

## THE INFLUENCE OF COGNITION AND EMOTION ON NIGERIAN UNDERGRADUATES' FRUSTRATION DURING e-REGISTRATION

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### Abstract

This study was designed to investigate the relative and combined contributions of cognition and emotion to Nigerian undergraduates' level of computer frustration in online environments. The 1972 students who participated in the study were randomly selected from the two state-owned universities in Ogun State, Nigeria. The data for the study were collected through the use of the Students' Cognition Scale, Students' Emotion Scale, and Students' Computer Frustration Scale. Data analysis involved the use of mean and standard deviation as descriptive statistics, as well as the Pearson Product Moment Correlation and regression analysis as inferential statistics. The research findings revealed that students encountered various frustrating experiences during e-Registration and that a combination of the predictor variables, cognition and emotion, significantly accounted for 2.5% of the variance in the students' level of frustration. Cognition was found to be the more potent contributor to this frustration. The results of this study further indicated that there was a statistically significant difference in the level of computer frustration among students at the two universities, potentially due to the relative differences in the schools' technology facilities. Recommendations are made at the end of this paper in accordance with the findings of the study.

**Keywords:** cognition, emotion, computer frustration, e-Registration

### INTRODUCTION

The rapid growth of computer networks and the evolution of the Internet in the last decades have added value to the role of computers in higher institutions of learning (Miltiadou & Savenye, 2003). As Internet usage is increases, the application of digital technology to create online environments grows rapidly in various areas of education, ranging from advertisements, admission processes, recruitment of staff, record keeping, general administration, uploading and downloading of course materials, and student registration (Lim, 2004; Miltiadou & Savenye, 2003). Today, there is widespread interest in online registration (e-Registration) at institutions of higher learning across the globe. E-Registration is an interactive online method of processing admission application forms, student enrolment, selection of courses, payment of school fees, entry of personal data, and other information via the Internet (Ojerinde & Kolo, 2009). It has become increasingly popular recently because it offers the ability to perform transactions anytime and anywhere (Mandernach, Donnelly, & Dailey-Hebert, 2006).

Registration of prospective and returning undergraduates in Nigeria was not easy until recently, when e-Registration was introduced in some higher education institutions. Online registration of Nigerian students began with the Joint Admission Matriculation Board (J.A.M.B.) in 2002. The method was then adopted by other examination bodies, such as the West African Examination Council (W.A.E.C.), the National Examination Council (N.E.C.O), and various institutions of higher learning (Onochie, 2010; Ojerinde & Kolo, 2009). The popularity of e-Registration is gaining ground in Nigerian institutions, as it has the potential to reduce student pressure during registration, prompt un-delayed registration, curtail fraud, reduce congestion of students in offices, avoid incidents of late registration, reduce paper documents, and reduce the stress generated by waiting in long queues in the scorching sun.

The introduction and adoption of e-Registration in Nigeria was seen as a step in the right direction towards globalisation. However, Onochie (2010) reported that many admission-seeking candidates and students returning to tertiary institutions complained of the hassles and frustration they experienced in the online registration process in many cyber-cafes. Bessiere, Newhagen, Robinson, and Shneiderman (2006) have noted that computer users experience highly frustrating situations in the process of interacting with Internet facilities, for example, programme crashes, inability to open e-mail attachments, and non-responsive networks.

Frustration was first introduced by Sigmund Freud as a concept related to goal attainment (Lazar, Bessiere, Ceaparu, & Shneiderman, 2004). Any interruption to the successful accomplishment of a target task can be frustrating. Lazar, Feng, and Allen (2006) posited that computer frustration occurs when anything obstructs users' goal attainment in the process of interacting with computers. Earlier research has shown that frustration contributes to the digital divide (Bessiere, Newhagen, Robinson, & Shneiderman, 2006) and that people avoid using the Internet because of past frustrating experiences (Ceaparu, Lazar, Bessiere, Robinson, & Shneiderman, 2004; Pew, 2003). Meanwhile, Bessiere, Newhagen, Robinson, and Shneiderman (2006) remarked that frustration is the emotional outcome of a negative technology experience.

