Factors Influencing the Technology Adoption of Mobile Commerce in Taiwan By Using the Revised UTAUT Model

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Abstract

With the highly growing popularity of smart phones and tablets, the amount of users who use wireless Internet including mobile Internet have reached 11 million in 2013 (TWNIC 2013). Mobile commerce (m-commerce) is regarded as a tremendous market potential for businesses and customers. However, the expected benefits have not yet to be realized**.** The number of m-commerce services and applications accepted by the customers in Taiwan is still small in comparison with other countries, e.g., Japan and Korea. As a result, it becomes significant for researchers to understand customers' mobile commerce adoption behavior through national culture in Taiwan. This study aims to investigate the factors that predict consumer intention to adopt m-commerce in Taiwan. Based upon the revised UTAUT model, this research used two of Hofstede's cultural dimensions: power distance and uncertainty avoidance as modulators on the UTAUT model to enhance the understanding of influencing users' intention or actual use of m-commerce. In the research, the study sample consists of 300 respondents with using online questionnaires to collect data. The constructs are measured by means of online survey distributed among people who have smart phones or tablets. The SPSS will be used to analyze and explain the meaning of each factor. The conclusion in this study provides a way toward understanding from how much degree of cultural dimensions and trust influence on users adopting m-commerce in Taiwan.

Keywords: M-commerce, User Acceptance, UTAUT, National Culture

1. Introduction

Since iPhone was launched in 2007, the popularity of smart phones and tablets has been rapidly growing in these years, and these smart mobile devices let mobile commerce (m-commerce) ever-booming. It changes the way people purchase, people can purchase and communicate anywhere, at any time. In contrast with traditional electronic commerce (e-commerce), the key advantage associated with m-commerce is through the use of mobile terminals and networks, users may participate in omnipresent communications without the restrictions of wired solutions. Accordingly, it can be seen that m-commerce significantly enhances user efficiency (Chong, Chan, & Ooi, 2012).

Internet users in Taiwan have been a great number and powerful growth, particularly, Taiwan Network Information Center (TWNIC) pointed out that the amount of users who use wireless Internet including mobile network have reached 11 million in 2013, it increased almost 17.6 % compared to year 2012 (TWNIC 2013). Mobile network has become as one of main means of Internet access due to its rapid growth.

According to the survey of Consumer Barometer 2014, showed in Fig. 1.1, it shows that the proportion of using online purchase by mobile phone has reached to 54% in Taiwan, and it wins the highest rate in the world. Surprisingly, the survey demonstrates that only about 15% of users are satisfied with mobile commerce in Taiwan, it indicates there is still a big room to improve its service for m-commerce providers.

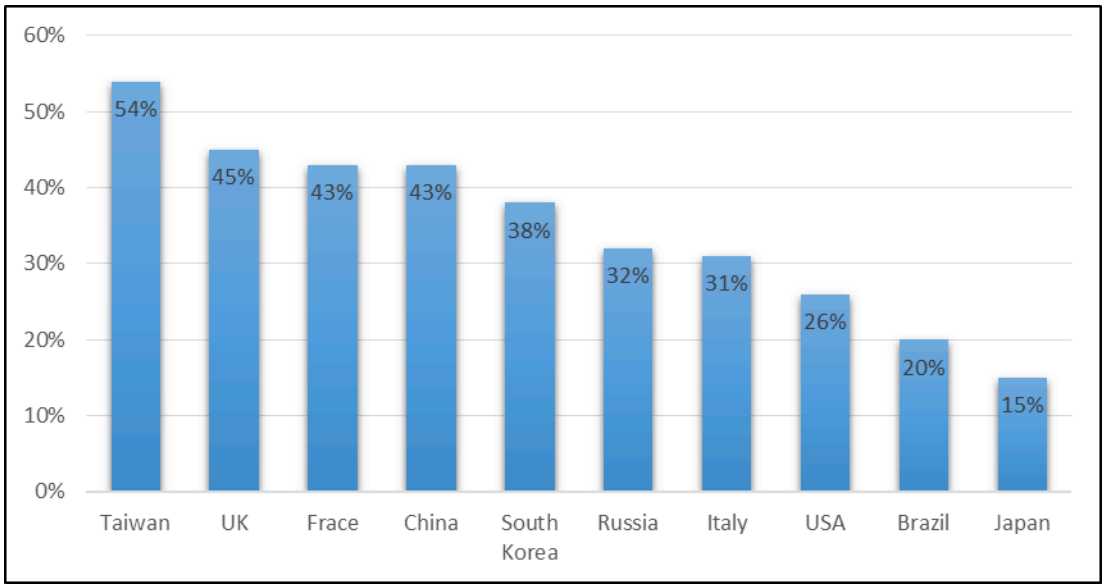


Fig. 1.1 Online purchase - mobile phone, source: Consumer Barometer (2014).

