International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2010, Vol. 6, Issue 1, pp. 102-116.

Modeling computer usage intentions of tertiary students in a developing country through the Technology Acceptance Model

Eben Afari-Kumah
University of Ghana/CSIR, Ghana

Akwasi Kyere Achampong
Methodist University College, Ghana

ABSTRACT

This study aims to examine the computer usage intentions of Ghanaian Tertiary Students. The Technology Acceptance Model was adopted as the theoretical framework to ascertain whether it could help explain behavioral intentions of individuals to accept and use technology. Factor analysis was used to assess the construct validity of the initial research model and to uncover any additional factors influencing students' behavioral intentions. Multiple Linear Regression analysis was done to determine the extent to which dependent variables were predicted by independent variables. T-tests were used for test of significance.

This study reveals that the age and level/year of tertiary students as well as prior experience of computer usage have no significant influence on perceived usefulness of a computer. Experience however significantly influenced perceived ease of use whilst age and level/year of students did not. The study also indicates that both perceived usefulness and perceived ease of use had a significant effect on the attitude of students towards their computer usage. Interestingly, only perceived usefulness significantly influenced the students' intention to use the computer. Thus fundamental changes may have to be made to the Technology Acceptance Model if it is to be applied to a developing country such as Ghana.

This research was limited to one particular university. The study did not consider data on actual computer usage. Further research would have to consider these factors. The findings of this research and the model developed provide a basis for individuals who have to make a decision concerning computer usage of tertiary students in a developing country.

BACKGROUND OF THE STUDY

Computer usage has increased in various tertiary institutions. Various computer types such as laptops, desktop computers, and palmtop computers are now available to tertiary students. Students can thus make use of Computer Based Tutorials (CBTs); store large volumes of books (e-books) quickly submit their assignments to their lecturers through the internet as well as download lecture notes from the internet.

Other tools available to students include instant messaging, emailing, search engines for research, web-based resources, access to library catalogues, and graduate degree programs online. Web-based learning technologies are increasing on college campuses as developers have created easy-to-use courseware applications such as E-campus (used by Regent University College Ghana) and KEWL(Used by the University of Ghana).

Two trends are evident with regards to educators identifying incentives for integrating computers in their teaching. These are student accomplishment, rather than educator external rewards; and the ability of students to use computers as a tool for their own purposes.

At an increasing number of universities, computers are gradually becoming a requirement for incoming students in preparation for their career success. Employers value extensive experience with Information Technology and are expecting their higher education graduates to be computer literate (Rola, 2002). Previous researchers have shown that laptop computers in the classroom can lead to positive educational outcomes (Finn and Inman, 2004).

The focus of this study is on the computer usage intentions of students in tertiary institutions in Ghana. Modern trends require that students use the computer a lot in their studies. Very little is known about computer usage intentions of Ghanaian tertiary students. There is therefore the need for empirical research on the intentions of computer usage among tertiary students.

OBJECTIVES OF THE STUDY

The main objective of the study is to investigate the behavioral intentions of computer usage among Ghanaian Tertiary students using a single institution as a case study. This may help to explain the key factors affecting the decision of students to use computers in their study. The long-term goal of the study is to help in the design and improvement of policies aimed at fostering the adoption, acceptance and usage of computer based technologies at all levels of tertiary education.

The study also examines the role of factors such as age, level and the computer usage experience of a student in determining the computer usage intentions of tertiary students in a developing country like Ghana. The application of the suggested model to both the background and experience of students highlights the similarities and differences of computer usage intentions among the different tertiary students in Ghana.

REVIEW OF THE LITERATURE

The introduction of various Information System Technologies is reducing geographical constraints and changing interpersonal communication dynamics. Information Technology is also dramatically affecting the way people teach and learn.

As new information technologies infiltrate workplaces, homes, and classrooms, research on user acceptance of new technologies has started to receive much attention from professionals as well as academic researchers. Developers and software industries are beginning to realize that lack of user acceptance of technology can lead to loss of money and resources.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) has received great respect in the information technology and information systems literature (Davis, 1989; Davis, Bagozzi, and Warsaw, 1989).The key purpose of TAM is to trace the impact of external variables on internal beliefs, attitudes, and intentions. The TAM focuses on information system use. The model is illustrated in Figure 1.

