EXTENDING TAM WITH SOCIAL NORM TO MODEL STUDENTS' INTENTIONS TO ADOPT ICT

Samuel Nii Boi Attuquayefio
Akwasi Kyere Achampong
Ishmael Tetteh Aryeetey
Methodist University College Ghana

Abstract

This study seeks to investigate problems associated with students' acceptance of information and communication technology (ICT) at tertiary institutions. An extension of the Technology Acceptance Model(TAM) with subjective norm was employed by the researchers to examine the effect of perceived ease of use, perceived usefulness and social norm on students' intention to accept and use ICT provided for learning and research at a university.

A total of 500 questionnaires were administered to students from Methodist University College Ghana, with 259 returned recording 51.8% return rate. SPSS 16 and AMOS 20 and Excel 2007 were used to analyze the data collected. Structural Equation Modeling was used to appraise the measurement and structure model.

Social norm (SN) (β=0.84, $p < .05$) significantly predicts perceived ease of use (PEOU) and afterward PEOU(β=0.74, $p < .05$) also significantly predicts perceived usefulness (PU). However, the effect of PEOU, PU and SN on behavioural intention (BI) is insignificant. The effect of BI (β=.16, $p < .05$) significantly predicts use behaviour (UB). Overall, the model accounted for 37.% of the variance in intention to use ICT among student .

Keywords: Perceived Ease of Use, Perceived Usefulness, Social Norm, Behavioural Intentions, Use Behaviour

Introduction

The advent of ICT has revolutionalized the face of how businesses are conducted on a global scale. According to Laudon (2010), organizations invest heavily in information systems to achieve six strategic business objectives: operational excellence; new products, services, and business

models; customer and supplier intimacy; improved decision making; competitive advantage; and survival. Most administrators of higher educational institutions have incorporated ICT to teaching and learning with the view of achieving the objectives posit by Laudon(2010). In the opinion of Krista et. al. (2012), the use of ICT may facilitate innovative teaching and learning practices in educational settings. However, in Laudon (2010) view, significant investment in ICT does not necessarily guarantee higher returns unless the investment is supported with some necessary complimentary assets.

It is therefore necessary to investigate factors that influence acceptance of information and communication technology (ICT) by students of tertiary Institutions. The study examines students' behaviour towards ICT adoptions by examining behavioural intentions and use behaviour. Researchers have applied several theoretical models to look for factors which influence behavioural intentions to use technology to be able to manage user behaviour. These models include Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975); Planned Behaviour (TPB) Ajzen, (1991), Technology Acceptance Model (TAM Davis, F. D. (1989) ; Combined-TAM-TPB (C-TAM-TPB) (Taylor and Todd 1995), Motivational Model (MM(Davis et al., 1992)), Innovation Diffusion Theory (IDT) (Rogers 1995) and others. Combination of the listed models have been applied as theoretical model in some situations whiles in others, these models have been extended with additional factors.

The principal motivation of this study is, an observed under-utilization of ICTs provided by administrators of MUCG for teaching, learning and research by students and lecturers juxtaposed on the assertion by Gulbahar (2007) that despite huge educational ICT investments made in teaching and learning, there is little evidence in its adoption. The researchers were compelled by this situation to undertook this study to really appreciate why both students and lecturers rarely used the ICTs provided.

Technology Acceptance Model (TAM) was one of the first technology acceptance models developed (Davis 1989). It was based on Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). According to Davis (1989), perceived usefulness (PU) and perceived ease of use (PEOU) both affect people’s intention to use, which in turn contributes to either usage or non-use. Figure 1 shows the relationship between TAM's constructs while Table 1 describes the main constructs in this model and additional construct use in the study.

