

## FACTORS OF ACCEPTANCE AND USE OF WEB 2.0 TECHNOLOGIES FOR EFFECTIVE IMPLEMENTATION IN HIGHER EDUCATION: PRESENT LEVEL OF USE IN TWO COUNTRIES

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### Abstract

The use of Web 2.0 technologies in educational contexts is being emphasized in recent times with significant increase in its awareness in educational institutions. These tools are popularly used for social (non-academic) purposes (as also confirmed by this research). However, there is low use of these tools and little research on behavioural intention of students and academics. Hence, this study used technology acceptance models to develop a research model that includes perceived ease of use and motivation as constructs. These constructs were operationalised into a questionnaire that was responded to by 279 participants in Scotland and 317 in Nigeria. The constructs correlated with behavioural intention, which in turn correlated with actual use of social media for educational purposes. The validation of the model suggests that the constructs (which include prior knowledge) of the model should be taken into consideration when implementing social media in educational institutions.

**Keywords:** Web 2.0 technologies, acceptance factors, adoption for learning, collaboration, participation, Nigerian higher education, Scotland, social media

### Introduction

Acceptance of technology has long been a challenging issue in information systems research (Swanson, 1994). Understanding the reason why people accept or reject technology is very crucial because it serves as a guide to investors, manufacturers, institutions and their managers. Much research has used technology acceptance models (TAM) to measure acceptance of technology (Davis & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Oshiyanki, Cairns, & Thimbleby, 2007). Whereas some research exists in developed countries on acceptance of Web 2.0 tools in learning, not much of such empirical studies have been done in developing economies. Neither has there been a comparative study of these economies. Hence, this study investigates Nigeria and Scotland as well as compares these two countries in terms of the factors of the model, such as perceived usefulness and actual use. The investigation also endeavours to ascertain what factors in the model may have to be borne in mind to achieve acceptance of Web 2.0 social network technology tools in teaching and learning in higher education institutions of developed and developing communities.

## Literature Review

### Nigeria and Scotland

The researchers possess the multicultural learning experience of Nigerian and Scottish higher education where they *a priori* observed the low use of Web 2.0 tools for educational purposes. Thus, they conveniently chose these two countries for their study. In addition, no empirical studies of the two countries exist that examine the acceptance and use behaviour of Web 2.0 in learning (Anunobi & Ogbonna 2012; Baxter, Stansfield, & Connolly, 2011; Echeng, 2011). The researchers just cited were interested in the use of Web 2.0 by librarians, academics and students in Nigeria. These studies found the use of these tools for academic purposes lacking and identified five major problems: personality characteristics, motivation, lack of facilities, and lack of computer expertise. They also suggested more research into how these technologies could be adopted for teaching and learning to improve students' satisfaction. This research is interested in factors that could be associated with adoption.

Little research has been done on the acceptance of Web 2.0 tools in higher institutions in developed countries (Ajjan & Hartshorne, 2008), and the research inferred that subjective norms of students affect their acceptance, and little has been researched in Scotland on implementation strategies (Baxter et al., 2011; Echeng, Usoro, & Majewski, 2013). However not much has been researched on users' acceptance of Web 2.0 technology tools in learning in Scotland as found in some other developed communities. Hence, this research is a comparative study that seeks to bring together factors that influence acceptance and effective use of Web 2.0 technology tools in learning in order to understand the key factors that influence adoption in these two educational communities.

### The Need for Web 2.0 Technologies in Education

Web 2.0 technology provides very effective web-based collaborative systems. Being a relatively young technology, a number of issues are yet to be resolved (Franklin & Harmelen, 2007). One of these is its acceptance and use in teaching and learning challenges. However, several studies (Redecker, 2009; McLoughlin & Lee, 2007) 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 (2010) showed increase in students' performance as their critical thinking skills were improved as the students updated their blogs weekly. Other research offers effective strategies for implementation (Baxter et al., 2011). However, in order to achieve a better learner-centered approach, there is a need to investigate the challenges and factors that are associated with adoption of these technologies to improve learner engagement among other benefits.

