A Study of Fuzhou's Undergraduate Behavioural Intentions to Use Tablet Personal Computer as Replacement of Textbook

Fan Haiyang[1], Rohizan Binti Ahmad[2], Tet-Khuan[3]
[1, 2, 3]Asia Pacific University of Technology and Innovation
[1]fan_haiyang@foxmail.com, [2]rohizan@apu.edu.my, [3]tet.khuan@staffemail.apu.edu.my

Corresponding author email: tet.khuan@staffemail.apu.edu.my

***Abstract*— Under the background of education informatization, the traditional classroom teaching mode and student learning style are quietly changing. Based on paper textbooks can no longer adapt to the current educational concept. In order to measure Fuzhou's undergraduate's acceptance of new information technology, this paper used Unified Theory of Acceptance and Use of Technology (UTAUT) model to explore the intention of Fuzhou's undergraduates to use tablet personal computer instead of textbook. Total of 300 respondents which selected from 6 universities were collected using simple random sampling. Correlation Test show that Performance Expectancy (r=0.421, p<0.01), Effort Expectancy (r=0.387, p<0.01), Social Influence (r=0.582, p<0.01), Attitude of Using Technology (r=0.634, p<0.01), Facilitating Condition (r=0.587, p<0.01), Self-Efficacy(r=0.635, p<0.01) were significantly related to Fuzhou's Undergraduate Behavioral Intentions to use Tablet personal computer as Replacement of Textbook. From the multiple regression model, F (7, 292) = 59.261, 57.7% variance of the Fuzhou's undergraduate behavioral intention to use tablet PC as replacement of textbook was explained by five predictors, namely: Effort Expectancy, Social Influence, Attitude of Using Technology, Facilitating Condition, and Self-Efficacy. Implication and limitation also discussed.**

***Keywords*— Tablet PC; UTAUT model; Behavioral Intention; User Acceptance**

1. Introduction

Alan Kay from the Xerox Palo Alto Research Center proposed the concept of tablet personal computer (tablet PC). He imagined that this is a computer that can be carried to everywhere. The main function is to help children learn [1]. The iPad is the first tablet PC which have achieved great success in the consumer market. Encouraged by Apple, major electronics brands such as Samsung and Huawei have also launched their own tablet PC. In 2017, Apple sold about 40 million iPads [2]. The use of tablet PCs in the education has gradually become widespread [3]. The University of Ontario Institute of Technology, Bentley College, University of Texas at Austin and Massachusetts Institute of Technology has used tablet PC as a teaching tool in 2003 [5]. John Williams, the MIT Laboratory Director said: "The tablet is a 'killer' computer: powerful enough to do a lot of digital calculations, flexible enough to track jobs and deadlines, and enough Compact and unobtrusive, it can be brought to meetings or classrooms and lectures." The University of Ontario Institute of Technology (UOIT) is reported to be the first University in Canada to fully embrace the Tablet PC, which are currently used in every course at UOIT's School of Science [17].

In China, most universities are still taught in paper-based books (Le, 2017). According to a study of Sichuan's university students' use of textbooks and the willingness to recycle textbooks, 67.34% of students indicated that books are expensive, and only 11.26% of them have experience of using second-hand textbooks [21]. Based on other survey conducted at Tianjin University of Science & Technology in 2016, 46% of undergraduates indicated that they rarely buy or never buy second-hand textbooks. The reason for not choosing second-hand textbooks mainly from 20% of the students think that it is inconvenient to purchase second-hand textbooks. 30% of respondents choose to sell or throw away after using the textbook [22]. From the "China Education Reform and Development Plan" issued by the State Council of China, the development and use of electronic textbooks have developed into an inevitable trend in the reform of textbooks in universities and colleges. Universities should increase their efforts to promote electronic textbooks [9]. Therefore, it is meaningful to study the behavioural intension of undergraduates on tablet PC instead of textbooks in Fuzhou.

2. Literature Review and Formulating Hypothesis of the Research

The purpose of this article is to investigate Fuzhou's undergraduate Behavioural Intentions to use Tablet personal computer as replacement of Textbook, the hypotheses presented are as follows:

H_{01}: There is a significant relationship between performance expectancy and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

Performance expectancy is that an individual believes that using the new technology or system will help increase work or study performance. In [20] found performance expectancy to be the strongest predictor in UTAUT model [18] developed a UTAUT-based model to analyze the use of management information system in the higher education environment. From their study, performance expectancy also had the positively influence.

