user attitude towards WAP banking services would be positive if they are able to retrieve key banking information from their handsets.

Mobile security technology is already emerging in the form of SSL (Secure Socket Layer) technology within a closed end-to-end system. Although the SIM (Subscriber Identification Module) card provides authentication of the owner and enables a higher-level security than the fixed Internet environment, we believe that

security concern is something that would lead to a negative attitude towards WAP banking services. Concluding from all the above factors, it is therefore hypothesized that:

H1: WAP phone usage has positive impact on perceived convenience.

H2: WAP phone usage has positive impact on perceived superior information.

H3: WAP phone usage has positive impact on perceived security.

The Effect of Consumer Perceptions on Attitude Toward WAP banking

Behaviors are difficult to predict and measure, and thus the assumption has been that attitudes would provide a shortcut to understanding behaviors (Kahle 1984). Attitude is a categorization of a stimulus object along an evaluative dimension based upon, or generated from, three general classes of information: (1) cognitive information, (2) affective/emotional information, and/or (3) information concerning past behaviors or behavioral intentions (Zanna and Rempel 1988). Although we cannot directly measure whether owning WAP phones has positive correlation towards people's attitude toward adopting WAP Banking, Judd and Brauer suggest that repeated exposure to a novel stimulus object leads to the development of positive affect towards that object.

Extended thought devoted to an object seems to have effects similar to those found for repeated exposure to an object whose features are highly evaluative (Judd and Brauer 1995). Thought plays an important role in attitude dynamics and it changes cognitive content associated with the attitude object and those changes, although predictable, do not follow the canons of objective logic (Tesser et al. 1995). Venkatesh (2000) recently in "Determinants of Perceived Ease of Use: Integrating

Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model” has illustrated that prior experience with an IT usage is expected to have direct and moderating effects on constructs and relationships. As user experience with the specific system increases, the knowledge and anxiety related adjustment is expected to be objective usability. Objective usability is a construct that allows for a comparison of systems based on the actual level (rather than perceptions) of effort required to complete specific tasks. The role of direct behavioral experience and results of such experiences are expected to be important in shaping system-specified perceived ease of use overtime. It is therefore hypothesized that:

H4: WAP phone usage, mediate through consumers’ perception toward WAP banking services has positive impact on the adoption of WAP Banking.

Much of contemporary social psychologists have been associated with cognitive or information processing approach towards forming attitude. Social psychology attitudes are used as a construct to mediate between orientation and behavior. He adds that attitudes denote individual dispositions that are constituted by beliefs, affects and behavior tendencies connected with the attitude object (Engermann et al. 1988). From this perspective, consumers’ attitude toward WAP banking services should rely on consumers’ perception on WAP.

Davidson (1995) suggests that the amount of information about the attitude object has important implications for the study of the attitude-behavior relation. David et al. (1989) suggest that under theories of cognitive consistency, people should be attracted to others who share their attitudes and repelled by others whose attitudes

conflict with their own (Festinger 1957; Heider 1958; Boninger et al 1995). Fishbein and Ajzen (1975) have long established this theory through the expectancy-value model of attitudes. They assert that attitudes develop reasonably from the beliefs people hold about an object by associating it with certain attributes. Attitude toward behavior is a function of the product of one's salient belief that performing the behavior will lead to certain outcomes, and an evaluation of the outcome (Chang 1998). It is therefore hypothesized that:

H5: The more perceived convenience the WAP banking services, the more positive users' attitude towards the services.

H6: The more perceived superior information available, the more positive users' attitude towards WAP Banking services.

H7: The higher the perceived security offered in WAP banking services, the more positive users' attitude towards the services.

The Effect of Innovativeness on Attitudes Towards WAP banking

Besides the TAM and the Theory of Reasoned Action, other model such as Roger's Innovation Diffusion Theory also explains individual attitudes towards IT. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Roger 1995). In one hand, Brown (1981) defines the adoption of an innovation is primarily the outcome of a learning or communication process. On the other hand, Roger (1995) defines innovativeness as the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system. Therefore, we can assume that innovativeness would ultimately lead to adoption of an innovative product. Besides, Roger (1995) also posits that the perceived newness of

the idea for the individual determined his or her reaction to it. Therefore, it is hypothesized that:

H8: The more innovative an individual is, the more favourable his/her attitude towards the services.

