

EXAMINING THE EXTENDED EXPECTATION CONFIRMATION MODEL TOWARDS UNDERSTANDING VIRTUAL LEARNING TECHNOLOGY IN A MANDATORY USAGE CONTEXT



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ABSTRACT

Virtual learning technologies (VLT) are today enjoying widespread popularity globally. As tools that support fast dissemination of new techniques and processes in the e-learning domain, VLT platforms do not only open-up access to quality education, they enhance teaching/learning activities across diverse cultural backgrounds and educational levels. Research has showed that users' perception and interaction with technologies play critical roles in determining pre-adoption, adoption and post adoption usage decisions. However, review of related work on expectation confirmation model (ECM) or VLT show a lack of contextual studies that focuses on ICT practitioners' continued usage of VLTs in a mandatory usage context. Considering the relevance of social norms in workplace environments and its non-inclusion in the ECM model, this paper integrates social norms into ECM to analyze the factors influencing ICT practitioners' continued usage of VLTs and the relationships between the constructs in the model in a mandatory usage context. The responses from 167 questionnaire collected through from a survey using stratified random sampling technique were analyzed. Results from structural equation modeling (SEM) showed that social norms played a more dominant role in a mandatory usage context rather than when usage is optional. Implications for theory and practice are discussed.

INTRODUCTION

Virtual learning technologies (VLTs) are becoming pivotal and popular in higher education irrespective of the mode of education. The dynamic and continuous developments in communications and information technologies, the promotion of open source applications as well as the shortfall of teacher-students ratio has contributed to the high rates of adoption of VLTs globally. Broadly speaking, VLTs can be categorized into the following groups depending on the intention of the developers: (i) commercial software, (ii) open source platforms, and (iii) internally developed platforms. As an example of over 200 VLTs being used today, Modular Object Oriented Dynamic Learning Environment (MOODLE) is regarded as the most widely used VLT throughout the world. Its popularity is not unconnected to its open source and freely available nature (Hensman, 2010).

Originally developed by Martin Douglas in Australia in 1999, MOODLE has recorded more than 126 million users globally. In a survey conducted by a UK ICT agency *BESA*, it was concluded that that MOODLE was by far the most popular VLT in use within the sampled secondary schools and was equally ranked third in the primary section *Besa* (2007). By March 2018, over 530 million accounts have been created with 15,034,724 courses. The figure cuts across in more than 230 countries and 70 languages. 783,737,099 quiz questions, over 135 million resources all sit on the MOODLE online platforms. The United State of America currently tops other countries with a total user base of 10 million with no African country being among the top fifty countries (Google Analytics, 2018).

Past studies on Learning Management Systems (LMSs) have concentrated on factors predicting usage without necessarily reporting continued usage of LMS. For example, while reporting on the poor usage of open source applications in Nigerian universities, Njoku (2017) reported that

92% of respondents' identified lack of technological knowledge as being responsible for the provision and utilization of information resources and services. Other factors identified include passive attitude towards the use of technology by management (84%), lack of Internet facilities to download and use software (79%) among others.

Similarly, the work of Burling (2018) while exploring the views of nursing faculty perspective on LMS using the Bandura self-efficacy conceptual framework reported that nursing faculty did not seem to like their LMS platform; however, the majority of the faculty did consider the LMSs useful in providing materials to students and for posting grades, although faculty stated a desire for additional training and regular workshops on using LMSs as reported by Talke and Heidenreich (2014) faculty members determine in no small measure the rate of adoption of information systems. The work suggested that faculty members have a predisposition to resist change rather than naturally accepting it. As captured by McGill *et al.* (2008), the bulk of the previous research about instructor use of LMS addressed determinant militating against LMS use. Browne *et al.* (2006) identified lack of technical support and financial resources to support course material development while Pajo and Wallace (2001) concluded that the time required for learning how to use an LMS was the most crucial factor. However, Yueh and Hsu (2008) have shown that it is possible to increase LMS usage by instructors, by focusing on appropriate design of LMS. It implies that instructors' usage increases if LMS is known to make their teaching work easier.

In their work McGill *et al.* (2008) while using Goodhue and Thompson's (1995) technology-to-performance chain (TPC) as a theoretical model explored the roles of task-technology fit (TTF) and level of LMS use in the performance impact on academics. The results of the study revealed that TTF has a direct influence on academics' perception on LMS impact.

