

## **FACTORS AFFECTING INDIVIDUALS TO ADOPT MOBILE BANKING: EMPIRICAL EVIDENCE FROM THE UTAUT MODEL**

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### **ABSTRACT**

Fast advances in the wireless technology and the intensive penetration of cell phones have motivated banks to spend large budget on building mobile banking systems, but the adoption rate of mobile banking is still underused than expected. Therefore, research to enrich current knowledge about what affects individuals to use mobile banking is required. Consequently, this study employs the Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate what impacts people to adopt mobile banking. Through sampling 441 respondents, this study empirically concluded that individual intention to adopt mobile banking was significantly influenced by social influence, perceived financial cost, performance expectancy, and perceived credibility, in their order of influencing strength. The behavior was considerably affected by individual intention and facilitating conditions. As for moderating effects of gender and age, this study discovered that gender significantly moderated the effects of performance expectancy and perceived financial cost on behavioral intention, and the age considerably moderated the effects of facilitating conditions and perceived self-efficacy on actual adoption behavior.

Keywords: mobile banking, UTAUT, wireless commerce, technology adoption

### **1. Introduction**

With the recently quick growth in the market of 3G smart mobile phones, the wireless service delivery channel becomes a promising alternative for firms to create commercial opportunities. However, despite many wireless commercial services increase quickly, the use of mobile banking service is much lower than expected [Cruz et al. 2010] and still underused [Huili & Chunfang 2011], and the market of mobile banking still remains very small in comparing to the whole banking transactions [Luarn & Lin 2005; Laukkanen 2007; Yang 2009]. That is, the widespread adoption and large usage of cell phones did not reflect on the adoption and usage of mobile banking, although mobile banking perhaps was the first commercial mobile service [Scornavacca & Hoehle 2007] and first introduced in the early 2000s through short messaging service and wireless access protocol [Dasgupta et al. 2010].

Both Internet banking and mobile banking are often considered as electronic banking [Suoranta & Mattila 2004; Laforet & Li 2005; Laukkanen 2007; Sripalawat et al. 2011], but Internet banking and mobile banking are two alternative channels for banks to deliver their services and for customers to acquire services [Scornavacca & Hoehle 2007]. That is, customers using Internet banking are through computers connected to Internet, while customers using mobile banking are through wireless devices [Riquelme & Rios 2010]. Concerning the difference between online banking and mobile banking contexts, customers considered mobility as the most valued feature of mobile banking [Suoranta & Mattila 2004] and the time-critical consumers considered the always-on functionality as the most important feature of mobile banking [Singh et al. 2010], while banking users considered that Internet banking took significant advantage in Usefulness and Purpose [Natarajan et al. 2010] and online banking was suggested as the cheapest delivery channel [Koenig-Lewis et al. 2010].

Considering the immense penetration of cell phones, Cruz et al. [2010] observed that banks has very large potential to offer mobile banking services to people living in remote villages where only few computers are connected to the Internet. Acknowledging the limitations of Internet banking as opposed to widespread mobile phone penetration, Dasgupta et al. [2011] suggested that the emerging mobile banking may give banks a good commercial opportunity providing their services to rural people who are unable to access the Internet. Hence, Dasgupta et al. [2011] pointed out that main customer segments of mobile and Internet banking were not necessarily the same, which might explain why Sadi et al. [2010] distinguished mobile commerce from other electronic commerce.

Therefore, compared to huge online banking studies and relative few research available to help banks understand the adoption of mobile banking [Suoranta & Mattila 2003; Laukkanen & Pasanen 2008; Puschel et al. 2010], more studies to investigate what influences people to adopt mobile banking are necessary and demanded. Given that the chance of success in introducing a new product or service is highly related to the depth of understanding of what influences consumers to adopt this new product or service, this study employed the unified theory of acceptance and use of technology (UTAUT) with age and gender as moderating effects to elaborately investigate what affecting individuals to adopt mobile banking. The findings culled from this research can help banks execute intricate marketing campaigns and customize service options to cater to specific customer segments in the context of electronic banking.

## 2. Literature Review

Literature reveals that abundant research on electronic banking has focused on Internet banking (also called online banking), whereas research focusing on mobile banking is relative little and receives underrated attention [Suoranta & Mattila 2004; Laukkanen & Pasanen 2008; Puschel et al. 2010]. By employing innovation diffusion theory (IDT) and the decomposed theory of planned behavior (DTPB), Brown et al. [2003] surveyed 162 respondents and discovered that perceived advantages, the opportunity to try out cell phone banking, the number of banking services required by respondents and perceived risk significantly influenced people to adopt mobile banking. Lee et al. [2003] performed eight interviews to collect transcripts from participants and concluded that relative advantages and compatibility were positive factors affecting the adoption of mobile banking, perceived risk was negative factor affecting the adoption of mobile banking, and consumer previous experience and self-efficacy generalized their beliefs (a negative or positive attitude) toward the adoption of mobile banking.

Suoranta and Mattila [2004] took the Bass model of diffusion to separate 1253 respondents into non-users, occasional users, and regular users according to their mobile banking usage experience and density. The Bass diffusion model assumes that potential adopters of an innovation are influenced by two types of communication channels: mass media and interpersonal word-of-mouth, and the adoption rate can be described by S-shaped diffusion curves. Accordingly, Suoranta and Mattila [2004] empirically identified that interpersonal influence was over mass media in affecting users to adopt mobile banking. Contrasting to the study of Suoranta and Mattila [2004], Laforet and Li [2005] surveyed 128 respondents randomly selected in the city streets and indicated that awareness significantly influenced the adoption of online and mobile banking, while consumer awareness was effectively increased through mass media rather than word-of-mouth communications. Given that the reference group did not significantly affect the adoption of online and mobile banking, Laforet and Li [2005] thus contended that mass media was much more important than interpersonal word-of-mouth in affecting people to adopt mobile banking.

By adding one trust-based construct and two resource-based constructs, Luarn and Lin [2005] employed the extended technology acceptance model (TAM) to explore human behavioral intention to use mobile banking. They collected 180 respondents in Taiwan and discovered that perceived self-efficacy, financial cost, credibility, easy-of-use and usefulness had positive effects on the behavioral intention to use mobile banking. Likewise, due to the parsimony and predictive power of TAM, Amin et al. [2008] used an extended TAM containing five constructs - perceived usefulness, perceived ease-of-use, perceived credibility, the amount of information, and normative pressure - to explore the adoption of mobile banking. They gathered 158 valid questionnaires in Malaysia and supported that perceived ease-of-use markedly influenced perceived usefulness and credibility, and human intentions to adopt mobile banking was significantly affected by perceived usefulness, perceived ease-of-use, perceived credibility, the amount of information, and normative pressure.

Drawing from the theory of innovation resistance proposed by Ram and Sheth [1989], Laukkanen et al. [2007] summarized 18 factors into five barriers, namely Usage, Value, Risk, Tradition, and Image barriers. The theory of innovation resistance, adapted from the psychology and the IDT of Rogers [Rogers 2003], aims to explain why customers resist innovations even though these innovations were considered necessary and desirable. Through investigating 1525 usable respondents from a large Scandinavian bank, Laukkanen et al. [2007] uncovered that the value and usage barriers were the most intense barriers to mobile banking adoption, while tradition barriers (such as preferring to chat with the teller and patronizing the banking office) were not an obstacle to mobile banking adoption.

Yang [2009] employed the Rasch measurement model and item response theory to survey 178 students from one of largest university in south Taiwan. He found that the speed of transactions and special reductions in transaction fees encouraged mobile banking adoption, while factors inhibiting mobile banking adoption were safety and initial set-up fees. Similar to the finding of Yang [2009], Cruz et al. [2010] surveyed 3585 online respondents in Brazil and supported that the cost of Internet access and service and perceived risk were top two barriers for adopting mobile banking services.