Currently, there exists a number of obstacles and issues in regard to the development of m-commerce, namely the restrictions associated with mobile terminals, e.g. inconvenient input method, limited power, low resolution, and small screen (Alkhunaizan & Love, 2013). Such issues will impact the acceptance of m-commerce amongst potential users of the technology.

In addition to technique issues, user's usage behavior also plays an important role in m-commerce. The scholars presented that cultural characteristics can influence how users accept new technology (Davis, 1989; Venkatesh & Davis, 2000). The global use of wireless technologies adds further complexity to issues in m-commerce. Such complexity derives from the legal, cultural, social, political, and technical differences among countries (Tarasewich, Nickerson, & Warkentin, 2002). Research has shown that cultural aspects influence the typical ways in which web applications are used within a country (Norhayati Zakaria, 2003). As the usage of mobile Internet has spread around the world, culture can have a stronger effect on the ways in which mobile Internet services are used in a country than other technology applications (Lee, 2004).Taking i-mode which was provided by Japan NTT DoCoMo for example, the global mobile pioneer Japan NTT DoCoMo attracted over 45 million subscribers to its i-mode mobile commerce services, it reached almost 80% of the total number of DoCoMo mobile users at that time (Natsuno, 2003). It is believed that the unique Japanese culture is one of the reasons to explain the high market share of i-mode.

1.1 Research Objectives

Nowadays, m-commerce is regarded as a tremendous market potential for businesses and customers. As a result, it becomes significant for researchers to understand customers' mobile commerce adoption behavior and intention. The purpose of this research is to investigate the factors on usage intention within the context of people who have purchased online through mobile devices, e.g., smartphones and tablets.

The objectives of this research are as below:

1. To explore how national culture affects the use behavior of m-commerce by using Hofstede's national culture dimension.
2. To discover the factors which influence users on usage intention of m-commerce.
3. To discuss the impacts of these factors on m-commerce adoption in Taiwan.

2. Literature Review

2.1 Definitions of Mobile Commerce (m-commerce)

Smart phones and tablets have been growing in recent year, these mobile devices are widely accepted due to the convenience. Therefore, mobile commerce has become the latest and popular topic for today. The term Mobile Commerce was created by Kevin Duffey in 1997, he offered the preliminary definition of Mobile Commerce: '' *The delivery of electronic commerce capabilities directly into the consumer's hand, anywhere, via wireless technology*'', and since mobile commerce was new term at that time, Kevin Duffey explained m-commerce as simple definition: '' *A retail outlet in your best customer's pocket*''. There have been several definitions suggested for m-commerce. From narrow definitions, The Durlacher Mobile Commerce Report defines m-commerce as "*any transaction with a monetary value that is conducted via a mobile telecommunication network*". Broadly speaking, (Sadeh, 2003) characterized m-commerce as '' *the emerging set of application and services which people can access from Internet-enabled mobile devices*''. Overall, there are more definitions of m-commerce in detail shown in table 2.1.

After reviewing the definitions of m-commerce from other researchers, this research comment that m-commerce is the extension of e-commerce to mobile devices, i.e., smartphones and tablets, and it includes any monetary transaction of products and service with much simple interface and optimized process for users.

