

Affective Education With Enhanced Affective Information Technology

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ABSTRACT

Technology and technological innovation is rapidly changing the way humans perceives the world, redefining our ways of life and values, the very foundation of mankind is built on constant improvement and vital instructions. Technology and its application is growing at a tremendous rate but notably the education domain and technology is not pairing evenly, more so there is a severe drawback in the correlation between affect in both concepts. In recent years, the drive of the existence of our values and way of life is rapidly eroding. Computing dynamics is moving from just ordinary machines to human-like abilities with emotions as the underlying concept, by extension computers by design should be adapting to people rather than people adapting to computers and the pedagogy derived from the educational system. The research is conducted among four universities in the southern region of Nigeria adopting affect as latent variable in the Technology Acceptance Model (TAM) to analyse user acceptance of a recommender system. The experiment involves 840 students systematically selected from the four institutions, the research is a follow up of the same institution's research work conducted with respect to the lecturers. The outcome further substantiates the lecturers result that perceive ease of use has more impact than perceive usefulness to motivate acceptance of the recommender system. Likewise user emotional affects toward the system strongly influence perceive ease of use which directly impacts on perceive usefulness of the system. Without over stressing words the out pouring results further emphasises the role affective modelling in system design, development and administrators of recommender system to maximize users' efficiency.

Keywords — Perceived affect, Machine learning algorithms, TAM, Recommender system.

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1. INTRODUCTION

Bloom's taxonomy of educational objectives was created by Benjamin Bloom during the 1950s. The concept deals with the levels of reasoning and skills required in effective teaching and learning in the classroom environment. The taxonomy as viewed by Bloom as educational goals and objective were framed into three domains: a) The cognitive which is knowledge based. b) The affective which is attitudinal based and, c) The psychomotor that is skills based domain [4]. Among the domain the cognitive and psychomotor has been consciously and widely adapted in the educational setting as Bloom's taxonomy has stood the test of time, ignoring or unnoticeably avoiding affect in curriculum and systems designs. In a monthly e-Newsletter: A dialogue platform for doctoral scholars of Jain University reaffirm role of affect which governs emotions [6].

He noted that higher order activities in human endeavour are ruled by emotions and emotions play a very vital role in human intelligent, perception, memory, creativity including teaching and learning. Among the Bloom's classification of educational outcome, the affect is remarkable a factor that governs and rule our day to day activities. The undertone that "being emotional" or "acting emotional" are not valid proofs and excuses for ignoring the study and research of emotions in its application to teaching and learning and our better half the technology or computer systems. It is the right time to make our systems affective oriented, and examine how emotions can be incorporated into models of intelligence. Computers should be adapting to people rather than people adapting to computer. The shortfall on the subject matter may be conceived in various ramifications adopting different approaches and models but this work deem it necessary to employ the Technology Acceptance Model for standout and most widely used [5].

2. PREVIOUS WORK

- 1) Virtual community recommender recommends optimal virtual communities for an active user using behavioural factors suggested in TAM using a filtering function based on user needs type [3].
- 2) TAM model is used to evaluate the adoption of a recommender system in retail industry and banking sector [1].
- 3) TAM model to evaluate an existing personality based recommender system and considered that music and other factors such as emotion and mood have to be considered [7].
- 4) TAM and partial least squares regression are used to investigate learners' acceptance of a learning companion recommendation system [LCRS] in Facebook [2].
- 5) TAM used to review of the state-of-the-art about user experience and user acceptance research in recommender system [8].
- 6) TAM applying ICT in teaching and learning ability on students in Federal College of Education (Technical) Omoku-Nigeria [7].
- 7) TAM a model using ICT to improve teaching and learning (lecturer's perspective) using VBSE Omoku-Nigeria [7].
- 8) Applying TAM to evaluation of recommender systems using machine learning approach [6].

3. METHODOLOGY

The research work is an extension of students perception as earlier work has been published with respect to lecturers responds. The work as conducted invites students from same universities in the southern region of Nigeria. Introduction of new latent variables were deployed into the TAM model as a test to verify the impact of learning outcome of the users of the recommender system. To achieve this dataset was drawn from both science and arts related disciplines. Questions structured adopted the Likert-5 scale format corresponding to " Strongly Disagree" and 5 corresponding to "Strongly Agree".

