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Understanding adoption and continual usage behaviour towards internet banking services in Hong Kong

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UNDERSTANDING ADOPTION AND CONTINUAL USAGE BEHAVIOUR
TOWARDS INTERNET BANKING SERVICES IN HONG KONG

by
CHAN Siu Cheung

A thesis
submitted in partial fulfillment
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ABSTRACT

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towards Internet Banking Services in Hong Kong

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Banks and financial institutions in Hong Kong are increasingly finding themselves facing rapid increases in turbulence and complexity, leading to greater uncertainty and increased competition.   Customers are also becoming more demanding.   Apart from the traditional type of banking services, customers today require more personalized products and services, and access to such services at any time, and at any place.   Although there is no panacea for banks to stay competitive, Internet Banking is one of the advanced information technologies they can employ to achieve a high level of customer services.

Internet Banking is an emerging technology that permits conduct of banking transactions through the Internet.   From the banks' point of view, it requires the lowest transaction cost among various channels, just one percent of branch-based banking.   It also can improve the efficiency and effectiveness of corporate business processes through elimination of paper work.   One of the many benefits of Internet Banking is that customers can use bank services 24 hours a day from anywhere in the world.

This study investigates university students' adoption/continual usage behaviour within the context of Hong Kong Internet Banking services.   A research framework based on the extension of Technology Acceptance Model and Social Cognitive Theory was developed to identify factors that would influence the adoption/continual usage of Internet Banking.   The framework includes subjective norm, image, result

demonstrability, perceived risk, computer self-efficacy, perceived usefulness, perceived ease of use and intention constructs. A diverse sample of undergraduate and postgraduate students of seven universities in Hong Kong was used to test the models.

Structural Equation Modeling was used to examine the entire pattern of intercorrelations among the eight proposed constructs and to test related propositions empirically.   The results reveal that both subjective norm and computer self-efficacy play significant roles in influencing the intention to adopt Internet Banking indirectly. Perceived usefulness has significant positive effect on intention to adopt, this result supports the extension of the Technology Acceptance Model.   Perceived ease of use has significant indirect effect on intention to adopt/continual usage through perceived usefulness, while its direct effect on intention to adopt is not significant in this empirical study.   Theoretical contributions and practical implications of the findings are discussed and suggestions for future research are presented.

I declare that this thesis « Understanding Adoption and Continual Usage Behaviour towards Internet Banking Services in Hong Kong » is the product of my own research and has not been published in any other publications.

CHAN Siu Cheung
October 2001

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LIST OF SYMBOLS

Alpha	α	A
Beta	β	B
Chi	χ	X
Delta	δ	Δ
Epsilon	ε	E
Phi	ϕ	Φ
Gamma	γ	Γ
Eta	η	H
Iota	ι	I
Kappa	κ	K
Lambda	λ	Λ
Mu	μ	M
Nu	ν	N
Omicron	o	O
Pi	π	Π
Theta	θ	Θ
Rho	ρ	P
Sigma	σ	Σ
Tau	τ	T
Upsilon	υ	Y
Omega	ω	Ω
Ksi	ξ	Ξ
Psi	ψ	Ψ
Zeta	ζ	Z

LIST OF ABBREVIATIONS

DSS	Decision Support Systems
IS	Information Systems
IT	Information Technology
MIS	Management Information Systems
PC	Personal Computer
PDA	Personal Digital Assistant
WAP	Wireless Application Protocol
SCT / SLT	Social Cognitive Theory / Social Learning Theory
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
TAM	Technology Acceptance Model
TAM2	Extension of Technology Acceptance Model
AB	Actual Behaviour
ATB	Attitude Toward Behaviour
BI	Behavioural Intention
PBC	Perceived Behavioural Control
SE	Self-Efficacy
CSE	Computer Self-Efficacy
IMG / IMAGE	Image
INTENT	Intention to Adopt / Continue Use
PEOU	Perceived Ease of Use
PRISK	Perceived Risk
PU	Perceived Usefulness
RD	Result Demonstrability
SN / SNORM	Subjective Norm
SEM	Structural Equation Modeling
df	Degree of Freedom
χ^2	Chi-Square
RMSEA	Root Mean Square Error of Approximation
ECVI	Expected Cross-Validation Index
RMR	Root Mean Square Residual
GFI	Goodness of Fit Index
AGFI	Adjusted Goodness of Fit Index
PGFI	Parsimony Goodness of Fit Index
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index
PNFI	Parsimony Normed Fit Index
CFI	Comparative Fit Index
IFI	Incremental Fit Index
RFI	Relative Fit Index

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CHAN Siu-cheung

September 2001

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CHAPTER 1   INTRODUCTION

1.1   Background

Hong Kong is an international financial centre well known for its efficiency and its ability to adapt and keep up with the times. These are the traits that have made Hong Kong what it is today – a powerful economic leader in the modern world. Investors worldwide have recognized the potential of Hong Kong and have come to this small and densely populated area to expand their horizons. With an area of only 1,100 km^2 and a population of 6.8 million people, Hong Kong is crowded with a total of 268 domestic and foreign banking institutions (of which 235 banks are owned by over 30 different countries). Seventy-nine of the largest one hundred banks in the world have a branch(es) in Hong Kong.   At the end of June 2001, there were 268 authorized banking institutions, including 153 licensed banks, 50 restricted licence banks and 65 deposit-taking companies (HKMA, 2001).   Among these licensed banks, 31 were incorporated in Hong Kong and 122 were incorporated outside of Hong Kong.   Major players in the retail banking sector include Hongkong and Shanghai Banking Corporation (HSBC), Hang Seng Bank (HSB, a subsidiary of HSBC), Bank of China Group, Standard Chartered Bank and Bank of East Asia.   Recently, however, the Hong Kong banking industry is losing competitive advantages in some areas. The adoption of Internet Banking is one of them.   Several reasons have been suggested for the lost in competitiveness.   Firstly, the economic recession since 1998 has caused profit margins to decline in all sectors. Therefore, businesses are more conservative with their investments. Secondly, the

stock options offered by banks are not as encompassing and flexible as the leading investment companies. Thus, people are taking their money out of banks and giving it to investment companies to invest. The above reasons maybe why Hong Kong banks are slower in joining the e-commerce evolution, which was first introduced in 1995 in the US and was proven successful by the number of people who used it to trade and do banking transactions. The financial institutions in the US set a precedent to financial institutions around the world to promote online banking to better serve their customers. Many property and stock investment firms in Hong Kong have jumped on the bandwagon and adopted the Internet as a channel for providing better and more efficient service to their clientele as well. However, despite the great hype to promote online commerce worldwide, Hong Kong's banks are still quite slow in providing Internet Banking services that many overseas customers take for granted in their home countries. This is uncharacteristic of Hong Kong's economic development in this regard.

A survey by Internet Asia (1999) discovered that many local bankers ignored the Internet. The report revealed that most banks did not even provide adequate Internet access for their executives. The survey also found that 70 percent of banking institutions in Hong Kong had no plans or had not yet decided whether or not to use the Internet as a means to offer banking services. In subsequent months, little had changed. Many local banks were still taking a cautious approach to Internet Banking and were holding off providing online services. Perhaps one of the reasons could be that banks in Hong Kong prefer to invest in more profitable areas. In 1999, banks were busy with fixing the Y2K bug, and as a result had to clear their accumulated backlog in 2000. Most of them were also preparing for the implementation of the Mandatory Provident Fund (MPF). Therefore, it is

somewhat understandable that they had no time to consider the development of Internet Banking. In the beginning of year 2001, with the backlog behind them, many banks would launch new products, adjust service levels to retain and acquire new customers, and look into supplementary services such as Internet Banking in order to survive in a highly competitive and fast-pace environment. However, according to John Tsang, Deputy General Manager of Joint Electronic Teller Services (JETCO), only nine out of the 52-members banking consortium have elected to use Virtual ATM, which is a Web-based service that offers common retail banking services, excluding cash transactions (CWHK, 2001). JETCO manages 1,600 ATMs around Hong Kong and provides Virtual ATM services as part of a portfolio of services available to its consortium members. It is interesting to note that well-known banks, such as the Hongkong and Shanghai Banking Corporation (HSBC) and the Hang Seng Bank had already launched mobile banking services in 1999, but not online banking services. Their online services were made available only during the second half of the year 2000. What are the factors that would hinder a bank's decision to offer Internet Banking services? Is the startup cost of Internet Banking very expensive?   Is public acceptance of Internet Banking in Hong Kong very low?   This study attempts to shed some light on the above questions.

Customers' responses and readiness to use Internet Banking are most probably the key to the decision of a bank to provide Internet Banking services.   Courtier and Gilpatrick in their research (1999) recommended that financial institutions should regularly survey or gauge customers' needs and desires before setting up any banking strategies on the Internet.   Customers' needs and desires directly contribute to the success of the implementation of Internet Banking. Moreover, customers' expectations and acceptance of the new technology and the beliefs in their ability to

use it will directly influence their needs and desires to adopt it. The adoption behaviour of the people in Hong Kong towards Internet Banking is the primary focus of this research.

1.2 Objectives and Importance of the Research

In management information systems (MIS) research, information technology (IT) usage is always a key dependent variable (DeLone & McLean, 1992). Although many studies (Adams et al., 1992; Chin & Gopal, 1995; Christensen, 1987; Davis, 1989; 1993; Pavri, 1988; Taylor & Todd, 1995a; 1995b; Thompson et al., 1991) have empirically examined the determinants of IT usage, the temporal dimension of the adoption process (that is, the sequence of activities that lead to the initial adoption and subsequent continual usage of an IT innovation at the individual adopter-level) has been ignored in most empirical studies investigating user beliefs and attitudes. Kwon and Zmud (1987) suggested that research should explore the impact of contextual factors, such as characteristics of the technology and their interaction with organizational and task characteristics, at multiple implementation stages. These factors may have divergent impacts on the various stages of the innovation decision process.

Some studies in the general information systems (IS) implementation/diffusion area have articulated and/or tested differences across the stages of the innovation decision process (Brancheau & Wetherbe, 1990; Cale & Eriksen, 1994; Cooper & Zmud, 1990; Prescott & Conger, 1995). With only three exceptions (Davis et al., 1989; Karahanna et al., 1999; Thompson et al., 1994), individual-level empirical

studies in the general tradition of Theory of Reasoned Action (TRA)/Theory of Planned Behaviour (TPB) have not articulated or tested for differences in the determinants of attitude or behaviour prior to and post-adoption of an IT innovation. Although the studies by Davis et al. and Thompson et al. have only examined the influence of two innovation attributes (that is, perceived usefulness and perceived ease of use) on technology acceptance outcomes, their findings have enhanced the understanding of determinants of initial usage and continual usage. Other studies in innovation diffusion tradition have argued for a more comprehensive set of beliefs (Roger, 1983) in technology acceptance. Moore and Banbasat (1991) have expanded and refined Roger's (1983) set of beliefs in the domain of information technology, which helps explain information technology usage among adopters and potential users. Up to now, only the study by Karahanna et al. (1999) has included and examined these innovation attributes. The findings in their research was a breakthrough in the field of IS. It provided both a theoretical and a rational explanation of the differences in adoption and usage based on theories of attitude formation. Therefore, it is a research priority and goal in the field of Information Systems to isolate, identify and understand the different factors that influences both adoption and usage behaviour of IT innovations.

1.2.1 Research Objectives

The current research aims at enriching the knowledge and understanding of factors affecting adoption and continual usage of Internet Banking services in Hong Kong (an IT innovation). Specifically, the main objectives of this study are:

R1: To identify factors influencing the adoption and continual usage of Internet Banking.

R2: To investigate whether differences exist between the determinants of adopting and continuing to use Internet Banking.

R3: To examine the degree of mediating effects of the two constructs in Technology Acceptance Model (TAM) between the antecedents and intention to adopt/continual usage of Internet Banking via a structural equation model.

1.2.2   Significance of the Study

Following the approach taken by Karahanna et al. (1999), this study combines innovation attributes and attitude theories in a theoretical framework to examine potential adopters' and early adopters' beliefs for adopting and continuing usage of Internet Banking.   This study attempts to provide a better theoretical understanding of the antecedents of user acceptance and user resistance to adoption and continual usage of Internet Banking in Hong Kong.   This study also tries to extend TAM by adding Perceived Risk and Computer Self-Efficacy as external variables for Perceived Usefulness and Perceived Ease of Use.

Perceived risk is an external variable first introduced in marketing research on the study of innovation diffusion and adoption (Frambach, 1993; 1995; Ostlund, 1974).   The importance of perceived risk has also been examined in IS research, especially in Internet Banking literature (Bhimani, 1996; Cockburn & Wilson, 1996; Lee, 1996).   The perceived lack of security and privacy over the Internet has been a recognized obstacle in electronic commerce adoption.   This has made many people viewing Internet use as a risky activity.   Thus, customers will adopt Internet Banking only when they perceive it as being low-risk.   On the other hand, computer self-efficacy is adopted from the widely accepted model of individual behaviour in social sciences research, or better known as the Social Cognitive Theory (Bandura,

1977a; 1977b; 1978; 1982; 1986).   Evidences of the relationship between self-efficacy with respect to using computers are found in a variety of computer studies (Burkhardt & Brass, 1990; Gist et al., 1989; Hill et al., 1986; 1987; Webster & Martocchio, 1992; 1993). Users of Internet Banking need to have the necessary knowledge to operate a computer and use the Internet.   Therefore, computer self-efficacy helps to explain the adoption and rejection decisions of the users. It is with the above observations in mind, that the researcher decided to incorporate risk perception and computer self-efficacy in order to give a more in-depth analysis of adoption/continual usage behaviours of Internet Banking.

This study has two theoretical contributions. First, it is the first study to empirically examines the different influences of technology acceptance constructs together with risk perception and self-efficacy on both adoption and continual usage behaviours of Internet Banking. Second, it provides a theoretical framework that differentiates adoption and usage based on theories of social psychology and attitude formation.   Aside from theoretical values, knowing which criteria are important for adoption and which for continual usage will enable systems developers and banks to employ more targeted implementation efforts at each phase of the adoption process. Findings in the study will help banks formulating Internet Banking strategies by emphasizing the relevant criteria at each phase necessary for a successful adoption process.

1.3 Organization of the Thesis

This thesis is divided into four parts, which is composed of six chapters. Part One provides a preview of this study, including an introduction and two snapshots of Internet Banking services in Hong Kong. Part Two is literature review. Part Three presents the proposed research model and analysis of the survey data. Part Four provides the discussion of the findings and the conclusion.

Part One CHAPTER 1 introduces the background and research goals of this study. Despite the current trend of promoting online commerce, many local banks demonstrate a cautious approach towards Internet Banking. This is highly uncharacteristic of the Hong Kong economic behaviour, as Hong Kong has always been a leader in employing advanced information technologies to stay competitive in the financial world. CHAPTER 2 outlines the conception of Internet Banking and briefly reports on the evolution of Hong Kong retail banking services. It also provides two snapshots of Internet Banking services that offered by 34 selected banks in Hong Kong. Data collection for this part was done in May 2000 and May 2001.

Part Two CHAPTER 3 reviews selective literature on the theories of people's adoption behaviour of information technologies, namely the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM), and the Extension of Technology Acceptance Model (TAM2). The concept of self-efficacy, which is rooted from the Social Cognitive Theory (SCT), is also reviewed. Similarities and differences between the theories' constructs are analyzed and discussed.

Part Three   CHAPTER 4 applies the TPB and TAM2 theories to develop the proposed research model of Internet Banking Adoption in Hong Kong. Perceived Risk and Computer Self-Efficacy respectively are added as the antecedents of Perceived Usefulness and Perceived Ease of Use in this study. Hypotheses within the research framework are then explicated. Results of the elicitation studies, the design of the main survey, and methods of analysis are described and discussed in detail. CHAPTER 5 analyzes 499 university students' responses in the main survey; there are 352 potential adopters and 147 users of Internet Banking. The results of the statistical analysis and the path analysis of the structural equation model, which are created by using LISREL 8.30 for Windows, are reported. Appropriate graphic presentations are inserted for clearer illustration.

Part Four   CHAPTER 6, the concluding chapter, presents a discussion of the theoretical and practical implications of the findings. A summary of the contributions of this study, its limitations, suggestions for further research, and conclusion are presented.

CHAPTER 2   INTERNET BANKING IN HONG KONG

2.1   Conception of Internet Banking

Internet Banking means that banking services such as services introduction, loan application, account balance inquiry, fund transfer and so forth are provided by a bank through the Internet. According to Michael Karlin, the President and Chief Operation Officer of the world's first virtual bank, Security First Network Bank, the idea of Internet Banking is as follows:

1) *You do not have to purchase any software, store any data on your computer, back up any information, since all transactions occur on the bank server over the infrastructure of the Internet.*

2) *You will be able to conduct your banking services anywhere you like but you need to have a computer and a modem, no matter where you are (e.g. at home, at office, or in a place outside the country).*

3) *You can use the banking services 24 hours a day, 7 days a week, 365 days a year. You no longer have to reconcile a bank statement or manually track your ATM and paper cheques.*

Internet Banking is different from PC Home Banking.   The obvious difference is that Internet Banking is browser-based, whereas PC Home Banking requires customers to install a software package assigned by the bank on their PC. Moreover, PC Home Banking allows customers to do their banking services only on PCs that have been installed the assigned software package, such as include Intuit, Inc.'s Quicken and Microsoft Corp.'s Money.

2.2 The Cost-Effectiveness of Internet Banking

According to a global survey conducted by Booz-Allen and Hamilton (1997), the establishment of specialized Internet Banking requires only US$1-2 million, which is lower than branch-based banking setup. The traditional bank's running costs account for 50% to 60% of its revenues, while the running costs of Internet Banking is estimated at 15% to 20% of its revenues. Through the Internet, individual customers can interact with foreign banking and financial institutions from their homes or anywhere in the world. This decreasing importance of physical presence of a bank branch will diminish the competitive advantages of local banks.

Both setup and transaction costs of Internet Banking are not expensive. According to Walter Hamscher, the Director of Price Waterhouse, the setup costs of Internet Banking are not high. He expects that, owing to the rapid development of Internet in Hong Kong, and Hong Kong being one of the vital financial centres in the world, banks in Hong Kong should implement their services on Internet without delay. The "1997 Home Banking Report" revealed the relative costs to the US Banks per transaction for the various channels are as follows (see Table 2.1). Among the five transaction channels, Internet Banking requires the lowest cost per transaction.

Channel	Cost per transaction (US$)
Branch full service	1.07
Mail service	0.73
Telephone average	0.54
ATM full service	0.27
Internet Banking	0.01

Table 2.1   Relative Costs per Transaction for the US Banks

2.3 Technological Evolution of Hong Kong Retail Banking Services

2.3.1 Automatic Teller Machine

Between 1970-1980s, the Electronic Fund Transfer (EFT) system was introduced to Hong Kong. EFT helps financial institutions process financial data and transfer funds electronically. This technological innovation stimulated banks to offer a new array of computerized electronic banking services such as Automated Teller Machine (ATM) and Electronic Funds Transfer at Point of Sale (EFTPOS) in Hong Kong.

ATM was first introduced in Hong Kong by Standard Chartered Bank in 1979. ATM provides some basic banking services on a 24-hour basis. By using an ATM card and a personal identification number (PIN), customers can deposit or withdraw cash, transfer funds from one account to another, inquire about account balance and request for cheque books and account statement. The transactions are electronically recorded instantaneously (Ghose, 1987).

Nowadays, there are over 1600 ATM machines in Hong Kong and ATM services are widely accepted by the people in Hong Kong. The Hongkong and Shanghai Banking Corporation Limited's ATM network (also known as Electronic Teller Card System) is probably the most heavily utilized system in the world in terms of the number of transactions performed each day. Standard Chartered Bank claimed that 40 per cent of their daily transactions were processed by ATM (Carstairs, 1998).

2.3.2   Telephone Banking

Greater competition between banks has generally resulted in further technological development in services offered. In 1982, Chase Manhattan Bank in Hong Kong started to provide a home-based online banking service named "Telephone Banking" to the general public.   By linking the bank's computer system with the telephone line, customers are able to obtain personal banking services at home, in the office and even pay phones on the streets.

Telephone Banking is very successful in Hong Kong because it brings convenience to customers and the scope of services provided is almost the same as that of the bank branches except for cash withdrawal. Moreover, the high ratio of telephone usage in Hong Kong, 56 percent of Hong Kong's population are fix-line business and residential subscribers and 79 percent of Hong Kong's population are mobile phone subscribers (ITBB, 2001), also contributes to the quick adoption of Telephone Banking.   Nowadays, Telephone Banking is a necessity service for many retail banks in Hong Kong.

2.3.3   Home Banking

The popularity of Telephone Banking paved the way for the development of Home Banking services. Home Banking is defined as conducting of transactions and accessing bank account information via personal computers (PC). Sometimes, it is called Electronic Banking. To use Home Banking, a PC, a modem and a telephone line are required. In addition, specific banking application software has to be installed to perform banking functions.

HSBC and HSB launched the first Home Banking service in Hong Kong in

1985.　The HSBC's "Hexagon" targets corporate customers who are frequent users and have many accounts operating for different businesses.　In 1996, Citibank in Hong Kong used its own dial-up network to offer a Direct Access service (a PC-based banking service) to its customers.　Following Citibank, the Bank of East Asia, Standard Chartered Bank, and others also offered the Home Banking service, such as the "Excel Banking" service of Standard Chartered Bank.

2.3.4　Internet Banking

The PC Home Banking service is a forerunner of Internet Banking.　Internet Banking is defined as conducting banking transactions through the Internet.　The difference between Internet Banking and Home Banking is that no proprietary software has to be installed for accessing the banking services over the Internet, instead banking services can be acquired through the public network of the Internet. Hence, a customer can have access to his/her bank account through the Internet at any given time or place.

Internet appears to offer unlimited business opportunities, not just "Net Presence" and non-transactional banking services.　Several banks in Hong Kong have started to offer more Internet Banking services since late 1999, for example, the CFB Web Banking of Chekiang First Bank (http://www.cfb.com.hk), the Net Banking of Wing Lung Bank (http://www.winglungbank.com.hk), the CitiDirect of Citibank N.A. (http://www.citibank.com.hk), the Bank of East Asia (http://www.hkbea.com), and the Dah Sing Bank(www.dahsing.com.hk).　The following section will provide a general picture of the Internet Banking services, which are offered by the 34 selected banks in Hong Kong.

2.4   Direct Observations of Internet Banking Services in Hong Kong

Although Hong Kong is a well-known international financial centre, the uptake of Internet Banking in Hong Kong has been slow, and is still in the infant stage. There has been plenty of news on the subject recently, including the announcements of launching new Internet Banking sites, Internet Banking services, and strategic alliances among banks for offering Internet Banking services.   According to HKMA (June 2001), there are 153 licensed banks in Hong Kong, of which 31 that are locally incorporated, and most of them provide retail-banking services.   Since it is not the main purpose of this study to do a comparison of all Internet Banks in Hong Kong, only 34 banks were selected to do the summary of their Internet Banking services. These include 31 locally incorporated licensed banks and 3 typical licensed banks (have the most branches), which are separately incorporated in China, United Kingdom and the United States.   Data were collected in two waves that were one year apart.

Based on an extensive search on the World Wide Web in May 2000 and May 2001, two snapshots of Internet Banking providers and the services they offer are presented here.   All data in Appendix A and Appendix B were collected from the Internet, however, no verification with the individual banks was carried out.   There was an important reason for adopting this methodology.   Owing to the fierce competition prevalent in Hong Kong banking sector, individual banks declined to indicate how their services might develop in the future.   Several informal approaches with the banks revealed a reluctance to discuss their future developments. This necessitated the current data collection method that is solely from the Internet. Additionally, it was deemed essential that Web sites should be able to convey all the

information for both current customers and potential new customers via the Internet. If the content of the site fails to pass sufficient information, then the site is not fulfilling its purposes.

In May 2000, nine out of the 31 locally incorporated licensed banks did not have official Web sites (with results generated by Internet search engines, Hua Chiao Commercial Bank should have its official Web site, however, the site was not accessible during the first round of data collection). Two banks (Asia Commercial Bank and Liu Chong Hing Bank) had announced that they would co-operated with two other banks (International Bank of Asia and Chekiang First Bank), together with iMerchants Limited to provide multibank Internet Banking and WAP banking services (they are marked with ** in the column of Internet Banking launch date in Appendix A). iMerchants Limited is one of Asia's leading online business platform providers and the four-bank consortium is called "Net Alliance".

Moreover, seven locally incorporated licensed banks only provided information at their Web sites and two did not provide an email address for Internet users to contact them (DBS Kwong On Bank and United Chinese Bank). This means that over 50% of the locally incorporated licensed banks did not utilize the Internet. With the other 50%, only ten banks were offering Internet Banking services. Two of the other five banks might launch their Internet Banking services in the later half of the year 2000, while the other three did not announce any plan.

In May 2001, there were still six out of 31 locally incorporated licensed banks that did not have official Web site. They were Chiyu Banking Corporation, D.A.H. Private Bank, Overseas Trust Bank, Po Sang Bank, Tai Yau Bank, and Waifoong

Finance (Appendix B).   Hua Chiao Commercial Bank had a new Internet site address, which was under the domain of Bank of China Group.   However, it was one of those banks that only provided general information at their Web sites.   Their customers could do very little by means of their Web sites, accessing their banking accounts through the Internet was impossible.   There were a total of seven banks belonging in this category.

Besides, six locally incorporated licensed banks were using Virtual ATM, which was provided by JETCO, as their Internet Banking services (they are marked with ** in the column of Internet Banking launch date in Appendix B).   Of these six banks, two of them (Chekiang First Bank and First Pacific Bank) offered their own Internet Banking services, whereas Virtual ATM was an alternative for their customers.   The other three banks (International Bank of Asia, Jian Sing Bank, and Liu Chong Hing Bank) had Virtual ATM as their only Internet Banking services channel.   The last one, Asia Commercial Bank, was also providing Virtual ATM to its customers as the only channel in May 2001, but claimed that its own Internet Banking services would be launched soon.

The remaining 21 out of the 34 selected banks were providing true Internet Banking services.   This means their registered bank customers could perform a wide range of banking transactions such as inquiring account balances, renewing time deposits, obtaining statements, paying bills, transferring funds, and trading securities electronically via their Web sites by either wired devices (PC/kiosk) or wireless devices (mobile phone/PDA).

For the purposes of this research, customer expectations of Internet Banking can

be conveniently divided into five different categories, namely view-only functions, account control functions, new services applications, investment functions and other services. All of these categories were derived from research reported in Gandy (1998), Gandy & Brierly (1997) and Gandy & Chapman (1996). The last two categories were also derived from several local computer magazines (Hong Kong Economic Times' E-Zone, Ming Pao's Hi-Tech Weekly, Sing Tao's Computer Market, etc.) together with the functions stated by Jayawardhena and Foley (2000). Each of these categories has been further divided into subsets of functions, which are by no means exhaustive. These divisions were based on the cumulative aggregation of the functions enabled by the reviewed banks. These categories will be described in detail in the later part of the section.