By performing an empirical study in Brazilian major cities, Puschel et al. [2010] integrated the TAM, TPB, and IDT to investigate main factors influencing mobile banking adoption. Via collecting 666 usable samples, they found that relative advantages, visibility and compatibility significantly impacted attitude, self-efficacy and technology facilitating condition significantly impacted perceived behavioral control, and perceived behavioral control, attitude, and subjective norm significantly impacted Intention to use mobile banking. Drawing from TAM and IDT, Riquelme and Rios [2010] surveyed 681 Singaporean consumers and concluded that perceived usefulness, social norms and risks (in the order of influence) were three crucial factors influencing the adoption of mobile banking. Built on TAM and IDT, Koenig-Lewis et al. [2010] collected 155 consumers aged 18-35 in Germany and uncovered that perceived usefulness, compatibility, and risk significantly affected consumer intention to adopt mobile banking, while perceived costs, easy-of-use, credibility, and trust were not salient factors influencing behavioral intention to adopt mobile banking.

Based on TAM and TPB research structure, Sripalawat et al. [2011] collected 195 respondents and found subject norms to be the most influential factor, perceived usefulness to be the second influential factor, and self-efficacy to be the third influential factor in mobile banking adoption. Based on the extended TAM and through collecting 325 valid responses from MBA students in India, Dasgupta et al. [2011] first employed the exploratory factor analysis to identify seven antecedents to behavioral intention toward the adoption of mobile banking. Thereafter, they utilized the regression technique to examine the effects of these antecedents on behavioral intention. Their empirical results supported six of seven antecedents, except for risk. The six antecedents were perceived image, perceived usefulness, perceived ease-of-use, perceived value, self-efficacy, perceived credibility, and tradition, which significantly influenced the behavioral intent to use mobile banking. Recently by using interpretive structure modeling and mapping of mobile banking influences in India, Ketkar et al. [2012] systematically plotted key mobile banking barriers and enablers on the two dimensional map. By treating driving power of enablers as positive and that of barriers as negative, their work identified “facility to get quick updates”, “time and cost saving”, “reach of telecom distribution” and “need for telecoms to improve customer retention” as the crucial drivers for the adoption of mobile banking.

Building on the above literature review, only empirical and theory-based mobile banking studies were summarized in Table 1. Table 1 indicates that TAM, TPB/DTPB and IDT were frequently employed to investigate what influences mobile banking adoption, while small number of studies utilized other theories such as mean-end theory [Laukkanen 2007], Rasch measurement model and item response theory [Yang 2009], and analytical hierarchy process [Natarajan et al. 2010] to derive core determinants to explain the adoption of mobile banking.

Table 1: Empirical and theory-based empirical research in mobile banking adoption

| <b>Authors</b>              | <b>Theories</b>                    | <b>Sampling &amp; Countries</b>  | <b>Main Findings</b>   |
|-----------------------------|------------------------------------|--|--|
| Brown et al. [2003]         | IDT and DTPB                       | 162 questionnaires collected from convenience and online sampling in South Africa                | Relative advantage, trialability, number of banking services, and risk significantly influence mobile banking adoption.                              |
| Suoranta and Mattila [2003] | Bass diffusion model and IDT       | 1253 samples drawn from one major Finnish bank by the postal survey in Finland                   | Information sources (i.e., interpersonal word-of-mouth), age, and household income significantly influence mobile banking adoption.                  |
| Laforet and Li [2005]       | Attitude, Motivation, and behavior | 300 respondents randomly interviewed in the streets of six major cities in China                 | Awareness, confidential and security, past experience with computer and new technology are salient factors influencing mobile banking adoption       |
| Luarn and Lin [2005]        | Extended TAM                       | 180 respondents surveyed at an e-commerce exposition and symposium in Taiwan                     | Perceived self-efficacy, financial costs, credibility, easy-of-use, and usefulness had remarked influence on intention to adopt mobile banking       |
| Laukkanen [2007]            | Mean-end theory                    | 20 qualitative in-depth interviews conducted with a large Scandinavian bank customers in Finland | Perceived benefits (i.e, location free and efficiency) are main factors encouraging people to adopt mobile banking                                   |
| Amin et al. [2008]          | TAM                                | 156 respondents obtained via convenience sampling in Malaysia                                    | Perceived usefulness, easy-of-use, credibility, amount of information, and normative pressure significantly influence the adoption of mobile banking |

|                              |  |   |   |
|------------------------------|--|---|---|
| Laukkanen and Pasanen [2008] | Innovation adoption categories                   | 2675 questionnaires completed via the log-out page of a bank in Finland | Demographics such as education, occupation, household income, and size of the household do not influence mobile banking adoption, while age and gender are main differentiating variables.                  |
| Yang [2009]                  | Rasch measurement model and Item response theory | 178 students selected from a university in South Taiwan                 | Adoption factors are location-free conveniences, cost effective, and fulfill personal banking needs, while resist factors are concerns on security and basic fees for connecting to mobile banking.         |
| Cruz et al. [2010]           | TAM and theory of resistance to innovation       | 3585 respondents collected through an online survey in Brazil           | The cost barrier and perceived risk are highest rejection motives, following are unsuitable device, complexity, and lack of information.  |
| Riquelme and Rios [2010]     | TAM, TPB, and IDT                                | 681 samples drawn from the population of Singapore                      | Usefulness, social norms, risk influences the intention to adopt mobile banking   |
| Puschel et al. [2010]        | IDT and DTPB                                     | 666 respondents surveyed on a online questionnaire in Brazil            | Relative advantages, visibility, compatibility, and perceived easy-of-use significantly affects attitude, and attitudes, subjective norm, and perceived behavioral control significantly affects intention. |
| Natarjan et al. [2010]       | Analytical hierarchy process                     | 40 data obtained from a bank in India                                   | Purpose, perceived risk, benefits, and requirements are main criteria to influence people to choose banking channels.   |
| Koenig-Lewis et al. [2010]   | TAM and IDT                                      | 155 consumers aged 18-35 collected via online survey in Germany         | perceived usefulness, compatibility, and risk are significant factors, while perceived costs, easy-of-use, credibility, and trust are not salient factors   |
| Sripalawat et al. [2011]     | TAM and TPB                                      | 195 questionnaires collected via online survey in Thailand              | Subjective norm is the most influential factor, the following is perceived usefulness and self-efficacy.  |
| Dasgupta et al. [2011]       | TAM  | 325 usable questionnaires gathered from MBA students in India           | Perceived usefulness, easy-of-use, image, value, self-efficacy, and credibility significantly affect intentions toward mobile banking usage.  |

### 3. Hypothesis Development

To understand technology adoption, Venkatesh et al. [2003] empirically compared eight competing models named the theory of reasoned theory (TRA), TAM and TAM2, TPB and DTPB, combined TAM and TPB (C-TAM-TPB), IDT, motivational model (MM), model of PC utilization (MPCU), and social cognitive theory (SCT) by surveying 215 respondents from four organizations. Based on their longitudinal studies, Venkatesh et al. [2003] further integrated and refined the above eight models into a new model named UTAUT which captures the essential elements of different models. The UTAUT not only underscores the core determinants predicting the intention to adopt and actual adoption, but also allow researchers to analyze the contingencies from moderators that would amplify or constraint the effects of core determinants. Because UTAUT has been empirically tested and proven superior to other prevailing competing models [Venkatesh et al. 2003; Park et al. 2007; Venkatesh & Zhang 2010], this study chooses UTAUT as a theoretical foundation to develop the hypotheses.