H_{02}: There is a significant relationship between Effort Expectancy and Fuzhou's undergraduate behavioural

intention to use tablet personal computer as replacement for textbook.

Effort expectancy refers to the degree of ease associated with the use of tablet PC. In contrast to [20], a German study findings explained 27% of the variance in behavioural intention to use tablet PC, while effort expectancy appeared at the same time to be the only significant predictor [10].

H_{03}: There is a significant relationship between Social Influence and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

Social influence is the degree to which an individual perceives that important others believe he or she should use the new technology or system. In this study social influence refers to the degree to which a student perceives that important others such as faculty, advisors, and peers believe he or she should use tablet PC. In [20] found that social influence had a low positive relationship in UTAUT model.

H_{04}: There is a significant relationship between attitude of using technology and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

According to Technology Acceptance Model, Theory of Reasoned Action, individuals with a positive attitude towards a technology are more likely to accept a technology than those not showing such an attitude [6]. However, [20] indicate that attitude represents an interesting case where it has shown to be a significant determinant of acceptance in some studies while not being significant in other studies. Another study applied the UTAUT to examine university students' acceptance of the tablet PC [15]. The results indicated that student attitude is the determinant with the most direct influence.

H_{05}: There is a significant relationship between facilitating condition and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

Facilitating conditions are the degree to which a student believes that an organizational and technical infrastructure exists to support his or her use of tablet PC. In [15] indicated that facilitating conditions that affect integration to use technology tools indirectly. According to [4], facilitating conditions was not measurably significant in this new technology introduction.

H_{06}: There is a significant relationship between self-efficacy and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

H_{07}: There is a significant relationship between anxiety and Fuzhou's undergraduate behavioural intention to use tablet personal computer as replacement for textbook.

UTAUT does not use it as a direct determinant, although self-efficacy and anxiety are important direct determinants of intrinsic motivation, affect toward use and affect (SCT) intentions [14]. Self-efficacy and anxiety are modelled as indirect determinants of intention and are completely regulated by perceived ease of use. Studies have shown that self-efficacy and anxiety are conceptually and empirically different from expected efforts. Self-efficacy and anxiety are important determinants of intentions in the SCT [20]. In conclude, there may be a correlation between self-efficacy and anxiety and the acceptance of a tablet PC as a substitute for textbooks by university students.

3. Underpinning Theories

3.1 Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Fred D. Davis in the field of information systems/computer technology based on Theory of Reasoned Action (TRA) [19]. Used to explain and predict people's acceptance of information technology. Its purpose is to find an effective behavioral model for explaining the behavior of users in information technology to accept new information systems, and to analyze the factors that affect user acceptance. This model provides a theoretical basis for understanding the impact of external factors on the user's internal beliefs, attitudes, and intentions, which in turn affects the use of technology [12]. This model can be used universally for interpretation or Predict the factors that influence the use of information technology.

3.2 Unified Theory of Acceptance and Use of Technology Model

However, TAM model is only able to predict 40 percent to 60 percent technology adoption of the users. Based on this situation, another technology acceptance model has developed in order to achieve higher prediction. The modified model extended TAM model was known as UTAUT Model, the model incorporates variables under demographic and social perspectives [14]. Performance Expectancy in the four core dimensions of UTAUT refers to "the extent to which individuals feel that the use of the system is helpful" [4]. Effort Expectancy refers to "how much effort is required to use the system personally". Social Influence Refers to the extent to which individuals feel the influence of surrounding groups, including Subjective Norm, social factors, and public image. Facilitating Conditions refers to "individuals". The extent to which the organization supports the use of the system in terms of related technologies and equipment is felt [16].

UTAUT also pointed out that there are four control variables that have significant impact on the above core dimensions, namely gender, age, experience and voluntariness. The results of [20] found that the combined effects of two or more control variables made the effect more significant.