The constructs of our model came up from different models with major focus to the TAM. Agarwai and Karahannel (2000) suggest that despite the differences among all these models regarding the specific constructs and relationships assumed, there is some convergence among them that individual's beliefs about or perceptions of IT have a significant influence on usage behavior. In addition, a dummy variable is inserted into our model to capture any other external factors that might have an impact on influencing people's attitude.

CHAPTER IV

RESEARCH METHODOLOGY

Subjects

Research for this report commenced in Apr 2001 and a sample survey was conducted. We distributed questionnaires to (1) WAP phone users and (2) Non-WAP phone users. Hayduk (1987) suggests that any sample size of over 100 would provide stable estimates. Therefore, we have randomly selected 60 subjects that are WAP phone users and another 60 subjects that are non-WAP phone users out of a total of 168 subjects. Male participants account for 60% of our sampling with female representing the remaining 40%. The age of the subjects ranged from 21 to 55 and the majority (40.8% or 49) of the subjects were 26 to 30 years of age.

Procedure

Hardcopy questionnaires were given, whereas softcopy questionnaire was also send out to the subjects. The subjects were asked to read carefully the definition of WAP banking and the differences between WAP banking and mobile banking before they fill out the questionnaire that measured perceptions and innovativeness toward WAP banking services. The questionnaire is pre-tested by ten (10) non-WAP phone users to ensure our terminology used is reasonably easy to understand even to technology amateurs.

Measures

As WAP is still an innovative concept in Asia, questionnaire items for each variable are modified from previous studies available to ensure reliability. Questions

on attitude toward use are modified from Al-Gahtani and King's study (1999) on "Attitude, satisfaction and usage: factors contributing to each in the acceptance of information technology".

Although there are no direct studies on perceived convenience affecting attitude, TAM (Davis 1986, Davis 1989) posits that perceived usefulness will be influenced by perceived ease of use because, other things being equal, the easier a technology is to use, the more useful it can be. In our study, perceived convenience can be classified as a subset of "usefulness" because it contributes to WAP phone's usefulness.

Modified from Gefen and Keil's "The impact of the developer responsiveness on perceptions of usefulness and ease of use: an extension of the TAM Model" (Gefen and Keil 1998), we construct questions regarding how consumers would value perceived superior information availability. Gefen and Keil (1998) illustrates that the more responsive the information provider, the more people are interested to learn and adopt the technology.

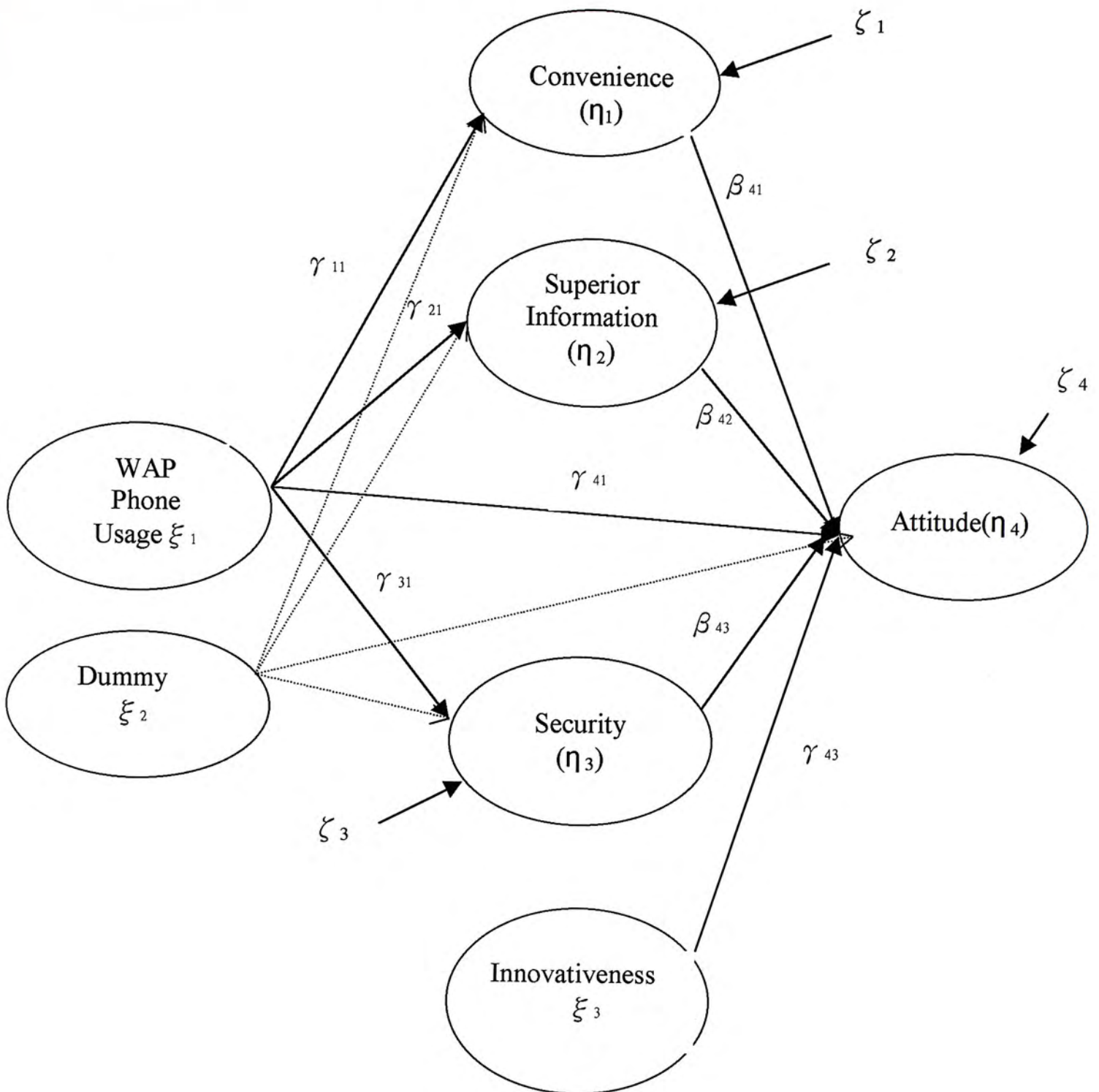
If large numbers of cell phones and mobile organizers are to serve as wireless wallets, mobile commerce must establish uniform security standards. Online shoppers until now still have hesitation to give personal credit card details over the net. Based on issues raised in "Wireless Security" (Sadaka 2000), questions are pinpointed to security concerns raised to financial institutions.