Several information theories exist in evaluating users' intention to adopt and use of information systems. Some of these models include the theory of planned action Ajzen 1991; diffusion of innovation theory 1995, technology acceptance model, etc. Existing researches have either focused on the use of LMS by lecturers (Burling, 2018) or students (Coates *et al.* 2005; Sterling & Farr, 2018). None of these models focuses on explaining ICT practitioners' intention to continue using an information system after its initial adoption using the updated expectation-confirmation model (ECM). Research is required therefore to investigate ICT practitioners' continuance intention towards MOODLE VLT. Better understanding of this relationship will not only benefit software developers, educational institutions made up of academics and other critical stakeholders like ICT professionals would have a clearer understanding of the critical factors that ensures continued usage of information systems.

The ECM was proposed by Oliver (1980). The theory posits that a consumer's intention to repurchase a product or service is determined by the level of satisfaction derived from it. Satisfaction is in turn determined by the initial expectations about a product or service and the observed differences between initial expectation and actual usage of the product/service. The theory explained that for a buyer to purchase a product/service, initial expectation is first developed at time (t_1). After purchase, assessment of its performance is confirmed through actual usage of the product/service at time (t_2). At the evaluation stage, if the pre-expectation is greater than the actual performance after usage (negative expectation) the buyer cancels repurchase intention. On the other hand, positive expectation is experienced when actual performance is greater than pre-expectation. Confirmation is zero when expectation meets buyers' expectation (Churchill and Surprenant, 1982). The theory has been widely applied in evaluating consumer satisfaction with firms, social psychology, sociology, and public policy fields (Anderson and Sullivan, 1993) among others.

Expectation-confirmation Model

Bhattacharjee (2001) adopted the expectation-confirmation theory to study information systems continued usage. While importing the theory, Bhattacharjee modified the theory by replacing

initial expectation (t_1) and actual performance (t_2) arguing that these constructs are contained in users' perception of confirmation. In addition, expectation at time t_2 was introduced as a new construct predicting satisfaction and continued intention to use. This expectation at time t_2 is regarded as perceived usefulness. Usefulness at time t_2 is assumed to subsume perceived usefulness at t_1 since users are likely to discontinue using a system if it is not useful.

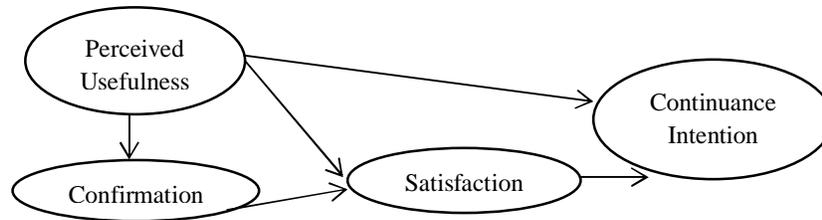


Figure 1: The ECM Model (Bhattacharjee, 2001)

The original ECM comprises of three independent variables namely perceived usefulness, confirmation of expectations and user's satisfaction. ECM posits that the higher the perceived usefulness and confirmation of expectations of an information system, the higher the user satisfaction derived from using the system and the intention to continue using the system. ECM also postulates that expectation confirmation predicts perceived usefulness while perceived usefulness influences intention to use an information system (Bhattacharjee, 2001).

As identified in Table 1, several researchers have adopted the ECM to investigate continued intention to use different applications and systems. Some of them include web-based services, social networking sites, students continued learning behaviour using LMS (Tan & Shao1 2015), instant messaging for mobile devices, mobile smartphone banking services (Susanto *et al.*, 2016), university students' continuance intention about MOOCs (Ouyang, *et al.*, 2017) among others. The work of Tan & Shao1 (2015) added academic integration and social integration to the ECM model to better understand students continued learning behaviour. Other related works that either used or combined the ECM model to other models or focused on LMS and e-learning and does not consider the "pressure factor" from workplace and even the society to perform or not to perform a behaviour that is determined by a person's inclination to comply with people who are important to information system users.

Social Influence

Historically, the concept of social norms was introduced into the social psychology field by (Fishbein and Ajzen, 1991) within the Theory of Reason Action (TRA). The theory explains that an individual's behavioral intention is determined by attitudinal and normative beliefs. They defined subjective norm as the person's perception that most people who are important to him think he should or should not perform the behavior in question. In their work, Eckhardt, *et al.*, (2008) presented 22 different subjective norms found in several research domains and provided three categories namely private environment, norms in a work environment and norms in a Public environment. Social influence from private environment includes families, parents, close friends, classmates, and club members. Social influence of work environment deals with social influence from customers, suppliers, competitors, superiors, subordinates, management, peers, IT staff, experts and consultants, community members. In addition to work and private environment, government and legal issues, religious leaders, medical doctors/ health experts' rules categorized as public environment influences an individual belief and behaviour.