Table 2.1 Definition of m-commerce

Researcher	Year	Definition
Kevin Duffey	1997	The delivery of electronic commerce capabilities directly into the consumer's hand, anywhere, via wireless technology
Muller Veerse	1999	Mobile commerce is a subset of electronic commerce, and any transaction managed through mobile communication network or related to monetary values is considered mobile commerce.
Skiba	2000	M-commerce is "the use of mobile hand-held devices to communicate, inform, transact and using text and data via connection to public or private networks".
Kalle Lyytinen	2001	Mobile commerce involves the use of mobile computing devices in carrying out different types of economic transactions or enabling them to take place over space and time.
Kalevi Kontinen	2001	"the *m* stands for both *mobile* and *multi-modal*, and he identified key features of m-commerce as wireless &

		anywhere & moving".
Carlsson & Walden	2002	Mobile commerce is in many cases of common wisdom (and anecdotal evidence) understood as electronic commerce products and services offered on mobile platforms.
Sadeh	2003	M-commerce is "the emerging set of application and services which people can access from Internet-enabled mobile devices".
Yang	2005	M-commerce is defined as any direct or indirect transaction conducted and facilitated through a wireless telecommunication network.
Tiwari and Buse	2007	M-commerce is "any transaction, involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobiles access to computer-mediated networks with the help of mobile devices''.
Sharma	2009	M-commerce is the subset of e-commerce, which includes all e-commerce transactions, carried out using a mobile (hand held) device.

Wireless communications and services are enabled by the convergence of two technologies, the Internet and wireless technology such as smart phones and tablets. What's more, mobile wireless technologies consist of two aspects—mobility and computing. It's reported that mobile computing represents users' continuous access to network resources without limitation of time and location (Malladi & Agrawal, 2002). Moreover, m-commerce involves the use of mobile computing devices in carrying out different types of economic transactions or enabling them to take place over space and time. Therefore, the two advantages of m-commerce—mobility and reachability have attracted not only many users but also providers' attention in the last few year.

2.2 Hofstede's Cultural Dimensions Theory

User acceptance of technology is a complicated issue, especially when it concern that it is a multi-disciplinary subject pertaining psychological, technical, and social contexts (DL Day, 2006). Particularly, it's more difficult as it considers studying such behavior across more than one cultural background. Technology and culture are not in two parallel lines, instead, they intimately affect each other.

2.2.1 Cultural Dimensions Theory

Hofstede (1984) developed the most influential national culture theory by far, he conducted one of the most comprehensive studies of how values in the workplace are influenced by culture. Hofstede's primary data were extracted from a pre-existing bank of employee attitude surveys undertaken around 1967 and 1973 within IBM subsidiaries in 66 countries. It describes the effects of a society's culture on the values of its members, and how these values relate to behavior. By using a combination of empirical and eclectic analyses, Hofstede created and defined four dimensions of cultural variation - individualism/collectivism, power distance, masculinity/femininity, uncertainty avoidance, and plus Long-Term Orientation which was added in 1991 based on research by (Bond et al., 2004).

There are the definitions and descriptions of five dimensions for Hofstede's cultural dimensions theory as following:

1. Power Distance (PD): *The extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally.* Societies high in power distance are more autocratic and accept differences in power and wealth more readily than societies low in power distance. In contrast, Low power distance societies are less tolerable, and democratic participation is encouraged.
2. Uncertainty Avoidance (UA): *The degree of how societies accommodate high levels of uncertainty and ambiguity in the environment* (Hofstede, 1984). People in high uncertainty avoidance culture tend to be more emotional. They try to minimize the occurrence of unknown and unusual circumstances and to proceed with careful changes step by step planning and by implementing rules, laws and regulations. On the contrary, Societies low on this factor work to meet basic needs, are tolerant of various behaviors, and feel relatively secure. In some research, it indicated that UA is expected to be intimately associated with trust.
3. Individualism (IDV): *The "relationship between the individual and the collectivity which prevails in a given society* (Hofstede, 1984). In high individualism societies have loose ties among me mbers-everyone looks after his or her own interests and those of the immediate family. Societies low in individualism, hold group values and beliefs and seek collective interests.
4. Masculinity (MAS): *The distribution of roles between the genders to the extent that it is characterized by male or female characteristics* (Hofstede, 1984). More masculine societies place greater value on achievement, tasks, money, performance, and purposefulness, whereas more feminine ones emphasize people, the quality of life, helping others, preserving the environment, and not drawing

attention to oneself.