The scale for each of the four constructs was generated, tested, and refined. In this study, perceived convenience was measured by a 4-item, 7-point Likert scale anchored at “strongly agree” to “strongly disagree”. A sample item is “WAP Banking is very convenient for me because I can perform my banking needs with my mobile phone”. Perceived superior information was measured by a 4-item, 7-point Likert scale anchored at “strongly agree” to “strongly disagree”. An example would be “I can get accurate information on prevailing interest rates, foreign exchange rates, as well as term deposit rates”. Perceived security was measured by a 3-item, 7-point Likert scale anchored at “strongly agree” to “strongly disagree”, illustrated by “I find my personal information under sufficient protection in using WAP Banking.” Innovativeness was measured a 3-item, 7-point Likert scale anchored at “strongly agree” to “strongly disagree”. “In general, I am among the first in my circle of friends to try new innovations or gadgets.” would be one instance. Please refer to more detail of measures in Appendix I.

Data Analysis

To test the effect of the adoption toward WAP banking services on consumers’ response (i.e., WAP usage, perceived convenience, perceived superior information, perceived security, and innovativeness) as well as the causal relationships among these response constructs, one-way MANCOVA path analysis suggested by Nunnally (1978) was used in this study. All constructs under examination have shown strong reliability as all Cronbach Alphas well exceed 0.7, recommended by Nunnally (1978) for exploratory research. The model is shown in Figure 2.

FIGURE 2
THE PATH ANALYSIS MODEL



CHAPTER V

RESULTS AND DISCUSSIONS

To test the effect of WAP phone usage attributes (i.e., perceived convenience, perceived superior information, perceived security, and innovativeness) on consumer's attitude toward adoption of WAP Banking, the data collected was analyzed by using several statistics applications, such as SPSS, and LISREL 8.3. In our model, η signifies the mean difference between one group which possesses WAP phones and the other group which does not. It measures the degree of relationship of whether owning a WAP phone will exhibit certain patterns of attitude towards the adoption of WAP Banking.

Assessment of Measures

Our model could be considered as adequately fit according to Bentler and Bonett's (1980) normed fit index (NFI = 0.96), Bentler's comparative fit index (CFI = 0.96) and Bollen's (1989) incremental fit index (IFI = 0.96). The reliability of perceived convenience, perceived superior information, perceived security and innovativeness was equal to 0.9179, 0.8865, 0.8622, and 0.8819 respectively. Because the reliability of all constructs exceeds 0.7, recommended by Nunnally (1978) for exploratory research, it is reasonable to use the mean of the items of the constructs to represent the construct on the analysis. MANCOVA by Path Analysis is performed to determine the mean value of each construct mentioned earlier. When Alphas exceed 0.7, it indicates that we can use means of items to represent construct reliability.