Apart from these expectations, the cost of banking is of prime importance to customers. With the exception of some investment services, like StockWatcher of Hang Seng Bank, all banks offered their Internet Banking services free of charge. Moreover, mobile banking (either WAP or SIM Toolkit) was so popular that 8 out of 34 banks had already offered it in the first period of data collection (May 2000). As mentioned before, the four-bank consortium "Net Alliance" would also provide the WAP banking services soon. There were ten out of 34 banks providing mobile banking services in the second period of data collection (May 2001). Furthermore, Bank of China was the only bank offering Interactive TV Banking.

One of the primary objectives of using an online medium is to take advantage of the 24 hours a day banking irrespective of location. However, customers can only do foreign exchange and time deposit operations in specific time periods (some offered these services between 08:30 and 21:00 on weekdays, and between 08:30 and

13:00 on Saturdays; some with much shorter time duration).   This had directly and indirectly minimized the flexibility and undermined the purposes of Internet Banking.

2.4.1   View-Only Functions

Increasingly customers feel the need to have knowledge of their bank balances. This has been confirmed by several studies that monitored bank support call centres. They concluded that more than 60% of the customer inquiries concerned details about account balances and the last few transactions made by the customer (Gandy, 1998).   Without exception, all banks in the current study (11 banks during May 2000 and 21 banks during May 2001) that provided Internet Banking services also offered view-only functions.   Both banks and customers should benefit from this. For banks, it reduces the workload for their staff at both branches and call centres, and relieves congestion at ATMs.   For customers, they can be assured of a private, quick and efficient service at any time as long as the computer system functions properly.

2.4.2   Account Control Functions

Account functions provide customers with the broadest range of access and control over their accounts.   In order to achieve maximum customer satisfaction, an Internet bank should provide as many these functions as possible.   All Internet banks reviewed offered the facility of transferring funds between accounts and ordering/printing statements.   With the exception of two (Bank of America and Wing Hang Bank), all of them provided the opportunity of paying bills to third parties.   These are important functions since almost all households incur bills for services like utilities.   Only Bank of East Asia and CitiBank offered the standing

orders/direct debit service.   There were four Internet banks offering the services of account amendment and stop cheque request in May 2000, but the numbers increased respectively to eight for account amendment and nine for stop cheque request in 2001.   Only three Internet banks provided the function of transferring funds to other banks' account in the first survey period, whereas the number increased to seven banks in the second survey period.

2.4.3   New Services Applications

Increasingly customers are looking for opportunities for transacting a number of diverse products and services under one roof.   Banks are increasingly offering non-core banking products and services.   Therefore, it is logical that these products and services are made available through the Internet.   Such facilities include insurance, credit cards, mortgages, etc.   In May 2000, there were nine banks allowed customers to apply credit cards and mortgages online.   Six of them processed loan applications online and five of them offered online insurance applications.   However in May 2001, almost all banks allowed customers to apply for new services online (especially loan and credit card), at least application forms were available for customers to download from their Web sites.   Nearly half of the 21 Internet banks offered online mortgage and insurance applications as well.   Only CitiBank's customers could open current and saving accounts through the Internet in 2000, Standard Chartered Bank's customers joined the rank in 2001.

2.4.4   Investment Functions

To exploit the convenience of Internet Banking fully customers must be able to make their investments in addition to the core banking services.   In May 2000, there were 15 banks offering rate inquiry services, while only five provided the real time

stock quotation function.   Eleven banks in their Web sites provided market commentary/analysis reports.   Bank of East Asia, Chekiang First Bank, Wing Lung Bank and CitiBank offered services such as transaction records viewing and sales and purchases of shares, and three of them (except Chekiang First Bank) allowed customers to change or cancel their transactions.

In contrast, in May 2001, twenty-one banks offered rate inquiry functions, and 11 banks offered real time stock quote services; fifteen banks provided market commentary/analysis reports at their Internet Banking sites.   Hang Seng Bank, HSBC, Wing Hang Bank, Bank of China, and Standard Chartered Bank were the five banks that allowed customers to view securities transaction records online, but only CitiBank offered the preset price alert function, and pledge and custody of shares service.

2.4.5   Other Services

Banks should not simply offer traditional services on the Internet, but should look for new ways to enrich customer experiences.   There were 13 banks providing job vacancy sections and 11 of them offered online calculators for customers to use in 2000, whereas 17 banks had job vacancy sections and 18 banks provided online calculators in 2001.   Dao Heng Bank, Hang Seng Bank, Wing Lung Bank, and CitiBank have special deals for their online users only, such as one-off shopping coupons and preferential brokerage fee.   Dah Sing Bank was the only bank that provided auto Octopus card add-value service while Wing Lung Bank provided travel information at its Web site as well.   With the exception of three banks (Hang Seng Bank, Hua Chiao Commercial Bank, and United Chinese Bank), all others had contact email addresses listed at their Web sites.

Foreign research (Jayawardhena & Foley, 2000) stated that increasing proportions of customers use software packages to manage their finances. Therefore, it is important that bank customers are given the opportunity to reconcile their accounts by freely downloading information from their bank accounts to their individual financial management software. However, only CitiBank offered the facility of integration with software packages for account reconciliation. Last but not least, for the language options, the most common language on the Internet is English. In May 2000, all banks had their Web sites in English of which 21 also had traditional Chinese version of their Web sites, and two banks had simplified Chinese version (only part of the Web sites). The lack of Web sites using simplified Chinese may hinder the market reach to mainland of China. In May 2001, almost all banks had their Web sites in both English and traditional Chinese. Only two (HSBC Investment Bank Asia Limited and Jardine Fleming Bank) had English version only and one (Hua Chiao Commercial Bank) had traditional Chinese version only. Three banks had three language options (with simplified Chinese as well), including CitiBank which is a foreign incorporated bank.

2.4.6   Conclusion

To conclude, the challenge that lies ahead for banks is threefold. Firstly, they need to lower the operation cost in order to maintain their competitiveness. The more transactions that can be converted to electronic form, the more money will be saved. The cost of an electronic transaction is dramatically less when done online by customers themselves. Secondly, they must continually invent new products and services. Internet Banking has the potential to solidify and extend a bank's relationship with its customers because it brings banking services directly to a customer's home or office. The more services a customer accepts, the more likely

that customer will stay loyal to the bank.   Finally, they need to face up to increased competition from within the sector and from new entrants coming into financial services market. Online services are a must for banks that have to compete with a growing number of services from other financial institutions, investment concerns, and insurance companies. The Internet provides many opportunities for banks. An Internet bank can act as a facilitator in Internet payment systems or a provider of other services and shopping opportunity and thus assist the growth of electronic commerce.

2.5   Chapter Summary

This chapter discussed the concept and cost-effectiveness of Internet Banking. A brief description of the technological evolution of Hong Kong retail banking services was provided, including ATM, Telephone Banking, Home Banking, and Internet Banking. Two direct observations on Internet Banking services in Hong Kong were reported, which revealed the changes in development and addition of new features of the 34 selected bank Web sites at two points in time (May 2000 and May 2001). Before the proposed research framework is described in detail, the very important subject of the related literature is reviewed in the next chapter.

CHAPTER 3   LITERATURE REVIEW

This study lies at the intersection of two aspects. The first is the technology adoption decision-making process. The second is the determinants of information technology acceptance and utilization among users. This chapter presents a review of existing literature on these two areas. Literature of five widely validated models/theories are reviewed and linked to the adoption of Internet Banking, which laid the theoretical background of the research.

3.1   Social Psychology

The raw power of computer technology continues to improve, making sophisticated applications economically feasible. As technical barriers disappear, a pivotal factor in harnessing this expanding power becomes the ability to create applications that people are willing to use. Therefore, practitioners and researchers require a better understanding of why people resist using information technologies in order to devise practical methods for evaluating technologies, predicting how users will respond to them, and improving user acceptance by altering the nature of technologies and the processes by which they are implemented. Information Systems investigators have suggested intention models from social psychology as a potential theoretical foundation for research on the determinants of user behaviour (Swanson, 1982).

Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) is an especially widely validated intention model that has proven successful in predicting and explaining behaviour across a wide variety of domains. However, due to its limitation on volitional control, Ajzen (1985) extended the Theory of Reasoned Action by including another construct called perceived behavioural control, which predicts behavioural intentions and behaviour. The extended model is called the Theory of Planned Behaviour (TPB). Empirical results (Mathieson, 1991; Taylor & Todd, 1995; Venkatesh et al., 2000) show the appropriateness of using these two theories for studying the determinants of IT usage behaviour.

3.1.1   Theory of Reasoned Action (TRA)

The Theory of Reasoned Action is a widely studied model from social psychology, which is concerned with the determinants of consciously intended behaviours (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). It is composed of attitudinal, social influence, and intention variables to predict behaviour. Figure 3.1 is a schematic representation of the relationships among constructs in TRA. It is hypothesized by TRA that the individual's Behavioural Intention (BI) to perform a behaviour is jointly determined by the individual's Attitude toward performing the Behaviour (ATB) and Subjective Norm (SN), which is the overall perception of what relevant others think the individual should or should not do.

The importance of ATB and SN to predict BI will vary by behavioural domain. For behaviours in which attitudinal or personal-based influence stronger (e.g., purchasing something for personal consumption only), ATB will be the dominant predictor of BI, and SN will be of little or no predictive efficacy. While for behaviours in which normative implications are strong (e.g., purchasing something

that others will use), SN should be the dominant predictor of BI, and ATB will be of
lesser importance (Ajzen & Fishbein, 1980).
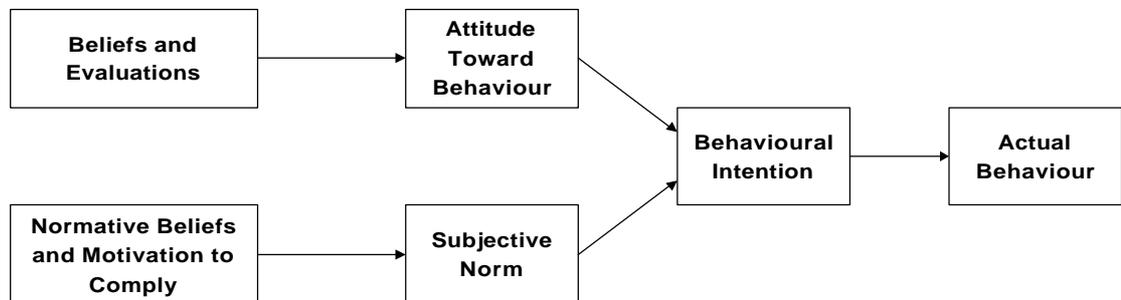
Figure 3.1   Theory of Reasoned Action

The Theory of Reasoned Action also hypothesizes that BI is the only direct
antecedent of actual behaviour (AB).   BI is expected to predict AB accurately if the
three boundary conditions specified by Fishbein and Ajzen (1975) can be hold: (a)
the degree to which the measure of intention & the behavioural criterion correspond
with respect to their levels of specificity of action, target, context, and time frame; (b)
the stability of intentions between time of measurement and performance of the
behaviour; and (c) the degree to which carrying out the intention is under the
volitional control of the individual (i.e., the individual can decide at will to perform
or not to perform the behaviour).

Moreover, TRA is a general model that does not specify the beliefs that are
operative for a particular behaviour.   Researchers using TRA must first identify the
beliefs that are salient for subjects regarding the behaviour under investigation.
Fishbein and Ajzen (1975, p.218) and Ajzen and Fishbein (1980, p.68) suggest
eliciting five to nine salient beliefs using free response interviews with representative
members of the subject population.   They recommend using "modal" salient beliefs

for the population, obtained by taking the beliefs most frequently elicited from a representative sample of the population.

The TRA has been successfully applied to a large number of situations to predict the performance of behaviour and intentions. For example, TRA predicted turnover (Prestholdt et al., 1987); education (Fredricks & Dossett, 1983); and breast cancer examination (Timko, 1987). In a meta-analysis of research on the Theory of Reasoned Action, Sheppard et al. (1988) concluded that the predictive utility of the TRA was strong across conditions.

3.1.2   Theory of Planned Behaviour (TPB)

Despite the predictability of the TRA is strong across studies, it becomes problematic if the behaviour under study is not under full volitional control. Sheppard et al. (1988) pointed out two problems of the theory. First, one must differentiate the difference between behaviour from intention. This could be problematic because a variety of factors in addition to one's intentions determine how the behaviour is performed. Second, there is no provision in the model for considering whether the probability of failing to perform is due to one's behaviour or due to one's intentions. To deal with these problems, Ajzen (1985) extended the Theory of Reasoned Action by including another construct called perceived behavioural control, which predicts behavioural intentions and behaviour. The extended model is called the Theory of Planned Behaviour (TPB).

As Figure 3.2 shows, TRA and TPB have many similarities. In both models, BI is a key factor in the prediction of actual behaviour. Both theories assume that human beings are basically rational and make systematic use of information available

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to them when making decisions. By considering control-related factors, TRA assumes that the behaviour being studied is under total volitional control of the performer (Madden et al., 1992). However, TPB expands the boundary conditions of TRA to more goal-directed actions.

Behavioural Beliefs and Outcome Evaluations	→	Attitude Toward Behaviour
Normative Beliefs and Motivation to Comply	→	Subjective Norm
Control Beliefs and Perceived Facilitation	→	Perceived Behavioural Control

Attitude Toward Behaviour, Subjective Norm, and Perceived Behavioural Control → Behavioural Intention → Actual Behaviour
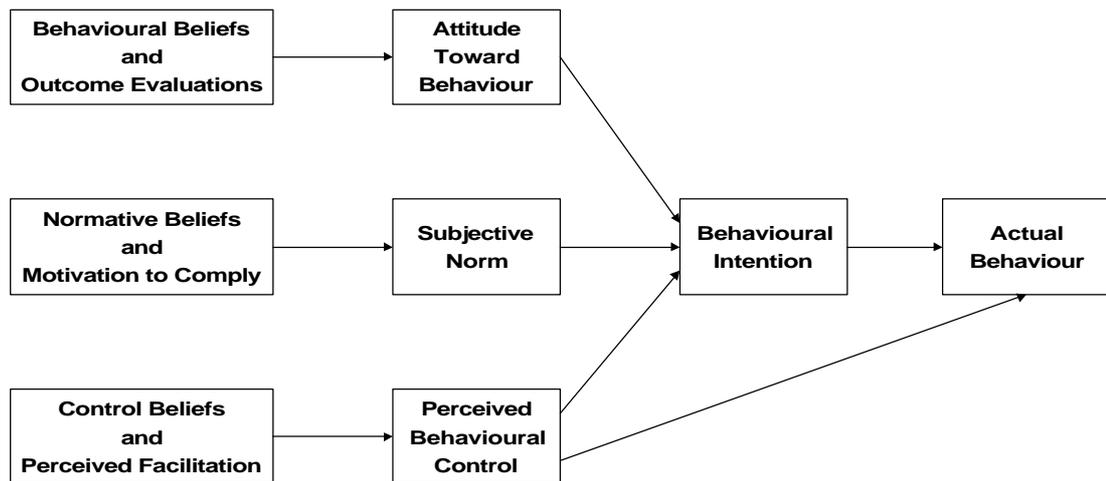
Figure 3.2   Theory of Planned Behaviour

Attitude toward Behaviour (ATB) is defined as "a person's general feeling of favourableness or unfavourableness for that behaviour" (Ajzen & Fishbein, 1980). Subjective Norm (SN) is defined as a person's "perception that most people who are important to him/her think he/she should or should not perform the behaviour in question" (Ajzen & Fishbein, 1980). Attitude toward behaviour is a function of the product of one's salient beliefs that performing the behaviour will lead to certain outcomes, and an evaluation of the outcomes, i.e., rating of the desirability of the outcome.

Subjective Norm is a function of the product of one's normative belief, that is, the "person's belief that the salient referent thinks he/she should (or should not) perform the behaviour" (Ajzen & Fishbein, 1980), and his/her motivation to comply

to that referent. Thus, variables that are external to the model are assumed to influence intentions only to the extent that they affect either attitudes or subjective norms (Fishbein & Ajzen, 1975).

The main difference between these two theories is that the TPB has added Perceived Behavioural Control (PBC) as the determinant of Behavioural Intention, as well as control beliefs that affect the perceived behavioural control. Though it may be difficult to assess actual control before behaviour, TPB asserts that it is possible to measure PBC - "people's perception of the ease or difficulty in performing the behaviour of interest" (Ajzen, 1991). PBC is a function of control beliefs and perceived facilitation. Control belief is the perception of the presence or absence of requisite resources and opportunities needed to carry out the behaviour. Perceived facilitation is one's assessment of the importance of those resources to the achievement of the outcomes (Ajzen & Madden, 1986).

PBC is included as an exogenous variable that has both a direct effect on actual behaviour and an indirect effect on actual behaviour through intentions. The indirect effect is based on the assumption that PBC has motivational implications for behavioural intentions. When people believe that they have little control over performing the behaviour because of a lack of requisite resources and opportunities, then their intentions to perform the behaviour may be low even if they have favourable attitudes and/or subjective norms concerning performance of the behaviour. Bandura have provided empirical evidence that people's behaviour is strongly influenced by the confidence they have in their ability to perform the behaviour. The structural link from PBC to BI reflects the motivational influence of control on actual behaviour through intentions.

The direct path from PBC to AB is assumed to reflect the actual control an individual has over performing the behaviour. Ajzen (1985) offers the following rationale for this direct path. First, if intention is held constant, the effort needed to perform the behaviour is likely to increase with PBC. For example, if two people have equally strong intentions to learn to ride a bike, and if both try to do so, the person who is confident that he or she can master this activity is more likely to ride the bike than a person who doubts his or her ability. Second, PBC often serves as a substitute for actual control, and insofar as perceived control is a realistic estimate of actual control, PBC should help to predict AB.

As with TRA, the relative importance of BI predictors varies with the behavioural domain. In some applications, it may be found that only ATB has a significant impact on BI; in others, ATB and PBC will be significant; in still others, ATB, SN, and PBC will contribute to the prediction of BI (Ajzen, 1985). Similarly, the ability of PBC and BI to predict AB also will vary across behaviours and situations. Both BI and PBC can make significant contributions to the prediction of goal-directed actions. In any given application, however, one predictor may be more important than the other, and only one of the two may be significant.

The Theory of Planned Behaviour has been successfully applied to various situations in predicting the performance of behaviour and intentions, such as predicting user intentions to use a new software (Mathieson, 1991), to perform breast self-examination (Young et al., 1991), to avoid caffeine (Madden et al., 1992), to perform unethical behaviour (Man, 1998), and to understand wastepaper recycling (Cheung et al. 1999). Madden et al. (1992), Man (1998), and Cheung et al. (1999) all found that TPB has a better predictive power of behaviour than TRA.

3.2 Information Technology Acceptance

3.2.1 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), introduced by Davis (1989), is an adaptation of the Theory of Reasoned Action (TRA) specifically tailored for modeling user acceptance of information systems. The goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified. Ideally one would like a model that is helpful not only for prediction but also for explanation, so that researchers and practitioners can identify why a particular system may be unacceptable, and pursue appropriate corrective steps. A key purpose of TAM, therefore, is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions. TAM was formulated in an attempt to achieve these goals by identifying a small number of fundamental variables suggested by previous research dealing with the cognitive and affective determinants of computer acceptance, and using TRA as a theoretical backdrop for modeling the theoretical relationships among these variables.
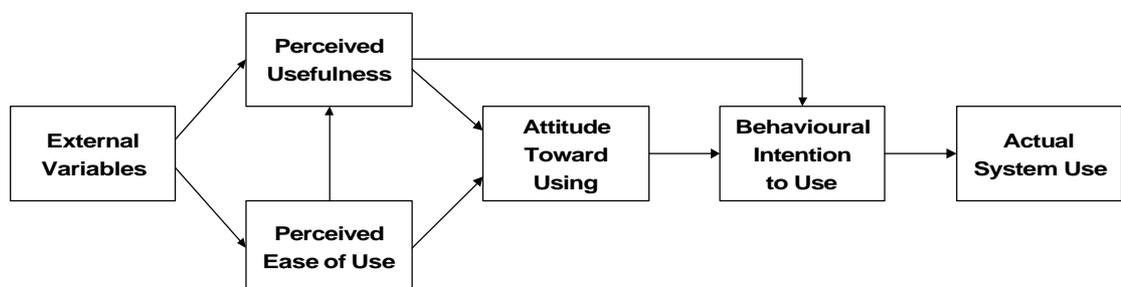
Figure 3.3   Technology Acceptance Model

As Figure 3.3 shows, TAM posits that two particular beliefs, perceived

usefulness (PU) and perceived ease of use (PEOU), are the primary relevance for computer acceptance behaviour.   PU is defined as the degree to which a prospective user believes that using a particular system would enhance his or her job performance.   This follows from the definition of the word "useful": "capable of being used advantageously".   Within an organizational context, people are generally reinforced for good performance by raises, promotions, bonuses, and other rewards (Pfeffer, 1982; Vroom, 1964).   A system high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship.

PEOU refers to the degree to which a prospective user believes that using a particular system would be free of effort.   This follows from the definition of "ease": "freedom from difficulty or great effort".   Effort is a finite resource that a person may allocate to the various activities for which he or she is responsible.   All else being equal, an application perceived to be easier to use than another is more likely to be accepted by users.   In January 2000, the Institute for Scientific Information's *Social Science Citation Index*® listed 424 journal citations of the two journal articles that introduced TAM (i.e., Davis 1989, Davis et al. 1989).   In the past decade, TAM has become well established as a robust, powerful, and parsimonious model for predicting user acceptance.

3.2.2   Differences between TAM and TPB

There are three main differences between the TAM and TPB.   First, there are varying degrees of generality between the two.   Second, TAM does not explicitly include any social variables whereas, TPB does.   Third, TAM and TPB treat behavioural control differently.   In which case, each of these points is discussed

below.

3.2.2.1   Degree of Generality

TAM assumes that beliefs about usefulness and ease of use are always the primary determinants of the user's decision to use the item. This definition was a conscious choice on the part of Davis et al. (1989, p.988), since they wanted to use "a belief set that …readily generalizes to different computer systems and user populations". Whereas, TPB assumes that the user's beliefs are specific to each situation.   That is, the TPB model does not assume that the beliefs that apply to one context will also apply to other contexts.   Although some beliefs may be generalized across contexts, other may not be.

This difference between the two models raises three concerns.   Firstly, in some situations there could be variables besides ease of use and usefulness that could predict the intention of the individual. For example, accessibility might be an important factor in determining the users will use the computer for users who are not always near a terminal. Identifying these beliefs is part of the standard research methodology for the TPB.   While such methodological consideration is not excluded from TAM, it is not an essential part of the TAM model.

Secondly, TPB is more difficult to apply across diverse user contexts than TAM. TAM's constructs are measured in the same way for every situation.   Whereas, TPB requires a pilot study to identify relevant outcomes, reference groups, and control variables in every context in which it is used.   This can be complex if different user groups focus on different outcomes from the usage of the same system.   For example, students using a computer-aided learning system might be interested in maximizing exam scores, while instructors are interested in using the system to save

class time.   Ideally, TPB's instruments could be tailored to each group.

Thirdly, some TPB items require an explicit behavioural alternative if they are to be as specific as possible.   For example, in asking someone whether they will use a spreadsheet to forecast sales will save time (a behavioural belief), it is best to explicitly identify an alternative behaviour so that the basis for comparison is clear. Potential users might be asked to respond to the following item: "Using a spreadsheet instead of a calculator will save me time in developing sales forecasts. (Agree/Disagree)".   Whereas, this is different from TAM because it does not require the identification of a specific behaviour for comparison. The advantage of TPB's approach is that all respondents are making the same comparisons.   The comparison target is not specified in TAM's instruments, and may vary across subjects (Ryan & Bock, 1990).   The disadvantage of TPB's approach, however is that this reference point may not apply to all individuals. For example, when people were asked the question, which is better or faster. Some people may be generating sales forecasts using a specialized decision support system (DSS) instead of a calculator, so the question may not provide a useful comparison to current practices.

3.2.2.2   Social Influences

The second major difference between TAM and TPB is that TAM does not explicitly include any social variables.   These are important if they capture variance that is not already explained by other variables in the model. Davis et al. (1989) point out that social norms are not independent of outcomes. For example, an individual might perceive pressure from his or her supervisor to use a particular system, with an implied outcome of nonuse being a poor performance evaluation. That is, social norms will already have been taken into account to some extent in the evaluation of outcomes.

However, the social variables in TPB may still capture unique variance in intention. There could be social effects that are not directly linked to job-related outcomes such as usefulness. For example, some individuals might use a system because they think their coworkers will perceive them as technology sophisticated. This motivation is more likely to be captured by TPB than by TAM.

3.2.2.3   Behavioural Control

The third major difference between TAM and TPB is their treatment of behavioural control, referring to the skills, opportunities, and resources needed to use the system. The only such variable included in TAM is perceived ease of use (PEOU). Examining the PEOU items by Davis (1989, pp.340), it is apparent that EOU refers to the match between the respondent's capabilities and the skills required by the system.   The items include "Learning to operate [the system] would be easy for me," and "My interaction with [the system] would be clear and understandable".

Although possession of requisite skills is important, sometimes other control issues will arise. Ajzen (1985) differentiates between internal control factors that are characteristics of the individual, and external factors that depend on the situation. Internal factors include skill and will power. External control factors include time, opportunity, and the cooperation of others. For instance, where connect time and CPU usage are charged to user departments, some people might not have the resources necessary to use a system, even if they feel they could benefit from doing so and have the necessary skills.   In other words, they are denied the opportunity to use the system by external factors.

PEOU corresponds to the internal factor of skill. However, external control issues are not considered in TAM in any obvious way. Although it could be argued that the PEOU item "I would find [the system] easy to use" (Davis 1989) implies that respondents consider external control issues, this is not explicit.

Some control factors will be stable across situations, while others will vary from context to context (Ajzen, 1985). An individual takes the same skills from situation to situation, and to the extent that similar skills are required for different IS-related tasks, ability should be a fairly stable control factor. In fact, Hill et al. (1987) found that the general efficacy measure predicted intentions to use a wide range of technologically advanced products. However, some control issues will be idiosyncratic to particular circumstances. For example, the availability of a telephone line is important to a sales representative, however, it is not as important to other people in other situations.

TPB taps the important control variables for each situation independently, and is more likely to capture such situation-specific factors. TAM is less likely to identify idiosyncratic barriers to use. This is in keeping with the stated objective of Davis et al. (1989) to develop a model that is applicable across many situations, but will cause the model to miss control issues that are important in particular contexts.

3.2.3 Extension of Technology Acceptance Model (TAM2)

A study of the adoption of telemedicine technology by physician using TAM has found relatively low explanation power of TAM of attitude and intention (Hu et al., 1999). The researchers suggested that integration of TAM with other IT acceptance models or incorporating additional factors could help to improve the

specificity and explanatory utility in a specific area.