### Potential of Web 2.0 Technology Tools

Over the past five to six years, there has been significant increase in research on educational usefulness and potential of Web 2.0 (Redecker, 2011; Alexander, 2006). Most of it has shown that Web 2.0 social network tools can enhance

participation, collaboration and interaction in learning. The tools enable social networking site users who are mostly young people to create profiles and to build personal networks that connect them to each other for a variety of professional and personal reasons.

### **Challenges of Adoption of Web 2.0 in Education**

Literature has documented the challenge of getting students and educators to adopt Web 2.0 tools for educational purposes (Jucevičienė & Valinevičienė, 2010). Some researchers explained that the limited adoption is due to lack of understanding of the behaviour of users, thereby shifting focus from what users want to what is technologically achievable (Njenga & Fourie, 2010; Ennew & Fernandez-Young, 2006). Though innovative educators appreciate and use Web 2.0 technologies, others are afraid that these technologies would disrupt young people's engagement with "traditional" education (Njenga & Fourie, 2010; Ennew & Fernandez-Young, 2006). These challenges and debates on them have been noticed in higher education institutions of developed economies (Jucevičienė & Valinevičienė, 2010). However, other researchers in developing economies think otherwise, and reported the use of these tools as potentially useful to enhance communication in learning activities in higher education institutions where there are high populations of students as well as insufficient facilities and academics (Olasina, 2008, Adoga, 2008).

### **User Acceptance**

Existing research on user acceptance has produced a variety of explanatory and predictive models (Jucevičienė & Valinevičienė, 2010; Ajjan & Hartshorne, 2008; Venkatesh et al., 2003; Davis Bagozzi, & Warshaw, 1989; Ajzen & Fishbein, 1980). However, these models suggest different and, sometimes, conflicting sets of predictor variables. Ajjan and Hartshorne's was specifically on Web 2.0 technology acceptance in higher education, and their study used the theory of planned behaviour as a theoretical underpinning. Their findings inferred that subjective norm of students is a key factor that affects their acceptance, whereas Armitage and Cornor (2007) studied 185 researchers that used the theory of planned behaviour (TPB) from 1980 until 1997 and found that subjective norm was a weak variable for predicting behavioural intention. Hence, the need to review other popularly used technology acceptance models in order to understand the major constructs that could contribute to acceptance and use of Web 2.0 technology in learning.

### **Technology Acceptance Models**

The literature review revealed three widely used models of acceptance of technology: the theory of reasoned action (Ajzen & Fishbein, 1980), the technology acceptance model (Davis et al., 1989), and the unified theory of acceptance and use of technology (Venkatesh et al., 2003). Acceptance of technology has been studied in different contexts, but there is limited research on acceptances of Web 2.0 tools in teaching and learning in higher institutions (Ajjan

& Hartshorne, 2008; Mazman & Usluel, 2010). Hence, this research developed hypotheses to test acceptance of Web 2.0 technology tools in learning.

### **Hypotheses Development**

A selection of constructs was made from three technology acceptance models that support learning after reviewing literature and carrying out a pilot study. Three theories of technology acceptance (theory of reasoned action; technology acceptance model and unified theory of acceptance and use of technology) served as the theoretical underpinning to this research. The chosen constructs are: motivation to use, social factors, facilitating conditions, performance expectancy, ease of use, and perceived usefulness. This selection was also guided by the preliminary interviews with five ICT directors, five lecturers and 16 students in five Nigerian universities and one university in Scotland. Fifteen semi-structured questions were used to investigate the situation on learning with Web 2.0 technology tools and the possible motivating factors that could be used to enhance acceptance and use of these tools in learning. These interviews were analyzed using NVIVO tag cloud in order to retrieve text that was mostly used by the respondents and the clustering co-occurrence or non-occurrence to determine important constructs to be included (Echeng et al., 2013). This was done to inform the inclusion of constructs from these three models, and also this analysis informed the addition of a new construct (prior knowledge) for hypothesis development. The hypotheses follow.

#### **Perceived Usefulness (PU)**

Perceived usefulness is the belief that the use of technology will improve and progress the work or learning activity of an individual or an organization. Davis et al. (1989) and Venkatesh et al. (2003) found that perceived usefulness affects technology acceptance. This research is to examine the effect of perceived usefulness with regards to Web 2.0 technologies for learning with the hypothesis:

H<sub>1</sub>: There is a positive relationship between perceived usefulness and behavioural intention to adopt Web 2.0 technologies in learning.