5. Long-term Orientation (LTO): *Long-term time orientation are posited to place great significance on the values of thrift, persistence, and long-term alliances* (Hofstede, 1984), this involves the fostering of virtues oriented towards future rewards. Long-term oriented societies attach more importance to the future. They foster pragmatic values oriented towards rewards, including persistence, saving and capacity for adaptation. In short term oriented societies, values promoted are related to the past and the present, including steadiness, respect for tradition, preservation of one's face, reciprocation and fulfilling social obligations.

2.3 Unified Theory of Acceptance and Use of Technology Model (UTAUT)

With quick expansions of wireless and mobile technology, Wireless technology has become an integral part of our life in the form of the mobile phone and mobile computing devices. However, there is still few research to identify the factors that affect customer intention to use m-commerce. Therefore, there is need for researchers to concentrate on how users apply and adapt for new technology.

Concerning with the research of technology acceptance behavior, the unified theory of acceptance and use of technology (UTAUT) is a technology acceptance model which is based on eight technology acceptance theories or models and formulated by Venkatesh in 2003. The purpose of UTAUT model is to explain user intentions to use an information system and subsequent usage behavior (Venkatesh, Morris, Davis, & Davis, 2003). The UTAUT model draws on the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behaviour (TPB), the combined TAM and TPB (C-TAM-TPB), the model of Personal Computer Utilization (MPCU), the Innovation Diffusion Theory (IDC) ,and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003). This research will review these important theories and models which were integrated with UTAUT.

The theory of reasoned action (TRA) was developed by (Fishbein & Ajzen, 1975). This theory is a well-established model that has been used broadly to predict and explain human behavior in various domains (Chen, Gillenson, & Sherrell, 2002). TRA predicts that behavioral intent is created or caused by two factors: our attitudes and our subjective norms. After that, in 1989, Davis developed the Technology Acceptance Model (TAM) which was originated from TRA. TAM predicts acceptance based on the end-user's perceived usefulness (PU) and perceived ease of use (PEOU) of the technology for a specific purpose. What’s the difference between

TRA and TAM, TAM replaces many of TRA's attitude measures with the two technology acceptance measures— ease of use, and usefulness. TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In the real world there will be many constraints, such as limited freedom to act (Bagozzi, Davis, & Warshaw, 1992). However, the most commonly reported limitation of TAM is the measurement of usage by relying on respondents' self-reporting and assuming that self-reported usage reflects actual usage, another shortcoming is that TAM provides only limited guidance about how to influence usage through design and implementation (Taylor & Todd, 1995; Venkatesh et al., 2003). To compensate with TAM, TAM2 is an extension of TAM introduced by (Venkatesh & Davis, 2000). Venkatesh and Davis made two processes on TAM2, the Social Influence Processes (Subjective Norm, Voluntariness, and Image) and the Cognitive Instrumental Processes (Job Relevance, Output Quality, Result Demonstrability, and Perceived Usefulness), were integrated into this model.

These two processes were considered to be crucial to the study of user acceptance. According to the research, the models of TAM and TAM2 account for only 40% of a technological system's use (Legris, Ingham, & Collerette, 2003). Then, (Venkatesh et al., 2003) found that IS or IT researchers were confronted with a choice among a multitude of models and were bound to choose constructs across models or choose a favored model, thus ignoring the contribution from alternative ones. They felt the need for a synthesis in order to reach a unified view of users' technology acceptance. UTAUT integrated advantages of each theories and models, and constructed to develop a whole new model. Unlike TAM and TAM2, UTAUT can account for an impressive 70 percent of the variance in behavioral intention and about 50 percent in actual use (Venkatesh, Thong, & Xu, 2012).

UTAUT was developed from the eight dominant models that have been used to explain technology acceptance behavior, also, UTAUT sorted out the four factors which can affect on use intention and behavior.

UTAUT assumes that four constructs act as determinants of behavioral intention and usage behavior, the constructs in the model were defined and related to similar variables in the eight models as follows:

1. Performance Expectancy (PE): *The degree to which an individual believes that using the system will help him/her to attain gains in job performance*

(Venkatesh et al., 2003). The constructs in the other models that pertain to performance expectancy are: perceived usefulness (TAM, and combined TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (DOI), and outcome expectancy (SCT). This construct, within each individual model, was the strongest predictor of intention and remained significant at all points of measurement in both voluntary and mandatory settings. The model hypothesizes that the degree of which performance expectancy directly influence behavioral intention and be moderated by gender and age. Some researches about gender differences demonstrate that men's motivation to accomplish tasks is much stronger. As for age, related researches show that younger people have stronger performance expectancy than older people (Venkatesh et al., 2003).