IS researchers have begun to use TAM to examine the possible antecedents of Perceived Usefulness and Perceived Ease of Use toward microcomputer usage (Igbaria, Guimaraes, & Davis, 1995; Igbaria, Iivari, & Maragahh, 1995).   However, one criticism of the current TAM studies is that there are very few investigations target at the study of the factors (i.e., the external variables) that affect the PU and PEOU (Gefen & Keil, 1998).   In order to address this issue, Venkatesh and Davis (1996) used three experiments to investigate the determinants of Perceived Ease of Use.   The results showed that general Computer Self-Efficacy significantly affects Perceived Ease of Use at all time, while Objective Usability of the system affects users' perception after they have direct experience with the system.

Furthermore, Venkatesh and Davis (2000) developed and tested a TAM2 model by including a number of determinants to Perceived Usefulness into the new model (see Figure 3.4).   It is a theoretical extension of the Technology Acceptance Model that explains Perceived Usefulness and Usage Intentions in terms of social influence processes (Subjective Norm, Voluntariness, and Image) and cognitive instrumental processes (Job Relevance, Output Quality, Result Demonstrability and Perceived Ease of Use).   Longitudinal data were collected from four different organizations that spanned a range of industries, organizational contexts, functional areas (ranging from small accounting service firm, medium-sized manufacturing firm, to the personal financial services department of a large financial services firm), and types of system being introduced.   The results showed that all the above-mentioned social influences and cognitive instrumental processes have significantly influenced user acceptance of the systems.
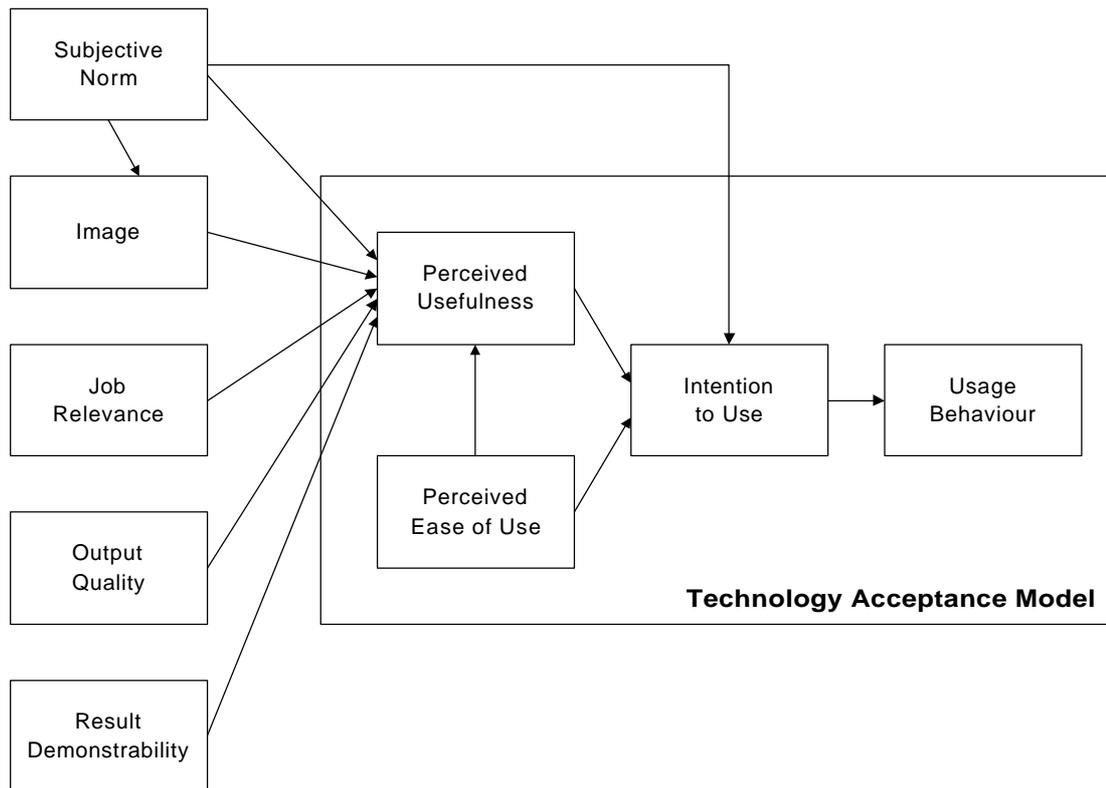
Figure 3.4   Extension of Technology Acceptance Model

3.3   Risk Perception

Risk perception is also a critical factor affecting the rate of adoption. Frambach (1993, 1995) contended that the level of Perceived Risk (PRISK) is negatively related to the speed of adoption.   The perceived risk surrounding an innovation might cause a potential adopter to postpone the decision to either adopt or reject the innovation.   PRISK is defined as the uncertainty that the customers face when they cannot foresee the consequences of their purchase decisions.   The definition highlights two relevant dimensions of Perceived Risk: uncertainty and consequences.   Perceived Risk can take many forms, depending on the product and consumer characteristics.

The degrees of risk that consumers perceive and their own tolerance of risk taking are factors that influence their purchase strategies. It should be stressed that consumers are influenced only by risk that they perceive, whether or not such risk actually exists. Semenik and Bamossy state that the characteristics of the product will wither speed or deter its acceptance by customers. If a new product or service has features that violate one or more of the factors, then specialized marketing mix strategies must be developed to overcome these barriers to diffusion.

In 1993, Mitchell and Greatorex listed some strategies to overcome the problems of risk and uncertainty in the purchasing of services. The strategies also help to increase the speed and the rate of adoption and diffusion of services. Based on a review of the growing body of literature in service marketing, the strategies suggested include brand loyalty, strong branding, image, celebrity endorsement, salesperson's advice, word-of-mouth referral, trial, and special offers.

In order to investigate the differences in perceived risk and the usefulness of risk-reducing strategies in service industries, Mitchell and Greatorex conducted empirical research in 1993. For the student population, Mitchell and Greatorex discovered that the riskiest service was hairdressing, then hotel, banking, restaurant, sports centre and fast-food. The usefulness of the risk-reducing strategies varied with the service. However, brand loyalty was once more confirmed as a most useful risk-reducing strategy, with the exception of hotels since repeat purchasing and the opportunity to be brand loyal are less likely to occur in the hotel industry. Asking the advice of family and friends (word-of-mouth) and developing a strong brand image were also considered to be an important way to reduce the risk. The least useful strategies were celebrity endorsement and salesperson's advice. Using

special offers was a moderately useful risk reliever.

3.4 Social Cognitive Theory - Self-Efficacy

Social Cognitive Theory (SCT) (Bandura, 1977; 1978; 1982; 1986), also called Social Learning Theory (SLT), is a widely accepted model of individual behaviour. SCT explains human behaviours from the perspective of a continuous reciprocality among behavioural, cognitive and other personal factors (including personality as well as demographic characteristics), and environmental determinants (such as social pressures or unique situational characteristics). This relationship, which Bandura refers to as "Triadic Reciprocality" or "Reciprocal Determinism", is shown in Figure 3.5.
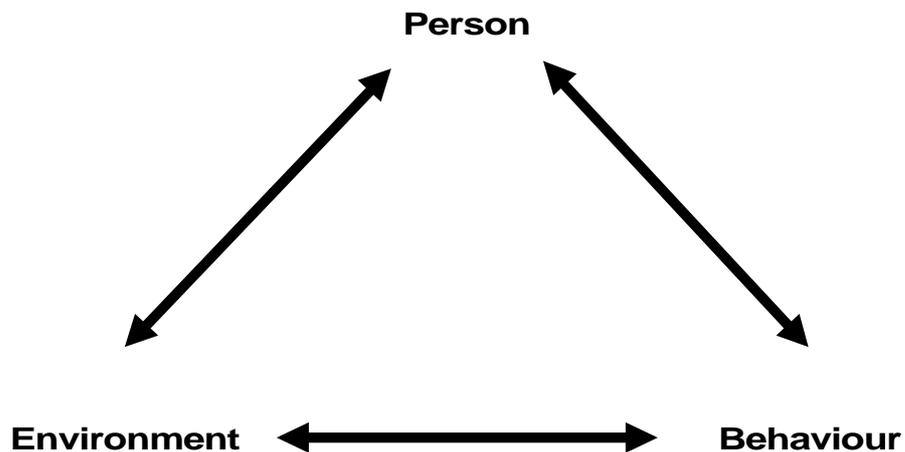
Figure 3.5   Triadic Reciprocality or Reciprocal Determinism

A key element in SCT is the concept of self-efficacy (SE), which refers to an individual's belief in his or her capability to perform a specific task.   Estimations of

SE are formed through a gradual and dynamic weighting, integration, and evaluation of complex cognitive, linguistic, social, and/or enactive experiences. Over the past two decades, literally dozens of academic works have emerged, both conceptual and empirical, that focus on the concept of self-efficacy. Gist (1987) and Gist and Mitchell (1992) provide thorough reviews of the literature on self-efficacy.

Several studies (Burkhardt & Brass, 1990; Gist et al., 1989; Hill et al., 1986; 1987; Webster & Martocchio, 1992; 1993) have examined the relationship between self-efficacy with respect to using computers and a variety of computer studies. These studies found evidence in the relationship between self-efficacy and the adoption of high technology products (Hill et al., 1986), registration in computer courses at universities (Hill et al., 1987), and technology innovations (Burkhardt & Brass, 1990), as well as performance in software training (Gist et al., 1989; Webster & Martocchio, 1992; 1993). All of the studies urge the need for further research to explore fully the role SE has in computing behaviour.

Although there is a limited amount of work examining the determinants of ease of use beliefs in TAM, Venkatesh and Davis (1996) postulated and presented empirical support for self-efficacy as a key antecedent in a recent study. Bandura (1986) defines self-efficacy as:

People's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgements of what one can do with whatever skills one possesses (p.391).

This definition indicates the importance of distinguishing between component

skills and the ability to "organize and execute courses of action". For example, in distinguishing driving self-efficacy, Bandura distinguishes between the component skills (steering, braking, signaling) and the behaviours one can accomplish (driving in freeway traffic, navigating twisting mountain roads). Thus, computer self-efficacy (CSE) represents an individual's perceptions of his or her ability to use the computer to accomplish a task (i.e., using a software package for data analysis, writing a mailmerge letter using word processor), rather than reflecting on simple component skills (i.e., formatting diskettes, booting up a computer, using a specific software feature such as "bolding text" or "changing margins").

In defining self-efficacy, it is also important to consider the relevant dimensions of self-efficacy judgements. SE judgements differ on three distinct, but interrelated, dimensions: magnitude, strength, and generalizability. The magnitude of CSE can be interpreted to reflect the level of capability expected. Individuals with a high CSE magnitude might be expected to perceive themselves as able to accomplish more difficult computing tasks than those with lower judgements of CSE. Alternatively, CSE magnitude might be gauged in terms of support levels required to undertake a task. Individuals with a high magnitude of CSE might judge themselves as capable of operating the computer with less support and assistance than those with lower judgements of self-efficacy.

The strength of a CSE judgement refers to the level of conviction about the judgement, or the confidence an individual has regarding his or her ability to perform the various tasks discussed above. It also reflects the resistance of self-efficacy to apparently disconfirm information (Brief & Aldag, 1981). Thus, not only would individuals with high CSE perceive themselves as able to accomplish more difficult

tasks (high magnitude), but they would also display greater confidence about their ability to successfully perform each of the tasks.

Self-efficacy generalizability also reflects the degree to which the judgement is limited to a particular domain of the activity or not. Within a computing context, these domains might reflect different hardware and software configurations. Thus, individuals with high CSE generalizability are expected to be able to competently use different software packages and different computer systems, while those with low CSE generalizability would perceive their capabilities as limited to particular software packages or computer systems.

3.5 Chapter Summary

Despite divergences in hypothesized relationships, a common theme underlying the various streams of research in technology adoption is the inclusion of perceptions of an information technology as key independent variables. Different models have alternate conceptualizations of perceptions; for example, the TAM (Davis et al., 1989) includes only two perceptions, the TRA (Fishbein & Ajzen, 1975) and TPB (Ajzen, 1985) recommend that perceptions be elicited specifically for each information system/technology.

As can be seen in the foregoing discussion, it has shown that it is useful to investigate the antecedents of Perceived Usefulness and Perceived Ease of Use of TAM. TAM2 has accomplished this partially by including the external variables of Perceived Usefulness, which are mainly the constructs of Theory of Planned Behaviour. Thus, the researcher goes one step further to extend TAM2 by including the tested determinant of Perceived Ease of Use (i.e., Computer Self-Efficacy) and adding Perceived Risk as the antecedent of Perceived Usefulness. The conceptual research framework by integrating them will be presented in the following chapter.

CHAPTER 4   METHODOLOGY

4.1 The Research Framework

As described in Chapter 3, the attitude literature including social psychology and technology acceptance provides the theoretical framework needed at this level to define the linkages between beliefs about adopting and using Internet Banking, communications received by the end-user about adopting Internet Banking, attitude of eventual adoption/rejection, and use of Internet Banking. The extension of Technology Acceptance Model (TAM2) provides the underlying structure for the theoretical model of the study.   The proposed conceptual model of Internet Banking adoption for this study is shown in Figure 4.1. The model is developed based on the Theory of Planned Behaviour (TPB) (Ajzen, 1985), the Technology Acceptance Model (TAM) (Davis et al., 1989) and the TAM2 (Venkatesh & Davis, 2000). Perceived risk is considered as one of the determinants for the construct of perceived usefulness of Internet Banking. Computer self-efficacy, which is derived from the Social Cognitive Theory (SCT)'s self-efficacy, is employed to help analysis the perceived ease of use in adoption behaviour of Internet Banking. The construct of job relevance and output quality are dropped from the TAM2 due to their irrelevance in this study. Moreover, the actual usage behaviour is not used as a dependant variable in the research model for two reasons.   One reason is that Internet Banking in Hong Kong is still in its introductory stage. The number of Internet Banking adopters has not yet reached a critical mass and thus it is difficult to measure for usage behaviour. The other reason is that the path from intention to

actual usage behaviour had been widely validated in many prior researches of different contexts and information systems/technologies; therefore, a positive and direct relationship between intention and actual usage behaviour of Internet Banking is expected.
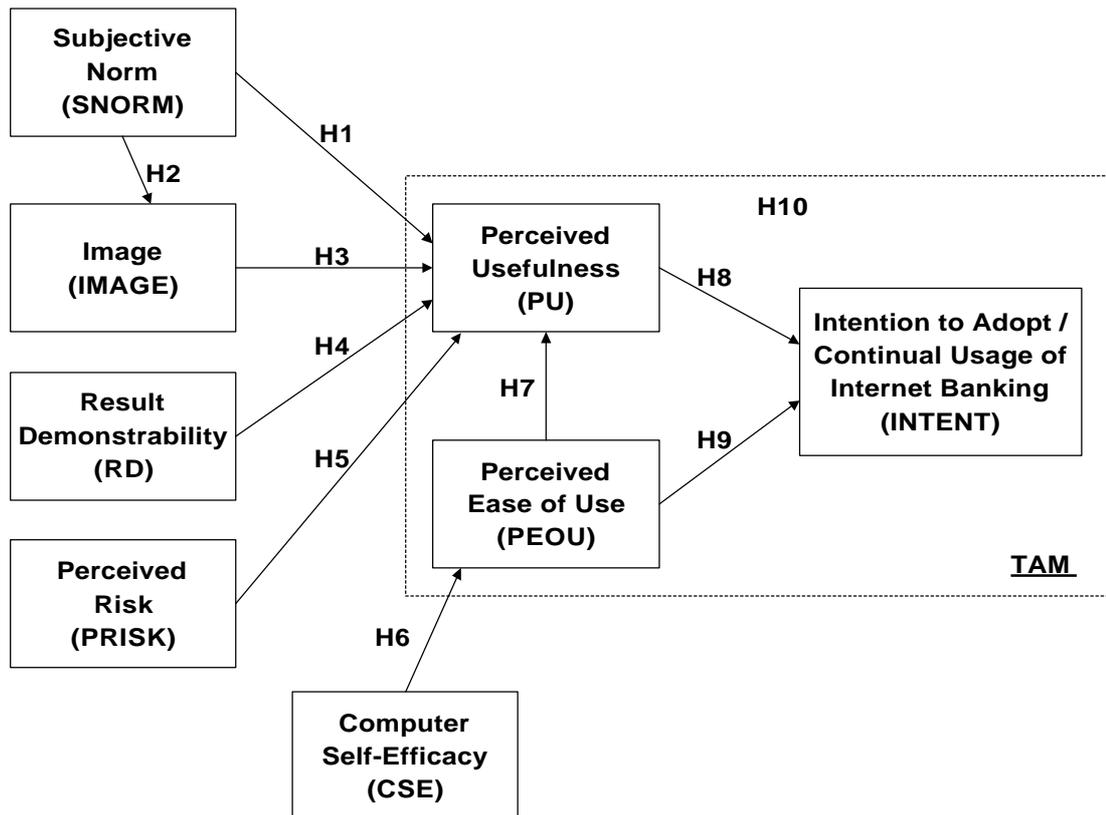
Figure 4.1   Proposed Internet Banking Adoption/Continual Usage Model

Before moving to the hypothesis development section, the researcher would like to introduce the definition of each construct first.   All the constructs are redefined in terms of adopting/continuing usage of Internet Banking.   Subjective norm, Image, Perceived Ease of Use, Perceived Usefulness, and Result Demonstrability are adapted from TAM2, while computer self-efficacy is adapted from SCT.   Table 4.1 presents a summary of the brief definitions for the selected research constructs adapted from TAM2 and SCT.

Research Constructs	Definition
Computer Self-Efficacy (CSE)	a potential adopter's (or user's) perception of his/her ability to use the computer to accomplish a task
Image (IMAGE)	the degree to which adoption/continual usage of Internet Banking is perceived to enhance one's image or status in one's social system
Perceived Ease of Use (PEOU)	the degree to which Internet Banking is perceived as easy to understand and use
Perceived Risk (PRISK)	the uncertainty that a potential adopter (or user) face when he/she cannot foresee the consequences of his/her adoption (continual usage) decisions
Perceived Usefulness (PU)	the degree to which a potential adopter (or user) views Internet Banking as offering advantages over previous ways of performing the banking transactions
Result Demonstrability (RD)	the degree to which the results of using Internet Banking are observable and communicable to others
Subjective Norm (SNORM)	a potential adopter's (or user's) beliefs that the salient referent thinks he/she should or should not adopt (continual usage) Internet Banking

Table 4.1   Definition of the Research Constructs

4.2 Development of Hypotheses

TAM is based on Ajzen and Fishbein's (1980) Theory of Reasoned Action (TRA), which recognizes the importance of subjective norm which influences individual behaviour. Early studies by Davis (1989) failed to show significant relationships between subjective norm and use. Thus this variable is not generally included in TAM. However, Thompson et al. (1991) found a relationship between subjective norm and PC utilization in a large manufacturing company, whereas Hartwick and Barki (1994) found weak associations between subjective norm and other variables in an empirical study of participation.   For this study, classmates and friends are likely to have influence on potential adopters and users of Internet

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Banking, thus subjective norm is included in the research model.

The direct relationship between the subjective norm and intention in TRA and TPB is based on compliance. The TAM2 (Venkatesh & Davis, 2000) encompasses two additional theoretical mechanisms by which subjective norms can influence intention indirectly through perceived usefulness: internalization and identification. Internalization (Kelman, 1958; Warshaw, 1980) refers to the process by which, when one perceives that a particular group or person thinks one should use a system, one incorporates the referent's belief into one's own belief structure. Internalization is equivalent to what Deutsch and Gerard (1955) refer to as informational (in contrast to normative) social influences, defined as "influence to accept information from another as evidence about reality" (p.629). In the present context, if a superior or a co-worker suggests that a particular system (Internet Banking) might be useful, a person may come to believe that it actually is useful, and in turn form an intention to use it. In French and Raven's (1959) taxonomy, the basis of internalization is expert power, where the target individual attributes expertise and credibility to the influencing agent (Kelman, 1958). In the case of internalization, subjective norm has an indirect effect on intention through perceived usefulness, as opposed to a direct compliance effect in intention. Research based on Salancik and Pfeffer's (1978) social information processing model is consistent with the proposed internalization effect (Fulk et al., 1987; Rice & Aydin, 1991). TAM2 (Venkatesh & Davis, 2000) theorizes that internalization, unlike compliance, will occur whether the context of system use is voluntary or mandatory. This is consistent with past results, which follows that:

H1: **Subjective Norm has a positive direct effect on Perceived Usefulness about Internet Banking**

Individuals often respond to social normative influences to establish or maintain a favorable image within a reference group (Kelman, 1958). Moore and Benbasat (1991, p.195) define image as "the degree to which use of an innovation is perceived to enhance one's …status in one's social system." TAM2 (Venkatesh & Davis, 2000) theorizes that subjective norm will positively influence image because, if important members of a person's social group believe that he/she should perform a behaviour (using Internet Banking), then performing it will tend to elevate his/her standing within the group (Blau, 1964; Kiesler & Kiesler, 1969; Pfeffer, 1982). Kelman (1958) refers to this source of social influence as identification and distinguishes it from compliance and internalization. Viewed from the perspective of French and Raven's (1959) taxonomy, the basis of identification is referent power. In the typical work environment, with a high degree of interdependence with other social actors in carrying out one's duties, increased status within the group is a basis of power and influence via processes such as social exchange, coalition formation, and resource allocation (Blau, 1964, Pfeffer, 1981, 1982). Pfeffer (1982, p.85) argues that by performing behaviours are consistent with group norms. That is, an individual "achieves membership and the social support that such membership affords as well as possible goal attainment which can occur only through group action or group membership." The increased power and influence resulting from elevated status provides a general basis for greater productivity. An individual may thus perceive that using such a system will lead to improvements in his/her job performance (which is the definition of perceived usefulness) indirectly due to image enhancement, over and above any performance benefits directly attributable to system use. This identification effect is captured in TAM2 by the effect of subjective norm on image, coupled with the effect of image on perceived usefulness. Although this research does not focus on understanding the factors influencing user

acceptance and intention adoption of emerging Internet Banking in the workplace, the subjective norm and image constructs tested by TAM2 are also applicable to the proposed model. Thus, this study postulates that:

H2: **Subjective Norm has a positive effect on Image**

H3: **Image has a positive effect on Perceived Usefulness about Internet Banking**

Even effective information technologies can fail to garner user acceptance if people have difficulty attributing gains in their performance specifically to their use of the technology. Therefore, TAM2 (Venkatesh & Davis, 2000) theorizes that result demonstrability, defined by Moore and Benbasat (1991, p.203) as the "tangibility of the results of using an information technology," will directly influence perceived usefulness. This implies that individuals can be expected to form more positive perceptions of the usefulness of an information technology if the covariation between usage and positive results is readily discernable. Conversely, if an information technology produces effective job-relevant results desired by a user, but does so in an obscure fashion, users of the technology are unlikely to understand how useful such an innovation really is. Based on empirical research, Agarwal and Prasad (1997) found a significant correlation between usage intentions and result demonstrability. The relationship between result demonstrability and perceived usefulness is also consistent with the job characteristics model, which emphasizes knowledge of the actual results of work activities as a key psychological state underlying work motivation (Hackman & Oldham, 1976; Loher et al., 1985). Therefore, the following hypothesis is tested:

***H4:* Result Demonstrability has a positive effect on Perceived Usefulness about Internet Banking**

Bauer (1960), Webster (1969), and Ostlund (1974) introduced risk as an additional measurement in information technology adoption. A common and widely recognized obstacle to electronic commerce adoption has been the lack of security and privacy over the Internet (Bhimani, 1996; Cockburn & Wilson, 1996; Quelch & Klein, 1996). This has led many people to view Internet commerce and even using Internet applications as a risky undertaking. Therefore, it is expected that only individuals who perceive using Internet Banking as a low risk undertaking would have tendency to perceive it as useful, it follows that:

***H5:* Perceived Risk has a negative effect on Perceived Usefulness about Internet Banking**

The Social Cognitive Theory of self-efficacy (Bandura, 1977; 1982) has been used to understand people's behaviour and performance in a wide range of activities (e.g., walking alone, shopping, etc.). Bandura (1982) has suggested that self-efficacy measures should be tailored to the domain of psychological functioning being explored. Gist (1987) also suggests that self-efficacy is strongly related to future performance. From an empirical standpoint, social psychologists have found that self-efficacy tailored to a computer/information technology context is an important determinant of the perceptions of users about such technologies (e.g., Burkhardt & Brass, 1990; Gist et al., 1989; Hill et al., 1986; 1987). This suggests that self-efficacy can be, and needs to be, explored and understood in the context of user acceptance of information technology innovations. Computer self-efficacy can be used to predict user perceptions and subsequent acceptance and use of systems

among specific target user groups within organizations. It is often believed that solely usability features, which in turn form the basis for acceptance or rejection, determine perceptions about the ease of use of a system. However, Venkatesh and Davis (1996) have suggested that users strongly anchor ease of use perceptions about any system to their computer self-efficacy. Consequently, this research attempts to explore and understand acceptance of Internet Banking as a function of an underlying situation of high computer self-efficacy of the target user groups, thus the current research framework posits that:

H6: **Higher Computer Self-Efficacy has a positive effect on Perceived Ease of Use about Internet Banking**

As suggested by both TAM and TAM2, PEOU is a direct determinant of PU (Davis et al., 1989; Venkatesh & Davis, 2000), since, all else being equal, the less effortful a system is to use, the more using it can increase the performance. There is empirical evidence which have accumulated over a decade that suggest PEOU is significantly linked to intention, both directly and indirectly via its impact on PU (Davis et al, 1989; Venkatesh, 1999; Venkatesh & Davis, 2000). Consistent with past results, it follows that:

H7: **Perceived Ease of Use has a positive effect on Perceived Usefulness about Internet Banking**

*H8:***Perceived Usefulness has a positive effect on Intention to Adopt/Continual Usage of Internet Banking**

*H9:***Perceived Ease of Use has a positive effect on Intention to Adopt/Continual Usage of Internet Banking**

A central tenet of TAM is that beliefs mediate the influence of all other factors in the environment that exhibit effects on individual acceptance of a new information technology. Whereas the beliefs-attitude-intentions relationships in TAM have been subjected to extensive empirical scrutiny. However, little research has been done to focus on the actual mediating role of beliefs. A few studies (Davis, 1993; Venkatesh & Davis, 1996) have shown full mediation of the effects of systems variables. Other research has examined external variables such as user involvement (Jackson et al., 1997), training (Compeau & Higgins, 1995; Venkatesh & Davis, 1996), and prior experience (Thompson et al., 1994), utilizing as mediators beliefs from TAM, but has been unable to demonstrate full mediation unequivocally. Indeed, only the results of Venkatesh and Davis (1996) and one of the two studies reported in Compeau and Higgins (1995) supported full mediation. Much of this work is theoretically motivated by the work of Triandis (1980) on attitudes. The current research attempts to address the inconclusive results on mediation of external variables by examining this issue from a different theoretical perspective, utilizing the social psychology and technology acceptance theories and the Social Cognitive Theory (Bandura, 1977). As a consequence, the last hypothesis tested here is:

H10: **Perceived Usefulness and Perceived Ease of Use fully mediate the influence of selected variables on Intention to Adopt/Continual Usage of Internet Banking**

Variables identified in this study will be discussed in detail later in the thesis. Data for these variables were collected through the use of a questionnaire survey. The next section will describe how the questionnaire was designed to operationalize all of the research constructs in the proposed model.

