

# Acceptance of Web 2.0 in learning in higher education: a case study Nigeria

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**Abstracts**—Technology acceptance has been studied in different perspectives. Though a few empirical studies on acceptance of Web 2.0 as a social networking tool in teaching and learning exist, none of such studies exist in Nigeria which is the focus of this study. This paper reports on a pilot study that begins to fill this gap by investigating the perceptions, attitude and acceptance of Web 2.0 in e-learning of this country. Based on literature review and initial primary study, a conceptual model of 9 variables and associated hypotheses was designed. The model was operationalised into a questionnaire that was used to collect data from 317 students from 5 universities. The findings that came from data analysis indicate that all the variables except *motivation* via learning management systems which are not presently used in these universities affect intention to use Web 2.0 in e-learning in Nigeria. Some of the validated variables are perceived usefulness and prior knowledge. The major conclusions and recommendations include the utilisation of Web 2.0 facilities to stimulate participation in learning. This work will contribute to the body of knowledge on acceptance of Web 2.0 social networking tools in teaching and learning. It will aid management decisions toward investing better on technology so as to improve the educational sector. This research will also be beneficial in the social development of individuals, local communities, national and international communities.

**Keywords**—Web 2.0; collaboration; active participation; enhanced learning; Web 2.0 acceptance; learning; higher education; technology based learning

## I. BACKGROUND

The usefulness of Web 2.0 tools has been empirically studied by few researchers. For example, Xie et al. [1] studied blogs, Parker et al. [2] researched Twitter, Ajjan and Hortshorn [3] researched acceptance, and McKinney et al. [4] studied podcast. Research on the impacts of Web 2.0 tools in higher education is increasing by the day in developed and developing countries [5] [6] [7] [8] [9]. Few studies are beginning to emerge in developing countries on the use of Web 2.0 in higher institution, for example Anunobi & Ogbonna [10].

Web 2.0 provides social networks as a student support feature [11] [12] [13]. It enables the sharing of learning experiences, exchanging of information about the subjects being taught and assessment requirements, and provision of moral support. Web 2.0 technologies provide opportunities for students to construct and share knowledge with each other. Jucevičienė and Valinevičienė [13] concluded in their studies that there are four main factors that determine the adoption of

social network usage in higher education: academic service support; student support; social and cooperate learning; and achievement representation. This paper tests three models of acceptance and discusses the acceptance of Web 2.0 technologies in learning. The rest of this paper will present the need for Web 2.0 technologies in education, theoretical framework, method, findings and discussion, and summary and future work.

## II. LITERATURE REVIEW

### A. The Need for Web 2.0 technologies in education

In order to achieve a better learner centred approach, there is need for education and training institutions to adopt the 21st-century technologies that improve learner engagement among other benefits. Web 2.0 is such a technology and it provides very effective web-based collaborative systems. Being a relatively young technology, a number of issues are yet to be resolved. One of these is its acceptance and use in teaching and learning [6]. However, several studies, for example, Redecker [7] [14], have shown that Web 2.0 social computing tools and application in education and training enhances participatory learning, collaboration, knowledge and information sharing. Also research findings from Xia and Sharma [1] show that students' thinking levels were increased as the students updated their blogs weekly. It also offers effective strategies for implementing what has been learnt by exploring other media.

Nevertheless, despite the opportunities offered by Web 2.0 technologies in learning, adoption is low [10] [15]. This research investigates this low adoption in Nigerian learning environment using an adapted technology acceptance model. The empirical work using this model examines attitudes and perceptions of users in order to predict their acceptance of Web 2.0 technologies for learning.

### B. Theoretical framework

This research used, as underpinning theories, the technology acceptance model (TAM) and the unified theory of the use and acceptance of technology (UTAUT). The TAM theory which origin is from theory of reasoned action (TRA) [16] states that users' behavioural intentions determine their acceptance of technology and their behaviour in turn influences their attitude [17]. Two variables, perceived ease of use and perceive usefulness, are the fundamental determinants of acceptance of technology [17]. TAM has been tested and validated in business settings with few validations in

educational sectors [18].