The questions presented to participants along with the associated TAM variable are detailed as follows;

- ❖ **-AICT₁**:Internet services provided by the university (Afrihub & Others) are adequate.
- ❖ **-AICT₂**:Internet services provided by the university are reliable.
- ❖ **-AICT₃**:The university's digital library is efficient.
- ❖ **-AICT₄**:Links to educational resources websites like e-journals, e-books can be found on the College's website.
- ❖ **-AICT₅**:Computers and other ICTs are adequately provided.
- ❖ **-AICT₆**:Digital Video Disk prayers, Flash drives/External Hard drives and software are adequately provided
- ❖ **-PITL₁**:Effective utilization of ICT facilities improves students' performance.
- ❖ **-PITL₂**:The use of ICT facilities for teaching and learning give better understanding to students.
- ❖ **-PITL₃** :Effective teaching will improve if all teachers have access to Internet facilities in their offices.
- ❖ **-PITL₄**:Teaching is very interesting when performed with any ICT equipment such as laptops, power point projector, clever board etc.
- ❖ **-PITL₅**:The practical approach of ICT in teaching and learning increases students' learning/achievement.
- ❖ **-PITL₆** :ICT facilities provide all the materials needed for the students at the right time.
- ❖ **-PE₁**:Computer/internet can be easily used for teaching/Learning
- ❖ **-PE₂** :Computer/Internet are efficient to use
- ❖ **-PE₃** :Sourcing for academic information through the internet is preferred to books
- ❖ **-PE₄**:Computer application makes teaching versatile
- ❖ **-PE₅** :Refer students to the internet to solve assignment
- ❖ **-PE₆** :Use computer simulations to aid teaching and learning
- ❖ **-PPAD₁**:Teaching and learning is more controlled with ICT facilities
- ❖ **-PPAD₂**:There is arousal in teaching or learning in the use of ICT facilities
- ❖ **-PPAD₃**:Using ICT facilities in teaching or learning gives me energy to proceed on and on
- ❖ **-PPAD₄**:ICT facilities create pleasure when using it in teaching or learning
- ❖ **-PPAD₅**:I have effective control when using ICT facilities in teaching or learning
- ❖ **-PPAD₆**:Using ICT facilities in teaching or learning gives me joy and pleasure

Key

AICT - Availability of ICT infrastructure

PE - Perceived Ease of Use of ICT

PITL - Perceived Impact of ICT in Teaching and Learning

PPAD - Perceived Pleasure/Arousal/Dominance of ICT facilities

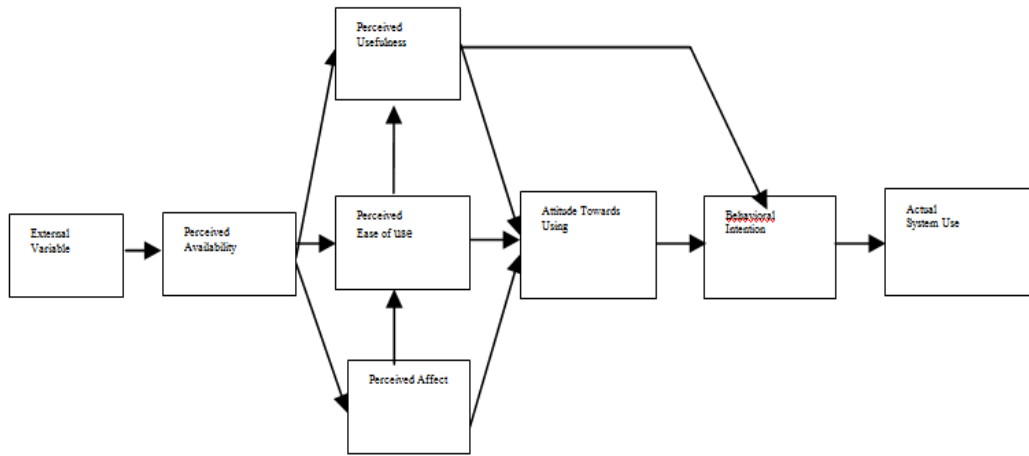


Fig.1. Technology Acceptance Model with introduced latent variable Modify (Davis, et al 1989, P₉₈₅)

4. EXPERIMENT

TAM is a theoretical model with latent variables in this work in addition to Davis foundational variables "Perceived Affect" and "Perceived availability" are introduced as variables not directly observed but revealed by the items on the questionnaire. The content of the model is unveiled through the questionnaire by using the machine learning algorithm and a structural model. As indicated by the previous work the classification model specifies the relationships amongst the latent variables. A reliability and validity test the consistency of the item-level within a single factor. A "reliable" set of variable will consistently load on the same factor, [7]. Measuring reliability and internal consistency of test item Cronbach's alpha is often used as a measure this work adopt same. Cronbach's alpha is a function of the number of test items average inter-correlation among the items. It measures how closely related a set of items are as a group.

Table 1 below shows the Cronbach's alpha coefficient correlation. The factors Cronbach-alpha is 0.736 which exceeds the average limit as recommended and this indicates for all factors, implies that the reliability test is successful.