4.3 Questionnaire Design

4.3.1   Salient Belief Elicitation

An elicitation study with a set of open-ended questions was conducted to the target sample first.   This step is necessary for Theory of Planned Behaviour studies because different populations may possess different beliefs regarding the same behaviour.

Courtier and Gilpatrick (1999) reported that households using Home Banking were younger and had higher average incomes. Hall et al. (1999) had similar comment on Internet Banking users.

The average online user of financial services is about 39 years old and make nearly $60,000 (US) annually. About 77 percent are college-educated, 63 percent have children, and 35 percent are self-employed. Thus, this group comprises an attractive and potentially profitable customer base.

The phenomenon guided us to conduct a study on Internet Banking more focused on young people in Hong Kong. Thirty participants (15 users and 15 potential users of Internet Banking) were invited in the elicitation study.   Their participation is not compulsory. An open-ended questionnaire was used to identify salient beliefs regarding the target behaviour (adopting/continuing use of Internet Banking).   Examples of questions are: "What do you think are the possible consequences of adopting Internet Banking?" and "What do you think are the possible barriers that might hinder you from adopting Internet Banking?"

4.3.2   Measurements of the Constructs

Based on guidelines given by both the TRA and the TPB, which suggest that belief-based measurements should be constructed by analyzing the most frequent responses from the open-ended questions used in the elicitation study. The questions were specific and consistent with respect to action (adoption or continual usage), target (Internet Banking services), context (an individual's beliefs), and time (in the next six months).

Theoretical constructs were operationalized using validated items from prior research and the result of the elicitation study. The measurement of Subjective Norm was adapted from Taylor and Todd (1995). Measures of Image and Result Demonstrability were adapted from Moore and Benbasat (1991). Measures of Computer Self-Efficacy were adapted from Compeau and Higgins (1995). The TAM scales of Perceived Usefulness, Perceived Ease of Use, and Intention were measured using items adapted from Davis (1989), Davis et. al. (1989), Moore and Benbasat (1991), and Karahanna et. al. (1999). Several items of these three constructs were adapted from the result of the elicitation study. Measures of Perceived Risk were adapted from Bhimani (1996), Cockburn and Wilson (1996), and Rhee and Riggins (1997), two items were developed based on the result of the elicitation study.

The questionnaire consists of three parts (see Appendix C). Part I gathers information about the respondents' banking habits and their awareness of Internet Banking in Hong Kong. Part II seeks the perceptions of respondents toward using Internet Banking services. Finally, Part III gathers demographic information. Following recommendations for developing survey instruments, a seven-point Likert

scale was used to ensure statistical variability among survey responses for all constructs.   To ensure that measurement scales were adapted and developed appropriately to the current context, qualitative interviews were conducted with two academic professionals.   Minor suggested wording changes were done before three rounds of pilot test were conducted.

4.4 Pilot Tests

The preliminary questionnaire was pilot-tested to assess its comprehension and to estimate its average completion time.   Three rounds of testing were conducted. The first round was conducted on 50 Year 3 undergraduates of Lingnan University (20 males and 30 females).   The result revealed that 30% of the respondents were users of Internet Banking, while the other 70% were potential users of Internet Banking.   Based on feedback from this first round, some questions were rephrased for clarity.   In particular, five questions in Part II were deleted due to the low reliability of the scales (Cronbach's Alpha < 0.60).   All of these five questions were newly developed from the elicitation study, three of them were the indicators of PU and the other two items were the indicators of PEOU.   The questionnaire ended up with 45 items instead of the initial 50 items.

The second round of testing was conducted with 10 full-time postgraduates of Lingnan University (4 males and 6 females).   They were invited to critique the survey instrument including the wording and items to be added or dropped.   Based on the feedback gained from the two rounds of testing, the questions were examined for completeness of responses, reliability, and construct validity.   Suggestions made

by respondents were incorporated and a final version of the instrument was developed.   No item was further deleted.   The third round of testing was conducted on 6 other full-time postgraduates of Lingnan University (2 males and 4 females). They found that the questions were generally clear, thus the questionnaire was deemed ready for data collection.   The average completion time was 12 minutes.

Research Constructs	Number of Items	Cronbach's Alpha (a)
Subjective Norm	3	0.8537
Image	3	0.8266
Result Demonstrability	4	0.7086
Perceived Risk	5	0.7163
Computer Self-Efficacy	10	0.8964
Perceived Usefulness	7	0.8530
Perceived Ease of Use	7	0.8460
Intention to Adopt/Continual Usage	6	0.8880
Total	45	

Table 4.2   Reliability Analysis of the Constructs in the Pilot Test

With respect to analyzing data in the pilot tests, the statistical package SPSS 9.0 for Windows was employed for conducting factor analysis, calculating Cronbach's Alpha, t-tests and the like.   Table 4.2 shows the results of reliability test of final 45 questions in the pilot test.   Cronbach's alpha values of all items are over the recommended level of 0.70.   All 45 factor loadings were over 0.60 and no significant cross-loading was found among the variables.

4.4.1   Online Questionnaire

The amended questionnaire was programmed in HyperText Markup Language (HTML) and made available online.   To ensure that all required items are filled in completely, PERL scripts were used to caution respondents of incomplete responses. In addition, all data collected from online survey were stored into a text file, so that

they could be easily imported by any data analysis software packages, such as Excel, SPSS and LISREL. The online questionnaire was put on the Web through two UNIX servers in the Information Systems Department of Lingnan University. However, due to the unexpected low response rate in the pilot test using this online version of the questionnaire, the researcher did not use this method in the main survey.

4.5 Sampling and Data Collection Procedure

The population of interest was defined as the personal banking customers of Hong Kong banks. The researcher limited the sampling frame to students with age under 40 at the seven institutes of higher learning in Hong Kong. The seven selected institutes were Chinese University of Hong Kong (CUHK), City University of Hong Kong (CityU), Hong Kong Baptist University (HKBU), Hong Kong University (HKU), Hong Kong University of Science and Technology (HKUST), Lingnan University (LU), and Polytechnic University (HKPU). Both full-time undergraduates and full-time/part-time postgraduates at these institutes were targeted for research. Data collection was conducted from February to the middle of April in 2001. Since the researcher was unable to get the student list of each selected institutes, a strict probability sampling method could not be employed. Instead, systematic sampling technique was involved, one in every ten students encountered inside the canteens' main entrance of each selected institute was approached to complete the questionnaire, described as a survey of Internet Banking Adoption/Continual Usage.

The study targets university students for four reasons. Firstly, according to Courtier and Gilpatrick (1999), households using home banking were younger and had higher incomes than average. Hall et al.(1999) had similar comment on Internet Banking users in the US, the report showed that about 77 percent of online users of financial services are college-educated and 35 percent are self-employed. This data gives us a better understanding on Internet Banking and allows us to focus more on young higher-educated people.

Secondly, according to marketing strategies of Bank of East Asia, which was the winner of Asian Banking Awards 2000, the target segment of its Cyberbanking consists of youngsters, undergraduates and executives who look for online personal banking services (Marketing Strategies of East Asia Cyberbanking, November 2000). Thus, this suggests the importance to have a better understanding of the profiles of target subjects - youngsters and university students.

Thirdly, university students will eventually become the most active Internet users and influential consumers in the marketplace in the near future if not already are. They certainly comprise an attractive and potentially profitable customer base. Understanding the needs and preferences of potential customers are vital and desirable. Furthermore, the use of university students as the sampling frame in this study can decrease the effect of computer literacy variances. The findings can provide a further understanding of user's perception in the marketplace and offer a dynamic picture for future research.

The reason of placing the respondent's age to below 40 is due to the usage and nature of this research topic. According to the research of "Home Computers and

Networking in Hong Kong", which was conducted by TRP (1999), the age for the majority of computer (home) owners is under 40 (see Table 4.3). The category of users aged 40 and above amounts 8.9%. Users of Internet Banking need to have the required equipment along with knowledge as well. Although customers can use Internet Banking services via wired (PC/kiosk) or wireless (mobile phone/PDA) devices, personal computer is still the most popular personal-owned devices. This research suggests that controlling the age of respondents to below 40 can provide a more significant result in investigating the Internet Banking adoption and will be more convenient.

Age of Major Users (Years)	Below 18	18-20	21-29	30-39	40-49	50-59	60+
Valid Answer 1994	21.4%	18.2%	28.7%	21.8%	8.6%	1.1%	0.2%
Valid Answer 1998	21.8%	18.1%	29.8%	21.4%	7.7%	0.4%	0.8%

Table 4.3   Major Computer User Age Groups (1994 and 1998)

A total of 17 student canteens were selected to conduct the survey (see Table 4.4). There were two criteria for the canteen selection within each selected institute, the first and the main one was their large seating capacity and the other was their popularity. Coffee shops and other catering outlets with less than 200 seating capacity were not taken into consideration. Direct observation and consulting with caterers revealed that the peak hours were during lunch and teatime. That is, the busious time in the café are from 11:30am to 1:30pm and then again during 2:30pm to 4:30pm. All research subjects were invited to complete the questionnaire during the time span from 11am to 5pm on weekdays. A wider range of target respondents was expected to be reached during in these time periods. With about half-a-minute briefing, a self-administered questionnaire was distributed to one in every ten students encountered inside the selected canteens. The researcher was standing

somewhere near the subjects in case there is a need for explanation of the items on the questionnaire.

Name of Institutes	Total No. of Canteens	No. of Selected Canteens	Name of Selected Canteens
CUHK	10	6	Benjamin Franklin Student Canteen Benjamin Franklin Basement Fast Food Shop Chung Chi College Chung Chi Tang Student Canteen New Asia College Student Canteen United College Student Canteen Shaw College Student Canteen
CityU	4	1	City Express
HKBU	2	1	Student Canteen (old campus)
HKU	6	3	Union Restaurant Fong Shu Chuen Amenities Centre Restaurant Chong Yuet Ming Amenities Centre Restaurant
HKUST	7	3	LG1 Cafeteria LG5 Food Court LG7 Student Canteen
LU	1	1	Ling Hin Student Canteen
HKPU	7	2	G/F, Shaw Amenities Building Student Canteen 3/F, Communal Building

Table 4.4   Details of Selected Student Canteens

4.6 Statistical Analysis

Due to the complex nature of the proposed research model, the Structural Equation Modeling (SEM) approach was used to test the model's validity (Bagozzi 1980, Hoyle 1995).   This procedure allows a researcher to test the proposed structure of a model as a whole for the set of relationships between dependent variables and independent variables was analyzed simultaneously.   Each theoretical construct was covered by a set of multiple manifest items in the questionnaire.

The reference instruments of this study were adopted from the SCT and the TAM's constructs. Both of which have been widely applied and accepted in many prior researches. Thus, it has a strong theoretical support for its validity. Therefore, the SEM is highly appropriated for having a confirmatory data analysis to test the validity of the proposed model. The hypothesized structural equation model in this study was tested using LISREL 8.30 for Windows with the covariance matrix as the input. A brief introduction of SEM is presented in the following section. Advantages of using SEM are also mentioned.

4.6.1   Structural Equation Modeling

Structural equation modeling (SEM) is a statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to the multivariate analysis of a structural model bearing on some phenomenon (Byrne, 1998). The term SEM does not designate a single statistical technique, instead it refers to a family of related procedures. Other terms such as analysis of covariance structures, causal modeling with unobservables, covariance structure analysis, covariance structure modeling, latent variable structural modeling, linear structural relations, or moments structure modeling are also used in the literature to classify these various techniques together under a single lable of SEM (Kline, 1998).

In SEM, interest usually focuses on latent constructs rather than on the manifest variables used to measure these constructs. Latent constructs refer to the unobserved or theoretical constructs; for example, abstract psychological variables like "intelligence" or "attitude toward the brand". Whereas manifest variables refer to the observed or empirical variables, since these variables reflect latent variables; and they are known as reflective indicators. Measurement is recognized as difficult

and error-prone. By explicitly modeling measurement error, SEM users seek to derive unbiased estimates for the relations between latent constructs. To this end, SEM allows multiple measures to be associated with a single latent construct. However, it is not necessary to have latent variables in the models. The evaluation of models that contain only observed variables is certainly possible in SEM.

As mentioned before, SEM is largely a confirmatory rather than an exploratory technique. That is, researchers are more likely to use SEM to determine whether a certain model is valid, rather than using SEM to find a suitable model although SEM analyses often involve a certain exploratory element. A structural equation model implies a structure of the covariance matrix of the measurements. Once the model's parameters have been estimated, the resulting model-implied covariance matrix can then be compared to an empirical or data-based covariance matrix. If the two matrices are consistent with one another, then the structural equation model can be considered a plausible explanation for relations between the measurements.

There are at least two reasons for the popularity of SEM. Firstly, in the behavioural sciences, researchers are often interested in studying theoretical constructs that cannot be observed directly. One form of SEM deals directly with how well the measures reflect the intended constructs. Moreover, researchers are principally interested in questions of prediction. As the understanding of complex phenomena has grown, the predictive models have become more complex. SEM techniques allow for more specific testing of complex path models that incorporate sophisticated thought patterns. Thus, SEM techniques are more flexible than comparable statistical techniques that based on multiple regression.

Secondly, and perhaps more importantly is that SEM provides a unique analysis that simultaneously considers questions of both measurement and prediction. For the typical "latent variable models", SEM provides a flexible and powerful means of simultaneously assessing the quality of measurement and examining predictive relationships among constructs. For doing a confirmatory factor analysis (CFA) and path analysis at the same time, SEM allows researchers to frame increasingly precise questions about the phenomena in which they are interested. Such analyses offer considerable advantages for estimating predictive relationships among latent constructs that are uncontaminated by measurement error.

4.6.2   LISREL

Computer software are important tools for the conduct of SEM. Approximately 30 years ago, LISREL[1] (Linear Structural Relationships), which is currently in its 8.30 version (Jöreskog & Sörbom, 1993; 1996), was essentially the only widely available SEM software. However, the situation is very different now. There are many choices of SEM software, including AMOS (Analysis of Moment Structures; Arbuckle, 1997), CALIS (Covariance Analysis and Linear Structural Equations; Hartmann, 1992), EQS (Equations; Bentler, 1995), LISCOMP (Linear Structural Equations with a Comprehensive Measurement Model; Muthen, 1987), RAMONA (Reticular Action Model or Near Approximations; Browne et al., 1994), and SEPATH (SEM and Path Analysis; Steiger, 1995).[2]

Although a researcher wishing to use SEM procedures now has several computer software to choose from, LISREL is still the most longstanding and widely distributed (Austin & Calderon, 1996). Indeed, it has served as the prototype for all subsequent SEM software. Nonetheless, each of these software is unique in the command language it uses in model specification. In this regard, LISREL stands apart from the other software in its two-option capabilities. That is, in lieu of using

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[1] LISREL is a stand-alone software product marketed by Scientific Software, International. It is designed to estimate and test structural equation models. The researcher can carry out exploratory and confirmatory factor analysis, as well as path analysis, using this software.
LISREL uses the correlations or covariances among measured variables such as survey items to estimate or infer the values of factor loadings, variances, and errors of latent variables. LISREL syntax prior to version 8 relied solely on the specification of the nature of eight matrices: LX, LY, TD, TE, PH, PS, GA, and BE. These matrices detail the interrelationships of the manifest variables with the latent variables in any given model. In this way it can perform factor and path analyses. Furthermore, LISREL's flexibility allows it to also estimate the relationships among latent variables with other latent variables.

[2] For a more comprehensive listing together with links to the web sites of the distributors of these software, please visit Joel West's homepage at http://gsm.uci.edu/~joelwest/SEM/software.html. There have been several papers comparing the strengths and weaknesses of these software; for example, Waller (1993), Hox (1995), and Miles (1998).

the original Greek language traditionally associated with statistical models, the researcher has opt to specify models using everyday language, made possible by the SIMPLIS[3] command language. Computer software, however easy to use, should only be the tools of knowledge and not its master.

As with communication in general, one must first acquire an understanding of the language before being able to interpret the message conveyed; so it is with SEM. To fully comprehend the nature of both CFA and the full Latent Variable models within the framework of the LISREL software, it is helpful to examine a generalized model structure first. SEM is a covariance structure analysis that combines CFA and econometric modeling for the purpose of analyzing hypothesized relationships among latent variables measured by manifest indicators. A full covariance structural model is typically composed of two parts, the measurement model and the structural model.

The measurement model describes how each latent variable is measured or operationalized by corresponding manifest indicators. It also provides information regarding the validity and reliability of the observed indicators. Whereas the structural model describes the relationships between the latent variables themselves and indicates the amount of unexplained variance. The CFA confirmation is accomplished by comparing the computed covariance matrix implied by the

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[3] LISREL now features a new programming language called SIMPLIS, which allows the LISREL user to program in a language approximating plain English rather than explicitly specifying matrix values, as was the case in previous versions of LISREL. However, the user may still use the older LISREL matrix syntax with this version.
Scientific Software, International also produces a companion product called PRELIS. PRELIS is a data management program, which is designed to read and pre-process data prior to LISREL analysis (including tests of univariate and multivariate normality). It is also used to compute a specified matrix for reading into a LISREL session.

hypothesized model to the actual covariance matrix derived from the empirical data. Since it utilizes the covariance matrix rather than the individual observations as input, the covariance structure modeling is an aggregate methodology; unlike regression or ANOVA, individual cases or observations cannot be represented/predicted.

The LISREL methodology involves a number of steps:

- Identifying the variables to be used,
- Collecting data on these variables,
- Developing the model (model conceptualization),
- Constructing the path diagram and specifying the model,
- Testing the model against the data (parameter estimation),
- Assessing the model fit,
- Revising the model if necessary (model modification),
- Retesting the revised model, and
- Fitting the model to a fresh data set (model cross-validation).

4.6.3   Assessment of Model Fit

The purpose of assessing a model's overall fit is to determine the degree to which the model as a whole is consistent with the empirical data at hand.   However, assessing the overall goodness-of-fit for structural equation models is not as straightforward as with other multivariate dependence techniques, such as multiple regression, discriminant analysis, and conjoint analysis.   SEM has no single statistical test that best describes the "strength" of the model's predictions.   Instead, researchers have developed a wide range of goodness-of-fit indices that when used in combination assesses the results from three perspectives: (1) overall fit (absolute fit), (2) comparative/ fit to a base model (incremental fit), and (3) model parsimony.

Absolute fit indices determine the degree to which the overall model (structural and measurement models) predicts the observed covariance or correlation matrix.

No distinction is made as to whether the model fit is better or worse in the structural or measurement models. Among the absolute fit indices commonly used to evaluate SEM are the Chi-square statistic (χ^2), the noncentrality parameter (NCP), the goodness-of-fit index (GFI), the root mean square residual (RMSR), the root mean square error of approximation (RMSEA), and the expected cross-validation index (ECVI).

The second class of indices, incremental fit indices, compares the proposed model to some baseline model, most often referred to as the null model. The null model should be some realistic model that all other models should be expected to exceed. In most cases, the null model is a single-construct model with all indicators perfectly measuring the construct. A number of incremental fit indices have been proposed and the newer versions of LISREL includes the adjusted goodness-of-fit index (AGFI), the normed fit index (NFI), the relative fit index (RFI), the incremental fit index (IFI), and the comparative fit index (CFI). All these indices represent comparisons between the estimated model and a null or independence model. The values lie between zero and 1.0 and larger values indicate higher levels of goodness-of-fit.

Parsimonious fit indices relate the goodness-of-fit of the model to the number of estimated coefficients required achieving this level of fit. Their basic objective is to diagnose whether model fit has been achieved by "over fitting" the data with too many coefficients. This procedure is similar to the "adjustment" of the R^2 in multiple regression. However, because no statistical test is available for these indices, their use in an absolute sense is limited in most instances to comparisons between models. The parsimonious normed fit index (PNFI), the parsimonious

goodness-of-fit index (PGFI), and the Akaike information criterion (AIC) are the typical parsimonious fit indices.

Unfortunately, no one index is unequivocally superior to the rest in all circumstances, because "particular indices have been shown to operate somewhat differently given the sample size, estimation procedure, model complexity, violation of the underlying assumptions of multivariate normality and variable independence, or any combination thereof " (p.118, Byrne, 1998).   To make matters worse, there is a lack of "a clear notion of precisely what it is that is to be summarized about a model by any fit index, and …any agreement on the characteristics that such an index should have" (p.201, Hayduk, 1996).   As a result, different researchers tend to favour different indices, often leading to direct conflicts when recommending which indices should (or should not) be relied upon.   For example, Maruyama (1998) cites Mulaik et al. (1989) and does not recommend the use of AGFI, while Hayduk's (1996) recommendation is precisely the opposite!

For the sake of assessing by admittedly subjective standards of whether the model is acceptable, instead of using only one or two indicators, the researcher selected several more popular and appropriate goodness-of-fit indices from the three types of indices in assessing the measurement and structural models.   The selected indicators include the χ^2, GFI, RMSEA, AGFI, NFI, CFI, PNFI and PGFI.   The most fundamental measure of overall fit is the likelihood-ratio Chi-square statistics ($\chi^{2\cdot}$).   This is the only statistically based measure for goodness-of-fit available in SEM (Mooresville, 1993).   A large value of χ^2 relative to the degrees of freedom signifies that the observed and estimated matrices differ considerably.   However, an important criticism of the χ^2 indicator is that it is too sensitive to sample size

differences. Thus, the researcher is encouraged to complement this indicator with other indicators of fit in all instances.

The goodness-of-fit index (GFI) (Mooresville, 1988, 1993) is another indicator provided by LISREL. It is a non-statistical indicator ranging in value from 0 (poor fit) to 1.0 (perfect fit). It represents the overall degree of fit (the squared residuals from prediction compared with the actual data) but is not adjusted for the degrees of freedom. Higher values indicate better fit, but no absolute threshold levels for acceptability have been established. Another indicator that attempts to correct for the tendency of the Chi-square statistic to reject any specified model with a sufficiently large sample is the root mean square error of approximation (RMSEA). The value is the discrepancy per degree of freedom, and the discrepancy is measured in terms of the population, not just the sample used for estimation (Steiger, 1990). The value is representative of the goodness-of-fit that could be expected if the model were estimated in the population, not just the sample drawn for the estimation. Values ranging from 0.05 to 0.08 are deemed acceptable. For practical purposes, the results of the χ^2 used in conjunction with the GFI, RMSEA, and CFI should be more than sufficient to reach an informed decision concerning the model's overall fit.

For the type of incremental fit, the comparative fit index (CFI) has an advantage over other fit indices since it can avoid the under-estimation of data fit due to small sample, although this study has a large enough sample. The desirable value of CFI is 0.90, which indicates an acceptable fit of the model to the data. The adjusted goodness-of-fit (AGFI) is an extension of the GFI, adjusted by the ratio of degrees of freedom for the proposed model to the degrees of freedom for the null model. It is quite similar to the PNFI, and a recommended acceptance level is a value greater

than or equal to 0.90. One of the more popular indicator is the normed fit index (NFI) (Bentler & Bonett, 1980), which is an indicator ranging from zero (no fit at all) to 1.0 (perfect fit). The NFI is calculated as:

$$\text{Normed Fit Index (NFI)} = \frac{(\chi^2_{\text{NULL}} - \chi^2_{\text{PROPOSED}})}{\chi^2_{\text{NULL}}}$$

There is no absolute value indicating an acceptable level of fit, but a commonly recommended value is 0.90 or greater. Again, it is a relative comparison of the proposed model to the null model.

For the type of parsimonious fit, the parsimonious normed fit index (PNFI) (James et al., 1982) is a modification of NFI. The PNFI takes into account the number of degrees of freedom used to achieve a level of fit. Parsimony is defined as achieving higher degrees of fit per degree of freedom used (one *df* per estimated coefficient). Thus more parsimony is desirable. The PNFI is defined as:

$$\text{Parsimonious Normed Fit Index (PNFI)} = \frac{\text{Degrees of Freedom }_{\text{PROPOSED}}}{\text{Degrees of Freedom }_{\text{NULL}}} * \text{NFI}$$

Higher values of the PNFI are better, and its principal use is for the comparison of models with differing degrees of freedom. It is used to compare alternative models, and there are no recommended levels of acceptable fit. However, when comparing between models, differences of 0.06 to 0.09 are proposed to be indicative of substantial model differences (Williams & Hazer, 1986). The parsimonious goodness-of-fit index (PGFI) modifies the GFI differently from the AGFI. Where the AGFI's adjustment of the GFI was based on the degrees of freedom in the estimated and null models, the PGFI is based on the parsimony of the estimated model. It adjusts the GFI in the following manner:

$$\text{PGFI} = \frac{\text{Degrees of Freedom }_{\text{PROPOSED}}}{0.5 * \text{No. of Manifest Variables} * (\text{No. of Manifest Variables} + 1)} * \text{GFI}$$

The value of PGFI varies between zero and 1.0, with higher values indicating greater model parsimony.

4.7 Refinement and Validation of the Scale Items

4.7.1 Refinement of the Scale Items

Since some of the items in the research instrument are newly constructed, they may not have the desire psychometric properties and this may affect the validity and reliability of the scales adversely. Therefore, the scales need to be purified and inappropriate items need to be removed. First, parameters that include the factor loadings and covariance amongst the errors are added sequentially based on Modification Index (Bollen, 1989) to maximize model fit. The decision to add a parameter is based on substantive-based revisions and for avoiding re-specification of the model solely on statistical and model fit considerations (Bollen, 1989; Green, Thompson, & Poirier, 1999). Then, parameters are deleted if they are no longer necessary to maintain model fit. Finally, variables with significant cross-loading are deleted in order to maintain the unidimensionality of the scales.

4.7.2 Testing of Factor Structure of the Dimensions

Data are analyzed using the two-step approach as suggested by Anderson and Gerbing (1988). The first step is to test and refine the measurement model using confirmatory factor analysis (CFA). CFA is used to test whether the measured variables reliably reflected the hypothesized latent variables. In this study, they are subjective norm, image, result demonstrability, perceived risk, computer self-efficacy, perceived ease of use, perceived usefulness, and intention to adopt/continual usage.

The second step is to test all the latent variables, and the partial aggregation approach is used. The traditional analysis uses each item as a separate indicator of the relevant latent construct, which allows the most detailed analysis for construct testing. However, Bagozzi and Heatherton (1994) argue that the traditional analysis will be unwieldy in practice since there are likely to have a high level of random error in typical items and parameters that must be estimated. The partial aggregation technique can help to relieve this problem. It combines items of the same dimension into a composite to reduce the level of random error and treat the composite score as one indicator of the latent variable.