4. Research Methodology

4.1 Research Population, Sample Size, and Sampling Technique

Fuzhou is located in the eastern part of China. The capital of Fujian Province, the political, cultural and transportation center of Fujian Province. A total of 17 universities are in Fuzhou, with a total of 310,000 undergraduates [13]. The research data comes from the questionnaire. The questionnaire was

distributed to 6 universities, namely, Minjiang University, Fujian Agriculture and Forestry University, Fujian Normal University, Fujian Medical University, Sanming University, Jiangxia University. According to the Krejcie and Morgan (1970), the minimum number of samples is 245, 300 questionnaires will be issued,100 students were recruited in respective year of one, two and three. This study used simple random sampling as sampling as technique. The questionnaire was filled out by the students from the above universities, and there is not limited to gender and study programs.

4.2 Measurement of the Variables

The questionnaire is from [14]. The instruments will employ a 5-point Likert Scale anchored from 1 representing "Strongly Disagree" to 5 representing "Strongly Agree". The scores of each variable were added to obtain a sum score. A higher score indicates a higher consistency with the behavioural intension of undergraduates on tablet PC instead of textbooks. IBM SPSS 19 as statistical tool to analyse the collected data and to perform analyses to test hypotheses. The value of the Cronbach's Alpha for the Behavioural Intention is 0.612, Performance Expectancy is 0.683, Effort Expectancy is 0.692, Social Influence is 0.852, Attitude of Using Technology is 0.677, Facilitating Condition is 0.606, Self-Efficacy is 0.814, and Anxiety is 0.772. All of the value of Cronbach's Alpha is higher than 0.6 (Guildford, 2006). Therefore, the variables in this research were considered as consistent.

5. Results and Discussion

5.1 Independent Sample T-Test

Independent Sample T-test aims to test whether students from Fujian Province and other provinces in China have different intentions in using tablet personal computers instead of textbooks. Analysis results shows that there is no significant difference between the Residence and Performance Expectancy ($t = -0.445$, $p > 0.05$), Effort Expectancy ($t=-0.446$, $p>0.05$), Social Influence ($t = 0.217$, $p > 0.05$), Attitude of Using Technology ($t = 0.68$, $p > 0.05$), Facilitating Condition ($t= -0.846$, $p > 0.05$), Self-Efficacy ($t = -0.29$, $p > 0.05$), Anxiety ($t = 1.107$, $p > 0.05$) and Fuzhou's Undergraduate Behavioural Intentions to use Tablet personal computer as Replacement of Textbook.

5.2 One-Way ANOVA Test

The purpose of using ANOVA in this study is to analyse the relationship between all variables and study years of university students. The results indicate that there is significant difference between Behavioural Intention ($F = 7.077$, $p < 0.05$), Effort Expectancy ($F = 5.496$, $p < 0.05$), Social Influence ($F = 4.469$, $p < 0.05$), Attitude of Using Technology ($F = 3.222$, $p < 0.05$), Self-Efficacy ($F = 3.730$, $p < 0.05$) at different level of study years. Specifically, students within higher study level have more intention of using a tablet PC instead of a textbook. Performance Expectancy ($F = 0.544$, $p > 0.05$), Facilitating Condition ($F = 2.149$, $p > 0.05$) and Anxiety ($F = 1.426$, $p > 0.05$) have no significant difference between student's education level.

5.3 Pearson Moment Correlation Test

The Correlation Test shows that Performance Expectancy ($r = 0.421$, $p < 0.01$), Effort Expectancy ($r = 0.387$, $p < 0.01$), Social Influence ($r = 0.582$, $p < 0.01$), Attitude of Using Technology ($r = 0.634$, $p < 0.01$), Facilitating Condition ($r = 0.587$, $p < 0.01$), Self-Efficacy($r = 0.635$, $p < 0.01$) were significantly related to Fuzhou's Undergraduate Behavioural Intentions to use Tablet personal computer as Replacement of Textbook. However, Anxiety ($r = 0.056$, $p > 0.01$) was negatively related to Fuzhou's Undergraduate Behavioural Intentions to use Tablet personal computer as Replacement of Textbook. The results of this test are consistent with the previous study conducted in Kuala Lumpur (Foon, 2014).

5.4 Multiple Regression Test

The results of the multiple regression test determined all selected variables, Performance Expectancy, Effort Expectancy, Social Influence, Attitude of Using Technology, Facilitating Condition, Self-Efficacy and Anxiety would affect the student's Behavioural Intentions to use Tablet personal computer as Replacement of Textbook.