#### Performance Expectance

In UTAUT, performance expectance is driven from perceived usefulness (TAM/TAM2), relative advantage (IDT), extrinsic motivates (MM), job-fit (MPCU), and outcome expectations (SCT). In mobile banking studies, Brown et al. [2003] empirically demonstrated that the greater the perceived relative advantage, the more likely mobile banking would be adopted. Similarly, Luarn and Lin [2005], Amin et al. [2008], Riquelme and Rios [2010], Sripalawat et al. [2011], and Dasgupta et al. [2011] identified perceived usefulness as a crucial factor, while Yang [2009] and Puschel et al. [2010] concluded that relative advantages significantly influence individuals intention to

adopt mobile banking. Although focusing on the adoption of mobile technology instead of mobile banking, Park et al. [2007] concluded that performance expectancy significantly influenced people to adopt mobile technologies via 221 samples. Similarly, through using mobile data services instead of mobile banking services, Lu et al. [2009] employed UTAUT as a research basis to survey 1320 respondents and illustrated that performance expectancy significantly influenced people to use mobile services. Taken the above together, this work posits the following hypothesis:

*H<sub>1</sub>: Performance expectancy significantly affects individual intention to use mobile banking.*

### **Effort Expectance**

Drawing upon other competing models, Venkatesh et al. [2003] captured the concept of perceived ease-of-use (TAM/TAM2), complexity (MPCU), and easy-of-use (IDT) to define effort expectation as the degree of ease associated with technology use. Prior empirical studies of mobile banking adoption [Luarn & Li 2005; Amin et al. 2008; Puschel et al. 2010; Sripalawat et al. 2011; Dasgupta et al. 2011] supported perceived ease-of-use as a determinant impacting people to use mobile banking. Grounded in UTAUT, Park et al. [2007] and Lu et al. [2009] employed three constructs of performance expectancy, effort expectancy, and social influence to explore what influences individual intention to accept mobile technology and data service, respectively. Both studies supported that effort expectancy significantly influenced human intention to use mobile technology or service. As a result, rooted in UTAUT, this study hypothesizes:

*H<sub>2</sub>: Effort expectation significantly affects individual intention to use mobile banking.*

### **Social Influence**

Venkatesh et al. [2003] used social influence to represent subjective norm in TRA, TAM2, TPB/DTPB, and C-TAM-TPB, social factors in MPCU, and image in IDT. They defined social influence as the degree to which an individual perceives that important others believe he/she should use the technology. In a survey of 158 customers from a major bank in Malaysia, Amin et al. [2008] empirically found that individual intention to use mobile banking was significantly affected by people surrounding them. Like a manner, Singh et al. [2010] discovered that individual decisions to adopt mobile commerce services were influenced by friends and family members. Empirical evidence from Puschel et al. [2010], Riquelme and Rios [2010], and Sripalawat et al. [2011] indicated that subject norm was a salient influence, while Laukkanen et al. [2007] and Dasgupta et al. [2011] observed that perceived image was a significant factor for people willingness to adopt mobile banking. The above might explains why Singh et al. [2010] argued that mobile commerce users are not just technology users, but also part of social network. Accordingly, the following hypothesis is posited:

*H<sub>3</sub>: Social influence significantly affects individual intention to use mobile banking.*

### **Perceived Credibility and Financial Cost**

The goal of the present study is not to replicate the UTAUT study as in Venkatesh and Zhang [2010]. Instead, this paper aims to ascertain what factors considerably influence people to adopt mobile banking. Therefore, two additional constructs culled from mobile banking literature are taken into the research structure, which are addressed as follows.

Several mobile banking adoption studies have supported that people refuse or are unwilling to use mobile banking mainly because of perceived risk [Brown et al. 2003; Riquelme & Rios 2010; Natarjan et al. 2010; Dasgupta et al. 2011] or perceived credibility [Luarn & Lin 2005; Dasgupta et al. 2011]. Through investigating customer attitudes toward online and mobile banking, Laforet and Li [2005] used confidential and security to express perceived risk and detected that perceived risk was the most significant factor influencing the adoption of mobile banking. Following the concept of Wang et al. [2003], who distinguished perceived credibility from perceived risks and trust, Luarn and Lin [2005] and Amin et al. [2008] supported security and privacy as two important dimensions under the construct of perceived credibility. Also, Luarn and Lin [2005] and Amin et al. [2008] empirically concluded that perceived credibility significantly affected human intention to use mobile banking.

As the literature reveals that different scholars employ different perspectives to assess the concern of security, risk, trust, and credibility, the concern has been conceptualized and assessed from a variety of ways that fully depends on which discipline researchers interpret the concern. Given that perceived credibility has been empirically supported and used not only in mobile banking adoption studies [Luarn & Lin 2005; Amin et al. 2008] but also in many Internet banking studies as discussed in Wang et al. [2003], Amin [2009], and Yuen et al. [2010], the present study uses perceived credibility to represent individual security, privacy, risk, and trust concerns about mobile banking adoption. Accordingly, this study hypothesizes:

*H<sub>4</sub>: Perceived credibility significantly affects individual intention to use mobile banking.*

Academics generally investigate consumer adoption of mobile banking from psychological and sociological theories, but empirical evidence has also revealed that mobile banking adoption is highly encouraged by economic factors such as advantageous transaction service fees [Yang 2009] or discouraged by economic considerations such as concerns on basic fees for connecting mobile banking [Yang 2009], cost burden for using mobile banking [Cruze et al. 2010], and high payment for using mobile banking [Huili & Chunfang 2011]. By interviewing consumers in person, Luarn and Lin [2005] empirically identified perceived financial cost as a negative effect on behavioral intention to use mobile banking. Through analyzing 196 respondents in the Sultanate of Oman, Sadi et al. [2010] noted that high cost was crucial for unwilling to use mobile banking. Similarly, via collecting 195 surveys from bank customers in the Bangkok metropolitan area, Sripalawat et al. [2011] recently supported that perceived financial cost was a salient factor influencing consumers to adopt mobile banking. Taken the above together, this study hypothesizes:

*H<sub>5</sub>: Perceived financial cost significantly affects individual intention to use mobile banking.*

### **Facilitating Conditions**

By capturing the concepts of perceived behavioral control (TPB/DTPB, C-TAM-TPB), facilitating conditions (MPCU), and compatibility such as work style (IDT), Venkatesh et al. [2003] defined facilitating conditions as the degree to which an individual believes that an organizational and technical infrastructure exists to support technology use. In UTAUT, Venkatesh et al. [2003] integrated 32 factors used in eight competing models into five constructs and empirically identified that behavioral intention and facilitating conditions were two direct determinants of adoption behavior. In the mobile banking adoption literature, Joshua and Koshy [2011] illustrated that the more convenient the access of respondents to computer and Internet, the more proficient their use of the computer and Internet, which results in a higher adoption rate of respondents using electronic banking. Consequently, grounded in UTAUT, the following hypothesis is put forth:

*H<sub>6</sub>: Facilitating conditions significantly affect individual behavior of using mobile banking.*

### **Perceived Self-Efficacy**

After considerably analyzing eight competing models, Venkatesh et al. [2003] ever considered three constructs of perceived self-efficacy, facilitating conditions, and behavioral intention would directly affect actual behavior. However, after empirically testing the three constructs at three time-points in their longitude study, they finally verified that perceived self-efficacy did not play a determinant role in influencing the actual behavior. Through a further analysis, Venkatesh et al. [2003] argued that self-efficacy was an indirect determinant captured by effort expectancy and fully mediated by effort expectancy. Therefore, they dropped self-efficacy from the direct determinant of behavior, which is also supported by other UTAUT studies [Venkatesh & Zhang 2010]. Among mobile banking adoption researches, Brown et al. [2003] supported self-efficacy was not a direct determinant in affecting individual behavior to adopt mobile banking, and Puschel et al. [2010] supported self-efficacy was not a direct determinant in affecting individual intention to adopt mobile banking. Meanwhile, some mobile banking studies [Luarn & Lin 2005; Sripalawat et al. 2010; Dasgupta et al. 2011] supported perceived self-efficacy as a determinant in influencing people intention toward mobile banking adoption. The above discussion reveals a need to ascertain the role of self-efficacy. Therefore, the following hypothesis is posited:

*H<sub>7</sub>: Perceived self-efficacy significantly affects individual behavior of using mobile banking.*

### **Behavioral Intention**

Consistent to all models drawing from psychological theories, which argue that individual behavior is predictable and influenced by individual intention, UTAUT contended and proved behavioral intention to have significant influence on technology usage [Venkatesh et al. 2003; Venkatesh & Zhang 2010]. Given that the ultimate goal of businesses (i.e., banks) is to attract consumers to adopt their services rather than the intention to adopt services, extensive research has examined the relation between behavioral intention and actual use. However, only one work in extant mobile banking studies has taken this relation into the research structure [Sripalawat et al. 2011], which encourages a need to examine the relationship between behavioral intention and actual behavior in the mobile banking setting. Accordingly, this study hypothesizes:

*H<sub>8</sub>: Behavioral intention significantly affects individual behavior of using mobile banking.*

### **Moderator effects - Age**

Numerous studies have discussed the effects of demographics on new technology adoption. However, compared to traditional innovation diffusion studies [Rogers 2003] that reveal earlier adopters of technological

innovations as typically younger in age, having higher incomes, better educated, and having higher social status and occupation, research findings in the context of electronic banking are not consistent.