4.7.3   Unidimensionality

Unidimensionality is a necessary prerequisite for reliability and validity analyses (Nunnally, 1988). A construct is unidimensional if its constituent items represent one underlying trait. In confirmatory factor analysis, specifying a measurement model that defines the relationship between each construct and its constituent items is a test of unidimensionality. A good fit of the measurement model to the data indicates that, as hypothesized, all items load significantly on one underlying latent varible. The fit of the measurement model is indicated by the goodness of fit index (GFI). Scales with GFI values greater than 0.90 are unidimensional.

4.7.4   Reliability

Unidimensionality alone is not enough to ensure usefulness of a scale, for even a perfectly unidimensional scale may have resultant composite score that is determined primarily by measurement error (Gerbing & Anderson, 1988). Therefore, reliability of each scale will then be assessed after the unidimensionality

is established.

Reliability can be defined as the degree to which measurements are free from error and, therefore, yield consistent results. Operationally, reliability is defined as the internal consistency of a scale, which assesses the degree to which the items are homogeneous.   Cronbach's alpha (á) is a widely used measure of internal consistency (Cronbach, 1951; Nunnally, 1988).   A scale is considered reliable if the alpha coefficient is greater than 0.70. The composite reliability measure proposed by Werts, Linn, and Jöreskog (Jöreskog & Sorbom, 1988), which is an alternate conceptualization of reliability, represents the proportion of measure variance attributable to the underlying trait.   The Werts, Linn, and Jöreskog ρ_c represents the ratio of trait variance to the sum of trait and error variance.   Scales with ρ_c greater than 70 percent are considered to be reliable (Nunnally, 1994).   Both tests will be used to assess the reliability of the scales for this study.

Composite Reliability (Construct Reliability)
The formula for calculating the **Composite Reliability** is as follows:

$$\rho_c = \frac{(\mathbf{S}\lambda)^2}{[(\mathbf{S}\lambda)^2 + \mathbf{S}(\theta)]}$$

where ρ_c = composite reliability
           λ = indicator loadings
           θ = indicator error variances (i.e. variances of the δ's or ε's)
           $\mathbf{S}$ = summation over the indicators of the latent variable

Average Variance Extracted
The formula for calculating the **Average Variance Extracted** is as follows:

$$\rho_v = \frac{(\mathbf{S}\lambda^2)}{[\mathbf{S}\lambda^2 + \mathbf{S}(\theta)]}$$

where ρ_v = average variance extracted
           λ, θ, and $\mathbf{S}$ are defined as above.

4.7.5 Convergent and Discriminant Validity

Convergent validity is the extent to which varying approaches to construct measurement yield the same results. A commonly used method to assess convergent validity is to view each item on a scale as a different approach to measure the construct (Ahire, Golhar, & Waller, 1996). Convergent validity is then checked by using the Bentler-Bonnet coefficient ($\ddot{A}$), or called Normed Fit Index (NFI). The Bentler-Bonnet coefficient represents the ratio of the chi-square value of the specified measurement model to that of a null model, which has no hypothesized item loadings on a construct. Scales with $\ddot{A}$ values of 0.90 or above demonstrate strong convergent validity.

Discriminant validity refers to the degree to which measures of different constructs are unique from each other. This is achieved when measures of each dimension converge on their corresponding true scores and do not converge on true scores of other constructs. The following procedure is followed for assessing discriminant validity. That is, the confirmatory factor analysis runs on pairs of scales, allowing for correlation between the constructs. Next, the procedure is repeated with the correlation between the two constructs constrained to be equal to 1. A significant difference between the constrained model chi-square and that of the unconstrained model indicates that the two constructs are distinct (Ahire, Golhar, & Waller, 1996; Venkatraman, 1989). Both tests will be used to assess the validity of the scales for this study.

4.8 Chapter Summary

This chapter discussed the proposed research model that based the extension of Technology Acceptance Model and Social Cognitive Theory is developed to identify factors that would influence the adoption/continual usage of Internet Banking. Measurements for theoretical constructs have been employed from prior research and some new items have been developed from the result of a salient belief elicitation study.

Confirmatory factor analysis would be used to test the factor structure of the 45 manifest variables. Brief introduction of Structural Equation Modeling (SEM) and LISREL were made. SEM with partial aggregation would be used to test the proposed model. Several data analysis methods would be employed to test the construct validity and reliability. The following chapter reports the result of these analyzes.

CHAPTER 5   DATA ANALYSIS

This chapter analyzes the responses in the main survey.   The results of confirmatory factor analysis and reliability tests of the constructs, and the path analysis of the proposed research model are reported and discussed.   Comparisons are made between users and potential adopters of Internet Banking, with gender differences noted.   The profiles of the respondents are also summarized, which include their banking habits, Internet Banking knowledge and preferences, and expectations for Internet Banking services.

5.1   Sample Demographics

Data collection took place from February to mid-April of year 2001.   Eight hundred questionnaires were distributed, 634 were completed and returned (79.25% response rate).   Of these, 183 were from users of Internet Banking and 451 were from potential adopters of Internet Banking.   Fifty-nine of the 451 potential adopters had no knowledge of what Internet Banking was.   Their responses, therefore, were withdrawn from the study.   After cases with missing data eliminated, the final sample consists of 499 observations, of which 147 were users and 352 were potential adopters of Internet Banking.   Demographic data for the respondents are shown in Table 5.1.

Male and female are nearly even distributed.   Male respondents account for

51.50% (257 males, 80 users and 177 potential adopters) of the sample, while female respondents account for 48.50% (242 females, 67 users and 175 potential adopters). However, there could be gender differences among users and/or among potential adopters of Internet Banking.   Two sets of t-test were conducted to see how gender would affect the behavioural attitudes of users and potential adopters.   The results will be presented later in this chapter.

	Users (147)		Potential Adopters (352)	
	Mean	*Std. Deviation*	*Mean*	*Std. Deviation*
Age	23.04	3.96	22.24	3.92
Gender				
Male	80 (54.42%)		177 (50.28%)	
Female	67 (45.58%)		175 (49.72%)	
Education				
Undergraduate	94 (63.95%)		273 (77.56%)	
Postgraduate	53 (36.05%)		79 (22.44%)	
Income				
HK$ 0 - 5,000	90 (61.22%)		249 (70.74%)	
5,001 - 10,000	10 (6.80%)		29 (8.24%)	
10,001 - 15,000	15 (10.20%)		27 (7.67%)	
15,001 - 20,000	25 (17.01%)		34 (9.66%)	
20,001 - 25,000	1 (0.68%)		1 (0.28%)	
25,001 - 30,000	1 (0.68%)		3 (0.85%)	
30,001 - 35,000	1 (0.68%)		3 (0.85%)	
35,001 - 40,000	4 (2.72%)		6 (1.70%)	

Table 5.1   Sample Demographics

Most of the respondents (90 users and 249 potential adopters) have a monthly income less than HK$5,000 (almost all of these are undergraduate students) and 20.24% (40 users and 61 potential adopters) had a monthly income of HK$10,001 - HK$20,000 (most of these are postgraduate students).   Most undergraduate students probably hold part-time jobs, like tutoring primary and secondary school students, while most postgraduate students hold a stable job, such as studentship or tutorship offered by universities plus a flexible income from their part-time jobs.   Table 5.2

shows the distribution of respondents by universities.

	Number of Usable Responses		
	Undergraduates	Postgraduates	Total (%)
CUHK	76	35	111 (22.24%)
CityU	39	11	50 (10.02%)
HKBU	45	5	50 (10.02%)
HKU	68	40	108 (21.64%)
HKUST	46	20	66 (13.23%)
LU	50	3	53 (10.62%)
HKPU	43	18	61 (12.23%)
Total	367	132	499 (100%)

Table 5.2   Distribution of Respondents by Universities

As shown in Table 5.3, only 6 out of the 499 students respondents spend 0 hour on the Internet per week.   This does not imply that they are non-Internet users because all of them had put their email addresses in the questionnaire.   Therefore, it is possible that these students access the Internet just few times a month.

Number of Hours	Users	Potential Adopters
0	0 (0%)	6 (1.70%)
> 0 - 5	9 (6.12%)	30 (8.52%)
> 5 - 10	14 (9.52%)	64 (18.18%)
> 10 - 15	3 (2.04%)	49 (13.92%)
> 15 - 20	9 (6.12%)	31 (8.81%)
> 20 - 25	14 (9.52%)	26 (7.39%)
> 25 - 30	10 (6.80%)	30 (8.52%)
> 30 - 35	16 (10.88%)	34 (9.66%)
> 35 - 40	62 (42.18%)	58 (16.48%)
> 40	10 (6.80%)	24 (6.82%)
Total	147 (100%)	352 (100%)

Table 5.3   Number of Hours Spent on the Internet per Week

Among the users of Internet Banking, 42.18% (62) spent around 35-40 hours on the Internet per week, and 10.88% of them spent 30-35 hours on the Internet per week.   There were 10 respondents who spent more than 40 hours on the Internet per

week on average. Two respondents stated that they spent 100 hours per week. That means, nearly 60% of the users spent over 30 hours on the Internet per week.

For the potential adopters, 18.18% (64) spent around 5-10 hours on the Internet per week, and 16.48% of them spent 35-40 hours on the Internet per week. When the figures were summed up, about 40% of potential adopters spent 5-20 hours on the Internet per week and over one-third of them (32.96%) spent over 30 hours on the Internet per week. This reveals that practically all users and potential adopters of Internet Banking are Internet users already, with 40.8% of the respondents (204, 88 users and 116 potential adopters) are frequent Internet users, spending more than 30 hours on the Internet per week on average. Although there is a certain amount of non-Internet users within Hong Kong's population, it is wise move for banks to first target the Internet users as their potential customers of Internet Banking; since it takes time for non-Internet users to familiarize themselves with the Internet even they would like to use Internet Banking.

5.2 Confirmatory Factor Analysis of the Constructs

Before analyzing the structural path model, the validity and reliability of the measurement scales of all the constructs have to be established.   In order to test the measurement model of Internet Banking Adoption, the 45 items used to measure the acceptance/continual usage of Internet Banking as a whole was subjected to confirmatory factor analysis using LISREL 8.30.

5.2.1   Model Specification

The first step in operationalizing the model was to clarify exactly what relationships the model proposes.   The first-order factor structure having eight proposed constructs as the latent factors, as shown in Figure 5.1, was assessed.   The first factor (Subjective Norm) was measured by three items, the second (Image) by three items, the third (Result Demonstrability) by four items, the fourth (Perceived Risk) by five items, the fifth (Computer Self-Efficacy) by ten items, the sixth (Perceived Usefulness) and seventh (Perceived Ease of Use) each by seven items, and the eighth (Intention to Adopt/Continual Usage) by six items.   The factor variances were fixed at unity and all latent factors were allowed to correlate freely. The parameters were estimated using the maximum likelihood (ML) method with the covariance matrix produced by PRELIS 2.30.
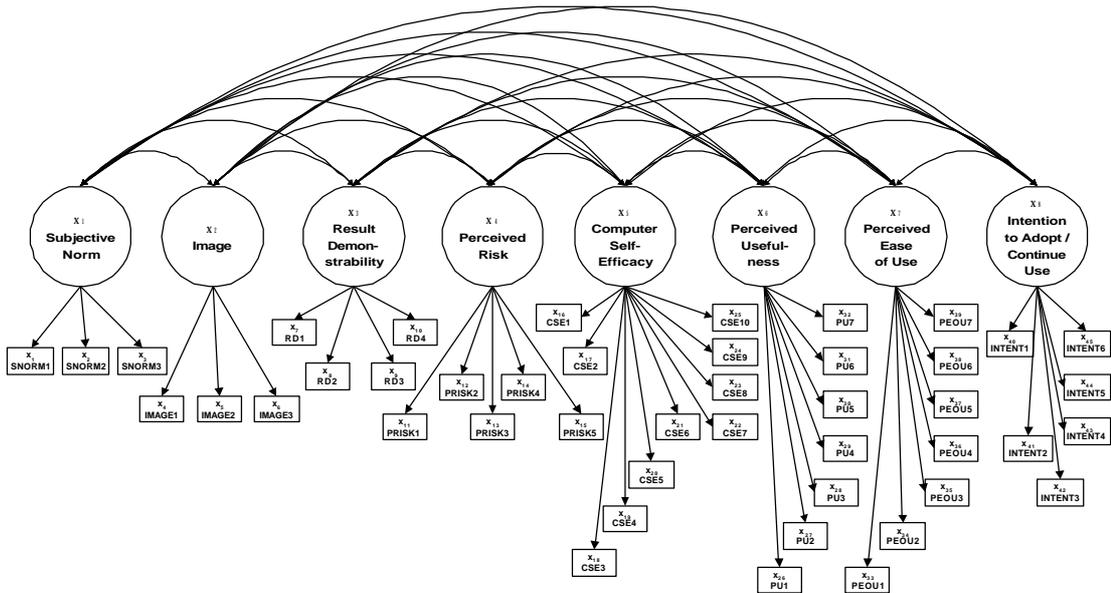
Figure 5.1   Eight-factor Oblique Model

Given the focus on comparing models, it is appropriate to develop rival models to contrast with the proposed eight-factor solutions.   Ideally these rival models will stand in nested sequence with the model of interest to allow for the use of direct comparisons with the $\chi^2_{\text{difference}}$ test.   Therefore, two alternative structures were obtained by (1) constraining all interfactor correlations to equal zero (i.e. a model containing orthogonal factors, see Figure 5.2) and (2) constraining all interfactor correlations to equal 1.0 (i.e. a unidimensional model, see Figure 5.3).
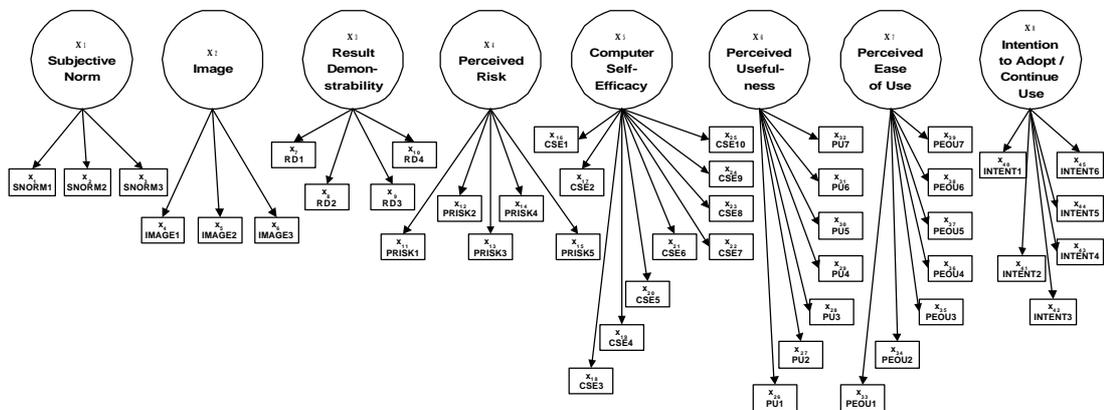
Figure 5.2   Eight-factor Orthogonal Model

82
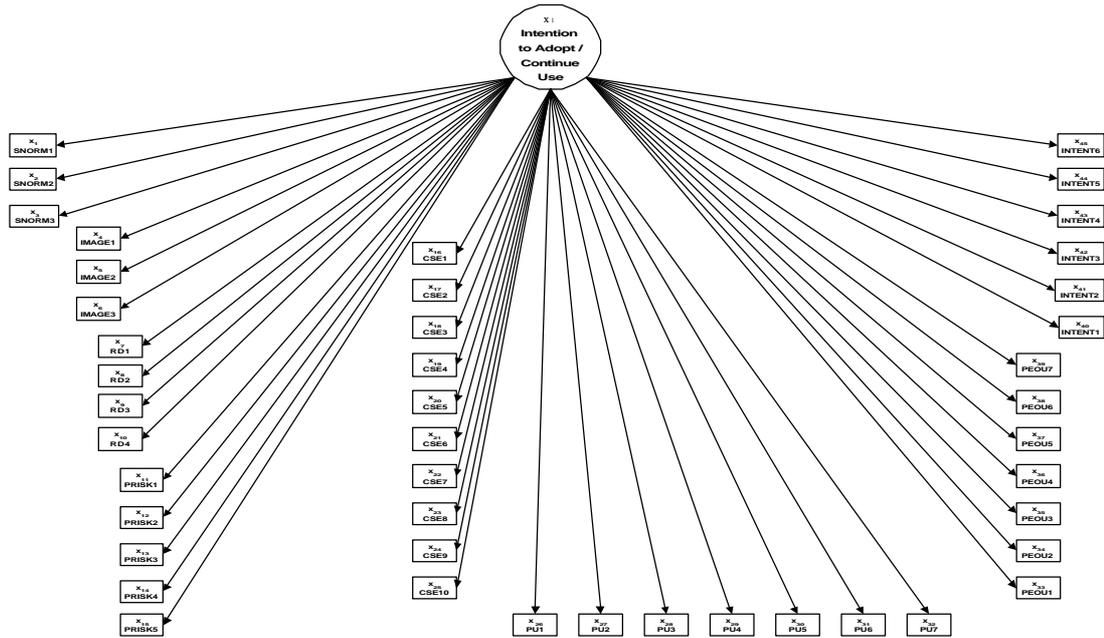
Figure 5.3   One-factor Model

5.2.2   Model Assessment

As shown in Table 5.4, all fit indices converge suggesting the superiority of the model hypothesizing eight oblique factors. A comparison with the other models shows that the eight-factors (oblique) model provides a better fit to the data than does the model hypothesizing eight orthogonal factors [$\chi^2_{\text{difference}}(28) = 4361.71$, $p < 0.01$], or one factor [$\chi^2_{\text{difference}}(28) = 11151.2$, $p < 0.01$].   Moreover, inspection of the indices of parsimonious fit (i.e., the PNFI and PGFI) suggests that the eight-factor model provides the most parsimonious fit to the data.   Table 5.5 shows the squared multiple correlation of the indicators.

Model	c^2	df	GFI	AGFI	RMSEA	NFI	CFI	PNFI	PGFI
8-factor oblique	4412.13	917	0.72	0.68	0.087	0.82	0.86	0.76	0.64
8-factor orthogonal	8773.84	945	0.56	0.52	0.13	0.71	0.75	0.68	0.51
1-factor	15563.33	945	0.42	0.36	0.18	0.56	0.58	0.53	0.38

Table 5.4   Fit Indices for Measurement Models

	R^2		
Factor	**8-factor oblique**	**8-factor orthogonal**	**1-factor**
Subjective Norm			
SNORM1	0.85	0.84	0.28
SNORM2	0.74	0.72	0.29
SNORM3	0.91	0.92	0.31
Image			
IMAGE1	0.87	0.90	0.40
IMAGE2	0.80	0.80	0.36
IMAGE3	0.68	0.65	0.41
Result Demonstrability			
RD1	0.71	0.70	0.49
RD2	0.74	0.80	0.49
RD3	0.72	0.69	0.54
RD4	0.20	0.18	0.19
Perceived Risk			
PRISK1	0.53	0.54	0.24
PRISK2	0.80	0.84	0.34
PRISK3	0.72	0.71	0.34
PRISK4	0.29	0.25	0.29
PRISK5	0.51	0.49	0.26
Computer Self-Efficacy			
CSE1	0.67	0.65	0.64
CSE2	0.70	0.67	0.65
CSE3	0.73	0.70	0.66
CSE4	0.75	0.76	0.58
CSE5	0.69	0.70	0.51
CSE6	0.60	0.62	0.42
CSE7	0.70	0.71	0.56
CSE8	0.66	0.66	0.56
CSE9	0.63	0.65	0.47
CSE10	0.67	0.68	0.54
Perceived Usefulness			
PU1	0.72	0.72	0.57
PU2	0.71	0.71	0.59
PU3	0.78	0.79	0.64
PU4	0.75	0.76	0.60
PU5	0.49	0.46	0.52
PU6	0.59	0.59	0.45
PU7	0.56	0.56	0.46
Perceived Ease of Use			
PEOU1	0.61	0.60	0.48
PEOU2	0.64	0.62	0.49
PEOU3	0.63	0.66	0.44
PEOU4	0.67	0.70	0.52
PEOU5	0.62	0.64	0.49
PEOU6	0.53	0.52	0.42
PEOU7	0.59	0.58	0.44
Intention to Adopt			
INTENT1	0.68	0.67	0.44
INTENT2	0.69	0.69	0.45
INTENT3	0.80	0.81	0.43
INTENT4	0.76	0.76	0.38
INTENT5	0.82	0.83	0.47
INTENT6	0.58	0.56	0.54

Table 5.5   Squared Multiple Correlations

5.2.3 Model Modification

It is typical in confirmatory factor analysis (Kelloway, 1995, 1996). The eight-factor model provides a better fit to the data than do rival specifications, however, the model itself does not provide a very good fit to the data. Although inspection of the LISREL output suggests that all the estimated parameters in the hypothesized eight-factor model are significant, the χ^2 associated with the model is also significant (χ^2/df = 4.8, which is < 5 and RMSEA = 0.087, which is <0.10). The comparative fit indices are outside the bounds that indicate a good fit to the data (e.g. NFI and CFI <0.90). Faced with results like these, the researcher may well be tempted to engage in a post hoc specification search to improve the fit of the measurement model.

5.2.3.1 Residuals

Since all the estimated parameters are significant, theory trimming (i.e., deleting non-significant paths) does not seem to be a viable option. However, theory building (i.e., adding parameters based on the empirical results) remains an option. To assist the researcher in pinpointing possible areas of misfit, both the residuals and the modification indices were examined. In reviewing the largest negative and positive standardized residuals produced by LISREL (using the "RS" command), the researcher can see that the lion's share of misfit in the model appears to lie with the covariances between items CSE1 and CSE2, and items CSE2 and CSE3.

5.2.3.2 Modification Indices

Inspection of the LISREL-produced modification indices (using the "MI" command) suggests several likely additional parameters. Most striking is the largest modification index 195.84 which pertains to an error covariance between

items CSE1 and CSE2; the corresponding EPC statistic is 0.66. From this information, one can anticipate that, if the model were to be re-estimated with this parameter specified as free, one could expect the overall χ^2 value to drop by at least 195.84, and the value of the estimate itself is to be approximately 0.66. However, any reparameterization of a model on the basis of MI information must take sound substantive sense, error covariances are no exception to this edict. Jöreskog (1993) admonished "Every correlation between error terms must be justified and interpreted substantively" (p.297).

Since the researcher could not substantiate the specification of an error covariance between items CSE1 and CSE2 with prior literature, the second largest modification index was considered together with the strategy proposed by Jöreskog (1993) who stated:

If it does not make sense to relax the parameter with the largest modification index, consider that with the second largest modification index, and so on. If the sign of certain parameters is specified a prior, positive or negative, the expected parameter change associated with the modification index can be used to exclude models with parameters having the wrong sign. (p.312)

In keeping with these recommendations, the researcher considers it inappropriate to re-estimate the model with the second largest MI parameter freely estimated. Then, moving to consider the third largest MI (95.75), which suggests freeing the path from the factor Image to item PU5. Although the modification index suggests that a substantial improvement in fit could be obtained from making this modification, a researcher would not typically make the change because (a) of the dangers of empirically generated modifications, (b) there is no theoretical

justification for the change, and (c) the item is clearly not designed to assess Image of adopting Internet Banking.

5.2.4   Post Hoc Analyzes

Following the above approach of specification searches, one parameter or indicator of the latent factors was freed or deleted for re-estimating the measurement model each time.   Items that had squared multiple correlations with the latent variables of less than 0.40 were dropped from the analysis (Bollen, 1989). Information derived from these exploratory and confirmatory factor analyses of the model constructs led the researcher to conclude that item IMAGE3, RD4, PRISK4, CSE1, CSE2, CSE3, CSE6, PU5, PU7, INTENT4, and INTENT6 may be inappropriate for use.   Most of these items were newly developed indicators by the researcher for the proposed research model.   Therefore it is reasonable for these items to have lower factor loadings and thus lower the constructs' reliability with the empirical data.   As a consequence, the researcher re-specified the model with these eleven items deleted.   The final eight-factor first-order model was then tested with the remaining 34 items, and resulted in a fairly good fit (χ^2 = 1626.07, df = 499, p < 0.00, CFI = 0.93, χ^2/df = 3.26) (see Table 5.6, several fit indices discussed in section 4.6.3 are used for assessing the model fit).   Table 5.7 shows the measurement properties of all eight constructs.   All the factor loadings were fairly high and were significant at an alpha level of 0.01.   Moreover, all construct reliabilities were much higher than the acceptable level of 0.70.   Together with NFI=0.90, this supported the convergent validity of the measurement of each construct (Anderson & Gerbing, 1988).

c^2	df	c^2/df	GFI	AGFI	RMSEA	NFI	CFI	PNFI	PGFI
1626.07	499	3.26	0.84	0.81	0.067	0.90	0.93	0.80	0.70

Table 5.6   Fit Indices for the Final CFA Model

	First-Order CFA		
Factor	**Construct Reliability**	**Factor Loading ***	**R^2**
Subjective Norm	0.936		
SNORM1		0.92	0.85
SNORM2		0.86	0.73
SNORM3		0.95	0.91
Image	0.919		
IMAGE1		0.94	0.89
IMAGE2		0.90	0.81
Result Demonstrability	0.889		
RD1		0.85	0.72
RD2		0.87	0.75
RD3		0.84	0.71
Perceived Risk	0.878		
PRISK1		0.73	0.53
PRISK2		0.91	0.83
PRISK3		0.85	0.72
PRISK5		0.71	0.50
Computer Self-Efficacy	0.938		
CSE4		0.85	0.72
CSE5		0.83	0.69
CSE7		0.86	0.73
CSE8		0.82	0.67
CSE9		0.86	0.74
CSE10		0.86	0.74
Perceived Usefulness	0.924		
PU1		0.85	0.72
PU2		0.85	0.72
PU3		0.89	0.80
PU4		0.86	0.74
PU6		0.76	0.57
Perceived Ease of Use	0.917		
PEOU1		0.78	0.61
PEOU2		0.80	0.64
PEOU3		0.79	0.63
PEOU4		0.82	0.67
PEOU5		0.79	0.62
PEOU6		0.73	0.53
PEOU7		0.77	0.59
Intention to Adopt/Continual Usage	0.920		
INTENT1		0.81	0.66
INTENT2		0.81	0.66
INTENT3		0.90	0.81
INTENT5		0.92	0.84

* All factor loadings are significant at alpha level of 0.01

Table 5.7   Standardized Parameter Estimates for the Final CFA Model

5.2.5   Constructs Reliability and Validity

Typically, a causal-indicator model is specified and analyzed for each theoretical construct individually (Ahire, Golhar & Waller, 1996; Venkatraman, 1989). The researcher followed these guidelines for all constructs with four or more indicators. Constructs with fewer indicators were pooled together and analyzed in order to provide adequate degrees of freedom for estimation of the model parameters. In this study, two constructs (Subjective Norm and Result Demonstrability) have three items and one construct (Image) has two items. Items for these three constructs were pooled together and analyzed. As shown on Table 5.8, the GFI indices for all eight constructs are higher than the recommended level of 0.90. These results suggest that all eight scales are unidimensional.

