The Study of Elementary School Teacher's Behavior of Using E-books by UTAUT Model

Tzong-Shing Cheng, University of Kang Ning, Taiwan
Chen Pei Chen, University of Kang Ning, Taiwan
Shu-Wei Chen, Southern Taiwan University of Science and Technology, Taiwan

The Asian Conference on Education 2014
Official Conference Proceedings

Abstract
The purpose of this research is to apply Unified Theory of Acceptance and Use of Technology (UTAUT) model to investigate the factors that influence elementary school teacher's behavior of using E-books. Based on the literature review, a questionnaire was modified and used to test the elementary school teachers in Changhua. A total of 420 questionnaires were administered and 364 of them were returned, including 328 valid and 36 invalid questionnaires. The effective response rate is 78%. The methods of data analysis include descriptive statistics, factor analysis, Pearson's correlation coefficient, one way analysis of variance (ANOVA) and simple regression analysis. The results show that:

1. There were significant difference in the Elementary school teachers' "Performance Expectancy", "Effort Expectancy", "Social Influence", and "Facilitating Conditions" depending on their different "Demographic Variables".
2. "Performance Expectancy" and "Behavioral Intention to Use" are positively correlated.
3. "Effort Expectancy" and "Behavioral Intention to Use" are positively correlated.
4. There was no significant relationship between "Social Influence" and "Behavioral Intention to Use".
5. There was significant relationship between "Facilitating Conditions" and "Use ehavior".

Keywords: E-books, UTAUT, Elementary school teacher, Behavioral Intention to Use

Chapter One

Introduction

Research Background and Motivation

In order to cater to the age of technology, Ministry of Education is making every effort to promote the idea of combining technology with teaching; hoping to educate a new generation with creative energy and the ability of international communication. That is a new generation which is able to use “technology and English” actively. It looks like e-textbook has lots of advantages that do not exist in the hard-copy textbook, but will it be accepted and used largely by all of the teachers in elementary schools? The structure of e-textbook has the substance of digital information, so this research is to find out the willing ness and the influence factors of elementary school teachers to use e-textbook through technology acceptance model. Among numbers of theories of technology acceptance model, this research used Unified Theory of Acceptance and Use of Technology (UTAUT) which is addressed by four scholars in 2003- Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis and Fred D. Davis. UTAUT model integrated and improved the old technology acceptance model and provided a more rounded model to explain user’s technology usability behavior. The explanatory ability is around 70% which is much higher than other models that are of 17% to 42% explanatory ability, and it is the reason why I used this model as the research basis. In UTAUT model, Venkatesh(2003) believed user’s technology usability willingness would be influenced by “performance expectation”, “effort expectation”, “social influence” and “enabling factor”. The research goal is to find out the willing ness and the influence factors of elementary school teachers to use e-textbook, and these four perspectives are the variables of the research.

Research Purpose

This research adopted the Unified Theory of Acceptance & Use of Technology (UTAUT) from Venkatesh scholars as theory basis, and combined with questionnaire method. The data collected is compared and analyzed one by one directed against the variable of “performance expectation”, “effort expectation”, “social influence” and “enabling factor” to discuss the usage pattern and influence factor of elementary school teachers towards e-textbook. The main research purposes are:

1. Understand the current situation of elementary schoolteachers using e-textbook.
2. Analyze the correlation among “performance expectation”, “effort expectation”, “social influence” and “enabling factor” of elementary school teachers using e-textbook.
3. Compare the difference among “performance expectation”, “effort expectation”, “social influence” and “enabling factor” of elementary school teachers using e-textbook.
4. Discuss the key factors of influencing elementary school teachers using e-textbook.

Chapter Two

Literature Review

This research is to find out the current situation of elementary school teachers using e-textbook, and then understand the key factors which influence elementary school teachers using e-textbook. Therefore, this chapter put all of the relevant theories together as the theory basis for more discussions. There are three sections in this chapter, and they are development and definition of e-textbook, relevant research of e-book teaching in elementary schools, and relevant research of technology acceptance model theories.