From research, various theories have been developed to predict acceptance of technology but these theories are applicable to few cultures mainly in developed countries. Researchers who have carried out empirical research using the existing models usually select variables from these models to measure general acceptance or adjust existing models to fit the technology being queried [18] [19] [20]. Technology Acceptance Model (TAM) which is frequently used by researchers to predict acceptance of technology was reported not valid across cultures. The differences were detected between Singaporean and Malaysian pre-service teachers. In that study, relationships between perceived usefulness (PU), perceived ease of use (EoU) and computer attitude (CA) on the one hand and behavioural intention (BI) on the other were validated as significant whereas the relationship between behavioural intention (BI) and motivation to use (MtU) was not significant [18].

Unified theory of acceptance and use of technology (UTAUT) which was extended from TAM with seven others (theory of reasoned action, motivational model, theory of planned behaviour and model of PC utilization) has been used by few researchers to predict acceptance. The UTAUT was validated in eight countries [21]. Oshiyanki et al. [19], in a follow up study, collected data from eight other countries but analysed from only three of the countries - United Kingdom, United States, and New Zealand - who speak English language. They measured and validated five out of the eight variables of UTAUT. These variables are effort expectancy, performance, attitude, social factor and self-efficacy. In addition, they added to and validated *anxiety* in their model. This means that there is a need for the eight variables to be tested in other cultures to see if these variables would be valid or not.

The UTAUT was extended in a research to predict acceptance of technology [19] with 290 participants. The result of the study showed that performance expectancy, social factors, facilitating conditions and system flexibility have direct effect on the employees' intention to use technology for training, while system enjoyment, effort expectancy and system interactivity have *indirect effects on employees' intention* to use the system. From secondary studies with empirical researches done so far *there is a lack of a good general framework of predicting user acceptance of the use of Web 2.0 technologies in learning and this research takes this challenge with regards to Nigeria from where data was collected.*

The rest of this section will explain the variables of the research model and hypotheses that describe the relationships between them.

#### Perceived Usefulness (PU)

Perceived usefulness is the belief of an individual that technology will make their work better. Davies et al. [17] argued that perceived usefulness is a factor that affects technology acceptance and the variable was valid across cultures. This research takes the same stand that perceived usefulness of Web 2.0 tools should positively co-vary with the

acceptance of these tools in teaching and learning. Thus the hypothesis:

**H<sub>1</sub>:** There is a positive relationship between *Perceived Usefulness* and *Behavioural Intention* to use Web 2.0 tools in learning in Nigerian higher education.

#### Social Factors (SF)

The social factor is an interpersonal agreement that binds individuals or people within a particular environment. Davis et al. [17] argued that there are other external factors that may influence the acceptance of technology, and this research supports this argument that social factors should relate positively with the behaviour intention to use Web 2.0 tools learning. Therefore:

**H<sub>2</sub>:** *Social factors* have a positive relationship with the *Behavioural Intention* to use Web 2.0 tools in learning in Nigerian higher education.

#### Prior Knowledge (PK)

Prior knowledge is very important in a learning environment. This affects the attitude of the learner and from a psychological point of view; people's attitudes are a large part of their behaviour [16]. In the context of this study the prior knowledge of the learner toward the use of Web 2.0 tools social activities is considered an important factor to determine the behaviour intention to engage in academic activity. Thus,

**H<sub>3</sub>:** *Prior Knowledge* has a positive relationship with *Behavioural Intention* to use Web 2.0 tools in learning in Nigerian higher education.

#### Facilitating conditions (FC)

Technology, including the Web 2.0, cannot be used without internet facilities. Users need to have access to computers, PDAs, phones with internet facilities to utilize Web 2.0 in their activities. Effective use of Web 2.0 tools would require users to own or have access to internet facilities to a sufficient extent [21].

**H<sub>4</sub>:** There is positive relationship between *Facilitating Conditions* and *Behavioural Intention* of Web 2.0 tools in learning in Nigeria.

#### Perceived Ease of use (PeoU)

Perceived ease of use is the feeling that the use of technology will be without much effort, but will achieve much in a short time. This has been used by Davis et al. [17] to predict acceptance of technology, and this research supports the notion that perceived ease of use would co-vary with the behavioural intention to use Web 2.0 hence the hypothesis

**H<sub>5</sub>:** There is positive relationship between *Perceived Ease of Use* and *Behavioural Intention* to use Web 2.0 in learning in Nigeria.