Construct	No. of items	Unidimen-sion ality Goodness of fit index [GFI]	Reliability		Convergent Validity Bentler-Bonnet Ä
			Cronbach's á	Werts Linn Jöreskog ρ_c	
Subjective Norm	3	0.97	0.93	0.94	0.98
Image	2	0.97	0.92	0.92	0.98
Result Demonstrability	3	0.97	0.89	0.89	0.98
Perceived Risk	4	0.98	0.87	0.88	0.98
Computer Self-Efficacy	6	0.95	0.94	0.94	0.97
Perceived Usefulness	5	0.98	0.92	0.92	0.98
Perceived Ease of Use	7	0.90	0.92	0.92	0.92
Intention to Adopt/Continual Usage	4	0.99	0.92	0.92	0.99

Table 5.8 Assessment of Unidimensionality, Reliability and Convergent Validity

Both Cronbach's á and Werts Linn Jöreskog ρ_c tests were used to access the reliabilities of the eight scales. Table 5.8 indicates that the ρ_c values are well above the threshold of 0.70 for all scales. The Cronbach's alpha values were also found to be greater than 0.70. These results suggest that all eight scales are reliable. The Bentler- Bonnet coefficient represents the ratio of the chi-square value of the

specified measurement model to that of a null model, which has no hypothesized item loadings on a construct.   The Bentler- Bonnet Äfor all eight scales are greater than 0.90, strong convergent validity of scales was demonstrated.

5.3 Analysis for the Structural Path Model

The proposed research model was tested separately with the samples of users and potential adopters of Internet Banking via the structural path model.   The partial aggregation approach was used for reducing the level of random error.   The results are as follows.

5.3.1   Users of Internet Banking

The fit statistics (see Table 5.9) suggested that the model did not provide a good fit to the data (χ^2 = 156.29, p < 0.00, GFI=0.79, CFI = 0.80).   Both GFI and CFI were less than the recommended level of 0.90.   With inspection of the estimated parameters, two non-significant paths were identified, one was the path between Perceived Risk and Perceived Usefulness (PRISK-PU), and the other was between Perceived Ease of Use and Intention to Continual Usage (PEOU-INTENT). However, deleting the PRISK-PU non-significant path from the model had no significant change to model fit [$\chi^2_{difference}(1) = 0.17$]. Deleting the PEOU-INTENT non-significant path from the model had also little significant change to model fit [$\chi^2_{difference}(1) = 3.08$].   Thus, the researcher examined some diagnostic elements (residuals and modification indices) that may indicate potentially significant model modifications.

The largest MI (49.52) for BETA suggests freeing the path from Subjective Norm to Intention to Continual Usage (SNORM-INTENT). This implies that user's intention to continue using Internet Banking was directly affected by Subjective Norm. Although Davis et al. (1989) and Mathieson (1991) found that subjective norm has no significant effect on intention. The effect of subjective norm on intention was consistent with prior results obtained by Taylor and Todd (1995) and Venkatesh and Davis (2001). Chua (1980) also suggested that the adopter's friends, family, and colleagues/peers are groups that can potentially influence the adoption. Thus, the researcher considered it appropriate to re-estimate the model with freeing the SNORM-INTENT path; the results of this re-specified model analysis are discussed in the next section.

Post Hoc Analyses

The estimation of the re-specified model resulted in a marginal fit of data ($\chi^2 =$ 114.24, $p < 0.00$, GFI=0.84, CFI = 0.87). Thus, a significant drop in χ^2 value was found [$\chi^2_{\text{difference}}(1) = 42.05$, $p < 0.005$]. It provided a better fit to the data than the model before re-specification. However, since it just provided a marginal fit; the researcher therefore examined the modification indices again. The MI suggests freeing the path from Result Demonstrability to Image (RD-IMAGE). This implies that individuals can be expected to have desired image enhancement if the covariation between image and positive results of using the innovation is readily discernable. Given that the sample under study is composed of young and higher-educated students, the link between Result Demonstrability and Image may derive from the emphasis of fashionable and trendy image desired by youngsters in Hong Kong. On the basis of this substantiated rationale, then, the researcher considered it appropriate to re-estimate the model by freeing the RD-IMAGE path.

This re-specification resulted in a better fit of the data ($\chi^2 = 78.73$, $p < 0.00$, GFI=0.88, CFI = 0.90).

Model	c^2	df	NFI	NNFI	CFI	IFI	RFI	GFI	AGFI
Original	156.29	13	0.79	0.58	0.80	0.81	0.56	0.79	0.42
Path added from SNORM to INTENT	114.24	12	0.86	0.70	0.87	0.87	0.68	0.84	0.51
Path added from RD to IMAGE	78.73	11	0.89	0.75	0.90	0.90	0.73	0.88	0.61

Table 5.9   Fit Indices for Continual Usage Models
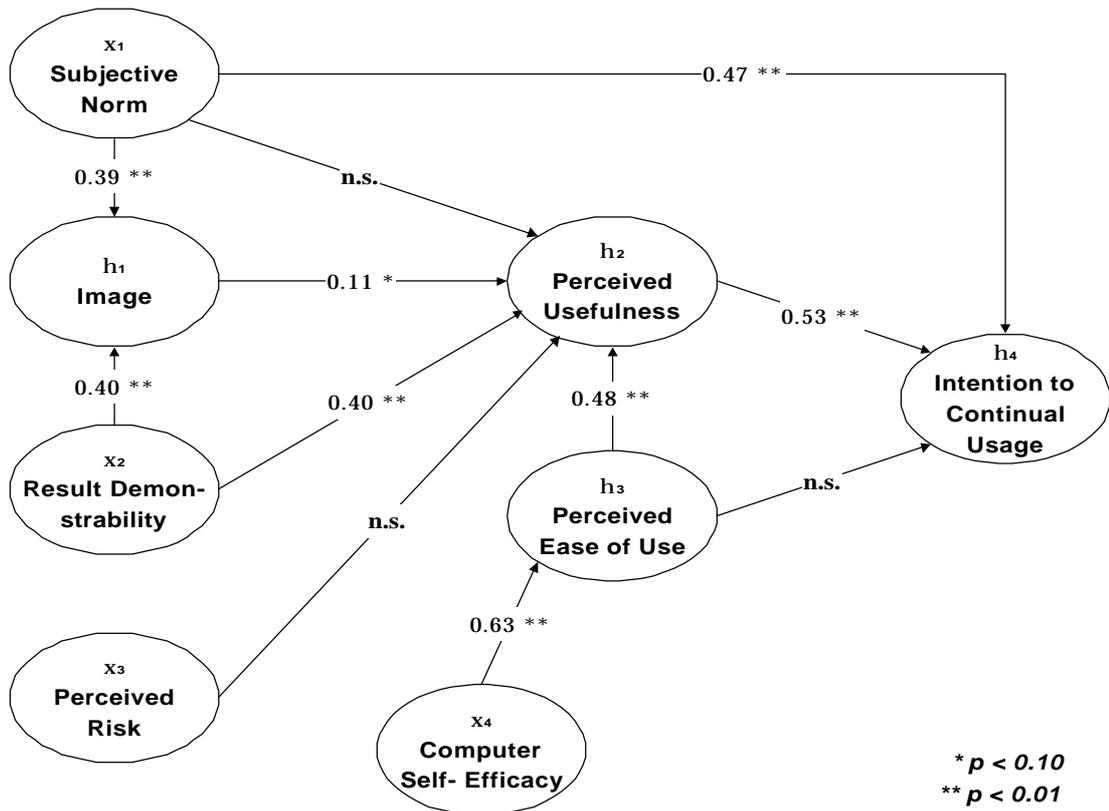
Figure 5.4   Standardized Parameter Estimates for Users

Standardized parameter estimates for the revised model are presented in Figure 5.4.   As shown, Intention to Continual Usage of Internet Banking was predicted by

Subjective Norm ($\beta = 0.47$, $p < 0.01$) and Perceived Usefulness ($\beta = 0.53$, $p < 0.01$), which in turn was predicted by Image ($\beta = 0.11$, $p < 0.10$), Result Demonstrability ($\beta = 0.40$, $p < 0.01$), and Perceived Ease of Use ($\beta = 0.48$, $p < 0.01$). Perceived Ease of Use was predicted by Computer Self-Efficacy ($\beta = 0.63$, $p < 0.01$). Image was predicted by both Subjective Norm ($\beta = 0.39$, $p < 0.01$) and Result Demonstrability ($\beta = 0.40$, $p < 0.01$). The model explained substantial amounts of item variance, 34% of the variance in Intention to Continual Usage of Internet Banking, 28% of variance in Perceived Usefulness, 60% of variance in Perceived Ease of Use, and 52% of variance in Image.

5.3.2 Potential Adopters of Internet Banking

The re-specified model was then validated with the potential-adopters sample. The fit statistics suggested that the model provided a marginal fit to the data ($\chi^2 = 189.83$, $p < 0.00$, GFI=0.88, CFI = 0.86). With inspection of the estimated parameters, the path from Result Demonstrability to Perceived Usefulness (RD-PU) and the path from Perceived Ease of Use to Intention to Adopt Internet Banking (PEOU-INTENT) were found to be non-significant. Since deleting these two paths from the model had little significant changes to the model fit, the researcher examined the residuals and modification indices instead.

The maximum MI (52.59) for BETA as shown by the LISREL output suggests freeing the path from Image to Intention to Adopt Internet Banking (IMAGE-INTENT). This implies that potential users' Image perceptions would directly affect their intention to adopt Internet Banking. The estimation of the re-specified model resulted in an overall good fit ($\chi^2 = 154.79$, $p < 0.00$, GFI = 0.90, CFI = 0.90). Table 5.10 shows the fit indices for the models, while standardized

parameter estimates for the final model are presented in Figure 5.5.

Model	c^2	df	NFI	NNFI	CFI	IFI	RFI	GFI	AGFI
Original	189.83	11	0.85	0.64	0.86	0.86	0.63	0.88	0.61
Path added from IMAGE to INTENT	154.79	10	0.89	0.72	0.90	0.90	0.70	0.90	0.64

Table 5.10   Fit Indices for Adoption Models
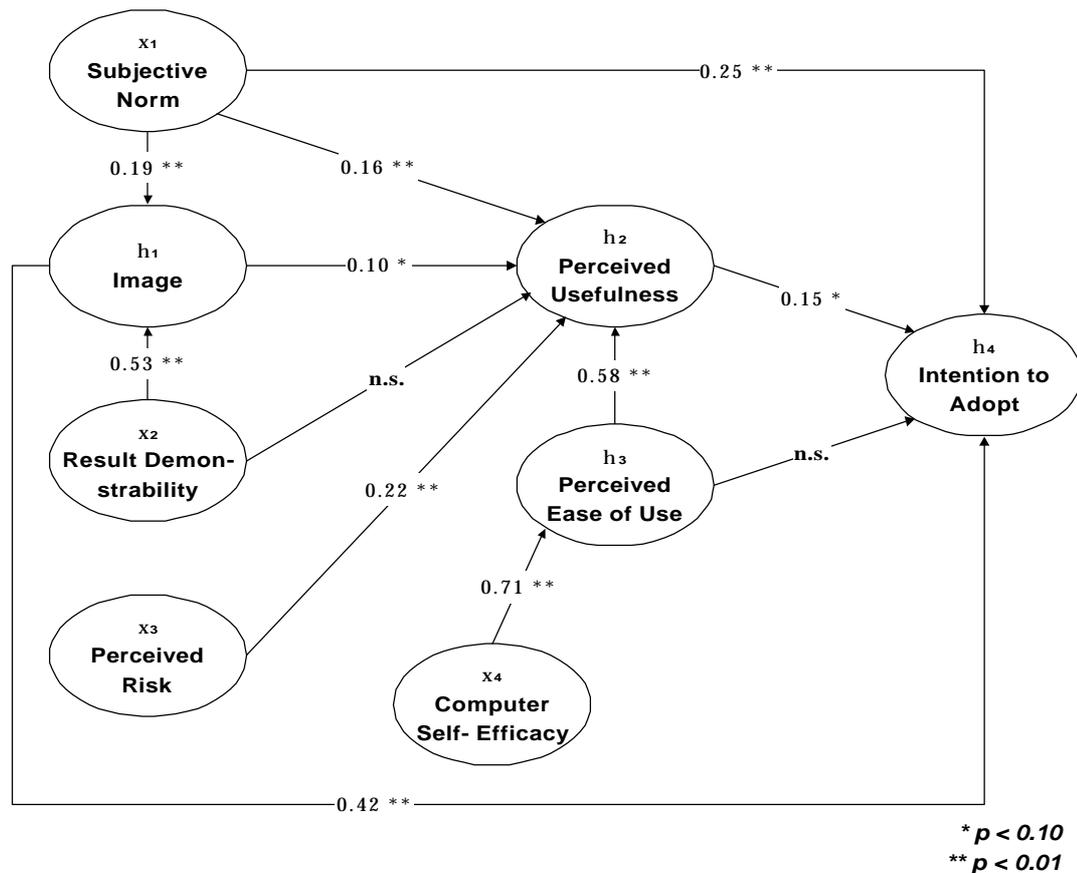
Figure 5.5   Standardized Parameter Estimates for Potential Adopters

For potential adopters of Internet Banking, Intention to Adopt Internet Banking was predicted by Image ($\beta = 0.42$, $p < 0.01$), Subjective Norm ($\beta = 0.25$, $p < 0.01$), and Perceived Usefulness ($\beta = 0.15$, $p < 0.05$).   Perceived Usefulness was predicted by Perceived Ease of Use ($\beta = 0.58$, $p < 0.01$), Subjective Norm ($\beta = 0.16$, $p < 0.01$), Image ($\beta = 0.10$, $p < 0.05$), and Perceived Risk ($\beta = -0.22$, $p < 0.01$).   Perceived

Ease of Use was predicted by Computer Self-Efficacy ($\beta = 0.71$, $p < 0.01$). Image was predicted by both Subjective Norm ($\beta = 0.19$, $p < 0.01$) and Result Demonstrability ($\beta = 0.53$, $p < 0.01$). The above model also explained substantial amounts of item variance, 53% of the variance in Intention to Adopt Internet Banking, 34% of variance in Perceived Usefulness, 49% of variance in Perceived Ease of Use, and 58% of variance in Image. Table 5.11 shows a summary of research results for both users and potential adopters of Internet Banking.

Hypotheses	Users	Potential Adopters
H1 Subjective Norm will have a positive direct effect on Perceived Usefulness	*Not Supported*	*Supported*
H2 Subjective Norm will have a positive effect on Image	*Supported*	*Supported*
H3 Image will have a positive effect on Perceived Usefulness	*Supported*	*Supported*
H4 Result Demonstrability will have a positive effect on Perceived Usefulness	*Supported*	*Not Supported*
H5 Perceived Risk will have a negative effect on Perceived Usefulness	*Not Supported*	*Supported*
H6 Higher Computer Self-Efficacy will have a positive effect on Perceived Ease of Use	*Supported*	*Supported*
H7 Perceived Ease of Use will have a positive effect on Perceived Usefulness	*Supported*	*Supported*
H8 Perceived Usefulness will have a positive effect on Intention to Adopt/Continual Usage	*Supported*	*Supported*
H9 Perceived Ease of Use will have a positive effect on Intention to Adopt/Continual Usage	*Not Supported*	*Not Supported*
H10 Perceived Usefulness and Perceived Ease of Use will fully mediate the influence of selected variables on Intention to Adopt/Continual Usage	*Not Supported*	*Not Supported*

Table 5.11   Summary of Research Results

5.3.3   Explaining Intention to Adopt/Continual Usage of Internet Banking

Perceived Usefulness ($\beta = 0.53$ for users and $\beta = 0.15$ for potential adopters) is significantly positively related to Intention to Adopt/Continual Usage of Internet Banking; besides, 34% of variance of Intention to Continual Usage and 53% of variance of Intention to Adopt were accounted for. This result is consistent with previous studies on TAM. It implies that if users/potential users perceive Internet Banking to be useful, they will be more likely to continue using/adopt the innovation. Therefore, the result supported hypothesis H8. The data also revealed that the effect of perceived usefulness on intention was stronger for users than that of potential users. This may be due to the fact that users have direct on-hand experience with Internet Banking, which leads to a better knowledge of its usefulness than for the potential users.

The results reveal that Perceived Ease of Use, however, is not significantly related to Intention to Adopt/Continual Usage, which contradicts the expectation. Thus, hypothesis H9 is not supported by the findings. This finding concurs with that of the original TAM but contradicts the results obtained in many previous studies (e.g. Lu & Gustafson, 1994 and Moore & Benbasat, 1991) where ease of use was a significant determinant of intention to use a computer technology. A plausible reason for this is that as information technology innovation (Internet Banking in this study, one of the Internet applications) becomes more user-friendly, learning to use it becomes much easier than in the past when users were required to remember dozens of commands. Davis (1989) also reported that, while perceived ease of use was found to be significantly correlated with usage, when controlling for usefulness, the effects of ease of use on usage were non-significant. He further suggested that "perceived ease of use may actually be a causal antecedent to perceived usefulness,

as opposed to a parallel, direct determinant of system usage" (p.319).

This finding has both practical and research implications. From a practical point of view, it may imply that users are relatively "pragmatic". They adopt a certain kind of information technology innovation mainly because they think it is, or will be useful to them. Users tend to focus on the usefulness of Internet Banking itself. From a research point of view, the differences between the findings of prior studies and this study may be due to the nature of the sample. IT end-users (university students) today are generally more computer-literate than their counterparts five to ten years ago. Hence, ease of use may have been less an issue for the sample of this study than it was for the samples used in prior studies. Owing to this general improvement of computer literacy among IT end-users, the relationships found to be valid in prior work may need to be re-examined.

Furthermore, Subjective Norm significantly showed a positive relation to Intention to Adopt/Continual Usage of Internet Banking. This means that users feel more positive about using Internet Banking when the social environment encourages the use of it. This finding concurs with the extended Triandis model by Cheung, Chang, and Lai (2000) and the extension of Technology Acceptance Model by Venkatesh and Davis (2000). However, the setting was different from studies by Venkatesh and Davis, in that the current context (Adopt/Continual Usage of Internet Banking) is not mandatory. There was no reason to assure that adoption/continual usage of Internet Banking was not voluntary to the subjects.

A possible reason is that with the planned deregulation of interest rates in July 2001, all banks in Hong Kong were striking hard to stay competitive in this new

commercial scenario. Electronic transactions and Internet Banking are means to reduce cost and improve efficiency for banks, thus many banks were trying to persuade their customers to switch to Internet Banking (e.g. imposing administration and service charges on saving accounts, lessening interest rates of saving accounts for small-amount customers, while promoting Internet Banking as a service that is free of charge). This kind of actions may give bank customers a feeling that it is mandatory to continue using/adopting Internet Banking. That is, no one would like to pay more for the same kind of banking services, therefore, adopting/using Internet Banking is the best choice.

The findings also suggest that the effect of subjective norm on intention was stronger for existing users than for potential users of Internet Banking. However, this contradicts with findings of Karahanna, Straub, and Chervany (1999), which revealed that the relationship between subjective norm and behavioural intention would be stronger for potential adopters than for users. Triandis (1971) also suggests that subjective norm will have a more pronounced effect in determining behaviour when the behaviour is new (as in adoption). This influence on behaviour will decrease when users become more experienced. A possible reason for explaining it, is the level of uncertainty that is created by Internet Banking remains unchanged as individuals move through the stages of the adoption process. This means users of Internet Banking are in general uncomfortable with uncertainty and in turn tend to increase communication.

Besides, Image ($\beta = 0.42$) was found to be the most significant factor affecting Intention to Adopt for potential adopters of Internet Banking. It is interesting to note that Image perceived by the potential adopters was very important. Internet

Banking, unlike other IT innovations, is less observable.   No one knows whether an individual is an Internet Banking user or not, with the exception of close peers. This is largely due to the fact that no Internet Banking users would demonstrate how to use Internet Banking in front of others, because banking and finances are something very personal matters that require privacy.

However, within peer groups, it is relatively easy for one person to know who are the Internet Banking users by means of communication.   For example, one may tend to adopt Internet Banking if he/she perceives that using it will lead to image enhancement among his/her friends.   Moreover, once individuals feel that Internet Banking is trendy among peers, they may perceive themselves as being looked down upon it they have not yet adopted the new technology.   Therefore, as the study has shown, Image and Subjective Norm were the main factors affecting Intention to Adopt for potential adopters.

5.3.4   Explaining Perceived Usefulness

Looking at the antecedents of Perceived Usefulness, only Image was significantly positively related to Perceived Usefulness for both users and potential adopters of Internet Banking.   The results support that Image has a positive direct effect on Perceived Usefulness of Internet Banking, that is, hypotheses H3.   For potential users, Subjective Norm and Perceived Risk were respectively significantly positively and negatively related to Perceived Usefulness, that is, supported. However, both hypotheses H1 and H5 are not supported for users of Internet Banking. It can be argued that after users have had adoption experience of Internet Banking, their perceived usefulness of Internet Banking would be based mainly on their own personal evaluation of the technology, rather than subjective norm.

For hypothesis H5, the result shows that Perceived Risk (β = -0.22) was significantly negatively related to Perceived Usefulness for potential users. It implies that if potential users perceive Internet Banking having security risk, they will be more likely to perceive Internet Banking as less useful. Similar arguments appear in the Internet Banking literature (Bhimani, 1996; Cockburn & Wilson, 1996; Quelch & Klein, 1996), that the perceived security and privacy risk associated with banking on the Internet is a major factor influencing the adoption of Internet Banking. Users may not perceive any risks after their adoption of Internet Banking, or at least the risk for continuing using Internet Banking. Thus, no significant relationship was found between Perceived Risk and Perceived Usefulness for users.

The finding of Result Demonstrability (β = 0.40) implies that if Internet Banking produces effective/positive results desired by the users, users are more likely to understand how useful Internet Banking is. Therefore, hypothesis H4 is supported for users by the findings. However, potential users may not be aware of these effective or positive results, or they may have no idea whether these results would be positive or negative, therefore, they are less likely to understand how useful Internet Banking may be. Thus, this does not support hypothesis H4 for potential users.

Furthermore, Perceived Ease of Use (β = 0.48 for users and β = 0.58 for potential adopters) was found to be the most significant factor affecting Perceived Usefulness, although it had no statistically significant influence on Intention to Adopt/Continual Usage. This result is consistent with most prior studies (e.g. Lu & Gustafson, 1994) and is easy to explain. For voluntary use of Internet Banking, since individuals usually explore a number of basic features first, the technology's

ease of use plays an important role in the exploratory stage. The individuals' assessment of the usefulness of the innovation, thus, is influenced by the innovation's ease of use. All of which supports hypothesis H7.

5.3.5 Explaining Perceived Ease of Use

Computer Self-Efficacy ($\beta = 0.63$ for users and $\beta = 0.71$ for potential adopters) was found to be a statistically significant factor of Perceived Ease of Use, and 49% and 60% of variance of Perceived Ease of Use was accounted respectively for potential adopters and users. The finding implies that individuals with higher Computer Self-Efficacy will perceive Internet Banking more easier to use. This concurs with the suggestion by Venkatesh and Davis (1996), that is, users strongly anchor ease of use perceptions about any system to their computer self-efficacy. Therefore, hypothesis H6 is supported. The data also reveal that the effect of Computer Self-Efficacy on Perceived Ease of Use was stronger for potential adopters than that of users.

5.3.6 Explaining Image

Both Subjective Norm and Result Demonstrability were significantly positively related to Image for both users and potential adopters of Internet Banking, and a large amount of variance (52% for users and 58 % for potential adopters) in Image was explained in the final model. The first part of the results conformed to prior studies of TAM2 (Venkatesh & Davis, 2000), which theorize that subjective norm would positively influence image. Thus, hypothesis H2 is supported.

5.3.7　Gender Differences

Prior research shows that there are significant gender differences in Information Technology innovation adoption. This prompts the researcher to investigate whether the empirical data that has been collected would have similar findings.

There are several important demographic variables that could potentially confound gender differences in perceptions (for a discussion of these, see Lefkowitz, 1994). Based on a careful analysis of a large sample (732, including 361 women), Lefkowitz (1994) found that income was the most important covariate, with organizational level the second important covariate. In addition, education level is an important covariate of gender. Specifically, men are over-represented in categories of higher income, higher positions, and higher educational qualifications.

The typical procedure to handle such situations has been to statistically control for these confounding variables. Since this research is not an organization behaviour research, organizational level was not considered for control. With the sample of students, education level was being controlled. For the income variable, no great variation was found in the empirical data. Thus, the researcher could examine whether gender differences existed in this study.

When comparing the mean scores, male respondents tended to have higher mean scores in seven out of the eight constructs than female respondents had. These are namely the IMAGE, RD, PRISK, CSE, PU, PEOU, and INTENT. In contrast, female respondents had a higher mean score in SNORM only. These findings applied for both users and potential adopters of Internet Banking. However, no significant gender differences were found from the results of t-tests

among the users.

For potential adopters, six of the observed gender differences were found to be significant by using t-tests, they are, IMAGE, RD, CSE, PU, PEOU, and INTENT. This implies that, compared to female's decisions, the decisions of male are more strongly influenced by their image perceptions, result demonstrability, computer self-efficacy level, perceived usefulness, and perceived ease of use toward adopting Internet Banking.   Besides, male potential adopters have generally greater intention to adopt Internet Banking than female potential adopters do.

5.4   Respondent Characteristics

Besides the path analysis, viewing the profiles of respondents could give more insights for banks to formulate strategies in offering Internet Banking.   The following section summarized and discussed the statistics analysis from the survey, including banking habits, Internet Banking knowledge and preferences, and expectations for Internet Banking of the respondents.

5.4.1   Banking Habit

Over 85% of the users had accounts in more than one bank, of which 36.05% (53) had accounts in three banks (see Table 5.12). At the extreme, there were two users, who had accounts in nine banks.   For the potential adopters, 50.28% of them (177) were a client of two banks.   Potential adopters who had accounts in one bank and those who had accounts in three banks both equated 21.59% (76). Less than 7% of potential adopters had accounts in more than three banks.   On average, users

of Internet Banking had more banking accounts than potential adopters had. Those who have more banking accounts may imply that they have more banking needs. Banks could focus on those customers who have more banking needs as a target group to market their Internet Banking services.