One-Way MANCOVA by Path Analysis

The discussion of one-way MANCOVA by path analysis proceeds in two stages. First, the model fit is examined. Then the structural model results are discussed.

Overall Model Fit

The Chi-square value we obtained from this model is 63.95 with 6 degrees of freedom, which is statistically significant at the 0.00 significance level. The χ^2 value indicates that our model does not adequately explain the relationship between the observed sample covariance and the hypothetical population covariance. The model, however, could be considered as adequately fit according Jöreskog and Sörbom's (1989) goodness fit index (GFI = 0.86), Bentler's and Bonett's (1980) normed fit index (NFI = 0.96), Bentler's (1990) comparative fit index (CFI = 0.96) and Bollen's (1989) incremental fit index (IFI = 0.96).

Structural Model Results

In Chapter III, we hypothesize that WAP phone usage has positive impact on perception on WAP. It is also hypothesized that consumers' perception on WAP as well as WAP phone usage, mediate through consumers' perception on WAP has positive impact on the adoption of WAP Banking. Lastly, it is hypothesized that the more innovative an individual is, the more favourable his/her attitude towards the services. Table 5 shows the structural model results. According to Bagozzi and Yi (1989), γ_{11} , γ_{21} , γ_{31} , and γ_{41} are the differences in the means of the dependent variables (i.e. perceived convenience, perceived superior information, perceived security and attitude toward WAP banking) between the two groups (i.e. user group

with prior WAP experience and user group without prior WAP experience). Results show that previous WAP usage generated higher perceived convenience ($\gamma_{11} = 0.74$, $p < 0.05$) and higher perceived superior information ($\gamma_{21} = 0.15$, $p < 0.05$) than those without as hypothesized. Contrary to perceived convenience and perceived superior information, perceived security is not a concern with the adoption to WAP banking services ($\gamma_{31} = -0.039$, $p > 0.10$). The hypothesized WAP usage effect on users' perception is therefore partially supported. Results show that prior WAP usage does not contribute any positive head start towards WAP banking services ($\gamma_{41} = -0.21$, $p > 0.10$) implying that the hypothesized WAP usage effect on consumers' attitude toward WAP banking is insignificant. Results show that consumers' perception on WAP has positive impact on attitude toward WAP banking services as hypothesized. Specifically, it is found that all three constructs, namely perceived convenience ($\beta_{41} = 0.40$, $p < 0.01$), perceived superior information ($\beta_{42} = 0.12$, $p < 0.01$), and perceived security ($\beta_{43} = 0.15$, $p < 0.01$) have positive impact on attitude. Results show that innovativeness has positive impact on attitude toward WAP banking ($\gamma_{43} = 0.32$, $p < 0.01$) as hypothesized. In general, as can be observed from Table 5, five of the posited relationships by the paths of our model are significant.

TABLE 5

LISREL PATH COEFFICIENTS AND T-VALUES FOR HYPOTHESES TESTED

Paths	Coefficient	T-value	Hypothesis	Supported?
WAP phone usage to perceived convenience (γ_{11})	0.74	2.86 ^a	H1	Yes
WAP phone usage to perceived superior information (γ_{21})	0.15	0.63	H2	No
WAP phone usage to perceived security (γ_{31})	-0.039	-0.15	H3	No
WAP phone usage directly to Attitude (γ_{41})	-0.21	-1.06	H4	No
Perceived convenience to Attitude (β_{41})	0.40	6.04 ^a	H5	Yes
Perceived superior information to Attitude (β_{42})	0.12	1.76 ^a	H6	Yes
Perceived security to Attitude (β_{43})	0.15	2.22 ^a	H7	Yes
Innovativeness to Attitude (γ_{43})	0.32	4.88 ^a	H8	Yes