#### Performance Expectancy (PE)

Performance expectancy is the degree to which an individual or group of people expect to be proficient in their work or education when they are using technology. Venkatesh et al. [21] researched and validated performance expectancy as

one of the factors that can promote acceptance of technology and this research is in support of this. Therefore we expect this variable to co-vary with behavioural intention to use Web 2.0, thus the following:

**H<sub>6</sub>:** There is positive relationship between *Performance Expectancy* and *Behavioural Intention* to use Web 2.0 tools in learning in Nigerian higher education.

#### Motivation (MtU)

Motivation involves internal and external processes that give behaviour its energy and directions [17]. Motivational perspectives were adapted in TAM model (e.g. perceived usefulness and enjoyment from both intrinsic and extrinsic motivation). Motivation to use Web 2.0 tools in learning is likely to co-vary with attitude of the users, and motivation should co-vary with behavioural intention.

**H<sub>7</sub>:** There is a positive relationship between *Motivation*

and *Behavioural intention* to use Web 2.0 tools in learning in Nigerian higher education.

#### Behavioural Intention (BI)

Ajzen and Fishbein [21] emphasized that attitudes can be used to determine behaviour. Davis et al. [17] in TAM argued that behaviour can influence acceptance of technology and this research supports the argument that the behavioural intention should co-vary with the actual use, hence this hypothesis:

**H<sub>8</sub>:** *Behavioural Intention* has a positive relationship with *Actual use* of Web 2.0 tools in learning in Nigerian higher education.

Based on the hypotheses presented in this section a conceptual model was developed (see Fig. 1). This conceptual model displays constructs from the literature review and relates them to each other (each link represents a relationship between constructs and is reflected in the relevant hypothesis).

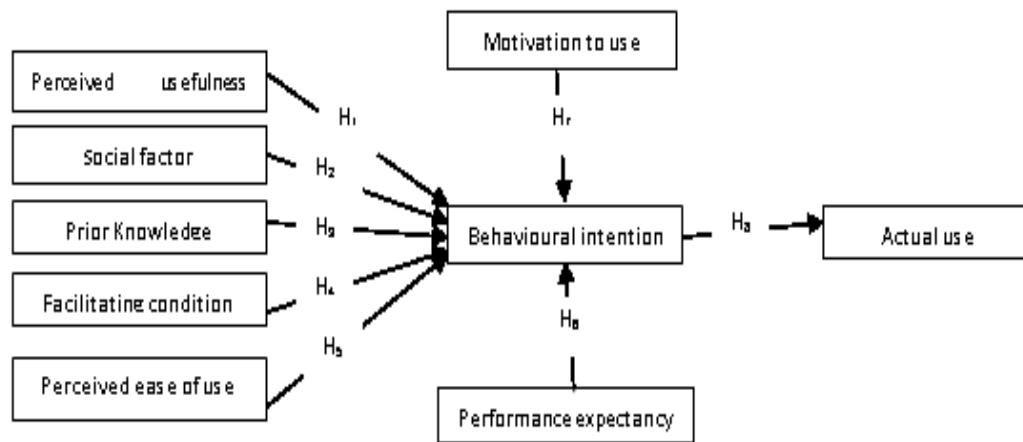


Fig. 1. Model showing Acceptance to use Web 2.0 for learning

### III. METHOD

A questionnaire was designed and used to collect data. This research measured eight constructs (see Table 2). The questionnaire was divided into three parts. The first part measured students' level of satisfaction in learning and facilities available for teaching and learning; the second part measured the eight constructs in the research model (prior knowledge, actual use, perceived usefulness, perceived ease of use, social factor, behaviour intention, motivation to use and performance expectancy). Then the third part investigated demographics (e.g. age, gender, educational level, faculty, having personal computer, having internet access in the university). Items were measured using 5 and 7-point Likert scale with 19 questions adapted from similar research on technology acceptance [21] [17].

#### Participants

500 questionnaires were administered to volunteers taken from five Nigerian universities (two federal, two states and one private university). The questionnaires were administered in class by lecturers and 317 were collected back, making a response rate of 63%.

#### Content Validation

To achieve content validity, the questions had strong literature underpinning. Also, they were pilot-tested with knowledge experts as well as a few students who represented prospective respondents. The questionnaire was amended based on comments from this process [22].