In information system research, the popular and well researched technology advancement model (TAM) by Davis and Warshaw, (1992) adopted the subjective norms factor from TRA to predict users' intention to adopt an information system. Although their findings showed insignificant relationship with intention to adopt IS, several other research works have showed a significant relationship with users' intention to adopt information system also found a significant

relationship between social norms and intention to use blackboard technology. As a dependable variable, continuance intentions deal with the tendency to continue using an IS after initial acceptance. In information system usage, pre-adoption intentions may be completely different from post-adoption perceptions. This is because users' perception and intention to continue using a system may change after system use. Users' satisfaction is critical and remains a major predictor of continuance intentions. Perceived usefulness remains another key construct that drives intention of users to seek for products or services. Upon confirmation of functionality and capabilities of the product or service during usage, satisfaction becomes a judgmental decision if expectations are confirmed (Bhattacharjee, 2001).

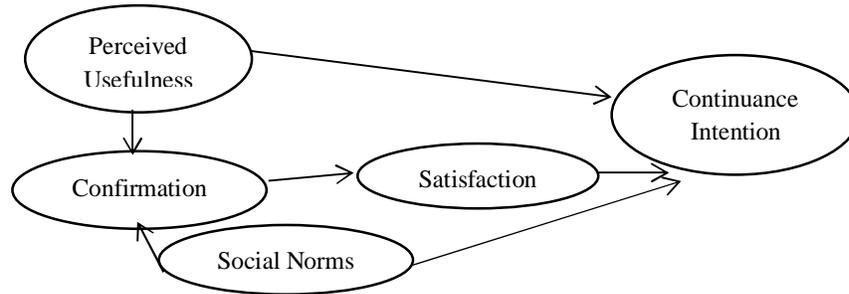


Figure 2: The Research Model

Considering that MOODLE platforms are steadily gaining popularity, it is imperative to examine ICT practitioners' attitudes and behaviors in the post-acceptance stage. Thus, using the ECM and social norms construct as a theoretical framework in this study, the following research hypotheses were proposed:

- H₁: There is a significant relationship between perceived usefulness and continuance intention to use MOODLE VLT such that as ICT practitioners' perceived usefulness increases, continuance intention increases.
- H₂: There is a significant relationship between perceived usefulness and confirmation such that as ICT practitioners' perceived usefulness of MOODLE VLT increases, confirmation results.
- H₃: The higher the ICT practitioners' expectation confirmation of MOODLE VLT, the stronger the satisfaction.

While using the ECM, theory of reasoned action and habit as the theoretical framework, Bhattacharjee & Lin (2015) investigated the influence of social norms on continuance intention to use insurance handling systems. Findings of this work reported that social norms played a significant role in explaining users' continuance intention to use insurance handling system. People who are important to the Lecturers in this context include the employer, colleagues, friends and family members. Hence, the hypothesis is stated thus:

- H₄: There is a significant relationship between social norms and satisfaction such that the higher the social norms towards the use of MOODLE VLT, the higher the satisfaction derived from the platform.
- H₅: There is a significant relationship between social norms and continuance intention to use MOODLE VLT such that social norms increase continuance intention increases.
- H₆: Social Norms positively affects ICT practitioner's expectation confirmation towards MOODLE VLT

METHODOLOGY

Questionnaires were administered on all employed ICT professionals from the National Open University of Nigeria, that carry out ICT related tasks in the university from a period of December 2017 to March 2018. ICT professionals use MOODLE to learn some useful knowledge or technologies on it and to administer examinations for the university. The instrument was sent via

electronic mail (email) to 285 ICT professionals immediately they finished conducting e-exams across the 36 states of Nigeria including the Federal Capital Territory, Abuja. Respondents were expected to tick the choices and return the questionnaire as attachment. Response to the survey was optional and assurances were given that the responses will be used for research purpose only. A period of two weeks was given with a reminder issued after the first week. Out of the 285 invitations sent out, 189 responded representing 66.3% return rate. However, after filtering incomplete and invalid responses, a total of 167 valid responses were obtained as analysis sample.