Of the mobile banking adoption literature, some research indicated typical users of electronic banking were relatively young [Joshua & Koshy, 2011] or discovered that the elderly had more resistances to change and negative attitude toward using mobile banking services [Laukkanen et al. 2007]. However, certain studies found that respondents aged 50 or over were mostly eager to use mobile banking services [Suoranta & Mattila 2004], typical mobile banking users were aged between 30 and 49 [Laukkanen & Pasanen 2008], and middle-aged or older customers were the main users of electronic banking [Laforet & Li 2005; Dasgupta et al. 2011].

Additionally, Laforet and Li [2005] randomly interviewed 300 respondents in the streets in six major Chinese cities and reported that mobile banking main users were not necessarily young and highly educated. Laukkanen et al. [2007] used age (over 55 or not) to separate Finnish respondents into two groups and identified that two groups differed in the risk, tradition, and image barriers. Cruz et al. [2010] investigated 3585 respondents in Brazil and claimed that older people perceived mobile banking as more difficult to use than younger people did. Likewise, by collecting 666 respondents in Brazil, Puschel et al. [2010] observed that typical users of mobile banking were less than 30 years old.

Based upon the above conflicting results, this is a need to ascertain the moderating effect of age. As a result, this study posits:

*H<sub>9</sub>: The influence of performance expectance on individual intention will be moderated by age.*

*H<sub>10</sub>: The influence of effort expectance on individual intention will be moderated by age.*

*H<sub>11</sub>: The influence of social influence on individual intention will be moderated by age.*

*H<sub>12</sub>: The influence of perceived credibility on individual intention will be moderated by age.*

*H<sub>13</sub>: The influence of facilitating conditions on individual behavior will be moderated by age.*

*H<sub>14</sub>: The influence of perceived self-efficacy on individual behavior will be moderated by age.*

#### **Moderator effects - Gender**

Concerning gender, previous studies have found a stronger proportion of perceived usefulness of mobile services among men than among women [Nysveen et al. 2005]. The reason is men appear more task-oriented than women and electronic banking services are typically motivated by goal achievement [Cruz et al. 2010]. Additionally, many empirical studies have revealed the statistical difference between female and male respondents in the mobile service/banking setting. For example, women perceive more risk in an online purchase than men do [Garbarino & Strahilevitz 2004], peer opinions have a higher effect on females in mobile services [Nysveen et al. 2005], men are more likely to use mobile banking than women are [Laukkanen & Pasanen 2008; Koenig-Lewis 2010], and men are more concerned on the cost of Internet access and service fees than women are when using mobile banking services [Cruz et al. 2010].

By using gender as a moderating variable in an extended TAM, Riquelme and Rios [2010] sampled 681 respondents in Singapore and found that the influence of social norm on intention to adopt and perceived ease-of-use on the perception of perceived usefulness were stronger among women than among men. In contrast, Puschel et al. [2010] collected 666 respondents in Brazil and discovered that mobile banking users were predominantly males. Likewise, through gathering 553 respondents in India, Joshua and Koshy [2011] observed that men might use electronic banking services more than women would.

Given that the findings above are inconsistent, it is necessary to ascertain the moderating effect of gender. As a result, this study hypothesizes:

*H<sub>15</sub>: The influence of performance expectance on individual intention will be moderated by gender.*

*H<sub>16</sub>: The influence of effort expectance on individual intention will be moderated by gender.*

*H<sub>17</sub>: The influence of social influence on individual intention will be moderated by gender.*

*H<sub>18</sub>: The influence of perceived credibility on individual intention will be moderated by gender.*

*H<sub>19</sub>: The influence of facilitating conditions on individual behavior will be moderated by gender.*

*H<sub>20</sub>: The influence of perceived self-efficacy on individual behavior will be moderated by gender.*

Notably, compared to UTAUT involving four moderators of gender, age, experience, and voluntariness, the present study does not contain experience and voluntariness. The first reason is, since this study is not a longitudinal study, this work is incapable of capturing increasing levels of user experience at different time periods (i.e., T1, T2, and T3). Venkatesh et al. [2003] used future tense at T1 and present tense at T2 and T3 to assess experience. The second reason is, instead of surveying respondents in two situational contexts (voluntary use and mandatory use), this study surveys the public in the context of voluntary use. Venkatesh et al. [2003] defined voluntariness as a dummy variable to separate the two situational contexts (one is voluntary use and the other is mandatory use). Furthermore, considering the research resources, manpower, and the response rate, which is heavily determined by

the number of items in the questionnaire, the current research only contains two moderators to investigate whether age and gender moderate the effects of performance expectancy, effort expectancy, social influence, and perceived credibility on behavioral intention to adopt mobile banking as well as the effects of facilitating conditions and perceived self-efficacy on individual behavior of using mobile banking, as depicted in Figure 1.

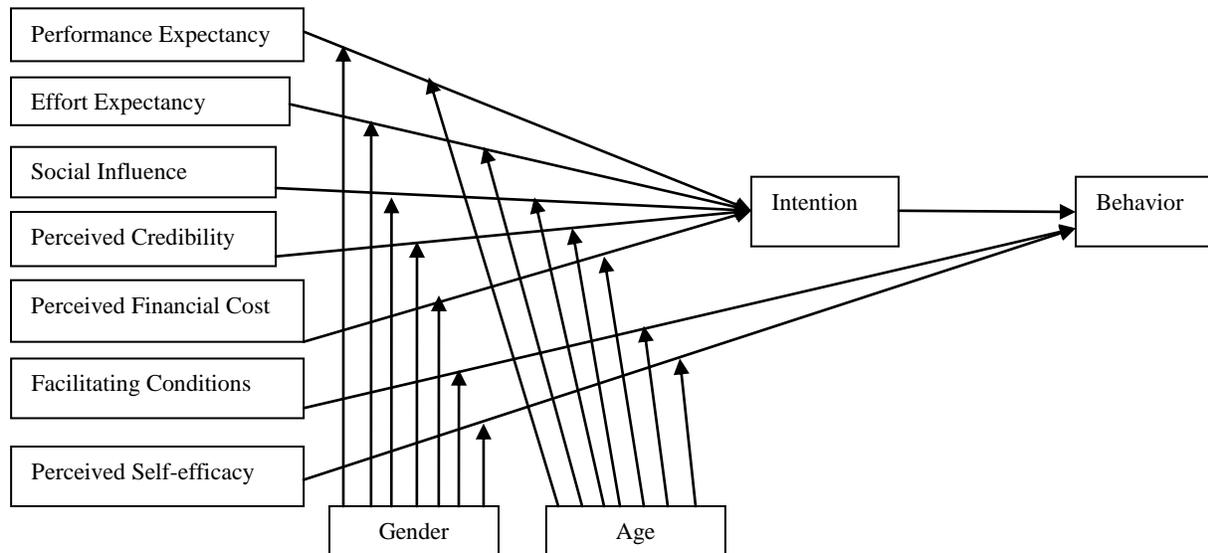


Figure 1: The Proposed Research Structure

#### 4. Questionnaire Design and Sampling

Referring to Venkatesh et al. [2003], Luarn and Lin [2005], Venkatesh and Zhang [2010], Foon and Fah [2011], and Sripalawat et al. [2011], this research operationalized performance expectancy as the extent to which a person believes that adopting mobile banking will help him/her gain banking performance, operationalized effort expectancy as the degree to which a person perceives that the level of ease associated with mobile banking adoption, operationalized social influence as the degree to which a person perceives that important others believe he/she should use mobile banking services, and operationalized perceived credibility as the extent to which a person believes that the use of mobile banking will have no security or privacy threats. Further, perceived financial cost was operationalized as the extent to which a person believes that adopting mobile banking will cost money, facilitating conditions was operationalized as the degree to which a person believes that he/she have necessary context to support using mobile banking, perceived self-efficacy was operationalized as the degree to which a person believes that he/she has capabilities to use mobile banking, and behavioral intention was operationalized as the degree to which a person perceives his/her willingness to use mobile banking.