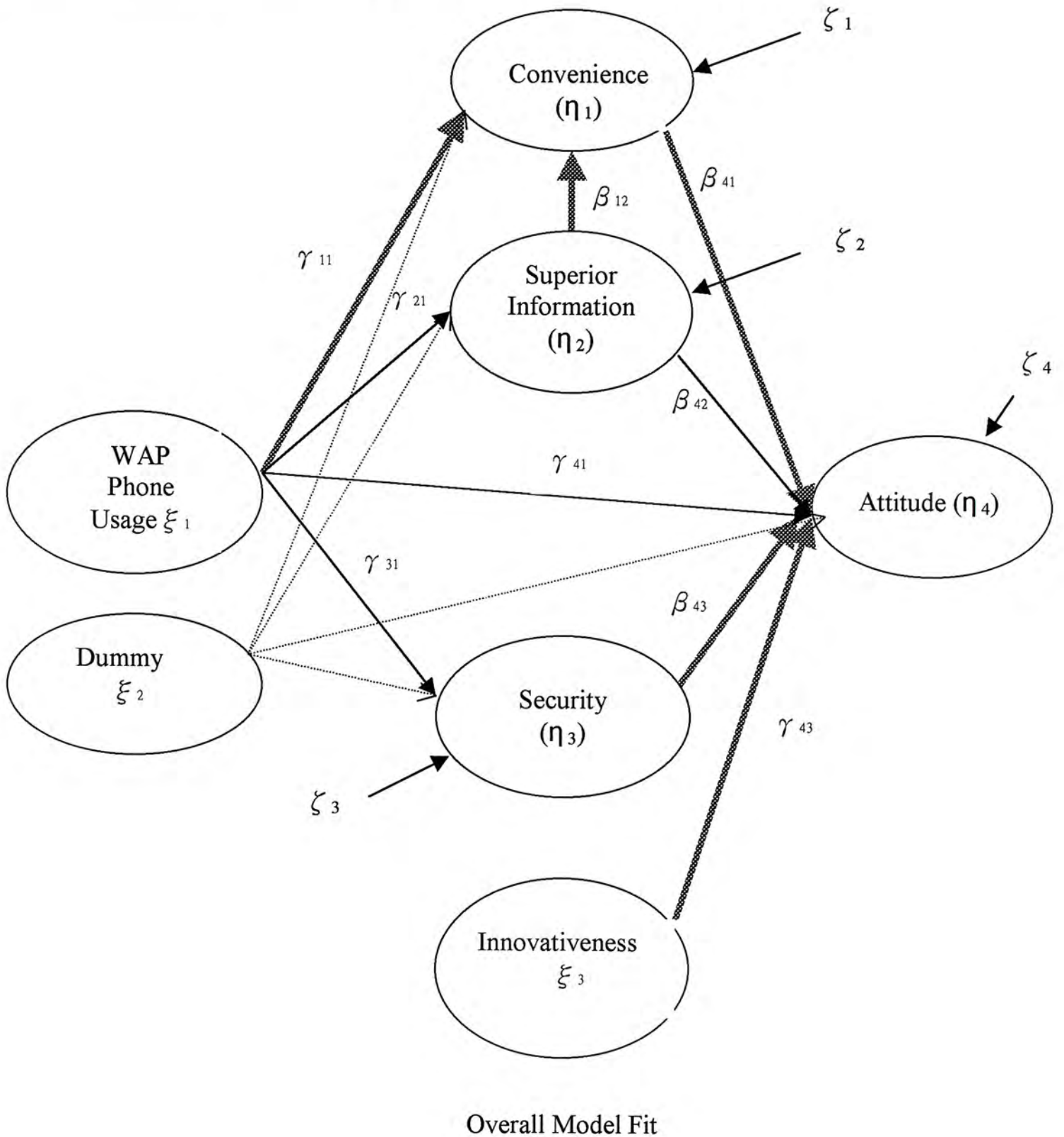
^a Significant at a 0.05 level

The Modified Model

Based on the modification index suggested by the LISREL program, a causal relation from perceived superior information to perceived convenience was added. The modified model is shown in Figure 3.

FIGURE 3

REVISED PATH ANALYSIS MODEL



Based on the Chi-square test, the modified model is still not adequately fit. There is, however, a significant improvement in terms of fit over the original model ($\chi^2_{diff=1} = 37.84$, $p=0.00$). The Chi-square value has been raised from $\chi^2_6 = 63.95$ to $\chi^2_5 = 26.11$ at $p=0.00$ significance level. The difference of 37.84 of one less degree of

freedom deems to be significant. There are also improvements in other fit indices: CFI and IFI have increased from 0.96 to 0.99; NFI from 0.96 to 0.98; and, GFI from 0.86 to 0.94.