Individuals' decisions to accomplish online tasks are influenced by their emotional state of mind regarding the use of computers (Creed & Beale, 2005). Hazlett (2003) and Roseman and Smith (2001) emphasised that emotion is a vital coping strategy in human endeavours and a significant element of human-computer interactions. According to Tu and Mclsaac (2002), many computer users are embattled with the expression of feelings of confusion and frustration; hence, many such people opt out or withdraw from interaction with computer technology. Graesser, Chipman, King, McDaniel, and D'Mello (2007); Hone (2006); and Picard (1997) reported that emotions expressed in the form of body language also influence human-computer interactions. On the basis of the discrete emotions theoretical framework, Ekman (1993) identified the basic facial expressions of emotions as anger, sadness, fear, surprise, and disgust. The appraisal theory of emotions connects individuals' emotions to the construction and appraisal of continuous interaction with the environment (Baylor, Warren, Park, Shen, & Perez, 2005). Empirical findings have shown that self-efficacy influences individuals' emotional states (Lazar, Jones, Bessiere, Ceaparu, & Shneiderman, 2004). The enjoyable experience of using technology in an online environment influences efficiency and performance, so a significant relationship between Internet experience and the emotional state of computer users has been established (Lazar, Feng & Allen, 2006).

Ratner (2000), cited in Glazer (2008), observed that emotions and cognition are inseparable twins. Glazer (2008) further emphasised that the recognition of a solid association between emotion and cognition enhances individuals' effectiveness in learning environments. In this cognitive framework, how humans think and find meanings in their environments is a reflection of individuals' cognition (Hess, 1999). It therefore follows that the centrality of emotion and cognition in activating attention, as well as the response to environment and performance, cannot be under-estimated. O'Regan (2003), however, remarked that emotion

forms the basis for functioning in the cognitive domain. Meanwhile, it has been found that some World Wide Web users often display elements of anxiety (Hemby, 1998). Such apprehension, according to Rozell and Gardner (2000), emanates from factors like stress, lack of basic knowledge about computer skills and Internet search engines, unclear instruction in the use of the Internet for specific tasks, and uncertainty about the system's performance. Apprehensive situations sometimes expose computer users to shame, embarrassment, incompetence, confusion, and discouragement.

Despite all this, researchers seem not to have not given adequate fundamental attention to the emotions that people encounter while using computers (Creed & Beale, 2005), and most studies on emotions and computers are targeted at adult users (Yildirim, Lee, Potamianos, & Narayanan, 2005). Despite the increasing acceptance and use of computers and the Internet in the education sector of developing countries such as Nigeria, many students still encounter difficulties with the e-Registration process. It is therefore apparent that the flexibility and convenience of e-Registration may not sustain students in an online environment. With the increasing popularity of e-Registration worldwide, research is needed to determine how emotion and cognition contribute to learners' frustration during registration in an online environment. This study was therefore conducted in order to examine the combined and relative contributions of emotion and cognition to students' computer frustration during e-Registration.

### **Research Questions/Hypothesis**

To achieve the objective of this study, three research questions and one research hypothesis were formulated:

1. What are the various frustrating experiences encountered by undergraduates during e-Registration?
2. To what extent does the combination of cognition and emotion affect students' frustration during e-Registration?
3. To what extent do cognition and emotion relatively affect students' computer frustration during e-Registration?

**Hypothesis:** Students' degree of frustration during e-Registration will be significantly different in each institution.

## **METHODOLOGY**

### **Design**

The study adopted a descriptive survey research design to predict the criterion variables of Nigerian undergraduates' computer frustration during e-Registration.

### **Participants**

All undergraduates at the two state-owned universities in Ogun State, Nigeria—Olabisi Onabanjo University, Ago-Iwoye (OOU) and Tai-Solarin University of Education, Ijagun, Ijebu-ode (TASUED)—constituted the population of this study. A total of 1,972 undergraduates (987 males, 985 females) were selected as the study sample through a simple random sampling technique. The mean age and standard deviation of the respondents were 23 and 7.9, respectively.