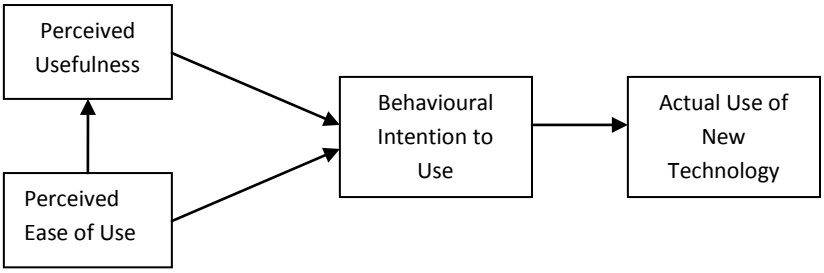

Figure 1: Technology Acceptance Model (Tam), Source: Davis et al (1989)
Source: Davis et al. (1989)

Table 1*: *Description of TAM variables

Constructs	Description
Perceived Usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance, Davis(1989)
Perceived Ease of Use (PEOU)	The degree to which a person believes that using a particular system would be free of effort. Davis (1989)
Subjective Norm	A person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen 1975, p. 302).
Behavioural Intention	Refer to consumers' perceptions of the resources and support available to perform a behaviour Venkatesh et al. (2003)

Table 1: Technology Acceptance Model Constructs and Description

Davis (1989) indicated that usefulness was more significantly affected by usage than ease of use. Perceived usefulness had a stronger correlation with user acceptance of technology. Major strengths of TAM are that, it provides factors which lead to information systems acceptance, provides room for extensions and elaborations better than other competing models (Taylor & Todd 2001). Some observed shortfalls highlighted by the users of the model include its failure to establish barriers that hinder technology adoption (Taylor & Todd 2001) and possibly its simplicity, which has led to its over-use at the expense of designing other models. TAM's acceptance in Information Systems (IS) research is documented in Lee, Kozar and Larsen (2003). TAM is a preferred choice of models when parsimony, research costs and outcomes are considered (Mathieson, 1991). For example, TAM explains more variance in attitude toward technology, and a comparable percentage of variance in usage, than the Theory of Planned Behavior (Mathieson, 1991; Taylor and Todd, 1995).

TAM is one of the theories unified by Venkatesh et al (2003). This model is tailored to information systems contexts, and was designed to predict information technology acceptance and usage on the job. TAM

excludes the attitude construct in order to better explain intention parsimoniously. TAM2 was formulated by extension of TAM with subjective norm as an additional predictor of intention in the case of mandatory settings Venkatesh and Davis (2000). TAM has been widely applied to a diverse set of technologies and users.

Methodology

A total of 500 questionnaires were administered to students from Methodist University College Ghana. Only 259 were returned recording 51.8% return rate. The researchers adopted the purposive sampling method to enable them delve deep into students behaviour towards ICT for learning and research as well as having sample that conveys the idea that represent the population Cresswell (2009).

Research Model

The study seeks to investigate problems associated with students' acceptance of information and communication technology (ICT) at tertiary institutions. The factors that may influence ICT acceptance by MUCG students are illustrated in figure 1 which depicts model for the study. The model is based on TAM Davis(1985) and has 5 constructs.

