

IDENTIFYING FACTORS OF USER SATISFACTION WITH SUMMATIVE E-ASSESSMENT: A QUALITATIVE APPROACH

¹HASSAN BELLO, ²NOR ATHIYAH ABDULLAH

^{1,2}School of Computer Sciences, Universiti Sains Malaysia, Penang, Malaysia.

Email: ¹hassbell72@gmail.com, ²athiyah@usm.my

ABSTRACT

In Nigeria, candidates for electronic examinations have expressed negative opinions about the system resulting from fear or unfamiliarity with the assessment technology, and a lack of knowledge about the methods of e-assessments. This paper aims to investigate the factors determining user satisfaction with a summative e-assessment system in Nigeria from the examinees' point of view, and to address the challenges and problems faced during the e-assessment. Therefore, the research adopts a qualitative approach (by interview) to provide a further understanding of the main factors which affect user satisfaction with e-assessment. Secondly, to map those identified issues with a corresponding objective and subjective aspects of satisfaction. As a result, this could set the stage right for future studies on resolving issues and enhancing the e-assessment satisfaction. This study showed that the satisfaction of examinees with e-assessment would be influenced by service quality, system quality, and user's computer experience. In contrast, information quality was found to be an insignificant determinant of user satisfaction with summative e-assessment. Past studies mostly address the relationship between these factors and user satisfaction quantitatively. This study reveals that Information System Success Model is the most suited underlying theory that could fit the case of e-assessment satisfaction.

Keywords: *Summative E-Assessment, User Satisfaction, Service Quality, System Quality, Computer Experience*

1 INTRODUCTION

Information and Communication Technology (ICT) has become an essential part of our daily life. With the flourishing development of ICT, it has changed our everyday life in a lot of aspects, including economic development, politics, social life, as well as education. Computers are fast becoming a necessary part of education, and they have become vital instruments in teaching and learning environments. The introduction of web technology into the computing environment has significantly brought a revolution in our social life, including the traditional educational system and assessment [1]. Likewise, the development in user-friendly web-based applications for assessments and also the availability of testing protocols that are secured over the internet both led to the common utilization of online assignments, quizzes, tests, and examinations [2].

E-assessment is any electronic assessment process where information and communication technologies are utilized for the activity of assessment, grading of performance, and record of responses. This amounts to the entire process of assessment from the standpoint of examinees, instructors, institutions, examination organizations, and the public [3]. E-assessment can be conducted using a different electronic like desktop, laptop, mobile devices like smartphones, iPad, and electronic gaming [1]. However, web-based application systems adoption in the modern education environment still met some challenges despite the role they play in solving some traditional assessment problems [4]-[5]. Therefore, it is crucial to understand what overcomes the challenges for users to use the system with ease and enjoyment. Thus, the understanding and prediction of determinants that influence satisfaction with e-assessment by examinees are becoming a vital subject.

Traditionally, students in Nigeria are examined using paper and pen on intellectual abilities. This method of examination is, however, characterized by different forms of examination malpractices such as impersonation, cheating, examiners taking bribes to leaking questions, or invigilators favouring some examinees. The threat of these malpractices on the validity of examination outcomes has caused some examination bodies to adopt a different method of administration. One such organization is the Joint Admissions and Matriculation Board (JAMB) that has introduced Computer-Based Testing (CBT) in the conduct of Unified Tertiary Matriculation Examination (UTME). The joint admission and matriculation board in 2013 promoted this method of assessment by introducing it as one of the options of writing the matriculation examination, even though some few universities were engaged with this approach for some years [1]. Furthermore, the benefits of using computer technology for assessment in education in a worldwide sense have been known, and these include lower running costs, time-saving and less stress on both teachers and students, increase the accuracy and efficiency of the testing [2]-[3]. Whereas recognizing these advantages, it is essential to explore the level of user satisfaction of this technology, especially from the examinees (students), by developing a model that will represent and identify factors of user satisfaction toward this mode of assessment.

E-assessment related researches have focused largely on user acceptance and adoption of these systems [6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]-[17]-[18]. While an improved understanding of these parts of e-assessment is critical, more understandings of whether and why examinees feel satisfied with e-assessment contributions are equally, if not more, important. The main justification for focusing on satisfaction is because of its positive association with key user and system outcomes such as system success [4], continuance acceptance [5]. However, adequate service quality is often lacking, looking for a better understanding of examinees' satisfaction [20].

In Nigeria, examinees have expressed contrary opinions about electronic examinations (E-examinations) resulting from fear, or unfamiliarity with the assessment technology, and limited knowledge on the procedure of electronic assessment [7]. Also, researchers established the impact of social, cultural, and environmental factors on the successful implementation of e-examination in Nigeria [8]. They further opined that an

interruption in the supply of power, limited technical competency, and adverse personal perception are some of the challenges affecting the successful implementation of e-examination in Nigeria. Other problems are complex user interface, question design, end-to-end e-examination management, or interface with local student management system [8].

However, previous studies on e-assessments depend largely on quantitative approaches and have found little agreement. Meanwhile, limited qualitative published works on user satisfaction with e-assessment exist, particularly in developing countries. The main aim of this study is to understand the determinants affecting users' satisfaction with e-assessment by exploring the examinees' experience with Nigerian Unified Tertiary Matriculation Examination (UTME) computer-based test with the hope to raise their satisfaction in using e-assessment systems. Thus, the present study addressed one research question: "What factors affect the satisfaction of e-assessment from the examinees' viewpoint?"