## **Instruments**

The instruments used for the study's data collection were the Students' Cognition Scale (SCS), Students' Emotion Scale (SES), and Computer Frustration Scale (CFS).

### **Students' Cognition Scale (SCS)**

Students' cognition was measured on an 18-item self-reported cognition scale developed by the researchers. The participants responded on a 4-point Likert scale (strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1).

### **Students' Emotion Scale (SES)**

In order to measure the students' emotions, a 13-item scale developed by the researchers was used to elicit the participants' responses about their affects based on three sub-scales of emotion (perception, expression, and management). The items of the instrument were rated using a 4-point Likert scale (strongly agree = 4, agree = 3, disagree = 2 and strongly disagree = 1).

### **Computer Frustration Scale (CFS)**

The CFS was developed by the researchers to measure students' level of frustration in the process of using computers during online registration. The 22-item instrument included statements about frustrating computer experiences (10 items) and frustrating computer software or programmes (12 items). The participants were required to place a tick before each item that related to their frustrating computer experiences and to rate their level of frustration on a scale of 1 (not very frustrating) to 9 (very frustrating).

## **Validity and Reliability of Instruments**

In order to ascertain the validity of the instruments used in this study, the initial versions of the measures were given to experts (two educational technology experts and a psychometrician) for suggestions and comments before the final versions were developed. Cronbach's alpha reliability coefficients of .81, .79, and .77 were obtained for SCS, SES, and CFS, respectively.

## **Procedure for Data Collection**

Data for the study were collected within a period of four weeks during the 2009/2010 registration process at the two universities examined in this study. Five research assistants were involved in the administration of the instruments. The research assistants were adequately trained in how to ensure participants' effective responses to the items. Voluntary participation of the students was individually sought; hence, only willing-to-participate students were involved in the study. The instruments were randomly distributed to volunteer students in the e-Learning centre at TASUED and the multi-media library at OOU, as well as at various cyber-cafes within the universities' campuses, where many of the students were engaged in online registration.

## **RESULTS**

A descriptive analysis of the mean and standard deviation of students' computer frustration (mean = 19.2880;  $\delta$  = 6.58421), cognition (mean = 46.7911,  $\delta$  = 4.77916), and emotion (mean = 36.3570,  $\delta$  = 5.10443) was performed. The results of the correlations matrix for the relationship between the predictor variables and the outcome variables showed that

students' computer frustration negatively and significantly correlated with cognition (-.157), but positively and significantly correlated with emotion (.139).

**Research Question 1: What are the various frustrating experiences encountered by undergraduates during e-Registration?**

The results of the analysed data indicated that undergraduates encountered various frustrating computer experiences: 1,678 (85.1%) of the participants experienced malfunctioning of computer parts as a frustrating experience, and 1,554 (78.8%) were reportedly frustrated by computers taking a long time to respond to commands. Another 1465 respondents (74.3%) reported being frustrated by a delay in downloading and uploading files during e-Registration. The number and percentages of participants with other frustrating experiences during e-Registration include booting problems (1,278, 64.8%), files/data infected by viruses (845, 42.8%), loss of data (688, 34.9%), poor computer networking (678, 34.4%), computer crashes (567, 28.8%), printer problems (456, 23.1%), and erratic power supply (1465, 74.3%), and the least frustrating experience during e-Registration was system complexity (431, 21.9%).