Structural Model Results

In addition to the hypothesis we stated in Chapter III, we have identified another hypothesis and empirically tested the data. Table 6 shows the structural model results of the revised model. According to Bagozzi and Yi (1989), γ_{11} , γ_{21} , γ_{31} , and γ_{41} are the differences in the means of the dependent variables (i.e. perceived convenience, perceived superior information, perceived security and attitude toward WAP banking) between the two groups (i.e. user group with prior WAP experience and user group without prior WAP experience). Results show that previous WAP usage generated higher perceived convenience ($\gamma_{11} = 0.65$, $p < 0.05$) and higher perceived superior information ($\gamma_{21} = 0.15$, $p < 0.05$) than those without as hypothesized. Although the magnitude on perceived convenience decreased from 0.74 to 0.65 comparing with the previous model, the hypothesis is supported. Since the other two hypotheses, H_2 and H_3 , are insignificant, therefore the hypothesized WAP usage effect on users' perception continued to be partially supported. Same as the previous model, results show that prior WAP usage does not contribute any positive head start towards WAP banking services ($\gamma_{41} = -0.21$, $p > 0.10$) implying that the hypothesized WAP usage effect on consumers' attitude toward WAP banking is insignificant. Although perceived convenience ($\beta_{41} = 0.40$, $p < 0.01$) and perceived security ($\beta_{43} = 0.15$, $p < 0.01$) continue to contribute positive effect to attitude toward WAP banking, perceived superior information ($\beta_{42} = 0.12$, $p > 0.10$) discontinued to bring positive effect to attitude toward WAP banking. However, the new

hypothesized mediating effect of perceived superior information to perceived convenience ($\beta_{12} = 0.55, p < 0.05$) is supported. Hence, an interesting finding is discovered. While providing more perceived superior information proves to increase people's perception of perceived convenience in using WAP phones, this increase in information upsets the relationship between perceived superior information and attitude. In other words, increased information contributes to people's attitude only through their perception of convenience, but not directly from the perceived superior information they receive. Finally, results show that innovativeness continues to have positive impact on attitude toward WAP banking ($\gamma_{43} = 0.32, p < 0.01$) as hypothesized.

TABLE 6

LISREL PATH COEFFICIENTS AND T-VALUES FOR REVISED MODEL

Paths	Coefficient	T-value	Hypothesis	Supported?
WAP phone usage to perceived convenience (γ_{11})	0.65	2.96 ^a	H1	Yes
WAP phone usage to perceived superior information (γ_{21})	0.15	0.63	H2	No
WAP phone usage to perceived security (γ_{31})	-0.039	-0.15	H3	No
WAP phone usage directly to Attitude (γ_{41})	-0.21	-1.06	H4	No
Perceived superior information to perceived convenience (β_{12})	0.55	6.59 ^a	New	Yes
Perceived convenience to Attitude (β_{41})	0.40	5.15 ^a	H5	Yes
Perceived superior information to Attitude (β_{42})	0.12	1.50	H6	No
Perceived security to Attitude (β_{43})	0.15	2.22 ^a	H7	Yes
Innovativeness to Attitude (γ_{43})	0.32	4.88 ^a	H8	Yes

^a Significant at a 0.05 level

CHAPTER VI

IMPLICATIONS TO MANAGER AND RESEARCHERS

Limitations of our Research

The primary limitation of our research is that WAP is still a brand-new technology, not yet fully launched in the market. Even people who do possess WAP phones may not grasp its full advantages offered as mobile infrastructure and networks provided by existing mobile operators do not support an extensive of WAP services.

Established global companies such as Motorola or Nokia has just launched their respective WAP-capable phones half a year ago, later than market expected date for two seasons. One prime reason might due to poor initial experience with WAP phones in Europe and the States. In the survey performed by Morgan Stanley Dean Witter Research Report, a number of reasons contribute to this bad reception of WAP phones (Shuper and Brixen 2000):

- The dial-up nature of WAP phones as there is always a delay while connection is being made;
- The lack of adequate number of WAP sites and relative difficulty in accessing those outside the operator's site; and
- A complicated set-up procedure before a connection can be established with a WAP server.

The second constraint is that all our questionnaire targets lived in Hong Kong. As a result, the effect of different countries and cultures could be not assessed. Similar to the nature of Internet, WAP usage is supposed to be global, boundary-less and without physical obstruction.

Contribution of the Study

Our revised model has explored a relatively novel technology which we based our groundwork on the Technology Acceptance Model. With reference to the recent literature review on Internet and Internet Banking, we have come up with a few constructs that are commonly associated with the benefits of WAP phone usage. These pilot constructs can be served as fundamental factors for later research use.