Development and Definition of E-Textbook

E-book was first addressed in Project Gutenberg by Michael Hart in 1971. It was a project to upload the public books written in different languages from different parts of the world to server by volunteers. Through powerful storage and transmission ability of computer and internet, everybody can retrieve the data easily and readers could study the gem of human wisdom at any time in any place. The concept was to make sure information, book and other material could be easily read by any computer, software program or for reader to read, quote and look up. This could be seen as a pioneer project of potential e-book (LEI Shu-Yun, 2004).

The reasons why e-book could be developed maturely in the past few years were mainly for three factors. One was the content structure of e-book getting more mature and diverse, no matter it was novel, comic books or classic literature; all kinds of reading resources could be found through internet. Another was the continuous update of reading interface; at the age of desk top only, reading e-book would be limited by hardware facilities. Along with the launch of notebook, PDA, smart phone nowadays, the “portability” and “mobility” of e-book increased hugely. The other key factor was the change of lifestyle; with the development of MRT, lots of commuters read while commuting to work and it brought up the development of e-book (CHEN Zheng-Wei, 2009).

In terms of content, the same as traditional hard copy books, e-book has text and pictures; the difference is that e-book integrated multimedia and put text, graphics, still image, sound, animation, digital music, video and some special effects together through computer technology. The relevant topic content can be looked up via hyperlink, and the reading tools can be the devices of e-book reader or computer (YU Pei-Chun, 2006). HO Shu-Chin (2004) found out e-book has more advantages than hard copy book from her research; the advantages are as the following: 1. Easy to carry lots of books at the same time; 2. Easy to get; 3. Higher accessibility; 4. Good retrieval capability; 5. Easy to remark; 6. With the function of hyperlink; 7. Multimedia application; 8. With novelty.

Relevant Research of Using E-Book Teaching at Elementary School

Because of the flow of teaching with technology as well as the rise of e-whiteboard and e-book in recent years, they started to be introduced to schools and related training education systems in Europe, America, Hong Kong, Japan and Kore;

providing supportive services for technological teaching and learning. They are now actively introducing e-textbook to formal education environment in Japan, and announced IT promoting policy "iJapan Strategy 2015" in 2009. Under the item of talent cultivation, it focused on applying IT technology to develop digital learning environment in order to increase learning willingness of the students'. In "Haraguchi Vision" released later in the same year, one billion Japanese yen would be invested to develop collaborative learning project "Future Classroom". All of the school students are expected to have their own e-textbook before 2015, and the comprehensive development project will be completed in 2020. After several meetings of professional discussion, e-textbook will contain three parts: e-textbook for teaching, e-textbook for learning, and terminal learning devices. At the moment, some publishers provided developed e-textbook for teaching to real-life teaching practice, and teachers believed students' leaning concentration in class wass improved when they used e-whiteboard with e-textbook for teaching. Through the presentation of multimedia, the course content could be explained more actively. It also helped the improvement of students' actively learning willingness; continuous building up learning content would be carried on as well as selected suitable learning device (TSAI Pei-Shan, 2010). The education system and environment in Taiwan are similar to Japan; we actively promote teaching with technology in the recent years plus the rise of e-whiteboard and e-book, there are lots of relevant literatures within the country. Therefore, we know e-textbook has been widely applied to teaching in all kinds of subject areas in Taiwan.

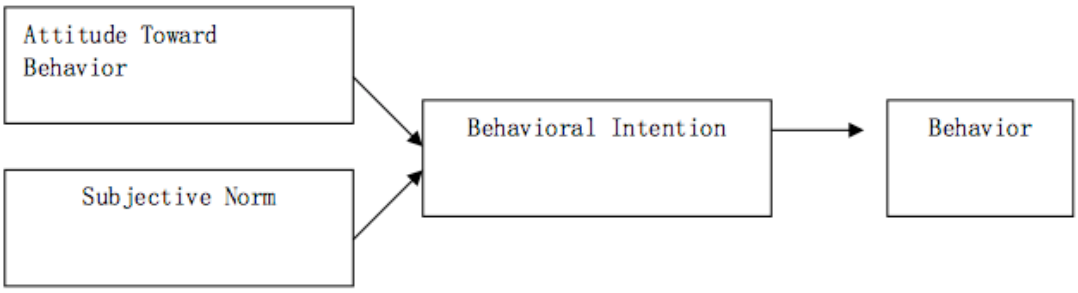
Using e-book for teaching has positive effects towards all of the learning areas for elementary school students, especially the benefits for the lower achievement students are better than the higher achievement students. Since using e-book for teaching is helpful for learning effects to most of the students, teachers at elementary schools should have high motivation to apply e-textbook on their teaching. However, some literatures addressed not all of the teachers have high motivation to use e-textbook for teaching.