#### **Social Factors (SF)**

Social factor in this context comes from the impact of social presence on individual behaviour. This could be communication and interaction with students and lecturers, which may result in interpersonal agreements that affect behaviour of individuals in a group (Guerin, 1993; Taylor & Todd, 1995; Aiello & Douthitt, 2001; Ajjan & Hartshorne, 2008). This factor was included in the Davis et al. (1989) model as an external factor, which they argued might influence technology acceptance. This variable is also included in UTAUT. This research seeks to validate this argument when considering Web 2.0 technologies acceptance for learning. Therefore:

H<sub>2</sub>: Social factors have a positive relationship with behavioural intention to adopt Web 2.0 technologies for learning.

**Prior Knowledge (PK)**

Prior knowledge can be described as knowledge of a set of circumstances gained in the past sufficient to make actions based on those circumstances. It is often helpful and very useful in learning environments (Mitchell, Chen, & Macredie, 2005; Eccles & Wigfield, 2002). This knowledge or experience could positively influence acceptance of Web 2.0 technologies for learning. Hence the following hypotheses:

H<sub>3</sub>: Prior knowledge has a positive relationship with behavioural intention to adopt Web 2.0 technologies for learning.

**Facilitating Conditions (FC)**

The access to internet facilities, the availability of good internet signals and cost of broadband can be regarded as facilitating conditions for the use of Web 2.0 technologies for learning. Therefore, they may influence the use of Web 2.0 technologies in higher education. Thus, it can be hypothesized that:

H<sub>4</sub>: There is a positive relationship between facilitating conditions and behavioural intention to use Web 2.0 technologies in learning.

**Perceived Ease of Use (PeoU)**

Perceived ease of use is the degree to which an individual believes that the use of technology will be without much effort, but will help to achieve much in a short time (Kujawa & Huske, 1995; Davis et al., 1989). This has been used to predict acceptance of technology (Davis et al., 1989) and this research suggests that perceived ease of use should be associated with acceptance of Web 2.0 technology tools for higher education. Hence the hypothesis:

H<sub>5</sub>: There is a positive relationship between perceived ease of use and behavioural intention to adopt Web 2.0 technology tools in learning.

**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. Ajjan and Hartshorne's (2008) research found this variable as promoting technology acceptance. To investigate this finding in the case of Web 2.0 in learning in Nigerian higher education, we used the hypothesis:

H<sub>6</sub>: There is a positive relationship between performance expectancy and behavioural intention to use Web 2.0 technologies in learning.

**Motivation to Use (MtU)**

Motivation in this context involves emotional support, internal or external support that stirs up a learner or gives the desire to act. Motivation can facilitate or hinder change in a learner (Ajzen & Fishbein, 1980; Eccles & Wigfield, 2002; Fetscherin & Lattemann, 2008). Intrinsic and extrinsic motivation develops personal

behaviour, which can in turn affect evaluation of choice, goals and achievements. Thus, motivation to use Web 2.0 technology tools for learning is likely to vary with the attitude of the learners, and it should also relate with behavioural intention.

H<sub>7</sub>: There is a positive relationship between motivation and intention to use Web 2.0 technologies for learning.

**Behavioural Intention (BI)**

Ajzen and Fishbein (1980) argued that a person’s exhibition of a specific behaviour is determined by his/her behavioural intention. Behavioural intention to use Web 2.0 technology should relate with actual use. Thus, the hypothesis:

H<sub>8</sub>: Behavioural intention has a positive relationship with actual use of Web 2.0 technologies for learning.