Measurement

A quantitative research approach was adopted to achieve the research objectives. The items measuring the model were adopted from previous researches with slight modifications to match the MOODLE VLT context. Perceived usefulness confirmation (Bhattacharjee, 2001), satisfaction, and continuance intention were adopted from Limayem *et al.* (2007) and social norms (Bhattacharjee, 2001). Each of the items was measured using a seven-point Likert scale from “strongly disagree” to strongly “agree”. Senior lecturers with specialty in information system reviewed the test items for clarity and the items were slightly reworded to reflect their views. All the items were worded using English language. All constructs were modeled as reflective. -1 was assigned to discrepant cases in the datasheet for computational reasons. The questionnaire is divided into two sections. The first section covers data from respondents regarding sex, age, geopolitical zone, years of experience with MOODLE. The second section, concentrated on the 16 test items that measured five constructs summarized in Table 2. This work considered the measurement and inner models’ analysis. While the measurement model represents the relationship between the indicators and the latent variables (LVs), the outer model focused on the assessment of the model based on criteria such as: uni-dimensionality, internal consistency reliability, indicator reliability, convergent validity and discriminant validity since our model is a reflective model.

Table 2: Constructs Coding

S/N	Construct	Code	Number of Items
1	Perceived Usefulness	PUSE	Puse1 ... Puse3
2	Confirmation	Conf	Conf1 ... Conf3
3	Social norms	SNM	Snm1 ... Snm4
4	Satisfaction	SAT	Sat1 ... Sat3
5	Continuance Intention	Cont	Cont1 ... Cont3

DATA ANALYSIS AND RESULTS

Out of the 167 returned questionnaires, the demographic distribution for sex shows 67.7% (103) for male and 38.3% (64) for female. Age had 11.4% (19) below 30 years while 61.7% (103) were aged between 31-40 years, 22.8% (38) for ages between 41-50 and 4.2% (7) for ages 50 years and above. Similarly, years of experience using MOODLE had 73.7% (123) for number of years less than two, 20.4% (34) and 5.9% (10) representing 3-5 years and 6 – 10 years of experience respectively.

Measurement Model Analysis and Results

Since the model is a reflective model, the following criteria were used to assess the measurement model: uni-dimensionality, internal consistency reliability, indicator reliability, convergent validity and discriminant validity.

- **Uni-dimensionality:** All items loaded significantly on their latent variables except for SNM2, SNM3 and SNM4 with poor indicator loadings on social norms. Hence there was high evidence of uni-dimensionality with the five constructs indicator loadings used in the model as all items loaded above the upper threshold of 0.6.
- **Internal Consistency Reliability (CR):** Using the composite reliability criteria, all constructs in the model except social norms exceeded the minimum threshold of 0.6 and 0.70 (Hair *et*

al., 2006). Hence, there was sufficient evidence of internal consistency reliability among the items of the variables in the model as shown in Table 3.

- **Indicator Reliability:** This criterion measures how much of the indicator variance is explained by the corresponding latent variables (LV). Values should be significant at a 0.5 level and higher than 0.70. As shown in Figure 2, the following items had values lower than 0.70: conf (3), Snm (2,3,4), Sat (3). All other 11 items used in the questionnaire had values higher than 0.7.
- To test for significance, the t-statistics of the inner model, latent variables of the following constructs had values lower than 2: satisfaction to continuance intention and perceived usefulness to continuance intention. All other constructs had t-values greater than 2. Hence there was sufficient evidence of indicator reliability. Details of the t-statistics and their corresponding p-values are contained in Table 4.
- **Convergent Validity:** From the average variance extracted (AVE) values extracted from Table 3, only Social norms had 0.228 as AVE values. All other constructs showed values greater than the 0.50 threshold. This implies that the latent variables showed enough evidence of convergent validity (Fornell and Larker, 1981).
- **Discriminant Validity:** The squared AVE values in Table 3, are the basis for evidence of strong discriminant validity of the instrument. Each of the constructs shared more variance with its assigned indicators than with any other variables within the column under it. As a test for discriminant validity, the items had highest loads on their targeted construct and relatively low loadings on all other constructs. Consequently, all items loaded highest on their targeted constructs as showed in Table 4.

Table 3: Measurement model Indicators

Construct	CR	AVE	Conf.	Cont.	Puse	Sat	Snm
Confirmation	0.840	0.643	0.802				
Continuance Intention	0.866	0.685	0.270	0.828			
Perceived Usefulness	0.880	0.711	0.505	0.392	0.843		
Satisfaction	0.780	0.549	0.500	0.276	0.248	0.741	
Social norms	0.292	0.228	0.537	0.500	0.458	0.262	0.478