#### Instrument Development

A combination of some variables from the Unified Theory of Acceptance and Use of Technology (UTAUT) by Vankatesh et al. [21], Technology Acceptance Model (TAM) (Davis, 1989), Technology Acceptance Model Extended (TAM2) by Davis et al. [17] and the Theory of Reasoned Action by Fishbein and Ajzen [16] underpin this research. A combination of some variables from these theories with one additional variable was used to develop the research model of this paper (Fig 1). These variables were operationalised into a questionnaire and pilot tested in the University of the West of Scotland (see Table 1 for the source of the variables and Table 2 for the operationalisation). Some demographic questions (gender, age and educational level) were also included in the questionnaire.

TABLE I. VARIABLES AND SOURCE

Variables	Source
Prior knowledge (PK)	Mine (new)
Social factors (SF)	TAM, UTAUT
Perceived usefulness (PU)	TAM
Performance expectancy (PE)	UTAUT

Motivation MtU	TRA
Perceived Ease of use (PEoU)	TAM
Facilitating conditions (FC)	UTAUT
Actual use (AU)	TAM UTAUT
Behavior intention (BI)	TAM UTAUT

TABLE II. OPERATIONALISATION

Constructs	Questions	Items	
EoU	How easy do you find using these Web 2.0 tools listed below to obtain the resources you need for your studies?	7	
AtU	How many times do you use Web 2.0 tools listed above for academic purposes per week?	5	
MtU	To what extent do you agree that social part of e-learning platforms (e.g. Module and Blackboard) motivate learner to a great extend to achieve learning objectives?	8	
	E-learning platforms enable you to send mails, download course materials upload assignments, read announcements, access the library material and discuss with other students, professionals and your lecturers. To what extent do you think such system would motivate you to achieve your learning objectives?	10	
FC	Regarding facilities available for learning and teaching in the university, how satisfied are you? Add any necessary comments regarding technology and facilities available in your university	4	
	Do you own personal computers or phone with internet connection		
PU	To what extent do you agree that Web 2.0 tools would speed up acquisition of knowledge?	11	
BI	To what extent do you agree that social computing should be adopted in education and training for sharing of knowledge and information?	9	
SF	To what extent do you agree that Web 2.0 tools will encourage active participation?	11	
AtU	How many times do you use Web 2.0 per week?	6	
PE	To what extent do you agree that the use of Web 2.0 technology in education will help improve performance	14	
Demographics	Gender	What is your gender?	16
	Status	Are you a student or lecturer?	1
	Field	What is your field?	19
	Age bracket	What is your age bracket?	17

#### IV. FINDINGS AND DISCUSSION

The bar chart on Fig. 2 shows the frequency distribution for *perceived usefulness*. The distribution is left-skewed with values: *neutral, slightly agree and agree* achieving higher frequencies as compared to other responses. This means that most of the users agree that the introduction of Web 2.0 tools will enhance students' learning.

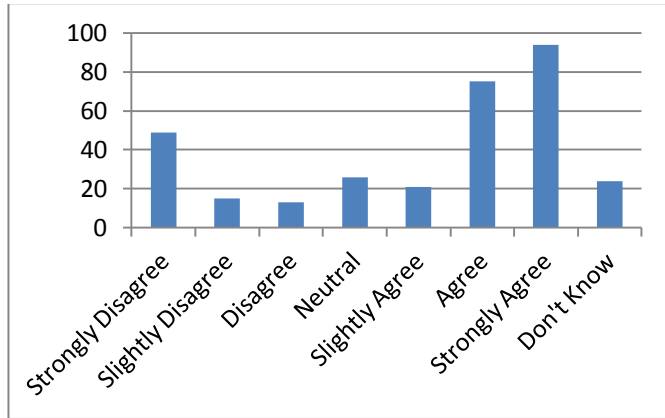


Fig. 2. Frequency distribution for Perceived Usefulness

To perform inferential statistics, correlation analysis was used to evaluate the relationships between variables therefore testing the hypotheses of this study (see the conceptual model at Fig. 1). The correlation formula is given as:

$$\rho_{X,Y} = \text{corr}(X, Y) = \frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y} = \frac{E[(X - \mu_X)(Y - \mu_Y)]}{\sigma_X \sigma_Y},$$

where  $x$  is one variable, eg *motivation to use* and  $y$  another, eg *behavioural intention*; and  $\rho_{X,Y}$  is the correlation coefficient.