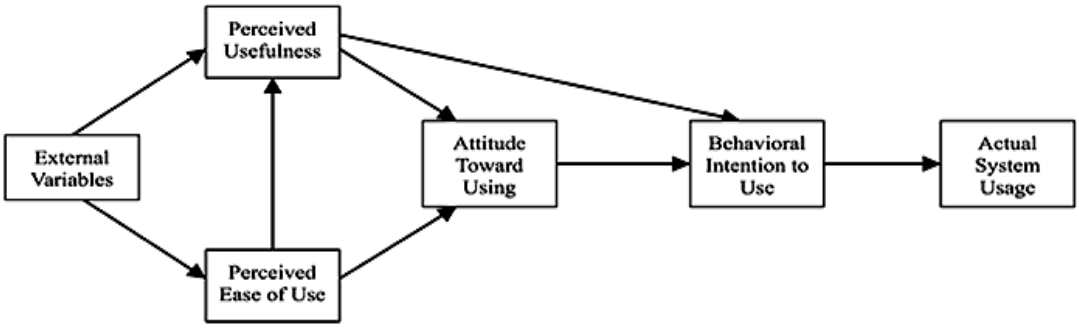

Figure 1: Technology Acceptance Model (Davis, Bagozzi, and Warsaw,1989, p985)

The Technology Acceptance Model (TAM) suggests that when users are presented with a new software package, a number of factors influence their decision about how and when they will use it, notably:

Perceived usefulness (PU) - This was defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, Bagozzi, and Warsaw,1989, p.320)".

Perceived ease-of-use (PEOU) was defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, Bagozzi, and Warsaw,1989, p.320).

These factors play a crucial role in understanding individual response to information technology (Agarwal and Karahanna, 2000; Chau, 2001; Hong, Thong, Wong and Tam, 2001). Research over the past decade provides evidence of the significant effect perceived ease of use has on usage intention (Agarwal and Prasad, 1999; Venkatesh, 2000; Venkatesh and Davis, 2000).

According to TAM, Usefulness (U) and Ease of Use (EOU) have a significant impact on a user's attitude (A) toward using a system (i.e. the feelings of favorableness or unfavorableness toward the system).

Behavioral Intentions to use a system (BI) are modeled as a function of A and U. BI then determines actual use. Research has consistently shown that BI is the strongest predictor of actual use (Davis, Bagozzi, and Warsaw, 1989).

The Concept of Acceptance

User acceptance is defined as "the demonstrable willingness within a user group to employ Information Technology for the tasks it is designed to support" (Dillon and Morris, 1996, p.4). The concept does not apply to situations in which users claim they will utilize technology without providing evidence of use, or where they use the technology for purposes unintended by the designers or those who acquired it (e.g., using an Internet connection for personal chatting in a work situation). Lack of user acceptance is a significant impediment to the success of new information systems (Gould and Lewis, 1985; Nickerson, 1981). User acceptance is therefore a pivotal factor in determining the success or failure of any information system project (Davis and Cosenza, 1993).

User Experience and Technology Acceptance

Researchers using the Technology Acceptance Model have proposed that an individual's experiences with a specific technology influence perceptions of ease of use and usefulness of that technology. An empirical study examining microcomputer usage found evidence that users' computer experience influenced perceptions of ease of use, usefulness and usage (Igbaria, Guimaraes, and Davis, 1995).

An empirical, longitudinal study examining e-mail usage of graduate business students suggested that as a user becomes more experienced with a technology, perceptions of usefulness directly determine intention of use and usage (Szajna, 1996). A study examining employee adoption of a new workstation operating system found that an individual's previous computer experience positively influenced perceptions of ease of use and usefulness (Agarwal and Prasad, 1999).

Venkatesh and Davis (2000) reported that users' experience influenced the relationship between model components and intentions. Experience may therefore be an important consideration in application of the models.

Several studies including (Macharia and Nyakwende, 2009) have proposed that, distinction had to be made between the various factors that influence adoption and diffusion of information systems including individual (Yang and Jolly, 2008), environmental (Gong, Li, and Stump, 2007), organizational factors (Seyal, Rahman, and Mohammad, 2007), and technical (Sheng, Jue, and Weiwei, 2008).