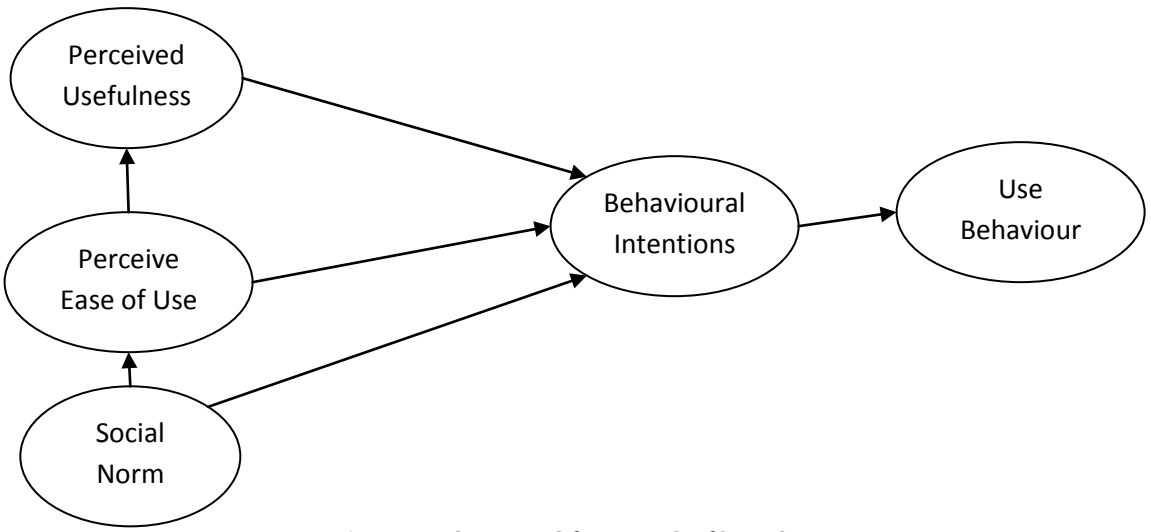

***Figure 1**: Theoretical framework of hypotheses.*

Research Hypothesis

In accordance with the previously stated purpose of the study and consistent with related literature, this study tested the following hypotheses:

H1: Perceive Usefulness positively influence behavioural intentions to use ICT for learning by students of MUCG

H2. Perceived Ease of Use positively influence students' behavioural intention to use ICT

H3: Social Norm conditions positively influence behavioural intentions of students to use ICT for learning and research

H4: Social Norm directly influence perceived ease of use which in turn positively influences perceived usefulness

H5: Behavioural intentions directly influence students' usage behavior of ICT provided for learning.

Data Collection and Analysis

Data was collected from Methodist university college Ghana using questionnaire. The design of the questionnaire was in two parts. The first part was based on seven-point Likert scale and the second part was deigned to glean some demographic information from respondents. The seven-point Likert scale ranges from (1) and (7) representing strongly agree and strongly disagree respectively, (2) and (6) also represent moderately agree and disagree respectively. (3), (5) and (4), represent agree, disagree and neutral. A total of 500 questionnaires were administered and 259 were returned recording 51.8%. The circulations of the questionnaires were done by the researcher and class representatives from the classes chosen. This exercise was carried out immediately after classes. AMOS 20 , SPSS 16 and Microsoft Excel were the tools used to analyze the data collected

Table 2 shows selected demographics of the respondents. It is observed that 52.1% of the students use ICTs provided by the institution once or more a day while 30.1% of the students use the ICTs Once a week. 1.9% and 5.0% of the respondents respectively use the ICTs once and twice in a month. Table 2 further shows that 27% of the students never use the ICTs provided by the institution for teaching, learning and research. Results clearly show that usage of ICT by students of MUCG is undesirable. Table 4 presents the distribution of usage in terms of ages. 14.3% and 12.2% of students below 20 years and between 20 and 30 years respectively had never used the ICT provided by the university for learning and research. For ages between 31-44 and 45 above the percentage of never used ICT provided were 7.8 and 6.7 respectively

Table 2: *Demographic Data of the Respondents (N=259)*

Character		Frequency	Percent
Gender	Male	176	68
	Female	83	32
Age	Under 20	7	2.7
	20 -30	147	56.8
	31-44	90	34.7
	45 and above	15	5.8
Educational Level	Diploma	37	14.3
	First Degree	140	54.1
	Masters	82	31.6
Frequency of Usage	Once or more a day	136	52.5
	Once a week	78	30.1
	Twice a month	5	1.9
	Once a a month	13	5.0
	Never	27	10.5

Table 3:A*ge * Usage Crosstabulation*

			Usage					
			Once or more a day	Once a week	Twice a month	Once a month	Never	Total
Age	Under 20	Count	2	2	0	2	1	7
		% within age	28.6%	28.6%	.0%	28.6%	14.3%	100.0%
	20 -30	Count	74	46	4	5	18	147
		% within age	50.3%	31.3%	2.7%	3.4%	12.2%	100.0%
	31-44	Count	52	25	1	5	7	90
		% within age	57.8%	27.8%	1.1%	5.6%	7.8%	100.0%
	45 and above	Count	8	5	0	1	1	15
		% within age	53.3%	33.3%	.0%	6.7%	6.7%	100.0%
	Total	Count	136	78	5	13	27	259
		% within age	52.5%	30.1%	1.9%	5.0%	10.4%	100.0%

Table 4*: *Data for ICT adoption using TAM indicators.