The results are as follows: $F (7, 292) = 59.261$, 57.7% variance of the Fuzhou's undergraduate behavioural intention to use tablet PC as replacement of textbook was explained by five predictors, namely: Effort Expectancy ($\beta = -0.107$), Social Influence ($\beta = 0.196$), Attitude of Using Technology ($\beta = 0.196$), Facilitating Condition ($\beta = 0.209$), and Self-Efficacy($\beta = 0.354$). The final model is shown in the Figure. The final

Behavioural intention to use tablet personal computer as replacement for textbook =0.787 - 0.107 Effort Expectancy + 0.135 Social Influence + 0.178 Attitude of Using Technology + 0.248 Facilitating Condition + 0.328 Self-Efficacy.

regression model produced by enters method for behavioural intention to use tablet personal computer as replacement for textbook is:

Furthermore, Figure 1 shows that one standard deviation increase in Effort Expectancy score brings 0.107 standard deviation decrease in dependent variable (behavioural intention to use tablet personal computer as replacement for textbook), and one standard deviation increase in Social Influence score brings 0.107 standard deviation increase in dependent variable. Further, the Self-Efficacy was the most influential than other predictors.

6. Conclusion, Limitation and Suggestion for Future Research

The results of the multiple regression test determined all independent variables. Performance Expectancy, Effort Expectancy, Social Influence, Attitude of Using Technology, Facilitating Condition, Self-Efficacy and Anxiety would affect the student's Behavioural Intentions to use Tablet personal computer as Replacement of Textbook. However, Performance Expectancy is not a relevant variable for this topic, where this can be explained because most people still regard tablet PCs as entertainment devices over learning tools. Through the questionnaire, 64% of university students started using

computers before middle school and have rich experience in using computer, this may explain that Anxiety is not a problem for Fuzhou's undergraduates. Therefore, the result in this study does not fit with the result from previous studies.

In term of limitation, the limit is that the number of female respondents is higher than that of males, according to [20], effort expectancy is more important in women, so the results of this study may be affected by male and female not equally distributed. All examined respondents were selected only from 6 universities of the 17 Fuzhou's universities. Due to time and cost constraints, the sample size of the study is relatively small. Hence, this result can only be interpreted as Fuzhou's Undergraduate Behavioral Intentions to use Tablet personal computer as Replacement of Textbook. In addition, the reliability of this study depends on the honesty of respondents, and the data of respondents may be biased because respondents spent their time participating in the survey.

Future research should cover all of Fuzhou's universities. The research can be conducted on universities in different cities of China. More data could be collected to ensure the reliability of the results. It is also important that future research to equally distribute between male and female respondents to avoid the gender bias. In addition, the university environment should take into account. Because this may affect the undergraduate students' intention to use tablet PC. Then influence the research results. In the end, it is recommended that similar research should also extend in elementary and junior schools.

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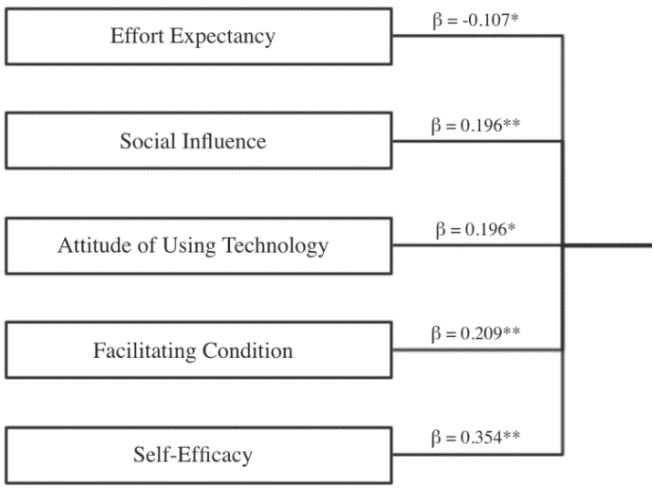
Figures

Figure 1: Final model of this study



* Correlation is significant at the 0.05 level of significance
** Correlation is significant at the 0.01 level of significance

Tables

Table 1: Descriptive results of respondent background (N=300)