To ensure the content validity of the questionnaire used to assess each constructs depicted in Fig. 1, all items regarding the measurement of constructs were adapted from previous studies and carefully reworded to fit the mobile banking adoption context in Taiwan. Notably, to date, empirical research using UTAUT to explore the adoption of mobile banking is absent. Past studies suggested that a good scale might result from not only pertinent literature, but also in-depth interviews with professional comments, particularly when direct empirical research is absent [Swinyard & Smith 2003; Ahmad et al. 2010; Yu 2011]. Consequently, this research performed a panel discussion by inviting two academics and two practitioners to go through and reword the initially constructed questionnaires. Following the panel discussion consensus, the selection and rewording of items were based on three criteria: measurability according to the operationalization definition of each construct, fitness to mobile banking context, and fitness for general respondent perceptions when adopting mobile banking.

Thereafter, a pre-testing with 20 respondents was executed to check the wording, completeness, sequencing, and other possible errors in the questionnaire. Following respondent feedback, the questionnaire was slightly reedited to strengthen clarity and completeness. As a result, the formal questionnaire was organized into two sections, comprised of 38 questions. The first section contained 31 questions used to evaluate eight constructs of performance expectancy, effort expectancy, social influence, perceived credibility, perceived financial cost, facilitating conditions, perceived self-efficacy, and behavioral intention as listed in Table 2. All questions in the first section were measured using a five-point Likert scale, ranging from “strongly disagree” to “strongly agree”.

Table 2: Constructs and Corresponding Items

| Construct                | Corresponding Items   | Items Sources  |
|--------------------------|---|--|
| Performance Expectance   | In conducting banking affairs,<br>(PE1) using mobile banking would improve my performance<br>(PE2) using mobile banking would save my time<br>(PE3) I would use mobile banking anyplace<br>(PE4) I would find mobile banking useful   | Luarn and Lin [2005], Venkatesh and Zhang [2010], Foon and Fah [2011]                              |
| Effort Expectance        | (EE1) Learning to use mobile banking is easy for me<br>(EE2) Becoming skillful at using mobile banking is easy for me<br>(EE3) Interaction with mobile banking is easy for me<br>(EE4) I would find mobile banking is easy to use   | Luarn and Lin [2005], Venkatesh and Zhang [2010], Foon and Fah [2011], Sripalawat et al. [2011]    |
| Social Influence         | (SI1) People who are important to me think that I should use mobile banking<br>(SI2) People who are familiar with me think that I should use mobile banking<br>(SI3) People who influence my behavior think that I should use mobile banking<br>(SI4) Most people surrounding with me use mobile banking  | Venkatesh et al. [2003], Venkatesh and Zhang [2010], Foon and Fah [2011], Sripalawat et al. [2011] |
| Perceived Credibility    | When using mobile banking,<br>(PC1) I believe my information is kept confidential<br>(PC2) I believe my transactions are secured<br>(PC3) I believe my privacy would not be divulged<br>(PC4) I believe the banking environment is safe   | Luarn and Lin [2005], Foon and Fah [2011]  |
| Perceived Financial Cost | (PFC1) the cost of using mobile banking is higher than using other banking channels<br>(PFC2) the wireless link fee is expensive when using mobile banking<br>(PFC3) the mobile device setup to using mobile banking charges me lot of money<br>(PFC4) Using mobile banking services is cost burden to me | Luarn and Lin [2005], Sripalawat et al. [2011]   |
| Facilitating Conditions  | (FC1) My living environment supports me to use mobile banking<br>(FC2) My working environment supports me to use mobile banking<br>(FC3) Using mobile banking is compatible with my life<br>(FC4) Help is available when I get problem in using mobile banking  | Venkatesh et al. [2003], Venkatesh and Zhang [2010], Sripalawat et al. [2011]                      |
| Perceived Self-Efficacy  | I could use mobile banking ....<br>(PSE1) if I had the built-in help guidance for assistance<br>(PSE2) if someone showed me how to do it<br>(PSE3) if I had seen someone else using it<br>(PSE4) if I could call someone for help   | Venkatesh et al. [2003], Luarn and Lin [2005], Venkatesh and Zhang [2010],                         |
| Behavioral Intention     | When dealing with banking affairs<br>(BI1) I prefer to using mobile banking<br>(BI2) I intend to use mobile banking<br>(BI3) I would use mobile banking   | Venkatesh and Zhang [2010], Luarn and Lin [2005], Sripalawat et al. [2011]                         |

Of the seven questions in the second section, the first five questions were used to collect respondent demographic variables of gender, age, occupation, education level, and income level. The sixth question was to ask respondents whether they had used mobile banking or not. If the respondents answered “Yes”, they were deemed as mobile banking users. The seventh question was to ask respondents “how frequently do you use mobile banking each month”. As the panel discussion suggested, the seventh question gave the respondents five options: zero, one-five times per month, six-ten times per month, eleven-fifteen times per month, and over fifteen times per month. Notably, for those respondents answered “No” to the sixth question, they were deemed mobile banking nonusers and coded to choose “zero” to the seventh question.

Because respondents through online sampling method were frequently found to be young students, this study employed the shopping mall intercept method to diversify the respondents. Following the suggestion of past studies [De Bruwer & Haydam 1996; Yang 2004; Yu 2011], this work trained three research assistants and dispatched them

to recruit respondents in major Taipei downtown areas in the mornings, afternoons, and evenings during ten weekdays and two weekends, to remove potential sampling bias. After a two-week survey in late June 2011, 441 valid samples were collected based on a structured questionnaire. The basic data of respondents is summarized in Table 3.

Table 3: The Profile of Respondents

| Category                     |                                    | Number of Respondents | Percentage |
|------------------------------|------------------------------------|-----------------------|------------|
| Gender                       | Male                               | 229                   | 51.9%      |
|                              | Female                             | 212                   | 48.1%      |
| Age                          | Less than 20-year-old              | 3                     | 0.68%      |
|                              | 20-30 years old                    | 229                   | 51.93%     |
|                              | 30-40 years old                    | 162                   | 36.73%     |
|                              | 40-50 years old                    | 34                    | 7.71%      |
|                              | above 50 years old                 | 13                    | 2.95%      |
| Occupation                   | ICT-related Sector                 | 65                    | 14.7%      |
|                              | Banking/Financial/Insurance Sector | 39                    | 8.8%       |
|                              | Education/Culture Sector           | 18                    | 4.1%       |
|                              | Medical/Hospital/Bio-Tech Sector   | 16                    | 3.6%       |
|                              | Retail/Distribution Sector         | 15                    | 3.4%       |
|                              | Restate/Construction Sector        | 19                    | 4.3%       |
|                              | Media/Publishing Sector            | 21                    | 4.8%       |
|                              | Military/Police Sector             | 17                    | 3.9%       |
|                              | Student                            | 39                    | 8.8%       |
|                              | Government/Non-Profit Sector       | 25                    | 5.7%       |
|                              | House Keeping/SOHO                 | 27                    | 6.1%       |
|                              | Other Manufacturing Sector         | 49                    | 11.1%      |
|                              | Other Service Sector               | 60                    | 13.6%      |
| Others                       | 31                                 | 7.0%                  |            |
| Education                    | Senior High Diploma or Below       | 77                    | 17.5%      |
|                              | Associate Bachelor Degree          | 144                   | 32.7%      |
|                              | Bachelor Degree                    | 129                   | 29.3%      |
|                              | Master Degree                      | 89                    | 20.2%      |
|                              | Ph.D. Degree                       | 2                     | 0.5%       |
| Annual Income                | Less than NT\$ 250,000             | 73                    | 16.6%      |
|                              | NT\$ 250,001 – 500,000             | 102                   | 23.1%      |
|                              | NT\$ 500,001 – 1,000,000           | 168                   | 38.1%      |
|                              | NT\$ 1,000,001 – 1,500,000         | 59                    | 13.4%      |
|                              | Over NT\$ 1,500,000                | 39                    | 8.8%       |
| Have you used mobile banking | Yes                                | 96                    | 21.8%      |
|                              | No                                 | 345                   | 78.2%      |