Descriptive Statistics			
	N	Mean	Std. Deviation
pu1: I find ICT provided by my institution useful to my study	259	5.78	1.814
pu2: Using the ICT provided by my institution enhances the quality of my work	259	5.58	1.782
pu3: Using ICT provided by my institution increase my productivity	259	5.55	1.832
pu4: Using ICTs provided by my institution increase my chances of getting good grade	259	5.24	1.829
peou1: My interaction with ICTs available in my institution is clear and understandable	259	5.13	1.742
peou2: It is easy for me to become skilful at using the ICTs provided by my institution	259	5.15	1.875
peou3: I find it easy to use ICTs provided by my institution	259	5.13	1.893
peou4: Learning to operate ICTs provided by my institution	259	5.07	1.775
sn2: Peers think that I should use the ICT provided by my institution	259	5.05	1.859
sn3: Professors in my institution have been helpful in the use of ICT	259	5.06	1.985
sn4: People who are important to me think I should use the ICTs provided by my institution	259	5.24	1.956
bi1: I intend to use the ICTs provided in the next semester	259	5.85	1.616
bi2: I predict I would use the ICTs provided in the next semester	259	5.56	1.793
bi3: I plan to use the ICTs provided in the next semester	259	5.86	1.608
ub1: I use the ICT provided by my institution to search for information for my research	259	5.23	1.911
ub2: I use the ICTs when learning in class	259	4.92	1.830
ub3: I use the ICTs for accessing personal materials	259	4.76	1.964

Table 4 illustrates the descriptive statistics of TAM constructs indicators. The table shows that the mean values for perceived ease of use, perceived usefulness and social norm indicators are between 5 and 6, which implies that most of the students' responses were either somewhat Agree and Moderately Agree. The descriptive statistics also suggest that most of the respondents agree with the statements in the questionnaire as observed in table 4.

Analysis of Measurement Model

Structural equation modeling data analysis requires two major steps. They include the measurement and structural models appraisal Hair et al (2006). The first step involves the determination of convergent and

discriminant validity while the second step appraise the structural model to establish the strength and direction of the relationships among the constructs. For a good measurement indicator, factor loadings must be at least 0.5 however, 0.7 is preferred. Also, the minimum threshold for construct reliability and average variance extracted should be 0.7 and 0.5 respectively Hair et al.(2010).

Measurement of Reliability and Construct Validity

AMOS 20.0 statistical software and Microsoft Excel 2007 were used to evaluate the construct validity and the reliability of the measurement instrument. The following equation, CR= $(\sum$ factor loading$)^2$ / $((\sum$ factor loading$)^2 + \sum$ measurement error) and AVE= $\sum$ (factor loading$)^2$/n were used to measure the construct reliability and average variance extracted (AVE) respectively. The AVE was measured to check for convergent validity. Table 5 presents the factor loadings of each indicator, CR and AVE for each construct. The values in the table portrays adequate evidence of validity and reliability, since factor loadings exceed 0.5, CR and AVE figures exceed the recommended threshold of 0.7 and 0.5 respectively.

Table 4: *Standard item loadings, Composite Reliability and Average Variance Extracted*

Construct	Indicator	Factor Loadings	AVE	CR
	Pu4	0.74		
	Pu3	0.91		
	Pu2	0.91		
Perceived Useful	Pu1	0.81	.72	.91
	Peou4	0.81		
	Peou3	0.83		
	Peou2	0.87		
Perceived Ease of Use	Peou1	0.81	.69	.90
	Sn4	0.82		
	Sn3	0.72		
Social Norm	Sn2	0.71	.57	.80
	Bi1	0.83		
	Bi2	0.81		
Behavioural Intention	Bi3	0.85	.69	.87
	Ub1	0.75		
	Ub2	0.88		
Use Behaviour	Ub3	0.74	.63	.83

In the opinion of Hair et al.(2010), to appraise the fitness of a model, it is ideal to use at least one absolute and one incremental fit measures in addition to the χ^2 and the associated degrees of freedom. Table 6 presents fit indices, recommended cut off values, actual values and the corresponding authors who recommended those values. Clearly all the actual values

computed fall within the acceptable region. Hence the results revealed that the measurement model fit with the data collected

Table 6: Fit Indices, cut off and actual values

Fit Indices	Cut off	Actual Values	Authors
$\chi 2/df$	<3	1.55	Bagozzi, R.P., & Yi. 1988
AGFI	>.8	.90	Chau, P.Y. K & Hu P.J.H 2001
RMSEA	<.08	.046	Brown M. W. & Cudeck R ,1993
CFI	>.9	.98	(Bagozzi, R.P., & Yi. 1988)
NFI	>.9	.94	Chin and Todd, 1995, Hair et al., 1998

Discussions

Technology acceptance research have varying results with different supporting technology acceptance models or theories. Results from some research are in line with what the original authors' postulates whiles some contradict.