METHODOLOGY

The Technology Acceptance Model was adopted as the theoretical framework in this study to see whether it could help explain behavioral intentions of individuals to accept and use technology in a developing country. The main mode of data collection was through the use of questionnaires. The questionnaire was designed based on the theory and existing literature on Technology Acceptance Model. The questionnaires were administered in such a way as to capture data from all the various levels/years and types of students (i.e. day and evening) at the Methodist University College Ghana. The data captured included background information i.e. age and level/year of student; user experience; perceived ease of use; perceived usefulness; attitude towards computer usage, and behavioral intention to use the computer.

Sample

The population of the research was all tertiary students in Ghana. The sample frame was made up of all students of the Methodist University College Ghana at the time of the data collection. This included certificate and diploma students, undergraduate students and postgraduate students.

The questionnaires were randomly administered to a sample size of 250 students. Students were given the chance to decide whether to complete a questionnaire or not. Clarifications were sought in instances where the data provided in a questionnaire were not clear.

Prior Experience with the Computer

Information on prior experience with the computer was provided based on the following categories: Those who had no experience with the computer, those with one year experience,

those with two years, those with three years experience, students with four years experience and those who had used the computer for more than four years.

Perceived Ease of Use of the Computer

Students' perceptions about the ease of the use of the computer (ie. the extent to which they believed that learning to use the computer will require little effort) were captured with six, five-point Likert-type questions ranging from strongly disagree to strongly agree.

Perceived Usefulness of the Computer

Students' perceptions about how the computer was useful (this is the degree to which the students believed that the use of the computer would improve their performance) were captured using seven, five-point Likert-type questions ranging from strongly disagree to strongly agree.

Attitude towards the Computer

Three five-point Likert-type questions ranging from strongly disagree to strongly agree were used to collect data on students' attitudes towards using the computer. The questions examined the students' feeling towards the computer.

Intention to Use the Computer

The likelihood of students using the computer in the future (ie. the intention of the students to use the computer) was captured using seven, five-point Likert-type questions ranging from strongly disagree to strongly agree.

DATA ANALYSIS

To capture and analyze responses from the questionnaires, the software Statistical Package for the Social Sciences (SPSS) Software Version 15.0 was used. Since the research was based on the Technology Acceptance Model, the main variables used were Perceived Usefulness, Perceived Ease of Use, Attitude and Behavioral Intention. To test the overall fitness of the model, Chi- Square statistic was used.

Cronbach Alpha was used to test the reliability of the data collected. Factor analysis was used to assess the construct validity of the initial research model and to uncover any additional factors influencing students' behavioral intentions of using the computer. Multiple Linear Regression analysis was done to determine the extent to which dependent variables were predicted by independent variables. This was to ensure consistency with earlier studies that have developed and extended TAM. T-tests were used for test of significance.

A total of two hundred and fifty (250) questionnaires were administered and one hundred and eighty-five (185) which is 74% were completed and returned.

Factor Analysis

Principal components analysis was used as the extraction method with varimax rotation. Six factors emerged with eigenvalues greater than one. The factor matrix is presented in Table 1.

Table 1: *SPSS output of the Rotated Component Matrix*

	Component					
	1	2	3	4	5	6
Using the computer gave me greater control over my studies	.818					
Using the computer Improved my academic performance	.763					
Using the computer Improved my learning productivity	.745					
Using the computer Enhanced the effectiveness of my study activities	.701					
Using the computer Improved the quality of assignments I did	.688					
Using the computer Enabled me to accomplish study tasks more quickly	.620					
Using the computer Made it easier to study/learn	.586					
I would use the computer in the future to study for projects/assignments/quizzes/exams						
Learning to use the computer is easy		.735				
I believe that it is easy to use the computer to do what I want it to do		.702				
It is easy for me to remember how to perform tasks using the computer		.701				
My interaction with the computer is clear and understandable		.699				
Becoming skillful at using the computer is easy		.698				
Getting information using the computer is easy		.677				
I would use the computer in the future to discuss results of assignments			.820			
I would use the computer in the future to e-mail lecturers			.814			
I would use the computer in the future to access class information (calendar/schedule)			.809			
I would use the computer in the future to access my grades online			.739			
I would use the computer in the future to plan my studies in my classes			.552			
I would use the computer in the future to access readings and reference materials						
I like using the computer				.782		
The computer provides an attractive learning environment				.773		
The computer is fun to use				.748		
Please which type of student are you?					.776	
Please How old are you?					.709	
Have you used the computer before?						.861

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a Rotation converged in 6 iterations.