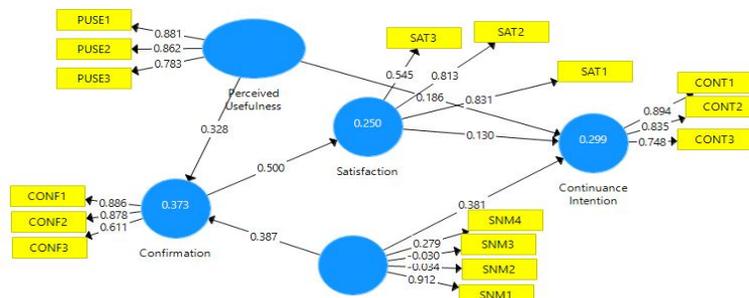


Figure 3: Graphical view of the PLS result with indicators

The Structural Model

The evaluation of the structural model involves the use of two criteria: the predictive power of the model which involves the ability of the model to explain the variance in the dependent variables and the statistical significance of the estimated model coefficients.

The Predictive Power of the Model

The predictive power of the model for the dataset is represented by the R² value on the endogenous variables as shown in Figure 2. From the model in Figure 3 above, 37% of dependent variables such as confirmation, 25% of users’ satisfaction as well as 30% of continuance intention to use MOODLE platform were predicted by the model. While 37% of confirmation was explained by perceived usefulness and social norms, 25% of user satisfaction was explained by users post confirmation experience. 30% of practitioners’ continuance intention was explained by perceived usefulness, social norms and satisfaction.

Significance of the Estimated Model Coefficients

This aspect examined the path coefficients of the latent variables used in the model. In structural equation modelling, path coefficients deal with the correlations between variables. When the T value of the path is greater than 1.96, the two variables on the path are considered to be correlated. The analyses of the summarized conceptual model with their t and p-values are shown in Table 4. Based on the t-values, four out of the six hypotheses were confirmed. H2, H3, H4 and H5 were statistically significant at the levels of p<0.000, 0.002, 0.003 and 0.005. H1 and H6 were rejected even at the level of p<0.189 and 0.234 respectively.

Table 4: Decision Table and Significance Level

Hypotheses	Paths	Path Coefficients	t-value	p-value	Support for Hypothesis?
H ₁	Perceived usefulness to continuance intention	0.19	1.32	p< 0.189	No
H ₂	Perceived usefulness to confirmation	0.33	2.95	p< 0.003	Yes
H ₃	Confirmation to satisfaction	0.50	5.03	p< 0.000	Yes
H ₄	Social norms to confirmation	0.39	2.84	p< 0.005	Yes
H ₅	Social norms to continuance intention	0.38	3.11	p< 0.002	Yes
H ₆	Satisfaction to continuance intention	0.13	1.09	p< 0.234	No

Conclusions

This work was motivated in order to consider external variables that may influence consumers’ beliefs, emotions, and use intentions; researchers have integrated the ECM to other critical constructs and theories in order to have an improved model. The introduction of the construct – social norms to the popular expectation confirmation model in this study revealed that social norm singlehandedly had the strongest contribution (39% and 38%) to the determination of confirmation and continuance intention to use MOODLE by ICT practitioners in an open and distance learning environment. This result agrees with the submission that social norms have both positive and direct influence on behavioral intention. It completely aligns with Goodhue and Thompson (1985) that concluded that users’ social norms and individual habits play a more dominant role in a mandatory usage environment rather than when usage is optional. Two of the original path ways proposed were supported by the result of the empirical analysis implying that when ICT practitioners are provided with a technology in their workplaces, pre-adoption activities such as confirmation results to satisfaction. This work revealed that in the compulsory usage environment context, satisfaction after confirmation is subsumed since users would be expected to produce results by getting use to the system through regular practice. This position was pointed out conservatively by the work of which stated that satisfaction is a weak predictor of the continuance intention. As a dependable variable, continuance intentions deal with the tendency to continue using an IS after initial acceptance. In information system usage, pre-adoption intentions may be completely different from post-adoption perceptions. The work of

Bhattacharjee (2001) alluded to the facts that users' satisfaction is critical and remains a major predictor of continuance intentions but upon confirmation of the functionality and capabilities of the product or service during usage, satisfaction becomes a judgmental decision if expectations are confirmed. The findings of this work would assist VLT designers focused more on features that would result to maximal and continued usage of information systems for specific context. As the open source community and other system developers turn out different technologies to support emerging trends in different industries, developers should have at the back of their minds the contextual background of the users and pay more attention to the critical factors affecting users' satisfaction and continued system usage in this case. Further research should explore the application of the model in this study in both voluntary and mandatory usage environments using expanded test items to spread across the three categories of norms; norms in the private environment, work environment and public environment.

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