Technology Acceptance Model Theory and Relevant Research

The flourishing development of information technology has a very deep influence towards human society; however, any advanced technology must be accepted and used by users before the impact arises. Thus, the research of technology acceptance relevant theories appeared.

The most famous relevant theory is Technology Acceptance Model (TAM) from Davis (1986), and the model was developed based on Theory of Reasoned Action (TRA). TRA was raised by Fishbein and Ajzen in 1975; according to Fishbein and Ajzen(1975), people's belief towards new technology and their evaluation after using it would influence their "attitude toward behavior". That was people has positive or negative perception for new technology user behavior, and it influenced "behavioral intention" directly. Other than "attitude", Fishbein believed personal "subjective norm" would have the effect on "behavioral intention". "Subjective norm" included two factors: one was that an individual would sense the expectation of not performing a specific behavior from another specific party, and the other was whether an individual should follow the expectation. According to reasoned action theory,

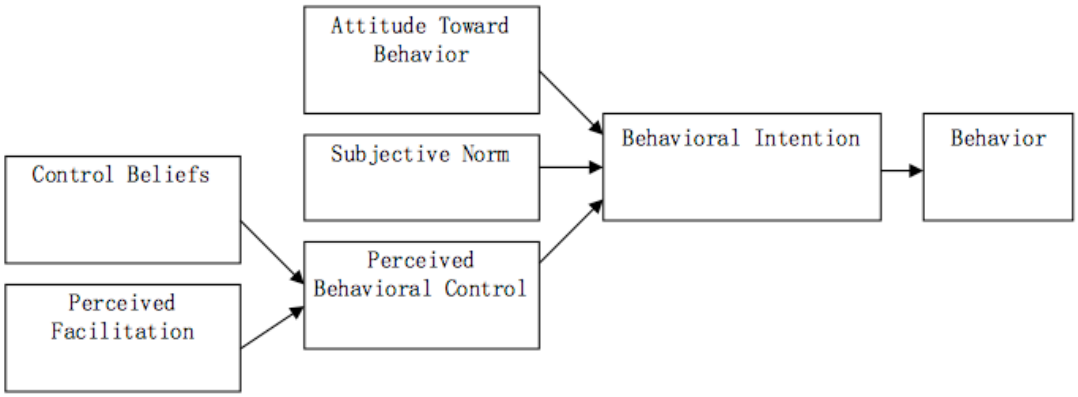
whether an individual perform a specific behavior was decided by their behavioral intention, and behavioral intention was decided by the attitude towards behavior and subjective norm. The model figure is as the following:



Source of Information: Fishbein & Ajzen (1975)

Figure 2-1 Theory of Reasoned Action (TRA)

After TRA, Ajzen extended the scale of original TRA in 1985 and put forward Theory of Planned Behavior (TPB). The aspect of Perceived Behavioral Control was added on top of the original structure of Behavioral Intention, and this aspect emphasized personal perception of how difficult a behavior is and self-control of whether to conduct the behavior or not. Ajzen(1985) believed this aspect was influenced by two variables; one was Control Beliefs, and the other was Perceived Facilitation. Control Beliefs is the personal subjective judgment of whether they can conduct the behavior; when people believe they won't be able to do something, the possibility of doing it will become lower. Perceived Facilitation is the convenience of conducting the behavior that people sense, and that is the resource availability when people conduct the behavior. Therefore, the opportunity of successfully behave is higher when people believe they have sufficient ability as well as sufficient resource and chances, and then higher possibility of doing something under self-control. Compared with TRA, TPB is much closer to the status of real behavior. The model figure is as the following:



Source of Information: Ajzen (1985)

Figure 2-2: Theory of Planned Behavior (TPB)