Factor loadings over 0.5 on one factor and less than 0.5 on all other factors produce a clean loading (Hair, Anderson, Tatham, and Black, 1995). As a result of the factor analysis, two questionnaire items relating to the following were discarded due to cross loadings between factors or no apparent loading:

1. I would use the computer in the future to study for projects /assignments /quizzes / exams
2. I would use the computer in the future to access readings and reference materials

The remaining items loaded cleanly onto the research constructs as follows:

(1) Perceived usefulness – survey items were:
- ☑ Using the computer gave me greater control over my studies
- ☑ Using the computer improved my academic performance
- ☑ Using the computer improved my learning productivity
- ☑ Using the computer enhanced the effectiveness of my study activities
- ☑ Using the computer improved the quality of assignments I did
- ☑ Using the computer enabled me to accomplish study tasks more quickly
- ☑ Using the computer made it easier to study/learn

These factors loaded onto one factor which is perceived usefulness.

(2) Perceived ease of use – survey items:
- ☑ Learning to use the computer is easy
- ☑ I believe that it is easy to use the computer to do what I want it to do
- ☑ It is easy for me to remember how to perform tasks using the computer
- ☑ My interaction with the computer is clear and understandable
- ☑ Becoming skillful at using the computer is easy
- ☑ Getting information using the computer is easy

These factors also loaded onto the dimension for perceived ease of use.

(3) Behavioral Intention – survey items:
- ☑ I would use the computer in the future to discuss results of assignments
- ☑ I would use the computer in the future to e-mail lecturers
- ☑ I would use the computer in the future to access class information (calendar/schedule)
- ☑ I would use the computer in the future to access my grades online
- ☑ I would use the computer in the future to plan my studies in my classes

(4) Attitude – survey items:
- ☑ I like using the computer
- ☑ The computer provides an attractive learning environment
- ☑ The computer is fun to use

The factor analysis identified the presence of these two additional constructs

(5) Student Background – survey items:
- ☑ Please which type of student are you?
- ☑ Please how old are you?

(6) Prior Experience with the computer – survey item:
- ☑ Have you used the computer before?

T-tests were conducted to determine how Behavioral Intention was affected by the other factors according to the model in figure 2.

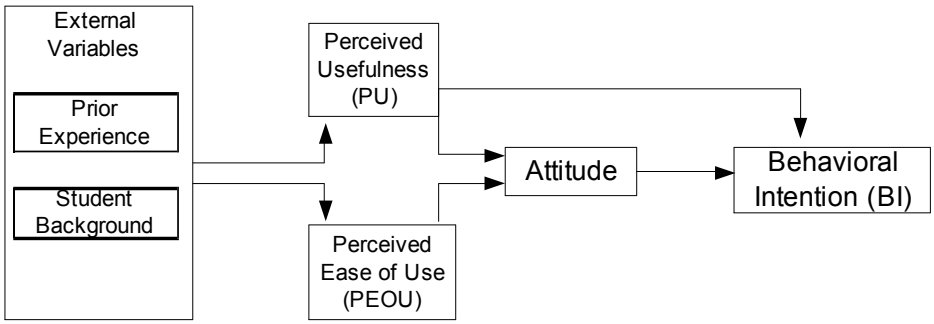

Figure 2: Initial model for the study based on the Technology Acceptance Model.

HYPOTHESES TESTING

Based on the factor analysis results, the hypotheses used were as follows:

H1a. A student's prior experience with the computer will increase perceptions of ease of use.
H1b. A student's prior experience with the computer will increase perceptions of usefulness.
H1c. A student's background in terms of age and level/year will increase perceptions of ease of use of a computer
H1d. A student's background in terms of age and level/ year will increase perceptions of usefulness of a computer
H2a. Perceptions of ease of use will positively influence attitude towards computer usage.
H2b. Perceptions of usefulness will positively influence attitude towards computer usage.
H3a. Perceived usefulness will directly influence the intention to use a computer.
H3b. Attitude towards a computer will influence the intention to use the computer

The hypothesized relationships can be represented in terms of the following regression equations:

H1a, H1c: $PEOU=ß_0 + ß_1\ Age + ß_2 Lev + ß_3 EXP + ε$
H1b, H1d: $PU = ß_0 + ß_1\ Age + ß_2 Lev + ß_3 EXP + ε$
H2a, H2b: $A = ß_0 + ß_1\ PU + ß_2\ PEOU + ε$
H3a, H3b: $BI = ß_0 + ß_1 PU + ß_2 A + ε$

Where: A = Attitude; Age = Age group of student; EXP = Prior Experience; Lev = Level/year of Student; BI = Behavioral Intention; PU = Perceived Usefulness; PEOU =Perceived Ease of Use.