**Research Question 2: What is the combined contribution of cognition and emotion to the prediction of students' computer frustration during e-Registration?**

Table 1 Summary of Multiple Regression Analysis between the Predictor Variables (Cognition and Emotion) and the Criterion Measure (Computer Frustration)

<b>Multiple R (Adjusted) = .157</b>					
<b>Multiple R<sup>2</sup> (Adjusted) = .025</b>					
<b>Stand Error Estimate = 6.51569</b>					
<b>Source of variation</b>	<b>df</b>	<b>Sum of Squares</b>	<b>Mean Square</b>	<b>F-Ratio</b>	<b>P</b>
<b>Regression</b>	2	526.561	263.280	6.202	.002
<b>Residual</b>	1,970	20802.539	42.454		
<b>Total</b>	1,972	21329.099			

- a. Predictors: (Constant), Emotion, Cognition
- c. Dependent Variable: Students' computer frustration

The results in Table 1 show that the independent variables (cognition and emotion) combined to contribute a coefficient of multiple regression (R) of .157 and a multiple correlation square of .025. By implication, 2.5% of the total variance of the undergraduates' computer frustration was accounted for by the combination of the two variables. In addition, the table shows that the analysis of variance of the multiple regression data produced an F-ratio value significant at the .05 level ( $F_{(2, 1972)} = 6.202; P < .05$ ).

**Research Question 3: To what extent do cognition and emotion relatively affect students' computer frustration during e-Registration?**

Table 2 Coefficient and t-value of the Regression of the Predictor Variables of Undergraduates' Computer Frustration during e-Registration

Model	Un-standardised Coefficients		Standardised Coefficients	t ratio	P
	B	Std. Error	$\beta$		
<b>(Constant)</b>	28.924	3.359		8.612	.000
<b>Cognition</b>	-.218	.062	-.158	-3.515	.000
<b>Emotion</b>	.016	.058	.012	.271	.787

a. Dependent Variable: Students' computer frustration

The results presented in Table 2 show that cognition ( $\beta = -.158$ ,  $t = -3.515$ ,  $P = < .000$ ) was the main predictor of the undergraduates' level of computer frustration. Furthermore, the results indicated that emotion ( $\beta = .012$ ,  $t = .271$ ,  $P = > .05$ ) did not make any significant contribution to the prediction of the dependent variable. This step of the analysis was performed to show evidence of the relative relevance of the independent variables in accounting for the variations in undergraduates' level of computer frustration during e-Registration. By implication, it is evident that students' computer frustration is dependent on their cognition level. It therefore follows that the higher the cognition level, the lower the computer frustration levels of the students are likely to be.

**Hypothesis: Students' degree of frustration during e-registration will be significantly different based on institution.**

Table 3 Comparison of Students' Frustration Level during e-Registration at Each Institution

Institution	N	Mean	Standard deviation	Df	t-cal	Sig	Remarks
<b>TASUED</b>	998	17.1224	6.30224	1970	-6.78	.000	Significant ( $p < .05$ )
<b>OOU</b>	974	21.4141	6.24542				

The results in Table 3 show that there exists a significant difference in students' computer frustration level between OOU and TASUED ( $t = -6.78$ ,  $p < .05$ ). This suggests that the students at OOU experienced more computer frustration during online registration than those at TASUED. Therefore, the hypothesis that students' degree of frustration during e-Registration will be significantly different at each institution was accepted.

## DISCUSSION

The major findings of this study are as follows:

- Varying percentages of students encountered frustrating computer experiences during e-Registration.
- The combination of cognition and emotion accounted for 2.5% of the total variance in students' computer frustration during e-Registration, which was found to be significant.
- Regarding the relative contributions of the predictor variables, cognition significantly contributed to students' computer frustration during e-Registration, whereas emotion did not make any significant contribution.
- There was a statistical difference in students' computer frustration during e-Registration based on institution: the students at OOU were significantly more frustrated than those at TASUED.

The fact that the students in this study encountered a series of experiences that culminated in frustration during e-Registration lends credence to the research of Lazar, Jones, Hackley, and Shneiderman (2006), who indicated that students and workplace computer users reported many frustrating computer experiences. Similarly corroborating the outcome of this study, O'Regan (2003) and Preece, Rogers, and Sharp (2002) found that computer users were often frustrated with events such as computer crashes, unclear error messages, pop-up advertisements, and confusing interfaces while surfing the Internet. Advancements in computer technology evolve regularly; hence, Tatum and Morote (2006) found that teachers' acquisition of appropriate knowledge and skills is an impetus for effective utilisation of instructional technology. We are thereby prompted to infer that the degree of students' frustrating experiences during e-Registration was aggravated by their lack of necessary skills, including appropriate techniques for exploring computer and Internet applications.