Number of Banks	Users	Potential Adopters
1	21 (14.29%)	76 (21.59%)
2	34 (23.13%)	177 (50.28%)
3	53 (36.05%)	76 (21.59%)
4	24 (16.33%)	9 (2.56%)
5	2 (1.36%)	6 (1.70%)
9	5 (3.40%)	5 (1.42%)
7	6 (4.08%)	3 (0.85%)
8	0 (0%)	0 (0%)
9	2 (1.36%)	0 (0%)
Total	147 (100%)	352 (100%)

Table 5.12   Number of Banks that the Respondents Have Accounts in

Table 5.13 compares six banking channels on the frequency of their use. Automatic Teller Machines (ATM) are the most popular channel for banking transactions for both users and potential adopters of Internet Banking. This may be due to the user-friendliness, accessibility, and capability of ATMs. ATM offers both English and Chinese version, and there are 1,600 ATMs in Hong Kong. ATMs can be easily found on streets, shopping malls, MTR stations, and even outside bank branches. In addition to the convenience and accessibility, one can perform a wide range of banking transactions on an ATM. Thus, ATM has been widely accepted by Hong Kong people.

Branch Counter was the second most popular channel to perform banking transactions. Almost all banking services can be performed through the bank branch counters. This is especially true for the elderly, which constitute for the

largest group of branch counter users.   They are relatively conservative in accepting

new technologies.   Some of whom are illiterate therefore must need help from the

bank's staff for completing their banking transactions. Since all of the subjects in

this study are university students under 40 years old, the data suggests they have to

perform some banking transactions in branch counters, such as paying for academic

fees, consulting the bank's staff for investment, exchanging foreign currencies.

Another reason would be the presence of campus branch counter(s).

	Rank	Branch Counter	ATM	Phone Banking	Internet Banking (PC/note book access)	(mobile phone access)	Interactive TV Banking
Users (147)							
	1	6	**118**	4	16	3	0
	2	**69**	20	17	35	0	0
	3	42	3	**36**	**39**	9	2
	4	20	0	35	28	5	0
	5	2	0	7	4	**47**	10
	6	3	4	5	0	10	**19**
	Total	**142**	**145**	**104**	**122**	**74**	**31**
	(%)	(96.60%)	(98.64%)	(70.75%)	(82.99%)	(50.34%)	(14.28%)
Potential Adopters (352)							
	1	52	**288**	10	0	0	2
	2	**227**	39	44	0	0	0
	3	41	7	**136**	0	0	6
	4	2	0	8	0	0	9
	5	5	0	6	0	0	19
	6	3	0	10	0	0	**26**
	Total	**330**	**334**	**214**	**0**	**0**	**62**
	(%)	(93.75%)	(94.89%)	(60.80%)	(0%)	(0%)	(17.61%)

Table 5.13   Rankings of Six Banking Channels Based on Frequency of Use

This survey reveals that Interactive TV Banking is the least popular channel for

both users and potential adopters of Internet Banking.   This may be due to its lack

of availability in the market. It seems that only the Bank of China has offer this banking service to their customers. This means only customers of the Bank of China can be users of Interactive TV Banking. Besides, the user of Interactive TV Banking must also be a customer of iTV, which is a video-on-demand service offered by PCCW. This constraint limits the amount of users that could use the service.

Internet Banking with PC/notebook access was the third most frequently used by users of Internet Banking, whereas Phone Banking was the third most frequently used by potential adopters of Internet Banking. It is reasonable to assume that potential users of Internet Banking use Phone Banking more frequent than Internet Banking, because they are not supposed to have any Internet Banking accounts. For users of Internet Banking, the data revealed that most of them use Internet Banking with PC/notebook somewhat more frequently than Phone Banking. This may be because users of Internet Banking find that Internet Banking provides a clearer interface (visual) than Phone Banking (audio).

However, Phone Banking has some advantages over Internet Banking. For example, Phone Banking users do not need to own a computer or have access to the Internet, instead, they can use any phones (including fix-line phone, mobile phone, and coin-phone on the streets) to make banking transactions. Moreover, it is really convenient for Phone Banking users to use their mobile phones to do account inquiries and banking transactions when they are in transit.

Users of Internet Banking ranked Internet Banking with mobile phone access as the fifth popularly used channel. Although it seems to be the most convenient way for users to perform banking services, there are at least three reasons that can explain

for its low popularity. One, it is a relative new and immature IT innovation in the Hong Kong market. Two, there are not many banks which are currently offering this channel to their customers. Three, not many WAP-enabled devices have been developed and made available for the market. Thus, potential customers may have limited choices for using such a service.

Besides WAP, potential customers can also use SIM Toolkit for using Internet Banking with their non-WAP mobile phones. However, SIM Toolkit is provider-dependent. This means that one can use mobile Internet Banking only if he/she is both the customer of a bank that provides such a service and of the mobile phone provider that co-operates with the bank as well. Moreover, a SIM card is limited in that it can only store one bank's Internet Banking information. This means customers that have two Internet Banking accounts need two separate SIM cards to operate. These two limitations have hindered the growth of the mobile Internet Banking market.

The total number of respondents who ranked Internet Banking with PC/notebook access (122) and Internet Banking with mobile phone access (74) is less than the number of Internet Banking users (147). This suggests that not all users of Internet Banking use Internet Banking services via these two channels. Most of them prefer PC/notebook access to mobile phone access though some of them would use both interchangeably. Furthermore, almost all the respondents (95.99%, 479) were ATM users (145 out of 147 users of Internet Banking, 334 out of 352 potential adopters of Internet Banking). Therefore, banks that offer Virtual ATM, which is a web-based banking service provided by JETCO to its members, may have a relatively larger pool of potential adopters.

As shown on Table 5.14, over 50% of the respondents (263, 62 users and 201 potential adopters of Internet Banking) used banking services 1-3 times per week on average. For users of Internet Banking, over 40% of them used banking services 4-9 times per week. Three users have reported using banking services over 24 times per week, which means more than three times per day. Two of them used banking services through Internet Banking with PC/notebook access and the other one used services through the ATMs.

Times	Branch Counter	ATM	Phone Banking	Internet Banking (PC/notebook access)	(mobile phone access)	Inter-active TV Banking	Total (%)
Users (147)							
< 1	4	7	0	2	1	0	14 (9.52%)
1-3	0	54	2	4	2	0	62 (42.18%)
4-6	0	36	2	3	0	0	41 (27.89%)
7-9	2	15	0	4	0	0	21 (14.29%)
10-12	0	3	0	0	0	0	3 (2.04%)
13-15	0	0	0	1	0	0	1 (0.68%)
16-18	0	2	0	0	0	0	2 (1.36%)
19-21	0	0	0	0	0	0	0 (0%)
22-24	0	0	0	0	0	0	0 (0%)
> 24	0	1	0	2	0	0	3 (2.04%)
Total	**6**	**118**	**4**	**16**	**3**	**0**	**147** (100%)
Potential Adopters (352)							
< 1	29	45	1	0	0	1	76 (21.59%)
1-3	20	176	5	0	0	0	201(57.10%)
4-6	3	55	2	0	0	0	60 (17.05%)
7-9	0	8	0	0	0	0	8 (2.27%)
10-12	0	4	0	0	0	0	4 (1.14%)
13-15	0	0	0	0	0	0	0 (0%)
16-18	0	0	2	0	0	1	3 (0.85%)
19-21	0	0	0	0	0	0	0 (0%)
22-24	0	0	0	0	0	0	0 (0%)
> 24	0	0	0	0	0	0	0 (0%)
Total	**52**	**288**	**10**	**0**	**0**	**2**	**352** (100%)

Table 5.14   Frequency of Use of the Banking Services per Week

Although it is difficult to explain why that a user uses ATMs over three times per day, it is not the case for those using Internet Banking. With the popularity of the Internet nowadays in Hong Kong (one can easily get connected with it in offices, homes, or Cybercafes), it is easy and possible for Internet Banking users to logon to their accounts and perform banking transactions at any times and in any places. This could be something as simple as to check account balances or to get real time securities quotes. Thus, it is not unreasonable for users to use Internet Banking services over 24 times per week.

When potential adopters were compared to users of Internet Banking, nearly 80% of potential adopters (277) use banking services less than three times per week, users of Internet Banking use banking services much more frequently. This data further provide evidence that users of Internet Banking are those bank users that have more banking needs. Therefore, the earlier the banks can convince their frequent customers to switch to Internet Banking channel, the greater the savings that banks can have (since Internet Banking requires the lowest cost per transaction).

5.4.2 Internet Banking Knowledge and Preferences

All of the respondents included in the data analysis were people who had heard about Internet Banking before the survey was conducted. The result shows a slightly differences between users and potential adopters when comparing where they heard about Internet Banking. The most popular source of Internet Banking information has been bank leaflets/advertisements. The second most popular source of information has been through television/radio, while newspaper/magazines and the Internet have been the third and the fourth sources respectively, followed by words-of-mouth, books, and MTR advertisement.

The data in Table 5.15 revealed that both bank leaflets/advertisements and television/radio are the most effective media for banks to promote their Internet Banking services. However, it may be interesting to find out how the depth of knowledge the potential users have if the most popularly sources of Internet Banking information is not the Internet. Most of them have never visited the bank's web sites. Therefore, banks should put more effort in educating potential adopters by emphasizing the advantages of Internet Banking with different means.

Information Sources	Users (147)	Potential Adopters (352)
Bank leaflets/advertisements	119 (28.27%)	205 (27.85%)
Television/Radio	91 (21.62%)	185 (25.14%)
Newspapers/Magazines	75 (17.81%)	152 (20.65%)
Internet	65 (15.44%)	108 (14.67%)
Words-of-mouth	41 (9.74%)	56 (7.61%)
Books	27 (6.41%)	25 (3.40%)
Other: MTR advertisements	3 (0.71%)	5 (0.68%)
Total	**421** (100%)	**736** (100%)

Table 5.15   Sources of Internet Banking Information

Internet Banking concerns personal finance matters, therefore it is unlike other IT innovations. It is difficult for existing users to educate potential adopters by showing them how easy it is to use Internet Banking. Instead, banks need to provide interactive demonstration accounts on the Internet to let potential users have an opportunity to try it out and know what the relative advantages of Internet Banking are. Video demonstration in bank's branches may also help potential adopters gain more knowledge about Internet Banking, especially those who are non-Internet users.

For those who are not using Internet Banking, the 352 potential adopters, over one quarter of them claimed they do not have confidence in Internet Banking security. The second main reason is that they do not feel there is a need for Internet Banking. Thirdly, they feel that they cannot directly contact bank staff on the Internet if there is an inquiry or a problem. They also do not want to pay for Internet Banking service charges. The above fourth reasons were the potential adopters' main worries for using Internet Banking; Table 5.16 reveals reasons that hinder their adoption of Internet Banking.

Reasons for Not Using Internet Banking (Potential Adopters)	Freq. (%)
Do not have confidence on Internet Banking security.	174 (27.32%)
No need.	150 (23.55%)
Cannot directly contact bank staff on the Internet if there is an inquiry or problem.	86 (13.50%)
Do not want to pay for Internet Banking service charges.	79 (12.40%)
Do not have required knowledge or equipment.	37 (5.81%)
Response may be slow on the Internet.	36 (5.65%)
It is inconvenient to use Internet Banking during office hours.	17 (2.67%)
Do not want to pay charges for an Internet connection.	15 (2.35%)
It is difficult to apply for an Internet Banking account.	15 (2.35%)
My banks do not provide Internet Banking services.	11 (1.73%)
Others: cannot withdraw cash, no time to register, server always down, etc.	17 (2.67%)
Total	637 (100%)

Table 5.16   Reasons for Not Using Internet Banking

A small percentage of the respondents had mentioned in the survey, the unstability of Internet Banking servers may be one of the main reasons why some users have given up using Internet Banking. Banks should try their best to maintain the stability of the Internet Banking servers in order to boost users' confidence for continual usage. Besides, the impossibility of cash withdrawal from the Internet is another problem because cash transactions are still the most popular payment method in Hong Kong. Banks may encourage the public to use electronic payment method, such as Visa Cash, Mondex, and Octopus. Dah Sing Bank is now offering a unique function of auto Octopus add-value with its Internet Banking.

5.4.3 Expectations for Internet Banking Services

Respondents were asked in the questionnaire to indicate the usefulness of different Language Options offered in Internet Banking (1 for Not at all Useful to 7 for Very Useful). The result shows certain differences between the mean scores (see Appendix D) of users and potential adopters of Internet Banking, although both groups express the same pattern for ranking in the Language Options. That is, Traditional Chinese was ranked the first (5.63 for potential adopters to 6.14 for users, i.e., from Useful to Very Useful), while English was the second (5.14 for potential adopters to 5.72 for users, i.e., from Useful to Quite Useful) and Simplified Chinese was the last (3.89 for potential adopters to 4.10 for users, i.e., from Useless to Useful).

Internet Banking Services	Users' Ranking	(Means)	Potential Users' Ranking	(Means)
Historical Records Inquiry	1	(6.74)	4	(5.48)
Account Balances Inquiry	2	(6.71)	2	(5.59)
Account Transfers	3	(6.66)	5	(5.44)
Bill Payments	4	(6.33)	3	(5.56)
24-hour Hotline Feedback Channel	5	(6.21)	1	(5.81)
Funds Transfer to Other Banks	6	(6.17)	7	(5.31)
Email Feedback Channel	7	(5.74)	6	(5.38)
Securities Trading	8	(5.63)	13	(4.32)
Real Time Securities Quote	9	(5.57)	12	(4.39)
Cheque Cancellation	10	(5.49)	8	(4.93)
Market Commentary	11	(5.49)	15	(4.26)
Rates Inquiry	12	(5.10)	14	(4.28)
Credit Card Application	13	(5.04)	9	(4.88)
New Account Application	14	(5.01)	10	(4.69)
Loan Application	15	(4.69)	17	(4.18)
Mortgage Application	16	(4.60)	11	(4.48)
Insurance Application	17	(4.52)	16	(4.19)

Table 5.17   Rankings of Expected Internet Banking Services

To investigate the public's expectation on what services are most useful for

Internet Banking, the following set of questions (see Appendix C, Question 13 of Part I) were designed. After reviewing Internet Banking services provided in other countries and Hong Kong, five categories together with 17 services were chosen for the ranking selection. Services with higher mean scores would be the more frequently used Internet Banking services in Hong Kong. As Table 5.17 shows, the top seven services with the highest mean scores are as follows: (1) Historical Records Inquiry; (2) Account Balances Inquiry; (3) Account Transfers; (4) Bill Payments; (5) 24-hour Hotline Feedback Channel; (6) Funds Transfer to Other Banks; and (7) Email Feedback Channel. The priorities of these seven banking services were different between users and potential adopters.

With respondents' expectation for the above services to be provided by Internet Banking, these are important services for banks to provide on the Internet. Referring to the mean score table, the fact that all services have mean scores higher than 4 indicates that both users and potential adopters of Internet Banking expect as many services as possible on the Internet. If a bank is going to launch Internet Banking services in different phases, the first phase should provide the top seven services. As for other services, they could be launched later.

According to the data collected, 84 out of the 147 users (57.14%) of Internet Banking said that Internet Banking would be an essential service requirement for opening a new account. However, 269 out of the 352 potential users (76.42%) do not think Internet Banking is a determinant when opening a new account. Thus, this data seem to suggest that Internet Banking is not a crucial determinant factor for a bank to attract new customers.

Furthermore, respondents were asked to show their preferences if banks want to charge for Internet Banking services. Both users and potential adopters expressed that they are unlikely to pay any charges for using Internet Banking. Table 5.18 shows the respondents' preference on the three Internet Banking fee structures; the numbers are mean scores (1 for Very Unlikely to 7 for Very Likely). The data suggest that both groups prefer a fee based on connection time to a flat fee per month for using Internet Banking. However, a flat fee per month plus a fee per transaction was the option they liked least. Banks could take this for reference if they really want to impose service charges on their Internet Banking customers. If they want to impose a fee, their customers will probably switch to other banks that do not have any charges unless quality and range of the Internet Banking services are quite different among banks.

Fee Structure	Users (147)	Potential Adopters (352)
a flat fee per month	2.59	2.75
a flat fee per month plus a fee per transaction	2.41	2.49
a fee based on connection time	2.73	2.81

Table 5.18   Preferences on Internet Banking Fee Structure

5.5   Chapter Summary

This chapter presents the results of data analysis. Respondents' profile together with their banking habits and expectations for Internet Banking services are presented. Structural Equation Modeling using LISREL has been employed to test the proposed research model with two groups: users and potential adopters of Internet Banking. The results of the structural path analysis of the research model provide support to six and seven hypotheses for users and potential adopters respectively.

Subjective Norm was found to have a direct effect on both Intention to Adopt and Continual Usage of Internet Banking, which Perceived Usefulness or Perceived Ease of Use cannot mediate this effect. Besides, Image is a significant factor that affecting potential adopters' Intention to Adopt. Whereas Perceived Ease of Use does not have any significant positive effect on Intention in this empirical study. Gender differences are found among potential adopters, but not among users of Internet Banking. Last but not the least, results of various tests provide support to the reliability and validity of the research constructs.

CHAPTER 6   CONCLUSION

Based on the results obtained in the study, a discussion of theoretical and practical implications will be presented in this chapter.   Contributions of this study, its limitations, and future research directions are contained and disclosed in the later section.   Finally, the conclusion to the study is made.

6.1   Contributions and Theoretical Implications

The current research has made an important contribution to IS research by extending Technology Acceptance Model (TAM) to address causal antecedents of its two belief constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The antecedents of PU help to measure the different dimensions of attitude towards Internet Banking adoption and continual usage.   Computer self-efficacy has been proven to be an important determinant for PEOU, which in turn affect intention to adopt/continual usage of Internet Banking indirectly.   This contributes to the theoretical elucidation of IT adoption.   As well, it provides insights for developers to design an Internet Banking system interface and for banks to formulate strategies in offering Internet Banking services.   Moreover, subjective norms are found to be a significant determinant for both potential adopter's intention to adopt and users' intention to continual usage of Internet Banking.   This further validates and provides support for the theoretical relationship contained in TRA/TPB and TAM2 between the normative beliefs and behavioural intention to adopt an IT innovation.

Further researches on TAM should address the role of other direct determinants of adoption/usage intentions and behaviour, instead of only mapping out the models of the determinants of PU and PEOU.

The findings of this study provide preliminary evidence suggesting that adoption and continual usage intentions are determined by different factors. While adoption intention is solely influenced by image, continual usage intention is determined by perceived usefulness. However, normative considerations are important for both intentions. Furthermore, risk perceptions are negatively related to PU for adoption intention, whereas no significant relationship of this exists for continual usage intention. On the other hand, result demonstrability is an important determinant of PU for continual usage intention, whereas no significant relationship is found in that for adoption intention. These conclusions are drawn from the study of potential adopters and users of Internet Banking in Hong Kong. A longitudinal study would provide more conclusive evidence to the process through which beliefs, attitudes, norms and intentions are formed and how they evolve.

Although there is a growing body of IS literature addressing the issue of user's behavioural perceptions in adopting IT innovations, the majority of the materials is within the organizational context and originates from foreign countries. This study provides a new perspective and a refined theoretical framework in applying TAM beyond the organizational limit, which has proven valid from the results of the sets of empirical data. This research focuses on the phenomenon and situation of Hong Kong, which is uniquely culturally different from other countries. IT adoption behaviour and perceptions of the Chinese people in Hong Kong may differ from that of people in foreign countries. Thus, this study provides a better understanding of

the antecedents of user and potential adopter acceptance to the adoption and continual usage of Internet Banking in Hong Kong, rather than foreign countries. Cross-cultural studies would provide insight and understanding into cultural differences between the East and the West.

Furthermore, the instruments used for assessing the user's and potential adopter's behavioural perceptions in this study is mainly adapted from prior attitude and technology acceptance research (TRA, TPB, TAM, TAM2, and SCT). Some amendments on the wordings are made with respect to the characteristics of the target information technology innovation in this Internet Banking research. In the context of examining the effects of innovation attributes, normative considerations, and computer self-efficacy on intentions for adoption and continual usage, future research could build upon this study through replication across different samples and across a range of different IT innovations. The instruments developed and validated in this study can be used in future research. The validated research framework proposed in this study can then serve as a basis for hypothesis formulation for future research in this area.

6.2 Practical Implications

Results from the path analysis suggest that subjective norm is an important factor that affects potential adopters' intention to adopt and users' intention to continual usage of Internet Banking. That means banks offering Internet Banking should put more efforts in promoting Internet Banking. When more people are aware of the availability of Internet Banking, they are more likely to increase

communications for discussing the advantages and disadvantages of Internet Banking. Once people perceive that its positive aspects outweigh the negative effects, they are more likely to become users of Internet Banking. Findings of the survey revealed that both bank leaflets/advertisements and television/radio are effective promotional tools for banks to market their Internet Banking. Therefore, banks offering Internet Banking should launch campaigns to direct awareness to potential adopters. Issues such as fear of the lack of privacy and security, together with relative advantages of using Internet Banking should be highlighted to educate potential customers. However, to attract potential adopters that rely more on references (such as friends, colleagues, and family members), member referral rewards programme can be employed.

Computer self-efficacy is also a significant determinant for perceived ease of use, which in turn indirectly affects the intention to adopt/continual usage of Internet Banking. Risk perceptions by potential adopters are negatively related to perceived usefulness about Internet Banking. Therefore, banks providing Internet Banking could do something to deal with these matters. To boost confidence and enhance self-efficacy in using Internet Banking services, demonstrations via video presentations could be made at bank branches to showcase the user-friendliness of such services. In the survey, ATM is the most popular channel (in terms of frequency of use) used by the respondents to do banking transaction. Therefore, banks could also educate potential adopters of Internet Banking through short video demonstrations and advertisements by the means of ATM. These initiative activities will help customers familiarize themselves with the bank and its Internet Banking services. New technology like all things that are unfamiliar requires initiation. This is an important criterion in helping potential adopters selecting the

bank that offers Internet Banking.

Banks have an ability to offer many creative banking services through the Internet to their customers; however, it is wise to make these services available online one phase at a time. This survey provides the rankings of expected Internet Banking services by both users and potential adopters (see Table 5.17). For the banks wishing to launch their Internet Banking services, the type of products and services offered through Internet Banking should basically include those frequently used by their clients and services requiring few interactions with bank staff. These services include checking account balances and inquiries, account transfers, bill payments, and funds transfer to other banks. Advanced value-added banking services that require interactions with bank staff ought to be introduced at a later stage when customer needs warrant their provision. Although banks could outsource its Internet Banking to famous software developers or adapt the market available systems (like Virtual ATM by JETCO), they should bear in mind that the importance of personalizes services. Otherwise, potential customers have no reason to select a specific bank rather than a competitor for Internet Banking services.

Banks offering Internet Banking should not charge fees for similar banking services that are free-of-charge in the physical world (i.e., bank branches/ATMs). The results of this survey revealed that both users and potential adopters are unlikely to pay any charges for using Internet Banking. However, certain transactions, such as cheque cancellations and wire transfers, would still require administrative charges. Since the cost of operating Internet Banking services is lower than any other channels of service, banks should look for opportunities to lower the charges and transfer the cost savings (at least part of instead of all) to customers. Emphasizing

the lower charges for online transactions as a key benefit, is an important feature to promote Internet Banking.   Lower interest rates on loans and higher interest rates on deposits made on by Internet Banking, preferential brokerage fees and deposit charges for using the online securities services are typical and feasible examples.

There can be substantial marketing advantages for banks offering Internet Banking services.   Bank analysts have estimated that up-to-now, three-to-seven percent of the population in Hong Kong using Internet Banking is comprised of the more affluent portion of the population - those who own homes, have higher incomes and considerable financial assets.   Recognizing this, banks can use the Internet to offer special services catered to their upper-scale customers more effectively.   That is, banks don't need to waste time, effort and money on promoting these services to those far less likely to use them.   Aside from the need to further promote Internet Banking to the public, there is also a need to further enhance mechanical resources within the structure of the main internal framework.   That is to say, if Internet Banking becomes popular, there would be problems generated by the influx of banking transactions being made at the same time.   Banks need to look into better equipping their systems with more powerful and advance computer technology. To solve this congestion, banks can employ two groups of servers.   The first group is for the specific target groups and the other for normal customers.   In this case, the stability of the server for Internet Banking can be maintained.   System downtime has highlighted the need for the above redundancy planning.   HSBC's Hong Kong branches and ATMs went out of commission for several hours on May 31, 2001 due to a hardware problem that affected its backend systems.   This backend systems crash underscored the need to have precautionary measures in place to safeguard valuable data.   Although banks could outsource the Internet Banking services in

order to minimize the cost of providing it, they must have their contingency plans to ensure low system downtime.   Otherwise, customers' loyalty becomes a problematic issue with low switching barriers in the world of highly competitive banking sector.

Furthermore, bankers can take wireless banking into consideration to supplement Internet Banking services.   The number of mobile phone users in Hong Kong is about 5.5 million, which is greater than the 3.9 million fixed-line business and residential subscribers. This high mobile penetration rate (79 percent of Hong Kong's population) will lay the foundations for 2.5G and 3G mobile Internet and m-commerce.   Currently, most mobile banking services in Hong Kong are offered to users through network carrier-dependent partnerships between individual banks and network carriers.   These services are SIM Toolkit-based rather than WAP-based. Under this arrangement, users can only access banking information if they are also customers of the network carrier.   For example, to use Standard Chartered's mobile banking service, the user has to be both a Standard Chartered customer as well as a Smartone customer.   When the user changes phone, or changes to another phone network carrier, the user either loses the service altogether or has to change the SIM card.   However, the Bank of America is the first bank to launch carrier-independent mobile banking services for WAP phone users in Hong Kong.   The Bank of America has proved to the Hong Kong Monetary Authority that data could be sent securely between WAP devices and the bank. Thus, this service was launched in mid-June 2001.

6.3 Limitations

Concerning the research, limitations cannot be totally avoided. Firstly, although Internet Banking in Hong Kong is not a brand new innovation, it is still in its infancy. During the collection of literature, the author found that there was a lack of relevant information. The origins of information inevitably come from other countries, like the United States and England. This may not accurately describe the phenomenon and situation in Hong Kong, especially with the cultural differences in between, the East and West.

Second, the use of an online survey could have been a good tool for gathering responses to this study in terms of manpower, cost and time frame. However, after taking into consideration of the extremely low response rate during the pilot test using the programmed online questionnaire, and to avoid the junk-mail policies of the selected universities, the researcher had to give up using this method in the main survey.

Third, adopters of Internet Banking should have been surveyed rather than having their "Intention to Adopt" measured. However, due to confidentiality and many other reasons, the researcher was refused a name list of Internet Banking users from the leading banks. Furthermore, since Internet Banking is relatively new in Hong Kong, the pool of adopters may not be quite big during the period of this study. For example, less than 30% of the total number of respondents were users of Internet Banking. This means 70% of the respondents may not know what Internet Banking exactly is. Therefore, their comments may be rather arbitrary.

The fourth limitation of this study is the generalizability of the findings. Since the strictly random sampling was not used, the researcher had no way of assessing the sampling error precisely. Also, the subjects of this study being university students, this sampling profile cover only a narrow range of different social classes. Therefore the representative of the sample population was reduced.