## 5. Data Analysis and Discussion

As did in original UTAUT studies [Venkatesh et al. 2003; Venkatesh & Zhang 2010], this study employs the partial least squares (PLS) regression to examine the presented research structure. The PLS, developed in 1960s by Herman Wold, is a useful exploratory analysis tool and probably least restrictive of the various extensions of multiple linear regression, particularly useful for constructing predictive models when collinearity may exist among factors [Wold et al. 1984]. The advantages and limitation of the PLS regression can be found in literature [Geladi & Kowalski 1986]. As suggested by Lee et al. [2009] and Yu [2011], factor loadings, composite reliability, and the average variance extracted (AVE) were used to assess the convergent validities, while the discriminant validity was assessed by examining whether or not the squared roots of AVE exceed the correlations between constructs and the reliability was evaluated by examining internal consistency reliability (ICR) as suggested by Venkatesh et al. [2003] and Venkatesh and Zhang [2010].

After running SPSS 18.0, this study found that the factor loading of the fourth item of items used to assess perceived self-efficacy (as shown in Table 2) was 0.631. Accordingly, this item was removed due to its factor loading below 0.7. Thereafter, the SPSS and Smart PLS 2.0 were executed again, and the generated results were summarized in Tables 4-5 and Figure 2. As Table 4 shows, all factors in the measurement model had adequate reliability and convergent validity because all factor loadings were greater than 0.7, the composite reliabilities exceeded acceptable criteria of 0.6, and the AVEs were greater than the threshold value of 0.5 in all cases. Table 5 is constructed where diagonal elements are the square roots of AVE, and off-diagonal elements are correlations between constructs. Since Table 5 indicates all diagonal elements were higher than the off-diagonal elements in the corresponding rows and columns as well as all ICRs were above 0.727, the discriminant validity and reliability were supported.

Table 4: Factor Loadings, Composite Reliability and AVE

| <b>Constructs</b>        | <b>Items</b> | <b>Loadings</b> | <b>Composite Reliability</b> | <b>AVE</b> |
|--------------------------|--------------|-----------------|------------------------------|------------|
| Performance Expectance   | PE1          | 0.772           | 0.699                        | 0.569      |
|                          | PE2          | 0.805           |                              |            |
|                          | PE3          | 0.736           |                              |            |
|                          | PE4          | 0.724           |                              |            |
| Effort Expectance        | EE1          | 0.914           | 0.940                        | 0.759      |
|                          | EE2          | 0.892           |                              |            |
|                          | EE3          | 0.875           |                              |            |
|                          | EE4          | 0.902           |                              |            |
| Social Influence         | SI1          | 0.733           | 0.773                        | 0.575      |
|                          | SI2          | 0.829           |                              |            |
|                          | SI3          | 0.714           |                              |            |
|                          | SI4          | 0.784           |                              |            |
| Perceived Credibility    | PC1          | 0.802           | 0.877                        | 0.649      |
|                          | PC2          | 0.751           |                              |            |
|                          | PC3          | 0.831           |                              |            |
|                          | PC4          | 0.746           |                              |            |
| Perceived Financial Cost | PFC1         | 0.732           | 0.645                        | 0.532      |
|                          | PFC2         | 0.725           |                              |            |
|                          | PFC3         | 0.758           |                              |            |
|                          | PFC4         | 0.705           |                              |            |
| Facilitating Conditions  | FC1          | 0.963           | 0.925                        | 0.756      |
|                          | FC2          | 0.933           |                              |            |
|                          | FC3          | 0.833           |                              |            |
|                          | FC4          | 0.722           |                              |            |
| Perceived Self-Efficacy  | PSE1         | 0.881           | 0.901                        | 0.816      |
|                          | PSE2         | 0.845           |                              |            |
|                          | PSE3         | 0.809           |                              |            |
| Behavioral Intention     | BI1          | 0.793           | 0.841                        | 0.597      |
|                          | BI2          | 0.793           |                              |            |
|                          | BI3          | 0.789           |                              |            |

Table 5: Measurement Model Estimation

|       | ICR   | Mean | SD   | PE           | EE           | SI           | PC           | PFC          | FC           | PSE          | BI           | Usage     |
|-------|-------|------|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------|
| PE    | 0.775 | 4.22 | 0.49 | <b>0.754</b> |              |              |              |              |              |              |              |           |
| EE    | 0.924 | 3.72 | 0.96 | 0.31***      | <b>0.871</b> |              |              |              |              |              |              |           |
| SI    | 0.777 | 4.04 | 0.70 | 0.35***      | 0.35***      | <b>0.758</b> |              |              |              |              |              |           |
| PC    | 0.867 | 3.43 | 0.89 | 0.36***      | 0.52***      | 0.34***      | <b>0.806</b> |              |              |              |              |           |
| PFC   | 0.727 | 3.09 | 0.79 | -0.38***     | -0.56***     | -0.33***     | -0.48***     | <b>0.729</b> |              |              |              |           |
| FC    | 0.841 | 3.76 | 1.04 | 0.39***      | 0.63***      | 0.38***      | 0.56***      | -0.66***     | <b>0.869</b> |              |              |           |
| PSE   | 0.850 | 3.71 | 1.11 | 0.31***      | 0.68***      | 0.323***     | 0.47***      | -0.44***     | 0.64***      | <b>0.903</b> |              |           |
| BI    | 0.751 | 3.98 | 0.61 | 0.33***      | 0.19**       | 0.67***      | 0.24***      | -0.35***     | 0.29***      | 0.23**       | <b>0.773</b> |           |
| Usage | NA    | 1.51 | 0.69 | 0.20**       | 0.18**       | 0.21**       | 0.23**       | -0.22**      | 0.41***      | 0.18**       | 0.68***      | <b>NA</b> |

Notes:

1. ICR: Internal consistency reliability
2. PE: Performance expectancy; EE: effort expectance; SI: social influence; PC: perceived credibility; PFC: perceived financial cost; FC: facilitating conditions; BI: behavioral intention