RESULTS

These results were based on the analysis of 185 usable responses collected from the student respondents.

Influence on Perceived Ease of Use

H1a, H1c: PEOU= $ß_0 + ß_1$ Age + $ß_2$Lev + $ß_3$EXP + ε
The following regression results were obtained:

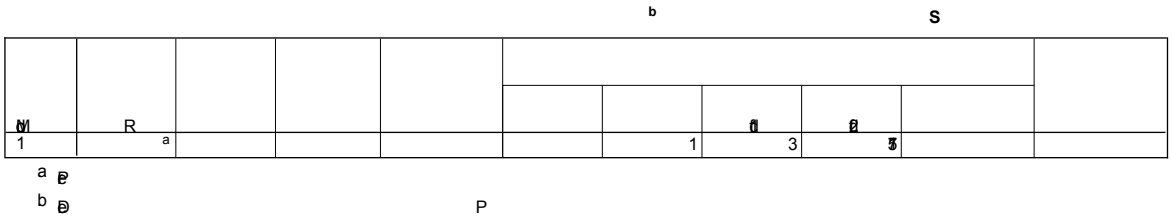

Table 2: SPSS Model Summary output for Perceived Ease of Use against Experience, Level/year and Age

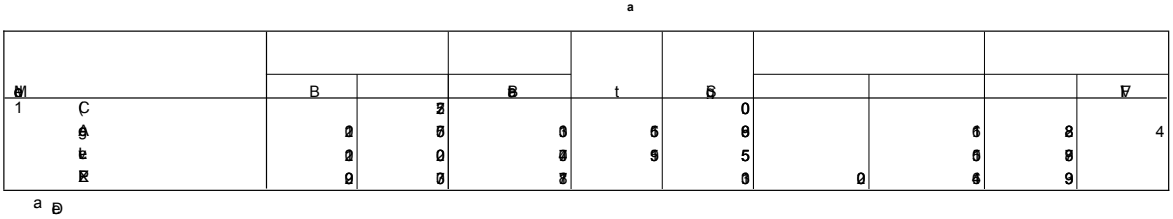

Table 3: SPSS Coefficients output for Perceived Ease of Use against Experience, Level/year and Age

The coefficients for the model are represented by:

PEOU= 3.466 + 0.012 Age + 0.012Lev + 0.092EXP

Experience, Age and Level of student have a positive influence on perceived ease of use. However, based on t-values and significance levels, Age and Level of student did not significantly affect the students' perception of ease of use of the computer. Experience however did significantly affect Perceived ease of use. H1a is accepted and H1c is rejected. The model thus becomes:

PEOU= 3.466 + 0.092EXP

Influence on Perceived Usefulness

H1b, H1d: PU = $ß_0 + ß_1$ Age + $ß_2$Lev + $ß_3$EXP + ε
The following results were obtained after the regression analysis:

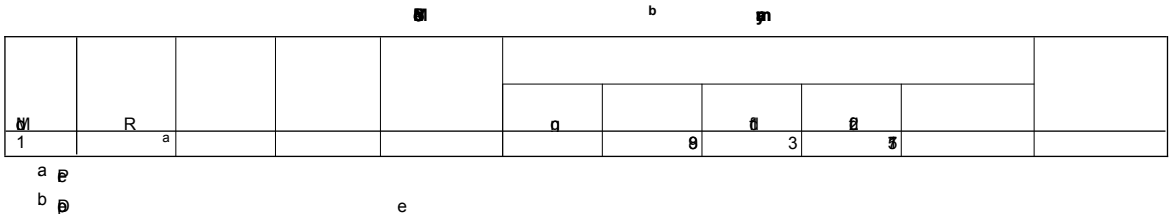

Table 4: SPSS Model Summary output for Perceived Usefulness against Experience, Age and Level