The results revealed that the two predictor variables combined to predict students' computer frustration during e-Registration. The observed F-ratio of 6.202, significant at the .05 level, is reliable evidence that the combination of the independent variables (cognition and emotion) did not occur by chance. The coefficient of multiple regression of .157 and the multiple R square of .025 indicate the magnitude of the relationship that exists between the independent variables and the criterion variables. The results shown in Table 2 demonstrate that the linear relationship of the two predictor variables accounted for 2.5% of the total variance in the students' computer frustration during e-registration. It is pertinent to note that the strength of the joint predictive power of the independent variables on the dependent variable of this study is weak at 2.5% but is still significant. This implies that there are other strong predictors of students' frustration during e-Registration, which requires further investigation.

There seems to be a dearth of research on the combination of cognition and emotion in predicting students' frustration during e-Registration. While Hess (1999) reported that a lack of in-depth knowledge about the use of search engines caused students' frustration in online environments, Lazar, Feng, and Allen (2006) and Baylor and Rosenberg-Kima (2006) found that an association exists between computer users' level of frustration and their emotions. Similarly, Rozell and Dusick (1998), cited in Rozell and Gardner (2000), indicated that emotion was an indicator of the degree of efforts computer users exerted on specific tasks. That cognition and emotion jointly contributed to students' frustration during e-learning is not a surprise, as cognition and emotion have been identified as Siamese twins. It therefore follows that knowledge of computer applications, software and hardware, and a positive affective state are most likely to be effective mitigating factors and/or antidotes to frustration during e-Registration. In addition, it may be likely that if students are less anxious and

exercise more patience, their moods may be better regulated when interacting with Internet facilities.

Cognition was the more significant contributor to students' frustration during e-Registration; emotion did not make any significant contribution. This finding was at variance with earlier research findings, which indicated that the learning process is not independent of learners' emotions (Vince, 2001, cited in Glazer, 2008), that computer-mediated communication is socio-emotional (Glazer, 2008), and that emotion was the potent differentiator in computer users' experiences (Cristescu, 2008). One would think that students' feelings should have a great impact on what they think, what they choose to do, how they choose to do it, and the decisions taken when challenges limit their success. Therefore, it is surprising that despite the degree of frustrating experiences encountered by the students in this study, emotion did not contribute significantly to their frustration during e-learning. It therefore follows that whether students' emotions are positive or negative, the degree of frustration during e-Registration is dependent solely on their level of cognition.

Another finding of this study indicated that there was a statistically significant difference in computer frustration during e-registration between students at TASUED and OOU. Students at TASUED had easy access to multiple computers in the institution's e-learning centre and a reasonable number of cyber-cafes within the immediate environment of the institution. These venues provide regular access to Internet facilities for students and at affordable costs. By inference, OOU students' higher levels of frustration during e-Registration might be connected to the fact they did not have access to privileges such as officially-provided professional technical assistance, easy access to websites, and high-speed Internet browsing that were available at the TASUED e-learning centre. There seems to be little or no earlier research regarding differences in frustration level during e-learning among students at different institutions of learning. This area of research could be worth exploring in the future.

## **CONCLUSION**

The results reported in this study underscore the need for researchers and educational technologists to use a combination of cognition and emotion, and perhaps more variables, as predictors of learners' frustration in online environment-related issues in education. In order to reduce the number of frustrating experiences encountered by students in developing countries while interacting with the Internet, authorities at various higher education institutions may need to administer competence tests in computer skills as a pre-requisite to students' admission to universities. Furthermore, in addition to being equipped with an appropriate number of computers and Internet facilities that can serve the student population, institutions of higher learning should provide commensurate human-power services that will make necessary technical support and assistance available to students. This will not only reduce the negative affective state of students when they encounter problems while interacting with the Internet, but also give them increased access to computers, which may improve their general knowledge and skills in using computer technology.

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