After TRA and TPB, Davis et al addressed Technology Acceptance Model(TAM) in 1989. The model was revised from TRA proposed by Fishbein and Ajzen (1975), and it was mainly structured according to the characters of Information System (IS). The purpose was to explain the deciding factor of how users towards the acceptance of information technology. The difference from TRA was TAM believed Behavioral Intention only decided by Attitude, and Attitude would be influenced by two beliefs- Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness refers to subjective perception of users believe some technology could increase personal working performance, while Perceived Ease of Use focuses on the expectation from a user using technology free of effort. It is worth noting that TAM model emphasized the important of users' subjective perception. That is when users don't sense the usefulness of using the technology, they wouldn't use it even though the technology could increase their working performance. Thus, compare with Perceived Ease of Use, Perceived Usefulness has outstanding link with users' attitude. However, the perceived ease of use from the users would strengthen the perceived usefulness of the users. Moreover, TAM model also focused on the importance of External Variables; External Variables included user characteristics, system character, organization factors. These External Variables influenced Attitude through Perceived Usefulness and Perceived Ease of Use, and further influenced Behavioral Intention and Behavior. The model figure is as the following:

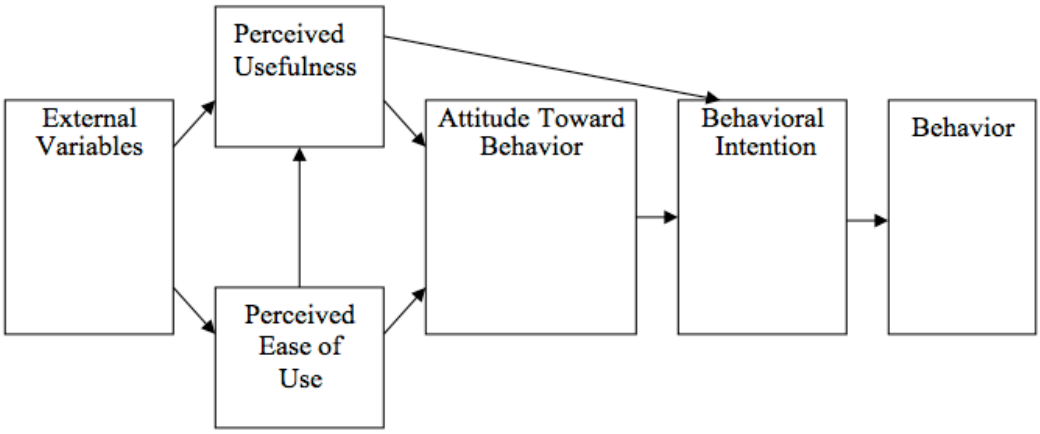


Figure 2-3: Technology Acceptance Model (TAM)

Source of Information: Davis (1989)

Because TAM Model was revised from Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975), it had the same limitation as TRA. It over-emphasized the importance of subjective perception from users, and believed people would decide to use as long as they have positive attitude towards information system used. However, information system always cost money, time and professional knowledge; even though the personal subjective perception is positive, it still might be out of use because of lacking some specific factor.

TAM Model is with both theory and simplicity as well as focuses on the use of information system, and it always plays an important role in the research of Technology Acceptance Model. Scholars started to continuous modify the limitation of TAM Model; after 10-year development, Venkatesh and Davis put the research in

the pat years together and addressed TAM2 Model in 2002. The model figure is as the following: (the dotted line is the adjustment effect)