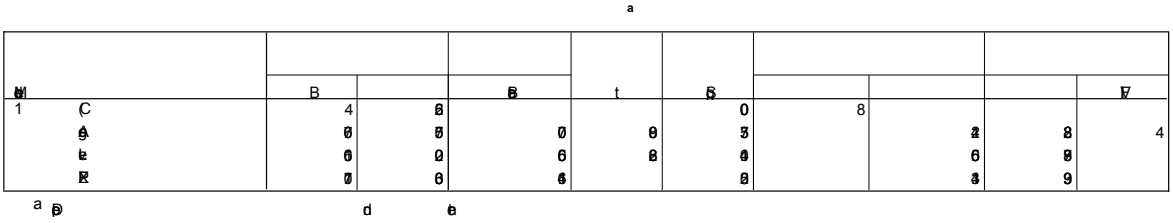

Table 5: SPSS Coefficients output for Perceived Usefulness against Experience, Level and Age

The coefficients for the model are represented by:

$$PU = 3.334 + 0.067Age + 0.016Lev + 0.071EXP$$

Experience, Age and Level of student all have a positive influence on perceived usefulness. However, based on t-values and significance levels, all three variables: Age, Level of student and EXP did not significantly affect the students' perception of usefulness of the computer. H1b and H1d are rejected.

This is consistent with the findings of various studies (eg. Stoel and Lee, 2003) and (Agarwal and Prasad,1999). Stoel and Lee recorded an insignificant relationship between Perceived Usefulness and Experience. Their research was however on the topic "Modeling the Effect of Experience on Student Acceptance of Web-based Courseware". Agarwal and Prasad also used non-student samples for their research.

Influence on Attitude

H2a, H2b: $A = ß0 + ß_1PU + ß_2PEOU + ε$

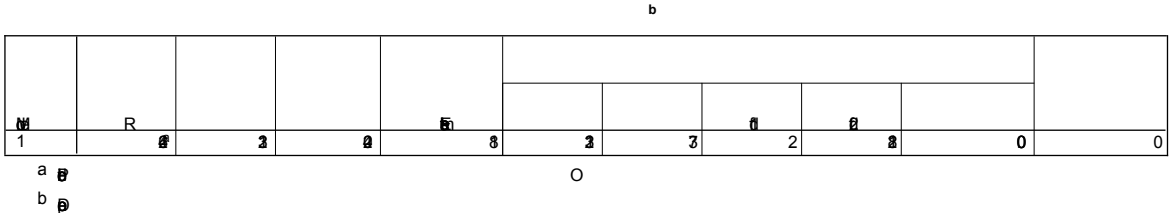

Table 6: SPSS Model Summary output for Attitude against Perceived Ease of Use and Perceived Usefulness

a

	B			t					
1 (	3			0 2 5			5		4

a

Table 7: SPSS Coefficients output for Attitude against Perceived Ease of Use and Perceived Usefulness

The coefficients for the model are represented by:

$$A = 2.523 + 0.155PU + 0.306PEOU$$

Perceived Usefulness and Perceived Ease of Use both accounted for 20.4% of Attitude(Adjusted R Square = 0.204). The two variables also have a positive influence on Attitude. Based on t-values and significance levels, the two variables significantly affected the students' Attitude towards the computer. H2a and H2b were accepted.

Influence on Behavioral Intention

H3a, H3b: $BI = ß_0 + ß_1PU + ß_2A + ε$

b

R	a									
1				4			2			

a

b :

Table 8: SPSS Model Summary output for Behavioral Intention against Attitude and Perceived Usefulness

a

	B			t					
1 (	0		7	8					5

a

Table 9: SPSS Coefficients output for Behavioral Intention against Attitude and Perceived Usefulness

The coefficients for the model are represented by:

$$BI = 1.550 + 0.622PU – 0.038A$$

Perceived Usefulness positively influenced Behavioral Intention. Attitude however negatively influenced Behavioral Intention. The influence of Perceived Usefulness is significant but that of Attitude is insignificant. This contradicts the findings of various studies (eg. Stoel and Lee, 2003;

Malhotra and Galleta, 1999) where a significant relationship was found between Attitude and Behavioral Intention. H3a was accepted and H3b was rejected. The model thus becomes:
BI= 1.550 + 0.622PU.