2. Effort Expectancy (EE): *The degree of ease associated with the use of system* (Venkatesh et al., 2003). The constructs in the other models that capture the same concept are: perceived ease of use (TAM), and complexity (DOI and MPCU). The construct in each individual model was significant in both voluntary and mandatory settings, and as expected from the literature it was significant only during the post training measurement. Effort expectancy will be influenced by gender, age, and experience. As for gender, the research of Venkatesh and Morris shows that women have stronger effort expectancy than men (Venkatesh, Morris, & Ackerman, 2000).
3. Social Influence (SI): *The degree to which an individual perceives that important others believe he/she should use the new system* (Venkatesh et al., 2003). The constructs are represented in following models: subjective norms (TRA, TAM2, TPB/DTPB, and combined TAM-TPB), social factors (MPCU), and image (DOI).

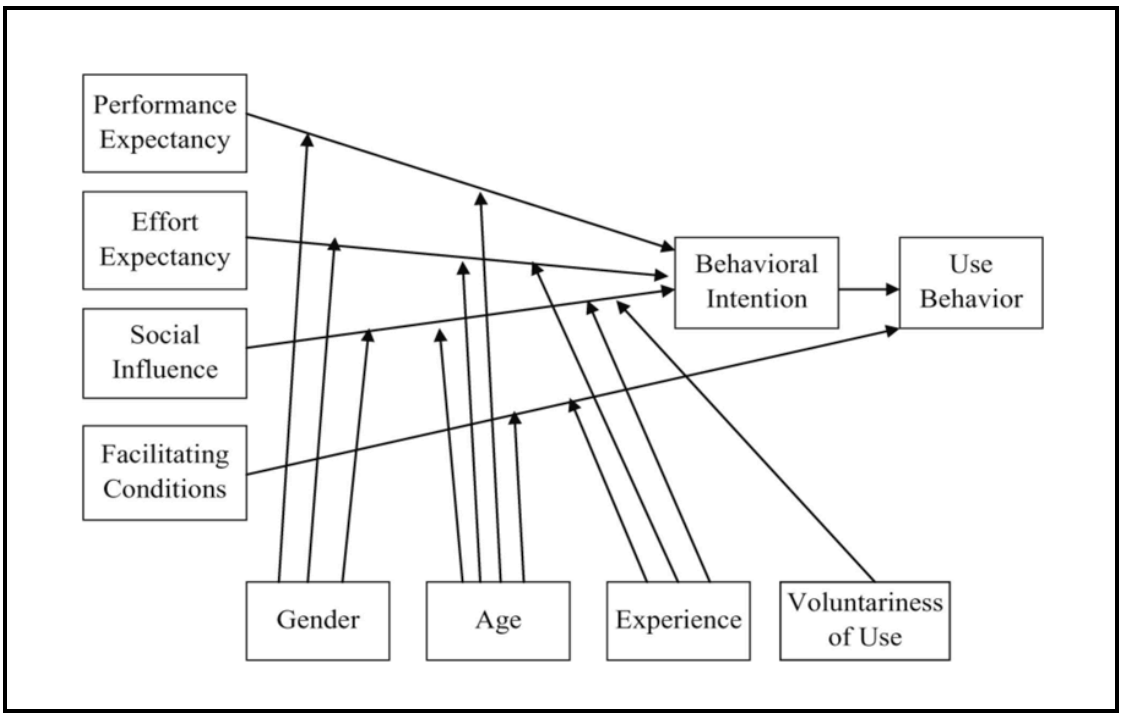
   These three constructs are about the influence of organizations, supervisors, and other people in a group, so they put them together to predict the impact of the psychological phase (Venkatesh et al., 2003).Social influence will be influenced by all moderators, which are gender, age, experience, and voluntariness of use. In other research, they suggest that women will be more aware of opinions from other people, and their intention toward using a system will be stronger (Miller, 2012; Venkatesh et al., 2000). As for age, from UTAUT, they found that elder people tend to be more sensitive to social influence, but the effects decline with experience.
4. Facilitating Conditions (FC): *The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.* (Venkatesh et al., 2003). This definition catches three different constructs

in existing models: perceived behavioral control (TPB/DTPB and combined TAM-TPB), facilitating conditions (MPCU), and compatibility (DOI).This construct is different from the other three. Facilitating conditions doesn't affect the intention behavior, but directly influences the user behavior. Facilitating conditions will be moderated by age and experience. According to UTAUT, the effect of age and experience will be stronger for elder workers, particularly with increasing experience.