A conceptual model was developed from the hypotheses that have been presented in this section (see Figure 1)

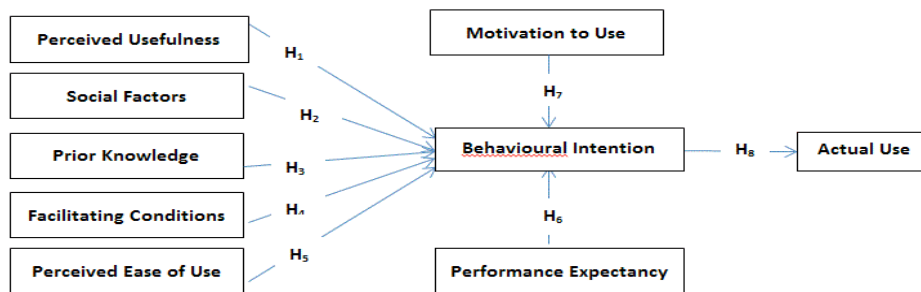


Figure 1. Conceptual model.

**Method**

The nature of the research question and focus, which are on the acceptance of Web 2.0 technologies, guided the method adopted. The literature also revealed that most researchers approach similar studies using quantitative research (Davis et al., 1989; Ajjan & Hartshorne, 2008). This research operationalised the constructs (see Table 1) into a questionnaire to collect data that would measure the eight constructs in the model. The questionnaire was divided into three parts: the first part measured students’ level of satisfaction in learning and facilities available for teaching and learning, and the second part measured the eight constructs in the research model (attitude to use, actual use, perceived usefulness, perceived ease of use, social factor, acceptance and performance). Then the third part investigated demographics (age, gender, educational level, faculty, having personal computer, having internet access). Items were measured using 5 and 7 point Likert scales with 19 questions. All items in the questionnaire were adapted

from earlier and similar research to suit this study (Davis et al., 1989; Ajjan & Hartshorne, 2008).

Table 1

*Questionnaire and Constructs*

Constructs		Questions	Question No.
Perceived ease of use		How easy do you find using these Web 2.0 tools (listed in question 6) to obtain the resources you need for your studies?	7
Perceived usefulness		To what extent do you agree that Web 2.0 tools would speed up acquisition of knowledge?	12
		To what extent do you agree that Web 2.0 tools will encourage active participation in learning?	13
Actual use		How often do you use Web 2.0 tools for academic purposes per week?	8
Social factors		To what extent do you agree that the social part of e-learning platforms (e.g. Module and Blackboard) motivates learner to achieve learning objectives?	10b
Motivation		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 systems would motivate you to achieve your learning objectives?	10a
Facilitating condition		Regarding facilities available for learning and teaching in the university, how satisfied are you? Add any comments regarding conditions necessary to facilitate Web 2.0 in learning.	4
Performance expectancy		To what extent do you agree that the use of Web 2.0 technologies for learning will help to improve performance?	14
Prior knowledge		How often do you use Web 2.0 tools (e.g., blogs, Wikis, twitter) for social purposes per week?	6
Behaviour intention		To what extent do you agree that social computing should be adopted in higher education and training for sharing of knowledge and information?	11
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

**Content Validation**

Allowing prospective participants to fill in the questionnaire in order to check whether they understood the questions validated the questions. The questionnaire was amended based on comments of these respondents (Zikmund, 2003).

**Participants**

The questionnaire was sent online to students and lecturers in one university in Scotland and participation was voluntary: 279 (78 lecturers and 201 students) responded. The Nigeria questionnaire was administered by lecturers and the researcher who visited five Institutions and collected 317 questionnaires with usable data from participants (51 academics and 266 students). Participants were from five universities in Nigeria, due to differences in the Nigerian educational system, and one University in Scotland.

**Data Analysis**

This study adopted the quantitative data analysis. Descriptive analysis for level of use in Figures 2 and 3 show that there is very high use for social and very low use for academics purpose.

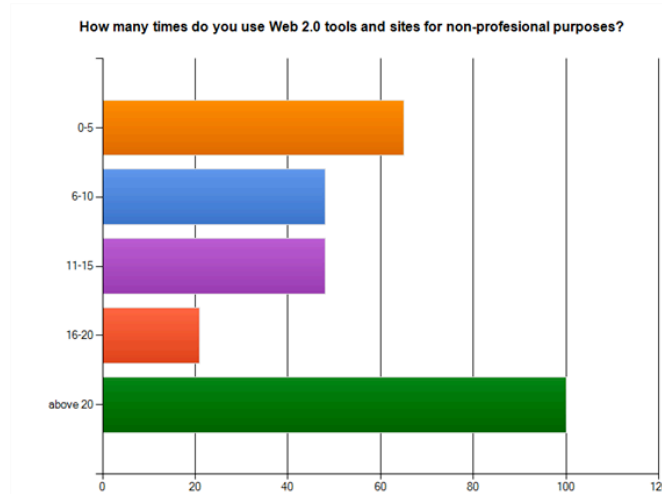


Figure 2. Level of use for social activities.