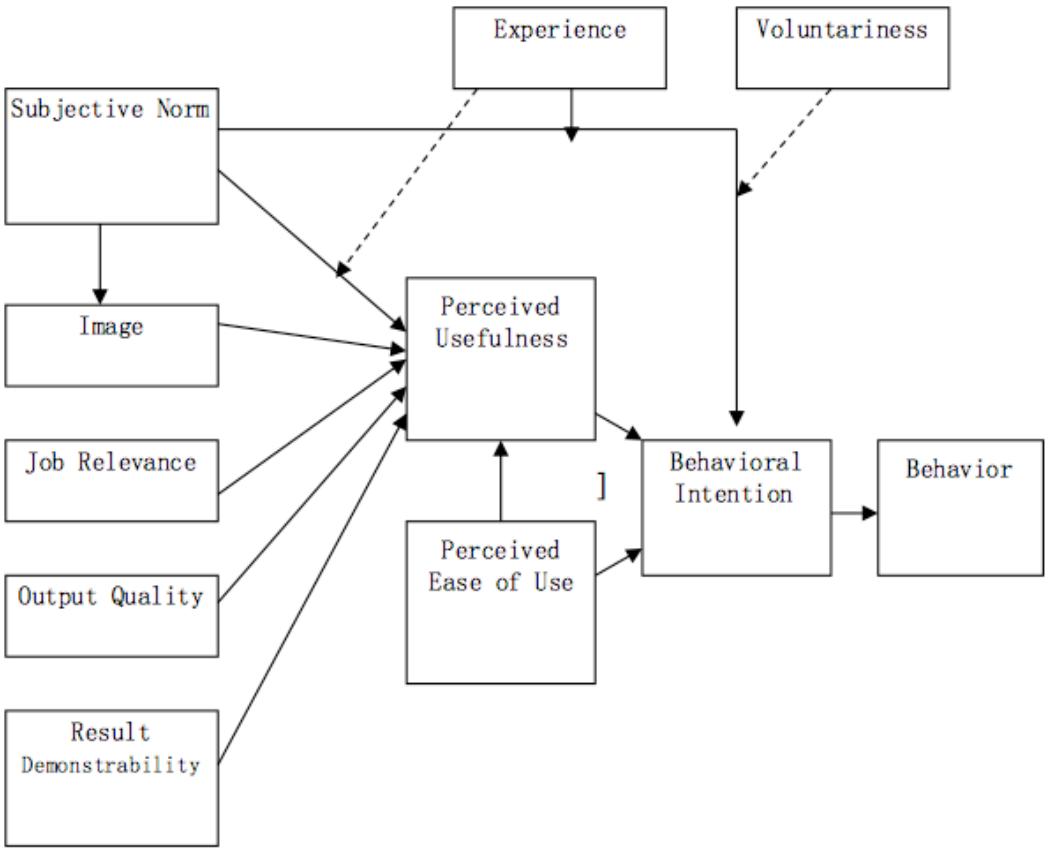
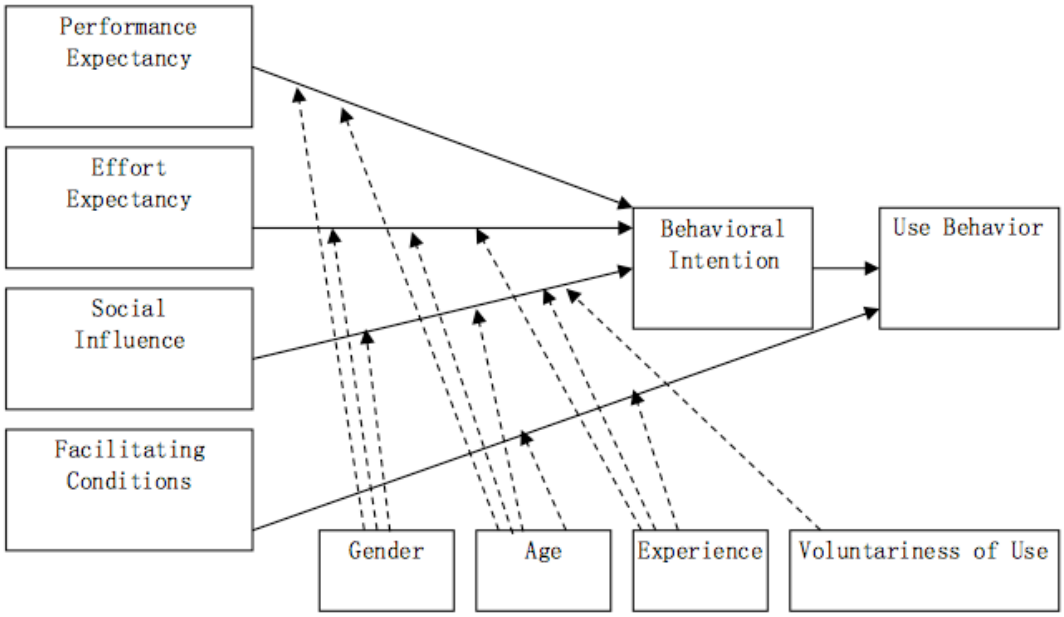


Figure 2-4: Technology Acceptance Model (TAM2)

Source of Information: Venkatesh & Davis (2000)