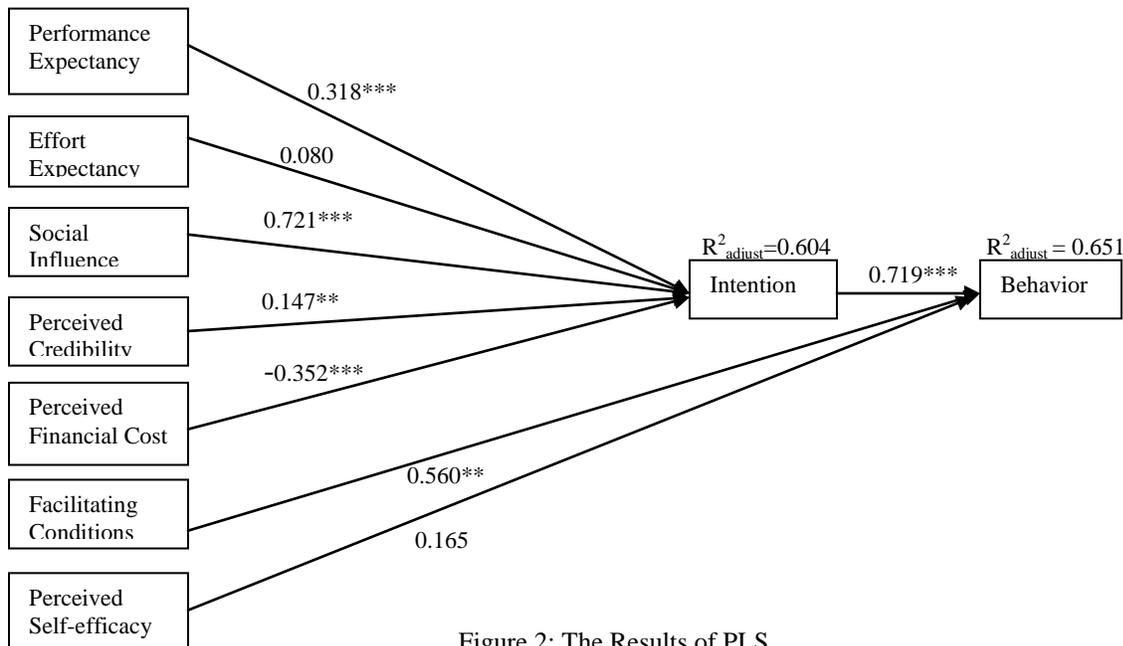


Figure 2: The Results of PLS

As Fig. 2 displays, the generated  $R^2_{adjusted}$  were 0.604 and 0.651 accounted for the variances explained in behavioral intention and in actual behavior, respectively. Consequently, this study demonstrates the applicability of UTAUT to a mobile banking setting, and the empirical results strongly support the extended UTAUT in predicting individual intentions and behaviors of mobile banking adoption. Fig. 2 also presents that consumer intention to adopt mobile banking was significantly impacted by social influence, perceived financial cost, performance expectancy, and perceived credibility, in their order of influencing strength. The actual behavior was significantly impacted by individual intention at the 0.001 level and by facilitating conditions at the 0.01 level, while perceived self-efficacy did not play a salient role in affecting actual adoption behavior.

The empirical evidence of the study indicates that the social influence is the most powerful factor in affecting people intention to use mobile banking, which is consistent with the finding of Sripalawat et al. [2010]. Besides, this work found that respondents were significantly influenced by peer groups and interpersonal world-of-mouth, which is consistent to Suoranta and Mattila [2004] but against to Laforet and Li [2005]. Laforet and Li [2005] performed the study in China while this study and Suoranta and Mattila [2004] were performed in Taiwan and Finland, respectively. Accordingly, the differences in the consuming culture or competitive environment related to banks, telecommunication industry, and cell phone service may become possible reasons, which is worthwhile to be further analyzed.

Regarding the perceived self-efficacy, the empirical evidence in this study is consistent with that of Brown et al.

[2003], Venkataesh et al. [2003], and Venkataesh and Zhang [2010]. That is, this study supports that perceived self-efficacy did not play a determinant role in influencing the actual behavior. Notably, instead of actual adoption behavior, Luarn and Lin [2005], Sripalawat et al. [2010], and Dasgupta et al. [2011] contended perceived self-efficacy is a determinant role in influencing the intention to adopt mobile banking. However, even though perceived self-efficacy was captured by effort expectance, argued by Venkataesh et al. [2003] and Venkataesh and Zhang [2010], this study empirically concluded that effort expectance was not a salient factor influencing the intention to adopt mobile banking. Therefore, this study might reveal that self-efficacy neither considerably influences behavioral intention nor significantly affects actual behavior in the mobile banking context. A possible reason is that mobile technology has advanced rapidly and the convergence of such technologies and financial services has evolved over time. As a result, consumers have rich experiences using cell phone and Internet, which largely reduces the effect of self-efficacy.

This phenomenon also explains why Fig. 2 depicted effort expectancy did not play a salient role in influencing individual intention to use mobile banking. This empirical result is also consistent to another recent UTAUT study [Yang 2010] that argued effort expectancy was not a significant driving factor to influence people toward using mobile shopping services, and consistent to another mobile banking study [Koenig-Lewis 2010] that concluded perceived ease-of-use did not impact human intention to adopt mobile banking.

As for moderating effects of age on five constructs toward behavioral intention, the PLS results with moderators were tabulated in Table 6. Table 6 indicates that the age did not moderate the effect of performance expectancy and the effect of perceived credibility to behavioral intention. The detailed statistical figures reveal that performance expectancy and perceived credibility were considered crucial factors for individual intention to use mobile banking in all age groups. Meanwhile, the age significantly moderated the effect of effort expectancy (more important to old respondents), the effort of social influence (more salient to young respondents), the effect of perceived financial cost (less important to the respondents aged below 30 or over 50).

Table 6: The PLS Results with Moderators

|                                    | Dependent Variable |          |
|------------------------------------|--------------------|----------|
|                                    | Intention          | Behavior |
| R <sup>2</sup> <sub>Adjusted</sub> | 0.712              | 0.738    |
| Performance Expectance             | 0.263***           |          |
| Effort Expectance                  | 0.027              |          |
| Social Influence                   | 0.664***           |          |
| Perceived Credibility              | 0.146**            |          |
| Perceived Financial Cost           | -0.279***          |          |
| Gender                             | 0.084*             |          |
| Age                                | 0.093*             |          |
| Performance Expectance x Gender    | 0.108*             |          |
| Effort Expectance x Gender         | 0.050              |          |
| Social Influence x Gender          | 0.007              |          |
| Perceived Credibility x Gender     | 0.041              |          |
| Perceived Financial Cost x Gender  | 0.142**            |          |
| Performance Expectance x Age       | 0.010              |          |
| Effort Expectance x Age            | 0.087*             |          |
| Social Influence x Age             | 0.102*             |          |
| Perceived Credibility x Age        | 0.023              |          |
| Perceived Financial Cost x Ager    | 0.098*             |          |
| Facilitating Conditions            |                    | 0.532**  |
| Perceived Self-Efficacy            |                    | 0.141    |
| Behavioral Intention               |                    | 0.688*** |
| Gender                             |                    | 0.138    |
| Age                                |                    | 0.273*   |
| Facilitating Conditions x Gender   |                    | 0.134    |
| Perceived Self-Efficacy x Gender   |                    | 0.065    |
| Facilitating Conditions x Age      |                    | 0.318*   |
| Perceived Self-Efficacy x Age      |                    | 0.297*   |

Regarding moderating effects of gender on five constructs toward behavioral intention, Table 6 indicates that effort expectancy, social influence, and perceived credibility to behavioral intention were not significantly moderated by gender, while gender significantly moderated the effects of performance expectancy and perceived financial cost to behavioral intention. The detailed statistical figures reveal that men perceived more performance expectancy in using mobile banking than women did, which is similar to the finding of Nysveen et al. [2005], and men had more concerns on perceived financial cost than women did, which is consistent to the finding of Cruz et al. [2010].

In moderating effects of age on two constructs toward actual behavior, Table 6 indicates that the age considerably moderated the effect of facilitating conditions and the effect of perceived self-efficacy to adoption behavior. Further analysis reveals that facilitating conditions are more important for the respondents aged below 30 or over 50 and perceived self-efficacy for older respondents. In moderating effects of gender on the effects of facilitating conditions and perceived self-efficacy to adoption behavior, Table 6 displays that facilitating conditions has a higher effect on males, while perceived self-efficacy has a higher effect on females. With respect to moderating effects of gender on two constructs to actual behavior, this study concluded that both facilitating conditions and perceived self-efficacy were remarked moderated by gender.

To contrasting Venkataesh et al. [2003] and Venkataesh and Zhang [2010] who found the effect of performance expectancy on behavioral intention was moderated by both age and gender, the empirical evidence of this study only supported gender significantly moderated performance expectancy to behavioral intention. Comparing with Venkataesh et al. [2003] and Venkataesh and Zhang [2010] who found the effect of effort expectancy on behavioral intention was moderated by both age and gender and the effect of facilitating conditions on actual behavior was moderated by age, this study contended that the effect of effort expectancy on behavioral intention was moderated only by age, but echoed that the effect of facilitating conditions on actual behavior was moderated by age only.

### **Theoretical contributions**

The UTAUT model was proven to be stronger to the other competing models [Venkataesh et al. 2003; Park et al. 2007; Venkataesh & Zhang 2010], but only a little UTAUT-based research exist, particularly compared huge TAM/TPB-based research. This is why Venkatesh and Zhang [2010] proclaimed that studies examining and enhancing the generalizability and validity of UTAUT in various technology contexts are demanded. Based on the feedback from 441 respondents in Taiwan, the empirical evidence of this study indicates that the variances of consumer intention and behavior can be significantly explained by the extended UTAUT. As Table 6 shows, the presented UTAUT model was able to explain as much as 71.2% of the variance in intention and 73.8% of the variance in behavior to adopt mobile banking. As a result, the first theoretic contribution of this work is to demonstrate the validity and generalizability of UTAUT in the context of mobile banking adoption.