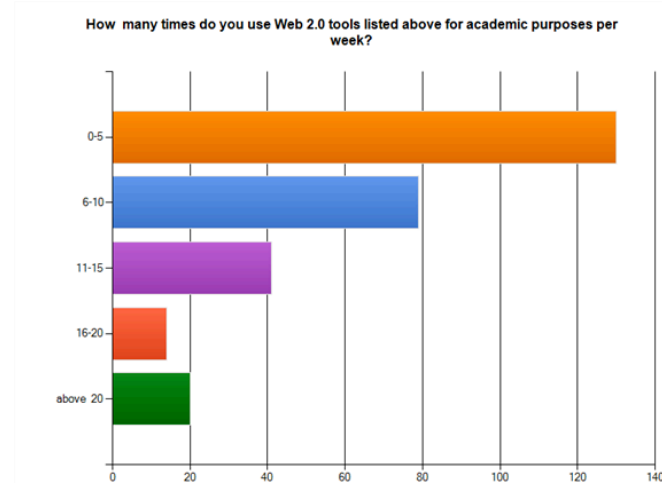


Figure 3. Level of use for academic activities.



The model was tested for content and face validity and inferential statistical statistics carried out to check significant correlation and relationships between variables to validate the conceptual model (see Figure 1, the conceptual model). The correlation formula is given as:

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

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

Kendall tau rank correlation coefficients were used because we do not have absolute values (Zikmund, 2010). Figure 4 is 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 absence of an asterisk indicates no correlation, and this is the case in motivation to use and behavioural intention. The rest of this section will discuss each pair of variables before a general summary of the findings and implications are presented.

Dependent Variable	Independent Variable	Correlations Coefficients		Significance		Hypothesis
		Scotland	Nigeria	Scotland	Nigeria	
BI	TAM(PU)	.616**	.549**	Yes 0.01	Yes 0.01	H <sub>1</sub>
BI	TAM,UTAUT(SF)	.674**	.520**	Yes 0.01	Yes 0.01	H <sub>2</sub>
BI	PK (Mfne)	.625**	.153 <sup>†</sup>	Yes 0.01	Yes 0.05	H <sub>3</sub>
BI	UTAUT(PC)	.130 <sup>†</sup>	.115 <sup>†</sup>	Yes 0.05	Yes 0.05	H <sub>4</sub>
BI	TAM (PEoU)	.221**	.134 <sup>†</sup>	Yes 0.01	Yes 0.05	H <sub>5</sub>
BI	UTAUT (PE)	.620**	.431**	Yes 0.01	Yes 0.01	H <sub>6</sub>
BI	MU (TRA)	.290**	.932	Yes 0.01	No	H <sub>7</sub>
AU	TAM,UTAUT (BI)	.155 <sup>†</sup>	.189 <sup>†</sup>	Yes 0.01	Yes 0.01	H <sub>8</sub>

Figure 4. General correlation between behaviour intention and other constructs.

### Discussion

The median score on behavioural intention for students is 5, meaning they slightly agree to adopt, and academics is 4 (neutral). The modal score for students' behaviour intention is 6 (agree to adopt) and 5 (slightly agree) for academics. The median score on performance expectancy for students is 7 (strongly agree) and for academics 5 (slightly agree).

Figure 4 is a correlation table from the data collected from Scotland and Nigeria; it shows that all the relationships examined in the model were significant except *motivation to use* in the Nigerian data. This research validates the constructs: perceived usefulness, performance expectancy, perceived ease of use, prior knowledge, motivation, facilitating conditions, and social factors from TAM,

UTAUT and TRA (Davis et al., 1989; Ajzen & Fishbein, 1980; Venkatesh et al., 2003) and also validates the new construct *prior knowledge*. The correlation between *behavioural intention* (BI) and *perceived usefulness* (PU) in Scotland data and Nigeria is highly significant and reaches the value of .616 and .549, respectively. 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 discuss the relationships between behavioural intention and other variables.