In TAM2 Model, there are two processes which influence Perceived Usefulness; they are Social Influence Processes and Cognitive Instrumental Processes. Social Influence Processes include Subjective Norm, Image, and two interference variables Voluntariness and Experience. Cognitive Instrumental Processes refer to "the judgment that people have towards to perceived usefulness partly is from whether the system has enough power to complete their demand cognition." (Venkatesh & Davis,2000; quoted from SU Po-Fang, 2004) including Job Relevance, Output Quality, Result Demonstrability, Perceived Ease of Use four factors. Among cognitive instrumental processes, Perceived Ease of Use is how easy to use certain technology (system) that people believe, Job Relevance is what extent of certain technology (system) could be applied to work that people believe, Output Quality is how well the technology (system) could complete a task, Result Demonstrability is the effectiveness of using the technology that people demonstrate, and these four will all influence Perceived Usefulness. In addition, TAM2 argued Subjective Norm would also influence Perceived Usefulness through Image; that is once the key member in a group considers an individual team member should do something (ie. using certain technology), and doing it will increase the position or image of the individual in the team; the individual would be willing to follow this Subjective Norm,

and the social support & team member cognition gained from this would increase the personal performance in the team or at work (Pfeffer, 1982; quoted from Venkatesh et al.,2000) to increase Perceived Usefulness and then reach higher Behavioral Intention. TAM2 proposed two main processes which influence Perceived Usefulness and conducted deep research, and expanded the original TAM Model more completely. In 2003, Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis and Fred D. Davis proposed Unified Theory of Acceptance and Use of Technology (UTAUT); it integrated several technology acceptance model and construct an integrated theory model. UTAUT Model consolidated and improved the old technology acceptance model to provide a more completed model to explain technology using behavior from users. Its explanatory ability achieved 70%, which is far more better than other previous model that only achieved 17% to 42%; thus, UTAUT model played an important role towards the research of technology acceptance (SUN Chien-Chun,CHENG Ying, KO Ching 2007). UTAUT Model included four main aspects: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Moreover, UTAUT Model added four adjustment variables, and they are Gender, Age, Experience and Voluntariness of Use. The model structure is as the following:



Source of Information: Venkatesh et al.(2003)

Figure 2-5: Unified Theory of Acceptance and Use of Technology (UTAUT) (TAM2)

Chapter Three

Research Method

This chapter is to explain the design of this research and the way it is conducted, and this is descripted in the order of research structure, research method, research object, sampling method, variable operational definition, research hypothesis, questionnaire design, questionnaire testing and data analysis.

Research Structure

This research used Unified Theory of Acceptance and Use of Technology (UTAUT) as the theory basis. Under this model structure, the research found Performance Expectancy, Effort Expectancy, Social Influence from elementary school teachers when using e-textbook might affect their Behavioral Intention while Facilitating Condition and its Behavioral Intention might influence their Use Behavior of using e-textbook. How the above variables influenced one another might be different by the gender, age, position and teaching experience of users as well as the population interference of years of using e-textbook. The research structure is as shown on figure 3-1:

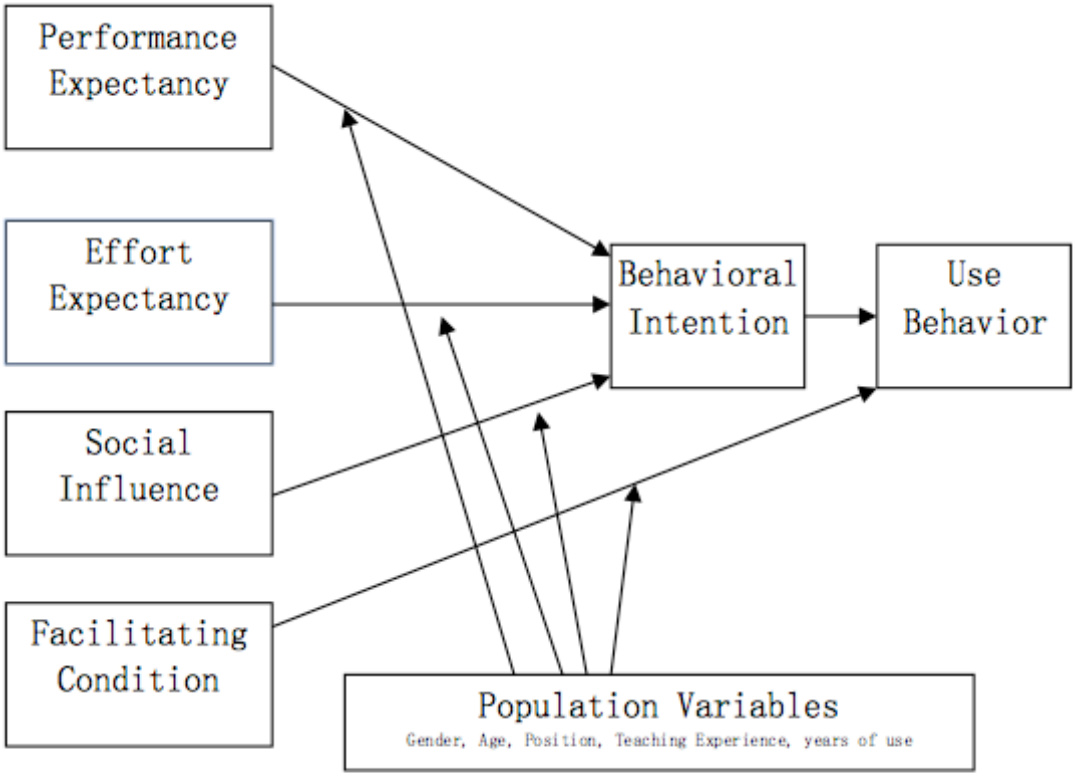


Figure 3-1: Structure of The Research
Source of Information: From This Research

Research Object and Sampling Method

The research was to find out the willingness of elementary schoolteachers in using e-textbook, and explore deeply the main factor which influenced the willingness of elementary schoolteachers using e-textbook. Limited by research time, this research couldn't conduct general investigation; in order to sample easily, this research used elementary school teachers in Chang Hua County who have real experience in using e-textbook in academic year 2012 as research object. To increase the representativeness of the samples and consider the time available of the researcher's as well as the budget limitation, the research used stratified random sampling- using school scale as stratified basis before sampling. According to the data of "Statistic of General Status of Elementary School and High School" (academic year 2012) from Department of Statistics, Ministry of Education, currently there are 175 elementary

schools in Chang Hua County. The research classified school scale according to class number with “Less than 12 classes”, “Between 13-36 classes” and “More than 37 classes”. Sampling 10% schools from each scale classification, and it turned out to be 18 schools, as shown on table 3-1.

Table 3-1: Scale of Elementary Schools in Chang Hua County

School Scale	Less than 12 (included)	Between 13-36	More than 37 (included)	Total
School Number	95	60	20	175
Sampling Number	10	6	2	18
Sampling School	Ming-Hu, Rao-Ming Tong-An, Te-Xing Fu-Xing, Nan-Ya Han-Bao, Ming-Sheng Guang-Xing, Bao-Shan	Ching-Shan, Yuan-Dong Bai-Sha, Shi-Hu Da-Cun, Hao-Hsiu	Nan-Kuo, Yuan-Lin	
% of Samples	56%	33%	11%	100%

Source of Information: Department of Statistics, Ministry of Education ; The Outcome of This Research

After stratified random sampling, the numbers of the sampling school will be the sample numbers. Conduct simple sampling for the sample number of each school needed. Table 3-2 showed the numbers of sampling class and the questionnaire copies given of this research.

Table3-2: Summary of Questionnaire Numbers

School Scale	Sampling School	Class Number	Issued Copy
Less than 12 (included)	Ming-Hu	6	6
	Rao-Ming	12	12
	Tong-An	12	12
	Te-Xing	6	6
	Fu-Xing	12	12
	Nan-Ya	12	12
	Han-Bao	11	11
	Ming-Sheng	11	11
	Kuang-Xing	6	6
	Bao-Shan	8	8
Between 13-36	Ching-Shan	21	21
	Yuan-Dong	25	25
	Bai-Sha	16	16
	Shi-Hu	25	25
	Da-Cun	31	31
	Hao-Shiu	25	25

More than 37 (included)	Nan-Kuo	80	80
	Yuan-Lin	95	95
Total		420	420

Source of Information: Department of Statistics, Ministry of Education ; The Outcome of This Research

Research Hypothesis

According to above research structure and variable operational definition, the research hypothesis is as the following:

H1：Elementary school teachers with different Population Statistic Variable have outstanding difference in Performance Expectation, Effort Expectation, Social Influence and Facilitating Condition.