By adding one trust-based construct (“perceived credibility”) and two resource-based constructs (“perceived financial cost” and perceived self-efficacy”) to the UTAUT, this study noticed that social influence, perceived financial cost, performance expectancy, and perceived credibility, in their order of influencing strength, were four salient factors in predicting human intention to adopt mobile banking, as well as individual intention and facilitating conditions were two salient factors in projecting the actual behavior. Meanwhile, this study also concluded that effort expectancy did not play a salient role in influencing individual intention to use mobile banking, and that perceived self-efficacy did not play a salient role in affecting actual adoption behavior. Consequently, the second theoretical contribution of this work is to enrich current theory-based mobile banking adoption studies and assert main factors that affect intention and behavior to adopt mobile banking.

Furthermore, by acknowledging the contingencies and referring to Venkataesh et al. [2003], Venkataesh and Zhang [2010], and Foon and Fah [2011], this study reveals that the effect of effort expectancy was significantly amplified for old respondents, the effort of social influence was markedly amplified for young respondents, the effect of perceived financial cost was notably constrained to the respondents aged below 30 or over 50, and that the effects of performance expectancy and perceived financial cost on behavioral intention were more crucial to men. Besides, the respondents aged between 30 and 50 had better facilitating conditions for adopting mobile banking. Consequently, the third theoretical contribution of this work is to manifest the role of such contingency factors which are crucial to technology adoption and ascertain how age and gender moderate main individual-level constructs that affect intention and behavior to adopt mobile banking.

### **Business implications**

Regarding the phenomenon that the adoption rate and usage of mobile banking are still marginal, this study reveals that social influence, perceived financial cost, performance expectancy, and perceived credibility, in their order of influencing power, were the four salient factors in predicting consumer intention to adopt mobile banking.

Being consistent with the finding of Sripalawat [2010] which argued subjective norm was the most influential factor, this study identified the social influence was the most powerful factor in affecting people intention to use mobile banking. By further analysis, this work found that respondents were significantly influenced by peer groups and interpersonal word-of-mouth, which is consistent to Suoranta and Mattila [2004] but against to Laforet and Li [2005]. Taken the above together, the first business implication may lead to that banks are advised to enhance the use of social media to promote mobile banking, particularly the strength and popularity of social media are significant powerful among interpersonal interactions. In other words, banks are suggested to emphasize interpersonal word-of mouth and put more advertising on emerging social media (such as Facebook, MSN, Twitter, and Blog) than traditional mass media (i.e., televisions, radios and newspapers) to increase the penetration of mobile banking.

Given that perceived financial cost is the second most important factor in affecting people intention to use mobile banking, the study performed a drill-down analysis and found that the cost for using services via cell phones was perceived a critical factor in hindering people to use mobile banking, and that, compared to women, men were more concerned with perceived financial cost. Consequently, the second business implication for banks is to efficiently reduce the cost for consumer to using cell phone-based service and to differentiate service/price packages for male and female customers.

As for another two salient factors of performance expectancy and perceived credibility, this study found that both age and gender did not moderate the effect of perceived credibility on influencing people intention, age did not moderate the effect of performance expectancy on influencing people intention to adopt mobile banking, and, compared to women, men had a higher perception of performance expectancy in using mobile banking. Accordingly, the third business implication for banks is to increase and promote female awareness about usefulness and value of using mobile banking, and the fourth business implication is to enhance consumer confidence about using mobile banking is safe and protected.

This empirical study also indicates that, in the current e-life context, people are more experienced using technology products/services than they were in several years ago. This explains why the effects of effort expectancy and perceived self-efficacy were decreased and would not play salient roles in affecting consumers to adopt mobile banking. Meanwhile, behavioral intention and facilitating conditions were found as two direct determinants in influencing people's actual adoption behavior. Therefore, the fifth business implication is that, beyond offering easy-of-use and useful mobile banking services, banks may emphasize the compatibility between the offered mobile banking services and the working/living styles of their target customers. That is, putting efforts on designing suitable services meet specific needs of different customer segments.

Moreover, this study empirically observes the moderating effects of age; for example, the effect of effort expectancy is perceived more important to old respondents, the effort of social influence is more salient to young respondents, the effect of perceived financial cost is less important to the respondents aged below 30 or over 50, facilitating conditions are more important for the respondents aged below 30 or over 50, and self-efficacy was perceived more important for older respondents. As a result, the sixth implication for business is that, instead of developing mobile banking systems from the holistic viewpoint, banks may customize their mobile banking systems to allow mature customers to choose a simple mobile banking version. The seventh business implication is to attract and influence young customer preferences by manipulating or operating social websites and communities. The eighth business implication is to offer a higher level of mobile banking service packages to customers who aged below 30 or over 50, as well as reduce the charging fees for customers aged between 30 and 50 by offering a lower level of mobile banking service packages.

## **6. Concluding Remarks**

Continuous and fast advances in the communication and information technologies have led to the rapid growth and diffusion of 3G smart cell phones, thus stimulating and creating wireless commercial opportunities. However, despite the rapid increase of many wireless commercial services, the usage of mobile banking services still remains very small compared to the entire banking transactions. Given that the widespread diffusion of cell phones does not reflect the adoption of mobile banking, there is a need to study what influences individuals to adopt mobile banking. Since UTAUT has higher predictive power for technology adoption than other competing models such as TAM/TAM2, TPB/DTPB, and IDT, and since UTAUT not only underscores the main individual-level factors that affecting technology adoption, but also identifies the contingencies that moderate the effects of these factors, this study presented an extended UTAUT model to explore what affects consumers to adopt mobile banking.

Like any study, this work naturally leaves some clues and limitations for further researches. First, to contrasting the original UTAUT study which is a longitudinal study, this research only measures respondents' perceptions, intentions, and usage at a single time point. Since the empirical research underlying UTAUT and the investigation of

mobile banking adoption and usage are relative few, conducting longitudinal studies on mobile banking adoption are necessary in order to compare the findings with Venkatesh's UTAUT studies. Moreover, the present study reveals the perceived financial cost and perceived credibility are two crucial factors influencing people intention to adopt mobile banking, while the original UTAUT lacks of considering trust-based and economy-based constructs, which may results in a limitation of UTAUT. However, given that the empirical result culled from this work is just single empirical evidence, it is too early to make conclusion. More studies using UTAUT to examine the limitation, validity and applicability of UTAUT are required, particularly in the context of mobile banking.

Due to that only 21.8% of respondents used mobile banking, this study merely represents a starting point for investigating crucial factors influencing people intention to adopt mobile banking and actual behavior of using mobile banking. Particularly because mobile technology has rapidly advanced and the convergence of such technologies and financial services has evolved over time, more research on mobile banking adoption is necessary. Consequently, generating the findings needs to be cautious, although the empirical findings from this study may offer valuable clues to promote mobile banking and even other wireless commercial or financial services. As Sripalawat et al. [2010] described, using mobile banking can make users in Thailand feel that they are in trends, and social currents have a strong impact on the way people live. The finding in this study is consistent to the argument of Sripalawat et al. [2010], but both Taiwan and Thailand are Asian countries. Hence, conducting studies in other countries in Europe and America are necessary to assert whether the social influence is the most influential factor in today individual intention to use mobile banking.

Finally, in contrasting Laforet and Li [2005], Suoranta and Mattila [2004] and this work empirically supported the influence of interpersonal world-of-mouth surpassed that of mass media. However, given that these studies not focused on the comparison between social media and mass media, more elaborate research to analyze and compare the influences between social media and mass media in promoting the adoption of mobile banking is also needed. As Venkataesh and Zhang [2010] contended culture plays significant role in technology adoption because culture shapes individual belief systems influencing their behaviors. It needs caution when generating the findings and implications culled from this study to other countries.

#### Acknowledgment

The author wishes to thank three anonymous referees for their constructive comments and National Science Council of the Republic of China for its support of this research under NSC 98-2410-H-158-003.

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