Variables	n	Percent (%)
Gender		
Male	136	45.33
Female	164	54.67
Residence		
Fujian Province	225	75
Other Provinces	75	25
University		
Minjiang University	91	30.33
Fujian Agriculture and Forestry University	77	25.67
Fujian Normal University	33	11.00
Others	99	33.00
Program of study		
Engineering	111	37.00
Management	32	10.67
Economics	31	10.33
Others	126	42.00
Education level		
Year 1	100	33.33
Year 2	100	33.33
Year 3 & above	100	33.33
Began using computer/laptop in		
Primary School	121	40.33
Middle School	71	23.67
High School	41	13.67
University	67	22.33

Table 2: Analysis of Variance (ANOVA)

Variables	Mean Score			F	Sig.
	Year 1	Year 2	Year 3&4		
Behavioral Intention	15.70	15.70	17.00	7.077**	0.001
Performance Expectancy	31.53	31.09	31.60	0.544	0.581
Effort Expectancy	24.37	24.01	25.25	5.496**	0.005
Social Influence	17.32	17.33	18.77	4.469*	0.012
Attitude of Using Technology	20.34	20.68	21.40	3.222*	0.041
Facilitating Condition	13.02	13.26	13.32	2.149	0.118
Self-Efficacy	18.43	17.73	18.86	3.730*	0.025
Anxiety	11.03	11.73	11.24	1.426	0.242
Note: *p<0.05, **p<0.01					

Table 3: Itemize Questionnaires

No.	Using the Tablet PC in my classes would ... ...
PE1	Enable me to accomplish tasks more quickly.
PE2*	Hamper my performance.
PE3	Would increase my productivity.
PE4*	Hamper my effectiveness in class.
PE5	Make it easier to do my homework.
PE6*	Hamper the quality of the work I do.
PE7	Because my classmate perceives me as competent.
PE8	Increase the instructors respect for me.
PE9*	Decrease my chances of getting good grade.
PE10	Be useful in my classes.
EE1	Learning to operate the Tablet PC is easy for me.
EE2	I find it easy to get the Tablet PC to do what I want it to
EE3	My interaction with Tablet PC would be clear and understandable.
EE4	I find the Tablet PC to be flexible to interact with.
EE5	It is easy for me to become skillful at using Tablet PC.
EE6	I find the Tablet PC easy to use.
EE7	Using the Tablet PC takes too much time from my normal duties.
EE8	Working with Tablet PC is so complicated, and difficult to understand.
AT1	Using the Tablet PC is good idea

AT2*	I dislike the idea using the Tablet PC.
AT3	Using the Tablet PC is pleasant.
AT4	The Tablet PC makes schoolwork more interesting.
AT5	Using the Tablet PC is fun.
AT6	I like working with Tablet PC.
SI1	People who influence my behavior think that I should use the Tablet PC.
SI2	People who are important to me think that I should use the Tablet PC.
SI3	Using the Tablet PC can improve prestige among lecturers.
SI4	Using the Tablet PC can improve prestige among students.
SI5	In general, the university has supported the use of the Tablet PC.
SI6	Having the Tablet PC is a status symbol in my university.
FC1	I have the resources necessary to use Tablet PC.
FC2	I have the knowledge necessary to use the Tablet PC.
FC3	The Tablet PC is not compatible with another computer system I use.
FC4	Using the Tablet PC fits into my work style.
BI1	Whenever possible, I intend to use Tablet PC in my studies.
BI2	I perceive using the Tablet PC as Involuntary.
BI3	I plan to use the Tablet PC in the next three months.
BI4	To extend possible, I would use the Tablet PC to do different things (school or Not school) related.
BI5	To the extent possible, I would use the Tablet PC in my studies frequently.
SE1	I could complete a task using the Tablet PC if there was no one around to tell me what to do as I go.
SE2	I could complete a task using the Tablet PC if I had seen someone else demonstrate how it could be used.
SE3	I could complete a task using the Tablet PC if I could call someone to help if I got stuck.
SE4	I could complete a task using the Tablet PC if I had a lot of time to complete the job.
SE5	I could complete a task using the Tablet PC if I had just the built-in help facility for assistance.
AQ1	I feel apprehensive about using the Tablet PC.
AQ2	It scares me to think that I could lose a lot of information by using the Tablet PC and pressing the wrong key.
AQ3	I hesitate to use the Tablet PC for fear of making mistake I cannot correct.
AQ4	The Tablet PC is somehow intimidating to me.

Source: (Moran, 2006)