Although we have postulated a positive effect on WAP phone usage to perceived convenience, perceived superior information, perceived security and attitude, yet three of the hypotheses are rejected with the exception to perceived convenience. To this end, we can conclude that the major reason that leads to WAP usage is because of convenience factors such as ubiquity and timeliness. Ubiquity denotes the ability to receive information and perform transactions from virtually any location, while timeliness represents the transmission and use of time-sensitive information whose value is inherent in its immediate delivery.

Interestingly, perceived security is not a major concern on WAP usage and yet it is a concern for WAP banking services. WAP services are still at its introductory stage and it seems that users use it mainly to retrieve information instead of performing monetary transactions. For this reason, perceived security does not pose a

major concern. However, with the introduction of WAP banking services, the story could be totally different.

Among the four constructs affecting the attitude towards WAP banking services, perceived convenience has the greatest coefficient meaning that it has the largest influence. Innovativeness ranks second, followed by perceived security and perceived superior information. Comparing the magnitude of the coefficients for perceived convenience and innovativeness, the effects on perceived security and perceived superior information are insignificant. Perceived superior information will ultimately lead to perceived convenience and therefore perceived security would become the least important factor influencing users' adoption to WAP banking services.

Various implications to bankers and researchers can be extracted from the result of our study. Bank marketing plans can be skewed to emphasize factors that create direct impact to intended behavior and euphemize others that inflict concerns. Researchers can base this as a fundamental review for future reference.

Managerial Implications

We found that previous WAP usage experiences have positive impact on only perceived convenience, but not on perceived superior information and perceived security. In short, perceived convenience is a factor user already considered before they adopt WAP services. Perceived superior information and perceived security are attributes that are indifferent between WAP users and non-WAP users. Therefore, service providers should emphasize on perceived superior information and perceived

security in their promotion campaign with the objective to allow non-WAP users to see the differences and change their attitude toward WAP services.

Although Hong Kong is already a geographically compact city, people value their time as important as money. The advantage or value that is brought about by convenience could ultimately be the key success factor in WAP Banking. In our research, we found that perceived convenience would bring positive effect to the attitude toward WAP banking. To this end, both banks and application developers should focus on the development on user-friendly WAP banking application in order to attract WAP users to subscribe WAP banking services.

In our research, we also found that perceived superior information will mediate through perceived convenience which ultimately has a positive effect to the attitude toward WAP banking. Therefore, when developing their WAP banking businesses, banks shall also look into the diversity and quality of information they provided through WAP. Most importantly, the beauty of diversified and high quality information must communicate to customers in an effective manner. WAP banking could be promoted as an information-seeking tool to complement other interactive banking methods. It could be characterized as the “Walking ETC machine in your pocket”, except that it would not accept cash withdrawal/deposit requests.

In our research, we found that perceived security has impact on attitude toward WAP Banking as well. We believe that this is an issue bankers cannot afford to neglect. Security issues must be fully tackled before WAP Banking can be launched to the public. Encryption and decryption technologies must be tested to be

extremely safe. Banks are considered to be the most secured institution where people save their money. Customers choose banks based on their trust, faith and reputation. Once they know that their privacy is in breach in any way, word-of-mouth, or media, would destroy everything that has been set up. Reputation could be lost overnight and so would customers and business. Again, banks must communicate this message clearly to their customers in order for them to adopt the services.

Innovativeness, which is the absolute opposite to subjective norm, is an innate personality toward avant-garde gadgets or technology. In our research, we found that innovativeness has direct impact on attitude toward WAP banking, therefore in promoting WAP banking services, banks may consider offering free services to their customers, most probably those younger customers which belong to the high income bracket.

People's love at first sight to a technology will not last long should the product cannot live up to anticipated requirements. Only usefulness or versatility would determine product's ultimate success. However, due to the limitation to mobile phone's screen size and accessibility speed, WAP Banking would be difficult to completely replace current popular means of banking, i.e. phone banking, Internet banking or traditional branch banking. Therefore, marketing of WAP banking services could focus more on simple day-to-day transactions such as balance enquiry, funds transfer or credit card payments. Since these are commonly used banking services that demand minimal screen size and memory size, people would value the perceived convenience offered through their phones they carry around all the time.