DISCUSSION OF RESULTS

Influence on Perceived Ease of Use

The fact that experience significantly influenced Perceived Ease of Use indicates that the more a student gets the chance to use the computer, the more he or she will perceive it to be easy to use. It should however be noted that experience accounts for only 2.3% of the students' perception of the Ease of Use of the computer.

This observation means that other external variables such as availability of computers, access to computers, the use of computers by lecturers and giving of assignments that require the use of computers to students have to be looked at in future research. The insignificant effect of age and level of student on the perceived ease of use suggests that age and level/year of student do not affect a student's perception of how easy it is to use the computer. This could be a reflection of the determination of students to learn to use the computer regardless of their age and level/year. A student may however need to experience the use of the computer before he or she finds it easy to use.

Influence on Perceived Usefulness

Age, level of student and prior experience with the computer did not significantly influence the students' perception of usefulness. This implies that the student does not need to experience the use of the computer before he/she finds it useful. The perception of usefulness is also independent of age and level/year of student.

Again it is necessary to note the weakness of the insignificant relationship between Perceived Usefulness, and the variables: Age, Level of student and Experience. It suggests that other external variables such as cost of a personal computer and income levels of families which are peculiar to sub-Saharan Africa have to be looked at.

Influence on Attitude

Perceived Usefulness and Perceived Ease of Use significantly affected attitude by accounting for 20.4% of it. Once a student perceives the computer as easy to use and useful, the student will develop a positive attitude towards the use of the computer.

Influence on Behavioral Intention

Interestingly, attitude did not significantly influence Behavioral Intention. Thus the fact that a student has a positive attitude towards the computer does not mean he/she intends to use the computer. Thus if a student likes using the computer and thinks the computer is fun to use, it does not necessarily mean he/she intends to use the computer in the future.

Consistent with various studies on the Technology Acceptance Model (e.g. Stoel and Lee, 2003) however was the fact that Perceived Usefulness positively and significantly influenced the

Behavioral Intention of the students to use the computer. This means that it is when a student perceives the computer as useful that he/ she will actually have the intention of using it.

The resulting model is shown in figure 3. It can be noted that unlike the original Technology Acceptance Model, (Figure 1), Attitude does not have any influence on behavioral intention.

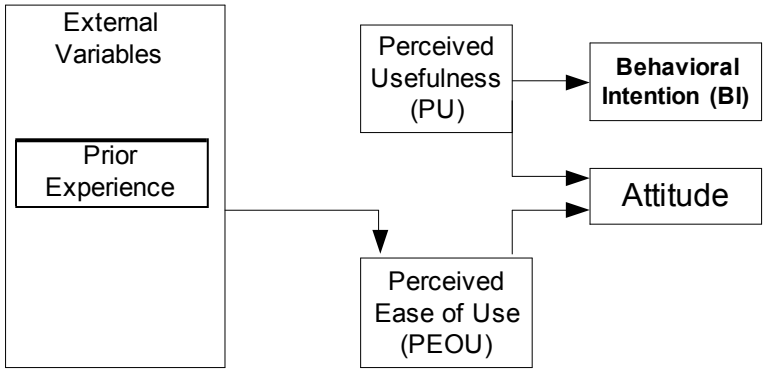

Figure 3: Model of Intention of Ghanaian Tertiary students to use the computer.

CONCLUSIONS AND RECOMMENDATIONS

This research sought to explain the behavioral intentions of students towards the computer with the hope of predicting the actual computer usage among tertiary students in Ghana. The Technology Acceptance Model was adopted as the theoretical framework to see whether it could help explain behavioral intentions of individuals to accept and use technology in a developing country. The research was able to develop a new model which explains the intention of Ghanaian tertiary students to use the computer.

The new model (figure 3) which was developed from the study can help in predicting the intention of tertiary students to use the computer. The Technology Acceptance Model cannot directly be implemented in a developing country such as Ghana to assess the intention of students to use the computer. The model in figure 3 thus provides a better explanation of the intention of students to use the computer.

Based on the conclusion that the perception of usefulness of the computer is independent of age and level of students, the design and implementation of computer related policies in a developing country like Ghana should be targeted at all levels and categories of students. Lecturers should incorporate the use of the computers into their teaching processes.

Since prior experience with the computer positively influences how the student perceives the computer as useful, governments, parents, heads of schools and even churches should make sure young and up coming pupils get early prior experience with the computer. This will help increase the perceptions of usefulness and thus lead to an Intention to use the computer.