Fifth, in order to solicit respondents' co-operation, multiple choice questions were employed throughout this study. Although the choices for each question were adopted from the elicitation study and amended according to the responses from several pilot tests, all possible alternatives might not have been included. Besides, showing the respondents the list of potential answers could have caused biases in their responses.

Last but not least, Byrne (1998) had said that "fit indices provide no guarantee whatsoever that a model is useful ...they can in no way reflect the extent to which the model is plausible; this judgement rests squarely on the shoulders of the researcher." Statistical analysis only provides numerical relationships for the constructs of the proposed research model. Interpretation of these numbers is the researcher's subjective appraisal. Care should be exercised when generalizing these results to other settings. Yet, consistent results with previous studies and theories, such as IDT and TAM, enhance the validity of the empirical findings.

6.4 Future Research Directions

The study on adoption intentions of Internet Banking services in Hong Kong

can be extended to corporate customers. Comparison can then be made between individual customers and corporate customers in terms of the factors influencing their adoption decisions, the criteria for selecting an online banking service, and the types of products and services perceived to be useful. Studies with random sampling is suggested to offer a clearer picture of the consumer profile and to gather more representative information of the population.

As Internet Banking services are still relatively new in Hong Kong, this study has been unable to measure the actual usage behaviour of such services, which was suggested by the Theory of Planned Behaviour. Future studies should incorporate this formula to measure when the number of Internet Banking customers reached a critical mass. This way, a more comprehensive investigation of Internet Banking intention and usage behaviour can be conducted. In order to examine the extent to which a model replicates in samples other than the one on which it was derived, the undertaking a cross-validation analysis is suggested.

A final suggestion for future research would be to test the proposed research model in a longitudinal study among different types of adopters according to the Innovation Diffusion Theory. The differentiation is an interesting avenue for research. Many people adopt a new information technology innovation because of its extrinsic value (Moore, 1991). However, the first ones to adopt an information technology innovation are the "innovators/pioneers" who adopt it because of its intrinsic value. The "early adopters" adopt it because it provides strategic advantage. Only then does the "early majority" adopt it for pragmatic reasons. The "late adopters" and "conservatives", who wait until it is very well established, follow them. This implies that the importance of the intrinsic information

technology innovation characteristics, including PEOU, should be greater with innovators.

6.5 Conclusion

In conclusion, all the objectives of this study are achieved. With respect to Research Objective 1, factors influencing the adoption/continual usage of Internet Banking are identified in the Hong Kong context. They are subjective norm, image, result demonstrability, perceived risk, computer self-efficacy, perceived ease of use and perceived usefulness of Internet Banking. For Research Objective 2, using the empirical research method, differences are found between the determinants of adopting and continuing to use Internet Banking. Risk perceptions by potential adopter hindered the adoption of Internet Banking. With respect to Research Objective 3, the degree of mediating effect of PU is very high in continual usage intention, whereas it is not strong when explaining the adoption intention. PEOU is found to be an important antecedent of PU; however, its mediating effects for both adoption and continual usage intentions are not significant. This research is especially valuable for extending TAM and applying TAM beyond the organizational limit. It should be an example for future research on Internet Banking to address the role of other direct determinants of adoption/usage intentions and behaviour. Findings in the study shed some lights for Hong Kong banks interested in implementing Internet Banking strategies by emphasizing the relevant criteria at each phase necessary for a successful adoption process.

APPENDIX A

Internet Banking Services in Hong Kong (May 2000)

Internet Banking Services in Hong Kong (May 2000)

Functions / Services provided in the web site

Column groups: Language Options (English, Traditional Chinese, Simplified Chinese) | View Only (Check balances, View Statements/Accounts, Historical records) | Account Control (Accounts amendment, Order cheque books, Transfer funds within the same bank, Transfer funds to other banks' account, Pay bills to third parties, Standing orders/Direct Debit, Order/Print statements, Pay Credit card bills, Stop cheque request) | New Services (Apply for loans, Open Current Accounts, Open Savings Accounts, Apply for Credit Cards, Apply for Mortgages, Apply for Insurance) | Investment (View transaction records, Change or Cancel transactions, Real time securities quote, Preset price alert, Sale and Purchase of shares, Market commentary/analysis reports, Pledge and Custody of shares, Rates inquiry) | Other Services (Online Calculators, Job Vacancies/Career Opportunities, Special Offers for online users only, Octopus Card Add-Value, Travel information, Send Messages/Email to Bank) | Mobile Banking (WAP/SIM Tool Kit) | Interactive TV Banking | Internet Site Address

Name of Bank	Launch Date of Internet Banking	Internet Site Address
ASIA COMMERCIAL BANK LTD.	**	N/A
BANK OF AMERICA (ASIA) LTD.	1999-2000	http://www.bankofamerica.com.hk/index.html
BANK OF EAST ASIA, LTD. (THE)	1999	http://www.hkbea.com https://www.easecurities.com.hk
CHEKIANG FIRST BANK LTD.	1997 **	http://www.cfb.com.hk
CHIYU BANKING CORPORATION LTD.		N/A
CITIC KA WAH BANK LTD.	N/A	http://www.citickawahbank.com
D.A.H. PRIVATE BANK LTD.		N/A
DAH SING BANK LTD.	the 2nd half of 1999	http://www.dahsing.com.hk
DAO HENG BANK LTD.	2000/4/17	http://www.daoheng.com http://www.dhsec.com
DBS KWONG ON BANK LTD.	N/A	http://www.kwongonbank.com.hk
FIRST PACIFIC BANK LTD.	the 2nd half of 1999	http://www.firstpacbank.com.hk
HANG SENG BANK LTD.	the second quarter of 2000	http://www.hangseng.com
HONGKONG AND SHANGHAI BANKING CORPORATION LTD. (THE)	the second half of 2000	http://www.hsbc.com.hk
HONGKONG CHINESE BANK LTD. (THE)	N/A	http://www.hkcb.com.hk
HSBC INVESTMENT BANK ASIA LTD.	N/A	http://www.ib.hsbc.com
HUA CHIAO COMMERCIAL BANK LTD.		not accessible: http://www.hccb.com
INTERNATIONAL BANK OF ASIA LTD.	the 2nd half of 1999 **	http://www.iba.com.hk
JARDINE FLEMING BANK LTD.	N/A	http://www.jfleming.com/jfbank/
JIAN SING BANK LTD.		N/A
LIU CHONG HING BANK LTD.	**	N/A
NANYANG COMMERCIAL BANK LTD.	N/A	http://nanyang.bocgroup.com
OVERSEAS TRUST BANK LTD.		N/A
PO SANG BANK LTD.		N/A
SHANGHAI COMMERCIAL BANK LTD.	2000/3/29	http://www.shacombank.com.hk
TAI SANG BANK LTD.	N/A	http://www.taisangbank.com.hk
TAI YAU BANK LTD.		N/A
UNION BANK OF HONG KONG LTD.	late 1999	http://www.unionbank.com.hk
UNITED CHINESE BANK LTD.	N/A	http://www.hkbea.com/whp_ucb/whp_ucbmain.html
WAYFOONG FINANCE LTD.		N/A
WING HANG BANK LTD.	N/A	http://www.whbhk.com
WING LUNG BANK LTD.	late 1998	http://www.winglungbank.com.hk

The above 31 licensed banks are all locally incorporated and the following banks are incorporated in China, United Kingdom and United States respectively.

Name of Bank	Launch Date of Internet Banking	Internet Site Address
BANK OF CHINA	N/A	http://www.bankofchina.com
STANDARD CHARTERED BANK	N/A	http://www.standardchartered.com.hk
CITIBANK, N.A.	1998	http://www.citibank.com.hk

APPENDIX B

Internet Banking Services in Hong Kong (May 2001)

Internet Banking Services in Hong Kong (May 2001)

Functions / Services provided in the web site

Column groups: Language Options | View Only | Account Control | New Services | Investment | Other Services | Mobile Banking (WAP/SIM Tool Kit) | Interactive TV Banking

Language Options: English; Traditional Chinese; Simplified Chinese
View Only: Check balances; View Statements/Accounts; Historical records; Accounts amendment
Account Control: Order cheque books; Transfer funds within the same bank; Transfer funds to other banks' account; Pay bills to third parties; Standing orders/Direct Debit; Order/Print statements; Pay Credit card bills; Stop cheque request
New Services: Apply for loans; Open Current Accounts; Open Savings Accounts; Apply for Credit Cards; Apply for Mortgages; Apply for Insurance
Investment: View transaction records; Change or Cancel transactions; Real time securities quotation; Preset price alert; Sale and Purchase of shares; Market commentary/analysis reports; Pledge and Custody of shares
Other Services: Rates Inquiry; Online Calculators; Job Vacancies/Career Opportunities; Special Offers for online users only; Octopus Card Add-Value; Travel information; Send Messages/Email to Bank

Name of Bank	Launch Date of Internet Banking	Internet Site Address
ASIA COMMERCIAL BANK LTD.	N/A **	http://www.asia-commercial.com
BANK OF AMERICA (ASIA) LTD.	1999-2000	http://www.bankofamerica.com.hk/index.html
BANK OF EAST ASIA, LTD. (THE)	1999	http://www.hkbea.com / https://www.easecurities.com.hk
CHEKIANG FIRST BANK LTD.	1997 **	http://www.cfb.com.hk
CHIYU BANKING CORPORATION LTD.		N/A
CITIC KA WAH BANK LTD.	N/A	http://www.citickawahbank.com
D.A.H. PRIVATE BANK LTD.		N/A
DAH SING BANK LTD.	the 2nd half of 1999	http://www.dahsing.com.hk
DAO HENG BANK LTD.	2000/4/17	http://www.daoheng.com / http://www.dhsec.com
DBS KWONG ON BANK LTD.	N/A	http://www.kwongonbank.com.hk
FIRST PACIFIC BANK LTD.	the 2nd half of 1999 **	http://www.firstpacbank.com.hk
HANG SENG BANK LTD.	the second quarter of 2000	http://www.hangseng.com
HONGKONG AND SHANGHAI BANKING CORPORATION LTD. (THE)	the second half of 2000	http://www.hsbc.com.hk
HONGKONG CHINESE BANK LTD. (THE)	N/A	http://www.hkcb.com.hk
HSBC INVESTMENT BANK ASIA LTD.	N/A	http://www.ib.hsbc.com
HUA CHIAO COMMERCIAL BANK LTD.	N/A	http://hccb.bocgroup.com/hccb/index.htm
INTERNATIONAL BANK OF ASIA LTD.	the 2nd half of 1999 **	http://www.iba.com.hk
JARDINE FLEMING BANK LTD.	N/A	http://www.jfleming.com/jfbank/
JIAN SING BANK LTD.	N/A **	http://www.jsb.com.hk
LIU CHONG HING BANK LTD.	N/A **	http://www.lchbank.com
NANYANG COMMERCIAL BANK LTD.	N/A	http://nanyang.bocgroup.com
OVERSEAS TRUST BANK LTD.		N/A
PO SANG BANK LTD.		N/A
SHANGHAI COMMERCIAL BANK LTD.	2000/3/29	http://www.shacombank.com.hk
TAI SANG BANK LTD.	N/A	http://www.taisangbank.com.hk
TAI YAU BANK LTD.		N/A
UNION BANK OF HONG KONG LTD.	late 1999	http://www.unionbank.com.hk
UNITED CHINESE BANK LTD.	N/A	http://www.hkbea.com/whp_ucb/whp_ucbmain.html
WAYFOONG FINANCE LTD.		N/A
WING HANG BANK LTD.	N/A	http://www.whbhk.com
WING LUNG BANK LTD.	late 1998	http://www.winglungbank.com.hk

The above 31 licensed banks are all locally incorporated and the following banks are incorporated in China, United Kingdom and United States respectively.

Name of Bank	Launch Date of Internet Banking	Internet Site Address
BANK OF CHINA	N/A	http://www.bankofchina.com
STANDARD CHARTERED BANK	N/A	http://www.standardchartered.com.hk
CITIBANK, N.A.	1998	http://www.citibank.com.hk

APPENDIX C

Questionnaire

INTERNET BANKING ADOPTION / CONTINUAL USAGE SURVEY

With this survey, we hope to gain an understanding of how Internet Banking can serve you better. Please be assured that your responses will be kept strictly confidential. If you have any queries, please do not hesitate to contact me by email at chansc@ln.edu.hk. Thank you very much for your kind assistance.

What is Internet Banking? Internet Banking means that registered bank customers can perform a wide range of banking transactions such as inquiring account balances, renewing time deposits, obtaining statements, paying bills, transferring funds, and trading securities electronically via the bank's web site by either wired devices (Personal Computer / kiosk) or wireless devices (mobile phone / PDA).

PART I

*For all questions, please either place "✓" in the boxes where appropriate **OR** fill in the details in the spaces provided.*

1. How many hours do you normally spend on the Internet a week?
   ❑ 0 hour ❑ > 0 - 5 hours ❑ > 5 - 10 hours ❑ > 10 - 15 hours ❑ > 15 - 20 hours
   ❑ > 20 - 25 hours ❑ > 25 - 30 hours ❑ > 30 - 35 hours ❑ > 35 - 40 hours ❑ _____ hours

2. How many banks are you a client of?
   ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 ❑ _____

3. Please rank the banking services below based on frequency of use (**1 for most frequent**)
   ___ Branch Counter
   ___ Automatic Teller Machine (ATM)
   ___ Phone Banking
   ___ Internet Banking with PC/notebook access
   ___ Internet Banking with Mobile phone access (SIM Tool Kit/WAP)
   ___ Interactive TV Banking

4. On average, how frequently do you use the banking service that you ranked "**1**" in question **3.** a week?
   ❑ < 1 time ❑ 1 - 3 times ❑ 4 - 6 times ❑ 7 - 9 times ❑ 10 - 12 times
   ❑ 13 - 15 times ❑ 16 - 18 times ❑ 19 - 21 times ❑ 22 - 24 times ❑ >24 times

5. Which of the following banking products are you currently using? (**There can be more than one selection**)
   ❑ Savings ❑ Current ❑ Time Deposit ❑ Foreign Currency Deposit
   ❑ Credit Card ❑ Securities Trading ❑ Investment Fund ❑ Forex Margin Trading
   ❑ Gold/Silver ❑ Unit Trust ❑ Overdraft ❑ Personal/Tax Loan
   ❑ Car Loan ❑ Mortgage ❑ Insurance ❑ Pension/Mandatory Provident Fund (MPF)

6. Please indicate the banking products that you are likely to use in the next six months **excluding those you checked in question 5.** (**There can be more than one selection**)
   ❑ Savings ❑ Current ❑ Time Deposit ❑ Foreign Currency Deposit
   ❑ Credit Card ❑ Securities Trading ❑ Investment Fund ❑ Forex Margin Trading
   ❑ Gold/Silver ❑ Unit Trust ❑ Overdraft ❑ Personal/Tax Loan
   ❑ Car Loan ❑ Mortgage ❑ Insurance ❑ Pension/Mandatory Provident Fund (MPF)
   ❑ Other, please specify: _____

7. Have you heard about Internet Banking before?
   ❑ Yes
   ❑ No (**please go to question 13**)

8. The sources from which you know about Internet Banking? (**You may tick more than one answer**)
   ❑ Bank leaflets/advertisements ❑ Books ❑ Internet
   ❑ Newspapers/Magazines ❑ Television/Radio ❑ Words-of-mouth
   ❑ Other, please specify: _____

9. Do you know which banks now provide Internet Banking service?
   ❑ Yes (please state **two** of their names) _____
   ❑ No

10. Do you have experience using Internet Banking (do not include running the demo at banks' web sites)?
   ❑ Yes (please state the names of banks) _____
   ❑ No (**please go to question 12**)

11. On average, how frequently do you use Internet Banking a week?
   ❑ < 1 time   ❑ 1 - 3 times   ❑ 4 - 6 times   ❑ 7 - 9 times   ❑ 10 - 12 times
   ❑ 13 - 15 times   ❑ 16 - 18 times   ❑ 19 - 21 times   ❑ 22 - 24 times   ❑ >24 times
   (**please go to question 13**)

12. Please tick the reason(s) why you are not using Internet Banking.
   ❑ Cannot directly contact bank staff on the Internet if there is an inquiry/problem.
   ❑ Do not have confidence in Internet Banking security.
   ❑ Do not have required knowledge or equipment.
   ❑ Do not want to pay for Internet Banking service charges.
   ❑ Do not want to pay charges for an Internet connection.
   ❑ It is difficult to apply for an Internet Banking account.
   ❑ It is inconvenient to use Internet Banking during office hours.
   ❑ My banks do not provide Internet Banking services.
   ❑ Response may be slow on the Internet.
   ❑ No need.
   ❑ Other, please specify: _____

13. *For the following __Internet Banking services__, please place "✓ " in the boxes to indicate their __usefulness to you __ as a current/potential user:*

	Not at all Useful	Quite Useless	Useless	Neither	Useful	Quite Useful	Very Useful
i. Language Options							
a. English	❑	❑	❑	❑	❑	❑	❑
b. Traditional Chinese	❑	❑	❑	❑	❑	❑	❑
c. Simplified Chinese	❑	❑	❑	❑	❑	❑	❑
ii. Account Inquiry							
a. Account balances	❑	❑	❑	❑	❑	❑	❑
b. Historical records	❑	❑	❑	❑	❑	❑	❑
iii. Account Control							
a. Account transfers	❑	❑	❑	❑	❑	❑	❑
b. Funds transfer to other banks	❑	❑	❑	❑	❑	❑	❑
c. Bill payments	❑	❑	❑	❑	❑	❑	❑
d. Cheque cancellation	❑	❑	❑	❑	❑	❑	❑
iv. New Services							
a. New account application	❑	❑	❑	❑	❑	❑	❑
b. Loan application	❑	❑	❑	❑	❑	❑	❑
c. Credit card application	❑	❑	❑	❑	❑	❑	❑
d. Mortgage application	❑	❑	❑	❑	❑	❑	❑
e. Insurance application	❑	❑	❑	❑	❑	❑	❑
v. Investment							
a. Real time securities quotation	❑	❑	❑	❑	❑	❑	❑
b. Market commentary	❑	❑	❑	❑	❑	❑	❑
c. Securities trading	❑	❑	❑	❑	❑	❑	❑
d. Rates inquiry	❑	❑	❑	❑	❑	❑	❑
vi. Feedback Channels							
a. Email	❑	❑	❑	❑	❑	❑	❑
b. 24-hour hotline	❑	❑	❑	❑	❑	❑	❑
vii. Other, please specify:							
_____	❑	❑	❑	❑	❑	❑	❑
_____	❑	❑	❑	❑	❑	❑	❑
_____	❑	❑	❑	❑	❑	❑	❑

14. Will Internet Banking be a requirement when you choose a bank to open a new account?
   ❑ Yes
   ❑ No

15. How likely would you prefer Internet Banking if the bank charges:-

	Very Unlikely						Very Likely
a. a flat fee per month for using Internet Banking.	❏	❏	❏	❏	❏	❏	❏
b. a flat fee per month plus a fee per transaction for using Internet Banking.	❏	❏	❏	❏	❏	❏	❏
c. a fee based on connection time for using Internet Banking.	❏	❏	❏	❏	❏	❏	❏
d. other, please specify: _____	❏	❏	❏	❏	❏	❏	❏

PART II

1. *For the following questions, please put down the **number** which best describes **your perceptions** of Internet Banking.*

Disagree	__1__	__2__	__3__	__4__	__5__	__6__	__7__	Agree
	Strongly	Quite	Slightly	Neither	Slightly	Quite	Strongly	

a. Internet Banking makes it easier for me to conduct my banking transaction. ____
b. Internet Banking gives me greater control over my finances. ____
c. Internet Banking allows me to manage my finances more efficiently. ____
d. Internet Banking is a convenient way to manage my finances. ____
e. Internet Banking is more user-friendly than other existing channels, including Bank Branches, ATMs, and Phone Banking. ____
f. Internet Banking eliminates time constraint; thus I can use the banking services at any time I like. ____
g. Internet Banking eliminates geographic limitation and increases flexible in mobility; thus I can bank any place that has Internet connection. ____
h. Internet Banking is easy-to-use. ____
i. Internet Banking is an easy way to conduct banking transactions. ____
j. Learning to operate Internet Banking would be easy for me. ____
k. It is easy for me to remember how to perform tasks with Internet Banking. ____
l. I believe it would be easy to get Internet Banking to do what I want it to do. ____
m. Using Internet Banking does not require a lot of mental effort. ____
n. Internet Banking provides a clearer interface (visual) than Phone Banking (audio). ____
o. If I were to adopt Internet Banking, it would give me higher status among my peers. ____
p. If I were to adopt Internet Banking, I would be more prestigious among my peers than people who have not yet adopted it. ____
q. Having Internet Banking is trendy among my peers. ____
r. I have no difficulty telling others about the results of using Internet Banking. ____
s. I believe I could communicate to others the advantages and disadvantages of using Internet Banking. ____
t. The results of using Internet Banking are apparent to me. ____
u. I would have difficulty explaining why using Internet Banking may or may not be beneficial. ____
v. I am not confident over the security aspects of Internet Banking in Hong Kong. ____
w. Others will know information concerning my Internet Banking transactions. ____
x. Others can tamper with information concerning my Internet Banking transactions. ____
y. Advances in Internet security technology provide for safer Internet Banking. ____
z. It is very easy for my money to be stolen if using Internet Banking. ____

2. *For the following questions, please put down the **number** which best describes **your perceptions** of Internet Banking.*

Disagree	__1__	__2__	__3__	__4__	__5__	__6__	__7__	Agree
	Strongly	Quite	Slightly	Neither	Slightly	Quite	Strongly	

My decision to adopt Internet Banking is influenced by:-
a. my friends ____
b. my family/relatives ____
c. my colleagues/peers ____
d. other, please specify: _____ ____

3. *For the following questions, please put down the **number** which best describes **your perceptions** of Internet Banking.*

Not at all Confident __1__ __2__ __3__ __4__ __5__ __6__ __7__ **Extremely Confident**

I would be confident in using Internet Banking
a. even if there is no one around to show me how to use it. ____
b. even if I have never used a system like it before. ____
c. even if I have only the online instructions for reference. ____
d. if I see someone else using it before I try it myself. ____
e. if I can call someone for help if I get stuck. ____
f. if someone else would help me get started. ____
g. if I have sufficient time to complete the transaction for which the system provides. ____
h. if I have the built-in online "help" function for assistance. ____
i. if someone shows me how to use it first. ____
j. if I had used a similar system before this one to do the same transactions. ____

4. *For the following questions, please put down the **number** which best describes **your perceptions** of Internet Banking.*

Unlikely ___1___ ___2___ ___3___ ___4___ ___5___ ___6___ ___7___ **Likely**
       Very   Quite   Slightly Neither Slightly Quite   Very

If Internet Banking is available at your bank(s), how likely would you
a. plan to experiment with or regularly use Internet Banking during the next six months? ____
b. be interested in using wireless Internet Banking (mobile banking) within the next six months? ____
c. be interested in using securities trading via Internet Banking within the next six months? ____
d. be interested in using insurance services via Internet Banking within the next six months? ____
e. be interested in using investment fund services via Internet Banking within the next six months? ____
f. be interested in using MPF services via Internet Banking within the next six months? ____

PART III

1. Your gender is
   ❑ Male   ❑ Female

2. Your age is
   ❑ 17 - 19   ❑ 20 - 22   ❑ 23 - 25   ❑ 26 - 28   ❑ 29 - 31
   ❑ 32 - 34   ❑ 35 - 37   ❑ 38 - 40   ❑ 40 or above

3. You are studying
   ❑ Undergraduate degree   ❑ Master degree   ❑ Doctorate
   ❑ Other professional qualification, please specify: _____

4. Your major is _____

5. Year of study ❑ 1   ❑ 2   ❑ 3   ❑ 4   ❑ 5   ❑ _____

6. Your Latest Monthly Income in HK$
   ❑ 0 - 5,000   ❑ 5,001 - 10,000   ❑ 10,001 - 15,000   ❑ 15,001 - 20,000
   ❑ 20,001 - 25,000   ❑ 25,001 - 30,000   ❑ 30,001 - 35,000   ❑ 35,001 - 40,000
   ❑ > 40,000

7. Your email address is _____
   (* *Optional: for contact to receive a copy of the analysis report.*)

- END -
✍ ***Thank you very much for your valuable time and information.*** ✍

APPENDIX D

Mean Score System

Mean Scoring System

For comparison purposes, some questions are grouped together under the same category.   The mean score was calculated for some questions under a category such that the highest or lowest mean score could be figured out.   The calculation method of **Mean Scoring System** is illustrated as follows:

	Not at all Useful	Quite Useless	Useless	Fair	Useful	Quite Useful	Very Useful	Total Frequency	Mean Score
A	8	10	15	80	191	88	107	**499**	5.26
B	1	10	8	44	161	92	183	**499**	5.73
C	55	34	66	163	113	37	31	**499**	3.96

The **Mean Score** of **A**
= [(8 x **1**) + (10 x **2**) + (15 x **3**) + (80 x **4**) + (191 x **5**) + (88 x **6**) + (107 x **7**)] / **499**
= **5.26**

Descriptive Statistics and Intercorrelations

Variables (n=147)	SNORM	RD	PRISK	CSE	IMAGE	PU	PEOU	INTENT	Mean	S.D.	No. of Items
SNORM	1.00								4.35	1.96	3
RD	0.57	1.00							4.98	1.24	3
PRISK	-0.65	-0.57	1.00						4.86	1.24	4
CSE	0.44	0.70	-0.60	1.00					5.54	1.30	6
IMAGE	0.61	0.61	-0.48	0.45	1.00				4.63	1.63	2
PU	0.50	0.72	-0.51	0.66	0.54	1.00			5.72	1.29	5
PEOU	0.28	0.44	-0.38	0.63	0.28	0.71	1.00		5.23	1.10	7
INTENT	0.71	0.60	-0.54	0.50	0.54	0.69	0.41	1.00	4.73	1.56	4

i) Descriptive Statistics and Intercorrelations (Adoption Model)

Variables (n=352)	SNORM	RD	PRISK	CSE	IMAGE	PU	PEOU	INTENT	Mean	S.D.	No. of Items
SNORM	1.00								4.49	1.66	3
RD	0.48	1.00							4.42	1.13	3
PRISK	-0.48	-0.54	1.00						4.85	1.14	4
CSE	0.46	0.56	-0.57	1.00					4.86	1.34	6
IMAGE	0.45	0.63	-0.38	0.39	1.00				4.09	1.57	2
PU	0.49	0.46	-0.55	0.64	0.40	1.00			5.01	1.22	5
PEOU	0.32	0.40	-0.41	0.71	0.28	0.74	1.00		4.80	1.17	7
INTENT	0.53	0.47	-0.38	0.41	0.60	0.48	0.36	1.00	3.99	1.63	4

ii) Descriptive Statistics and Intercorrelations (Continual Usage Model)

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