The researchers of this study seek to provide further understanding of issues surrounding acceptance of information and communication technology (ICT) by students of tertiary institutions using the TAM extended with subjective norm. The effect of the constructs SN, PEOU and PU on behavioral intentions to use the institution's ICT were statistically insignificant and contradicts Jen-her et al (2008) results in testing the technology acceptance model for evaluating healthcare professionals' intention to use an adverse event reporting system. The results further suggested SN significantly predicts PEOU. PEOU also significantly and positively influence PU. This is in line with Amin, (2007) and Shim & Viswanathan, (2007) predictions. Table 5 and figure 2 present the relationships between the variables namely PEOU, PU, SN, BI and UB.

Table 5 :*Relationship between exogenous and endogenous variables; Estimate is the standardized* regression coefficient; S.E is the standardized error; C.R. is the critical region and P is the significant level

PATHS			Estimate	S.E.	C.R.	P
PEOU	<---	SN	0.844	0.071	11.823	***
PU	<---	PEOU	0.738	0.063	11.672	***
BI	<---	PEOU	0.357	0.188	1.895	0.058
BI	<---	PU	0.167	0.132	1.264	0.206
BI	<---	SN	0.038	0.141	0.267	0.79
UB	<---	BI	0.169	0.078	2.182	0.029

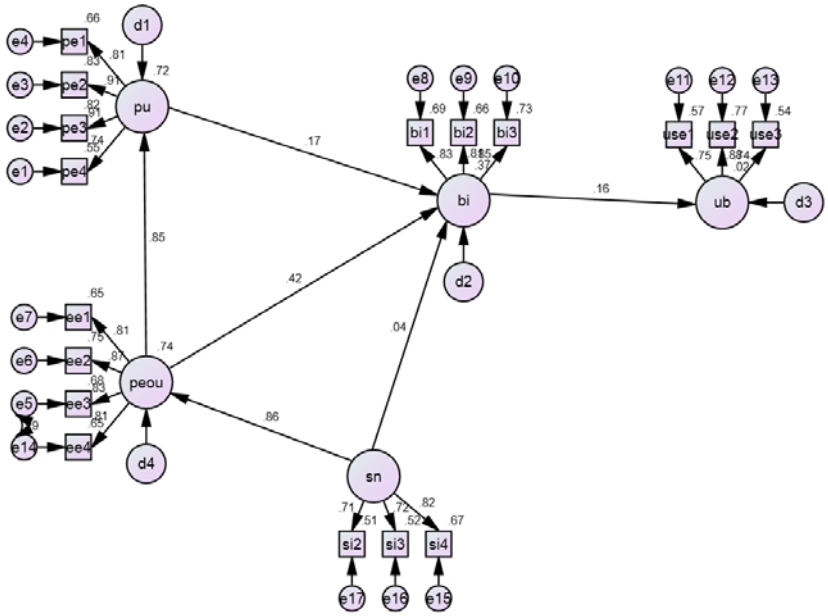

Figure 2*: Results of Structural Modeling Analysis*

Conclusion

The study provides insights into Ghanaian private students behaviour towards ICT usage when TAM model extended with SN was applied. Out of the five hypotheses stated, three were supported by the model. SN significantly predicts PEOU which subsequently predicts PU significantly. BI also significantly predicts UB. The results show that friends and lecturers influence are important contributors to students' perceived ease of use of the ICT provided by administrators for learning and research. It is therefore essential for authorities of these institutions to use lecturers and peer groups to nature the intuition of the ease of using the ICTs provided for teaching, learning and research. In addition, the researchers are of the opinion that when students become aware of the ease of use of the ICTs, they would then discover the usefulness of these tools which would lead to students formulating intensions to use ICTs provided and subsequently use them for learning and research.

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