H2：Performance Expectation and Willingness of Using E-Textbook have relevant correlation.

H3：Effort Expectation and Willingness of Using E-Textbook have relevant correlation.

H4：Social Influence and Willingness of Using E-Textbook have relevant correlation.

H5：Facilitating Condition and Willingness of Using E-Textbook have relevant correlation.

Chapter Four

Conclusion and Suggestion

Research Conclusion and Findings

In terms of current situation of e-textbook used by elementary school teachers, this research found that more than 90% of elementary school teachers who have used e-textbook were the participants of information education seminars while the motivation of using e-textbook was 90% for the demand of teaching, followed by teachers' personal interest. Regarding to the area of e-book, e-book related to language and mathematics were used the most; the research found average 5-7 times per week was the most frequency in using e-textbook. Considering the e-textbook using willingness and its influence factor, the research found Population Statistic Variable has outstanding difference in Performance Expectation, Effort Expectation, Social Influence and Facilitating Condition. Performance Expectation of elementary school teachers using e-textbook would be different because of gender, position, years of using e-textbook and years of teaching experience; Effort Expectation of elementary school teachers using e-textbook would be different because of gender, position, and years of teaching experience; Social Influence of elementary school teachers using e-textbook would be different because of position, years of using e-textbook and years of teaching experience; Facilitating Condition of elementary school teachers using e-textbook would be different because of gender, age, years of using e-textbook and years of teaching experience. Talking about Performance Expectation, the research revealed that female was easier to be influenced to use e-textbook than male because it could increase working efficiency; pure administrative staff and substitute teachers were easier to use e-textbook simply because it could increase teaching effects. It was

obvious that elementary school teachers who have used e-textbook for more than three years would chose to carry on using it than those who have less than three-year experience, and those who were with senior teaching experience (more than 15 years) had better using willingness than those who were with less experience because e-textbook could increase teaching outcomes. As for Effort Expectation, the research found that female was easier to be influenced than male; this meant female was more willing to try than male if e-textbook was easy to use. Substitute teachers would be easier to decide to use it than other formal teachers while senior teachers (with more than 15-year teaching experience) would decide whether to use it because of how easy the user interface was than those who were with less experience. In the aspect of Social Influence, the research found that pure subject teachers, those who have ever used e-textbook for more than three years, and those who were senior teachers would be influenced by realizing how others thought about whether to use e-textbook. With regard to Facilitating Condition, the research revealed that female, seniors teachers(more than 50 years old) as well as the teachers who have ever used e-textbook for more than three years and those who were with less experience (less than five years) were easier to be influenced because of the resources and support that the organization could offer when using e-textbook.

This research also revealed there were outstanding positive correlation among Performance Expectation and Effort Expectation towards Behavioral Willingness; that was the behavioral willingness would increase if e-textbook could increase the working performance of elementary school teachers plus they didn't need to spend too much time in learning how to use and operate the e-textbook.

References

1. Ajzen, I. (1985). “From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckman (Eds.), Action-control: From cognition to behavior, pp. 11-39. Heidelberg: Springer.
2. Ajzen, I.,& Fishbein, M. (1975). "Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research." Reading: Addison-Wesley Publishing Company, Inc.
3. Davis. (1989). “The Influence of Individual Differences on Skill in End-user Computing.” Management Science 25(10), pp 966-979.
4. Davis. (1989). “Perceived usefulness, perceived ease of use, and user acceptance of information technology.” MIS Quarterly, pp 319-340.
5. Venkatesh & Davis (1996). “A model of the antecedents of perceived ease of use:Development and test.” Decision Sciences 27(3), pp 451.
6. Venkatesh & Davis (2000). “A theoretical extension of the technology acceptance model:Four longitudinal studies.” Management Science 46(2), pp 186-204.
7. Venkatesh, V., and Morris, M. G., “Why Don’t Men Ever Stop to Ask For Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior”, MIS Quarterly (24:1), 2000, pp. 115-139.
8. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). “User acceptance of information technology: Toward a unified view.” MIS Quarterly 27(3), pp 425-478.