Once again, it is strongly recommended that further studies look at other external variables apart from experience and background of students that could account for the use and non-use of the computer, test the model on students in other tertiary institutions in Ghana. Future research can

draw some lessons from various social attitudes of Ghanaians towards various technologies like the use of ATMs at the banks and use of Mobile phones.

REFERENCES

Agarwal, R. and Karahanna, E. (2000). "Time flies when you're having fun: cognitive absorption and beliefs about information technology usage", MIS Quarterly, Vol. 24 No. 4, pp. 665-94.

Agarwal, R. and Prasad, J. (1999). "Are individual differences germane to the acceptance of new information technologies?" Decision Sciences, Vol. 30 No. 2, pp. 361-91.

Chau, P.Y.K. (2001). "Influence of computer attitude and self-efficacy on IT usage behavior", Journal of End User Computing, Vol. 13 No. 1, pp. 26-33.

Davis, D., and Cosenza, R. M. (1993). Business research for decision making (3rd ed.). Belmont, CA: Wadsworth.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*, 319–340.

Davis, F. D., Bagozzi, R. P., & Warsaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*, 982–1003.

Dillon, A. and Morris, M.G. (1996). "User acceptance of information technology: theories and models", Annual Review of Information Science and Technology, Vol. 31, pp. 3-32.

Finn, S. and Inman, J. (2004). "Digital unity and digital divide: surveying alumni to study effects of a campus laptop initiative", Journal of Research on Technology in Education, Vol. 36 No. 3, pp. 297-317.

Gong, W., Li, Z. G., & Stump, R. L. (2007). Global internet use and access: cultural considerations. *Asia Pacific Journal of Marketing and Logistics , 19* (1), 57-74.

Gould, J.D. and Lewis, C. (1985). "Designing for usability: key principles and what designers think", Communications of the ACM, Vol. 28 No. 3, pp. 301-11.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1995). Multivariate Data analysis, 4th ed., Prentice-Hall, Englewood Cliffs, NJ.

Hong, W., Thong, J.Y.L., Wong, W.M. and Tam, K.Y. (2001). "Determinants of user acceptance of digital libraries: an empirical examination of individual differences and system characteristics", Journal of Management Information Systems, Vol. 18 No. 3, pp. 97-124.

Igbaria, M., Guimaraes, T., & Davis, G. B. (1995). Testing the determinants of microcomputers usage via a structural equation model. *Journal of Management Information Systems, 11*, 87–114.

Macharia, J., & Nyakwende, E. (2009). Factors Affecting the adoption and diffusion of internet in higher educational institutions in Kenya. *The Journal of Language, Technology & Entreprenourship in Africa , 1* (2), 6-22.

Malhotra, Y and Galleta, D. F. (1999). "Extending the Technology Acceptance Model to Account for Social Influence: Theorical and Empirical Validation", Proceedings of the 32nd Hawaii International Conference on System Sciences-1999.

Nickerson, R. S. (1981). Why interactive computer systems are sometimes not used by people who might benefit from them. *International Journal of Man–Machine Studies*, *15*, 469–483.

Rola, M. (2002). "Building IT into lesson plans", Computing Canada, Vol. 28 No. 22, p. 28.

Seyal, A. H., Rahman, M. N., & Mohammad, A. Y. (2007). A quantitative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs. *Business Process Management Journal , 13* (5), 728-746.

Sheng, Z., Jue, Z., & Weiwei, T. (2008). Extending TAM for Online Learning Systems: An Intrinsic Motivation Perspective. *Tsinghua Science and Technology , 13* (3), 312-317.

Stoel, L., and Lee, K H, (2003). "Modeling the effect of experience on student acceptance of Web-based courseware", Electronic Networking Applications and Policy, volume 13, Number 5, pp 364-374.

Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. *Management Science*, *42*, 85–92.

Venkatesh, V. (2000). "Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model", Information Systems Research, Vol. 11 No. 4, pp. 342-65.

Venkatesh, V. and Davis, F.D. (2000). "A theoretical extension of the technology acceptance model: four longitudinal field studies", Management Science, Vol. 46 No. 2, pp. 186-204.

Yang, K., & Jolly, L. D. (2008). Age cohort analysis in adoption of mobile data services: gen Xers versus baby boomers. *Journal of Consumer Marketing , 25* (5), 272–280.