Future Research Direction

Future research examining users' attitude toward WAP banking should attempt to provide a greater understanding of the findings reported here. Ideally, other factors such as customization (e.g. possibility on one-to-one marketing), privacy, and data accuracy should be incorporated into the study.

CHAPTER VII

CONCLUSION AND WAP BANKING OUTLOOK

Conclusion

The study provides a number of interesting results with significant implications for WAP banking development. Results show that perceived convenience, perceived superior information, perceived security and innovativeness create higher attitude toward WAP Banking. WAP phone usage creates only higher perceived convenience but not perceived superior information nor perceived security. Perceived superior information mediates through perceived convenience to create a higher attitude toward WAP banking. To improve consumers' attitude toward WAP banking, banks must focus on the development of user-friendly or convenience applications for their customers, providing variety of information in a secure environment.

WAP Banking Outlook

Mobile phones currently outsell personal computers approximately 4 to 1, no wonder why businesses all flock to embrace this new gadget. Wireless e-commerce or m-commerce, in short will be the next Armageddon for the traditional "brick and mortar" businesses. As mentioned earlier, Merrill Lynch predicts that m-commerce revenue will reach US\$45 million in four years (Swartz 2000). Find-and-buy wireless transactions, including purchases of travel and entertainment tickets, books, CDs and stocks are estimated to reach US\$70 million in the US this year. M-commerce is

appealing because wireless offers customer-location information, personalized consumer interaction and constant connection to the Internet. Having just embraced online banking services delivered through ordinary personal computers, bankers are now juggling even more complex issues with respect to wireless channel, cost containment, customer demand and technology.

Pilots in North America include Bank of America, Wells Fargo, Citigroup, KeyCorp and Bank of Montreal began to offer banking services through mobile phones (Marlin 2000). Standard Chartered Bank in Hong Kong is the first pioneer to launch WAP Banking in March 2001. In this paper, we focus on the factors that lead to the users' adoption to the WAP banking services in the Hong Kong market. We applied the TAM model to the WAP banking systems and analyze the results using different statistical software.

Since the potential for alienating customers with poor services is high, bank strategists will need to think carefully about which customers will actually use wireless banking and what services they will require (Engen 2000). For consumers, WAP Banking will be a new experience, since thus far most of them have used their mobile phone primarily for voice, and more recently for SMS messages.

Forrester Research found the likelihood that people would actually purchase things on the Internet is directly correlated with age: younger people are a lot more adventurous (Judd 2000). According to our survey, 81.6% of the respondents who use WAP services are below 35 years old. We believe that the same rule shall apply to WAP banking services as well meaning that the target customer group for WAP

banking services would be those customers. With respect to our findings, it is very clear that Banks and WAP application developers should focus on the design of WAP banking applications which are user-friendly and convenient to users, specially catered for this target market.

In our view in order for WAP Banking to be accepted by customers in the market, the following two criteria must be met:

1. The penetration of WAP terminals must be sufficiently high; and,
2. Relevant WAP Banking applications, which provide both convenience and security

APPENDIX 1

Perceived convenience (a 4-item, 7-point Likert scale)

- y1: WAP Banking is very convenient for me because I can perform my banking needs with my mobile phone.
- y2: It is more convenient for me because I save time in commuting to a branch and queuing for service.
- y3: WAP Banking is time effective as all banking transactions can be updated with my mobile phone.
- y4: I value WAP Banking because I can perform my banking needs anytime, anywhere with my mobile phone.

Perceived superior information (a 4-item, 7-point Likert scale)

- y5: Regardless of where I am in Hong Kong, I can check my balance and banking stance up to that moment.
- y6: I can get update information on banks, credit card or mortgage promotions through the use of WAP Banking.
- y7: I can get accurate information on prevailing interest rates, foreign exchange rates, as well as term deposit rates.
- y8: I will be able to retrieve update market news and commentaries from my mobile phone.

Perceived security (a 3-item, 7-point Likert scale)

- y9: I feel that using mobile phone to access banking services is generally secure.
- y10: I find my personal information under sufficient protection in using WAP Banking.
- y11: My right to control the use of my personal information is safeguarded in using WAP Banking.

Innovativeness (a 3-item, 7-point Likert scale)

- y₁₂: In general, I am among the first in my circle of friends to try new innovations or gadgets.
- y₁₃: If I heard that a new method (i.e. banking or trading) was available, I would typically be interested to try it.
- y₁₄: Compared to my friends or colleagues, I have tried a lot of new methods (i.e. banking or trading) when they first appeared in the market.

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