Figure 4 shows the relationship between *behavioural intention* and *performance expectancy* as highly significant for Scotland and Nigeria (.620<sup>\*\*</sup>, .431<sup>\*\*</sup>) at the 0.01 level of significance. This is in agreement with other research (Venkatesh et al., 2003) that there is a relationship between acceptance and performance expectancy and behavioural intention. The correlation between *behavioural intention* and *social factors* is highly significant (.674<sup>\*\*</sup> and .520<sup>\*\*</sup> at the 0.01 level of significance. This also agrees with previous research (Davis et al., 1989; Ajzen & Fishbein, 1980; Venkatesh et al., 2003), meaning there is a relationship between social factors and intention to use Web 2.0 technologies for learning.

The correlation between *behavioural intention and actual use* is significant at the 0.05 level in the two economies, giving empirical evidence of the relationship in these constructs. This is in line with the technology acceptance model research (Davis et al., 1989; Ajzen & Fishbein, 1980; Venkatesh et al., 2003). There is correlation between *behavioural intention* and *motivation* (MtU) in Scotland at the 0.05 level of significance (see Figure 4) and this agrees with the research by Ajzen and Fishbein, 1980). However, MtU is not significant in Nigeria, and the reason likely was that learning management systems (LMS) are rarely available in Nigerian universities. Hence, the need for more research in this area where LMS are currently in use to facilitate learning activities in Nigeria.

The relationship between *behavioural intention* and *perceived ease of use* is highly significant in Scotland at the 0.01 level of significance, but just significant at the 0.05 level in Nigeria. However this agrees with other research (Davis et al., 1989; Straub, Keil, & Brenner, 1997) that ease of use influences behavioural intention, meaning that there is a relationship between perceived ease of use and behavioural intention. Figure 4 also shows that there is a significant correlation between *behavioural intention* and *facilitating conditions*, meaning that there is a relationship between these two variables, and this agrees with other research (Venkatesh et al., 2003).

This research agrees with other research (Davis et al., 1989; Ajzen & Fishbein, 1980; Venkatesh et al., 2003; Jucevičienė & Valinevičienė, 2010; Mazman & Usluel, 2010) and also unveiled a new construct, *prior knowledge*, which has a positive relationship with behavioural intention, which in turn correlates with actual use or acceptance of Web 2.0 tools for educational purposes. However, Figure 3 shows that there is generally low use of Web 2.0 tools for academic activities. The majority of the two populations studied in this research use these

tools for social and not academic activities. This research validates the research model; hence, the constructs in this model are associated with acceptance and positive change in behaviour that could lead to increased use of Web 2.0 technology tools in academic activities.

### **Significance**

This research examined user acceptance and adoption of Web 2.0 technology tools for learning among populations in Nigeria and Scotland. This work contributes to the body of knowledge on factors that affect acceptance and use of Web 2.0 social networking technology tools in teaching and learning. This will aid management decisions towards enhancing and improving educational experiences as they consider the key variables validated in this research. This research is aimed to give insight to lack of use and to proffer key determinants to increase the use of these technologies in higher education institutions.

### **Limitations and areas for further research**

This research examined relationships among constructs of the model with the use of correlation analysis. Therefore the model has no predictive powers. This should be done in a future study by not only using regression analysis but even before then in endeavouring to measure perhaps in a controlled experiment the effect of Web 2.0 by way of better academic achievements, e.g., higher grades.

### **Conclusion**

This research validates its model; hence, it is important to seriously consider the constructs of this model when aiming to increase the use of Web 2.0 technology tools in academic activities. It is also noted that social media in learning platforms are inadequate in Nigeria. Therefore motivation to use these facilities was not fully investigated in that country. A future research should investigate motivation to use Web 2.0 tools either as part of an LMS or as a separate system for learning when and where they are available in that country.

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