According to (Venkatesh et al., 2003), the UTAUT model has four moderators: gender, age, experience and voluntariness. UTAUT proposed that gender would moderate the effect of performance expectancy, effort expectancy, except for social influence. As for gender, UTAUT expected male to be more likely to rely on performance expectancy when determining whether or not to accept a technology due to their highly task oriented nature. Differently, the technology acceptance for female may be determined by effort expectancy rather than performance expectancy.
In table 2.4, it's the description of key determinants and moderators in the UTAUT. In figure 2.1 shows the proposed model of UTAUT.

Table 2.4 Description of key determinants and moderators in the UTAUT

	Variables	**Description**
Key constructs	Performance expectancy	The degree to which an individual believes that using the system will help him/her to attain gains in job performance.
	Effort expectancy	The degree of ease associated with the use of system.
	Social influence	The degree to which an individual perceives that important others believe he/she should use the new system.
	Facilitating conditions	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.
Moderators	Gender	Male, Female
	Age	Continuous
	Experience	Ordinal
	Voluntariness of use	A categorical variable



Source: (Venkatesh et al., 2003)
Fig 2.1 Proposed model of UTAUT

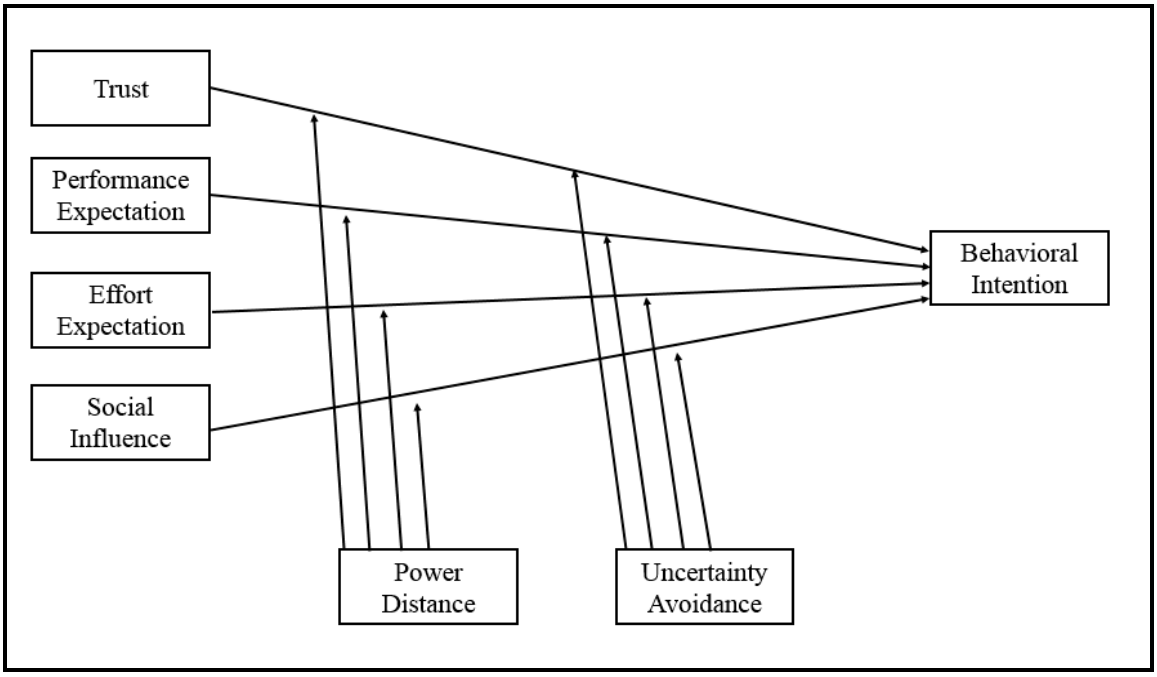
3. Research Methodology

3.1 Research Framework and Model

From above literature review, it is clear that there will be many factors impacting on the adoption of m-commerce still need to be found, and the model constructs need further to be tested. This research focuses on discovering the factors which influence users on usage intention of m-commerce, finds out the behavior of adopting m-commerce and acceptance of m-commerce, and also tries to test and modify the constructs of UTAUT model in the context of Taiwan. Based on these characteristics, this study applied the UTAUT model which was proposed by (Venkatesh et al., 2003). UTAUT model is a more complete model of technology acceptance, and it discusses more factors about the acceptance of new technology. Due to the characteristics of this research, UTAUT is adjusted and revised a little bit to fit the study.

The model of this research revised the original UTAUT model proposed by (Venkatesh et al., 2003). First, it tests the behavior and acceptance of new technology in a different time in UTAUT. This research belongs to cross sectional research, and data collected at one time. Second, this research aims to discover the factors which

influence users on usage intention of m-commerce, there are four independent variables (trust, performance expectation, effort expectation, social influence), and two moderating variables (power distance, uncertainty avoidance). The adjusted model is shown in Fig 3.1.



Source: (Venkatesh et al., 2003)

Fig. 3.1 Revised UTAUT model

3.2 Variables and Research Hypotheses