Rank correlation coefficients (Kendall tau) were used since we do not have absolute values [22]. Table 3 shows a summary of relationships between variables and links the relationships to hypotheses presented previously in the model. Correlations marked with a single asterisk are significant at level 0.05 and those with double asterisks are significant at level 0.01. The rest of this section will discuss each pair of variables before a general summary of the findings and implications are presented.

The correlation between Behavioral Intention (BI) and Perceived Usefulness (PU) is highly significant and reaches the value of 0.549. That means that there is a relationship between acceptance and usefulness in the case of Web 2.0 technologies. The rest of this section will investigate the relationships between BI and other variables.

The correlation between variables BI and Performance Expectancy (PE) is highly significant and reaches the value of 0.431. That means that there is a relationship between BI and PE in the case of Web 2.0 technologies in higher education of Nigeria.

The correlation between variables BI and Social Factors (SF) is highly significant and reaches value of 0.423 that means that there is a relationship between BI and SF.

The correlation between variables BI and Actual Use (AU) is significant and reaches the value of approximately 0.2 meaning there is relationship between BI and AC for academics purpose.

The correlation between variables BI and Prior Knowledge (PK) is highly significant with the value of 0.431. That means that there is a relationship BI and PK.

The correlation between variables BI and Motivation (MtU) is not significant.

The correlation between variables BI and Facilitating Conditions (FC) is significant and reaches the value of approximately 0.3. That means that there is a relationship between BI and FC.

The table below is a summary of the correlation analyses.

TABLE III. SUMMARY OF CORRELATIONS BETWEEN BEHAVIOURAL INTENTION (BI) AND OTHER CONSTRUCTS

Constructs	Correlations Coefficients	Significance	Hypothesis
PU	.549**	Yes	H <sub>1</sub>
PE	.431**	Yes	H <sub>2</sub>
SF	.520**	Yes	H <sub>3</sub>
AU	.169*	Yes	H <sub>4</sub>
PK	.153*	Yes	H <sub>5</sub>
MtU	.932	No	H <sub>6</sub>
EoU	.134*	Yes	H <sub>7</sub>
FC	.115*	Yes	H <sub>8</sub>

In summary, all relationships except the one between *motivation to use* and *behavioural intention* are significant as individually presented in this section. The variables with the significant relationships are *perceived usefulness, performance expectancy, social factor, behavioural intentions, prior knowledge or use for social purpose* and *facilitating conditions*. One of them, *prior knowledge* is a new variable that was generated by the researcher. The results generally confirm earlier research in acceptance of technology [17] [21].

The general implication of this research is that the use of Web 2.0 technologies would encourage active participation in teaching and learning. A specific implication is to increase each of the variables, if possible, so as to encourage greater use of these systems.

For instance, the systems should be customised in a way that is as easy to use as possible so as to encourage its use. However many Nigerians are not familiar with these technologies for teaching and learning. This was also observed by Anunobi and Ogbonna [10] in their research. Therefore, utilisation of these tools for academic purposes as well as awareness is needed to gain benefits from them.

#### V. SUMMARY AND FUTURE WORK

The research developed a model based on some variables of TAM, UTAUT and TRA along with one added variable to

examine the intention to adopt Web 2.0 in learning in Nigerian higher education. The results showed seven out of eight variables to significantly co-relate with behavioural intention. These variables include *perceived usefulness*, *performance expectancy*, *social factor*, and *prior knowledge*. The implications of the study include the need to make the tools available in the first place in Nigerian higher education; and to deploy them in an easy-to-use way so as contribute to learning and teaching in this environment.

As has been noted, *motivation* did not exhibit a significant influence on intention likely because the students were not using the any learning management systems (moodle or blackboard) whereas the question on *motivation* was emphasizing the use of Moodle or Blackboard platform enhancing learning activities. However previous research in United Kingdom [24] was significant probably because the students are familiar with Moodle. Therefore this variable will be tested again in the future after the students are exposed to LMS. A setting up of a LMS will also enable experiments that will engage the students and teachers in Web 2.0 technologies. Such experiments will produce useful qualitative data that will richly complement this quantitative study.

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