Table 1: Summary of universities reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.736	.738	5

Table 2: Parameter estimate, SVM regression, Random Forest Tree, Pearson's Correlation Coefficient, Multiple Regression and t-value

HYPOTHESIS PATH	SVM REGRESSION (5-Point Likert Scale)	RANDOM FOREST TREE % (If than Rule)	CORRELA-TION (Coefficient) r = Value	MULTIPLE REGRES-SION (P-Value)	t-VALUE	RESULT
AICT PPAD	3̄ Undecided	Nil	0.20	0.42	-0.80	Not Supported
PE PPAD	4̄ Agree	<u>RSUST</u> 81.8 (4&5) Arts 65.7 (5&5) Science <u>UNIPORT</u> 52.6 (4&5) Arts 63.6 (4&3) Science	0.41	0.00	5.29	Supported
PITL PPAD	4̄ Agree	Nil	0.49	0.00	10.30	Supported
PCUTL PPAD	3̄ Undecided	<u>RSUST</u> 66.7 (3&4) Arts 60 (4&4) Science	0.23	0.08	1.73	Not Supported
PITL PCUTL	4̄ Agree	Nil	0.33	0.00	4.50	Supported
PE PCUTL	4̄ Agree	<u>RSUST</u> 66.7 (3&4) Arts 60 (4&4) Science	0.33	0.00	3.32	Supported
AICT PCUTL	3̄ Undecided	<u>FCET</u> 66.7 (3&4) Arts 60 (4&4) Science	0.37	0.00	7.42	Supported
AICT PITL	4̄ Agree	Nil	0.35	0.00	4.96	Supported
PE PITL	4̄ Agree	Nil	0.55	0.00	15.82	Supported

t- table value

Table 2 reveals the result of a overall model fit analysis test of *SVM regression analysis, Random forest tree, correlation coefficient, Multiple regression analysis and t-value*.

A general structural model used to test the simple bivariate relationships between the constructs included in the model. Hypothesis was tested within the context of the structural model. This simplified the review of the results because a relationship between two constructs could be examined while holding constant other constructs in the model. SVM scatter plot of the universities based on perceived pleasure reveals a high cluster of data on universities agreeing to strongly agreeing significant relationship and in contrast as accepted by the institutions, there is an opposition to a backdrop in the availability of ICTs materials for effective teaching and learning in the institutions. From the revelation of figures of the analysis perceived inhibitors showcase a negative relationship with both perceived usefulness and perceived ease of use of ICTs, this call for adequate provisions of ICTs facilities to enhance teaching and learning. The same results speak loudly viewing the Random forest tree results that reveals that ICTs availability is not availed in any of the institutions also while inhibiting factors has negative impact on teaching and learning.

There is a strong overall fit of the five algorithms used to analysis the dataset regarding perceived pleasure against perceived ease of use, perceived impact (usefulness). Rivers State University Science and Technology (RSUST) with Random forest tree with the if than rule with (81.8% Arts Students, 65.7% Science Students) agreeing and strongly agree respectively. While University of Port Harcourt (UNIPORT) reveals a (52.6% Arts Students, 63.6% Science Students) in the university. The relationships among the constructs were all significant except for parameter estimate from ICTs availability ($r=0.20$, $t=-0.08$, $SVM=3$), perceived pleasure and perceived pleasure to ICTs inhibitors ($r=0.23$, $t=0.08$, $SVM=3$). In contrast both perceived usefulness and ease of use were found significant in affecting user attitude toward perceived pleasure. Perceived usefulness ($r=0.55$, $t=15.82$, $SVM=4$) had the largest relationship on user affection or pleasure, perceived ease of use with ($r=0.41$, $t=5.29$, $SVM=4$). More so, systems availability was found to be non-significant of all construct except for perceived usefulness. Considering the above results, perceived pleasure (affect) rank one of the most important variable, followed by perceived usefulness, in influencing the behavioral intention to use ICTs.

5. RECOMMENDATION AND CONCLUSION

This work is a an abstract from an ongoing research from four higher institutions in the southern geo-political region of Nigeria to reveal the availability and impact of a recommender system (ICTs) adopting a new latent variables based on TAM to enhance the effectiveness teaching and learning. With a similar research conducted and published for lecturers in the stated institutions, the researchers performed an experiment with some commonly used ICT facilities to enhance teaching and learning.

Participants responded to a post treated questionnaire related to a set of variables that influence each latent variable in TAM and new latent variables corresponding to "Perceived affection or arousal, availability and inhibitors" were in use of the recommender system as previously published.

It further strengthen the confirmatory evidence that validate the fact that the data fit adequately in the proposed model. nevertheless some new latent variables in some universities varies as the case may be. The experiments confirmed the previous work viewing that perceived usefulness plays a predominant role for users to accept a new recommender system, as proposed in TAM. More so, ICT availability is a key player in the institutions evolution to improve teaching and learning as perceived ease of use is agreed upon by these institution in the use of ICTs. The result speak and reveals that at least an institution reflex the fact that perceived affection has a strong correlation with perceived impact that is usefulness in the analysis. The bottom line is that get the required affective technology and affectively motivate user through effective institution and a heart warming results achieved.

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