According to the original UTAUT formulation, we revised the UTAUT model. There are four independent variables, one dependent variable and two moderating variables. Independent variables are trust, performance expectation, effort expectation, social influence. Dependent variable is the behaviroal intention to use m-commerce by mobile devices. Moderating variables are power distance and uncertainty avoidance. We suggest the following hypotheses regarding the beharioral intention to use m-commerce by mobile devices, and the relationship between moderating variables and independent variables:

H1. Trust will significantly influences the behavioral intention to use m-commerce by mobile devices.

H2. Performance expectation will significantly influence the behavioral intention to use m-commerce by mobile devices.

H3. Effort expectation will significantly influences the behavioral intention to use m-commerce by mobile devices.

H4. Social influence will significantly influences the behavioral intention to use

m-commerce by mobile devices.

H5a. Power distance has a negtive relationship with trust to adopt m-commerce.

H5b. Power distance has a negtive relationship with performance expectation to adopt m-commerce.

H5c. Power distance has a negtive relationship with effort expectation to adopt m-commerce.

H5d. Power distance has a negtive relationship with social influence to adopt m-commerce.

H6a. Uncertainty avoidance has a positive relationship with trust to adopt m-commerce.

H6b. Uncertainty avoidance has a positive relationship with performance expectation to adopt m-commerce.

H6c. Uncertainty avoidance has a positive relationship with effort expectation to adopt m-commerce.

H6d. Uncertainty avoidance has a positive relationship with social influence to adopt m-commerce.

3.3 Questionnaire Design

A quantitative approach has been adopted in this paper, the questionnaire design is based on the UTAUT and Hofstede's cultural dimensions theory.

The survey questionnaire consisted of eight parts. The first part is demographic information. The other parts are factors of using m-commerce, the variables are performance expectancy (PE), effort expectancy (EE), social influence (SI), trust (TT), and behavioral intention (BI), Moderated variables are power distance (PD), and uncertainty avoidance (UA). Data were collected using a five point Likert-type scale, from totally disagree to totally agree. The items measuring three factors of UTAUT and behavioral intention were adapted from (Venkatesh et al., 2003).

3.4 Data Collection

To collect related data and test hypotheses, we use survey method for this research. The empirical data was collected through online survey, and the questionnaires were responded by users on different online platforms. We targeted people who had used m-commerce before in order to add the validity. To increase the response rate, we gave virtual money as incentives to respondents. The samples have been randomly selected, and all of them are anonymous.

4. Prospective Conclusion

This research investigate the factors influencing the technology adoption of mobile commerce in Taiwan. The prospective results will show the factors such as trust, social influencing, performance expectation, effort expectation, and convenience have a significant relationship with consumer decisions to adopt m-commerce. For moderating variables, the results of power distance and uncertainty avoidance provide some suggestions for mobile commerce service providers to improve its service for Taiwanese.

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