2. BACKGROUND

2.1 E-assessment

Assessment is an integral part of educational endeavours because it measures the students' learning process [9]. Traditionally, students are assessed by attending an assessment session with their facilities for the assessment. Electronic tools for assessment are proposed as a solution to automate these assessment sessions [10]. Consequently, an e-assessment is introduced to streamline the assessment process by reducing unnecessary efforts that students must undergo; also, the time for marking is reduced with enhanced fairness due to less human error.

E-assessment manages all documents and purposes related to assessment in an organization. Therefore, using e-assessment reduced cost of conducting assessment radically, and saves examinees' as well as organizations time [11]-[12]-[13], it will enhance test security, and benefit the institutions by preparing immediate feedbacks and report generations to strengthen the process of decision making for question items analysis and distance learning [10]-[14]-[15]. Besides, registration and retention of students raised because opportunities for creating new courses are created due to e-assessment, therefore, opening the financial horizon for the institutions [16].

Fundamentally, there are two types of technologies used for e-assessment. While some institutions make use of e-learning systems as tools

for teaching, learning, and assessment in their institutions, others like Joint Admission and Matriculation Board (JAMB) of Nigeria use large-scale computer-based assessment technologies designed solely for assessment purposes. Previous studies categorized e-assessment into summative and formative assessment [10]. Summative assessments aim to establish whether students/learners/examinees have attained the goals set for them while Formative assessments provide corrective feedback to support students in reaching their goals mostly conducted during the learning experience [10]. Moreover, different approaches of assessments are used to measure different skills of students using computers, which include: multiple-choice questions (MCQ), multiple responses, hot spot, matching, ranking, drag and drop, various steps, and open-ended [17].

The development of user satisfaction of information system studies in education resulted in an increasing number of researches dedicated to it. Still, most of them have been on the use of e-learning [14]. In contrast to e-assessment, just a little research work has been done. This motivated the researcher to carry out a study to assess the determinants of user satisfaction of electronic assessment in Nigeria and the need for having a standardized model for predicting factors that affect system satisfaction because of increased lamentations by the examinees.

2.2 User Satisfaction

In information system discipline, satisfaction has been one of the long-studied areas. Several types of research have been conducted to assess the overall post-adoption impact of IS, focusing on end-users and specifically their satisfaction and the variables that determine it [18]-[19]. In essence, an organizational decision to mount and installed an information system makes it necessary to find a mechanism to determine whether the installed information system is needed. If implemented to discover whether it is functioning correctly, user satisfaction is one of such tools [20]. Also, user satisfaction has been the most popular tool in the information system literature used for measuring the success of a system [4]. This resulting popularity is mainly due to high face validity of user satisfaction as a result of reliable instruments been developed, unlike other measures which are either conceptually weak or empirically challenging to evaluate; hence, user satisfaction provides a viable proxy measure for system success [21]. Furthermore, user satisfaction is generally recognized as a required outcome of any service or product experience because it is one of the

most important conditions for measuring IS success [22].

Researchers in information systems (IS) has offered several definitions of user satisfaction. In their attempt to define satisfaction with traditional IS, Ives et al. [20] defined user information satisfaction as "*the extent to which users believe the information system available to them meets their information requirements*" p. 785. A review of literature from previous studies indicated that the concept of user satisfaction is frequently interchanged with end-user satisfaction. However, this study will adopt the definition of end-user satisfaction offered by [23] (p. 453), who critically viewed it as "*the IS end-user overall affective and cognitive evaluation of the pleasurable level of consumption-related fulfilment experienced with the IS.*" They referred the end-users here as non-technical personnel who interact directly with the system, unlike technical personnel who design the information system.

Using IT has now become an integral part of the learning process. Researchers investigate learners motivating factors of satisfaction in the e-learning system. Several researchers have identified factors that may explain learners' satisfaction with the e-learning system. As previous studies investigated the learners' satisfaction, examinees' satisfaction with e-assessment has not attracted equal attention. The roles of user's satisfaction in influencing e-learning success have been investigated by researchers using different models [24]. A study by [25] stated that the success of e-learning implementation in Malaysia depends on users' satisfaction and continuance usage of the system for learning and other purposes (as cited in [25] (pp 1). In another study [25] tested [4] the IS success model and investigated the relationship between perceived quality (information, system and service qualities) and end-user satisfaction and also the effect of user satisfaction on continuance use of e-learning system. In a cross-sectional study to investigate users perception and intention on e-learning in Iran, [26] used integrated model of [4] and Technology acceptance model (TAM) to investigate the effects of quality factors, perceive ease of use, perceived usefulness on users intention and satisfaction with the mediation of usability towards the use of e-learning and reported that system and information quality were the primary factors driving users' intentions and satisfaction towards the use of e-learning. E-learning effects like actual use and perceived learning assistance were positively predicted by satisfaction and intention. This result is in support of the study of [27] that

found a strong positive relationship between information quality and e-learners satisfaction on the introduction of an open-source LMS to replace home-grown LMS.

2.3. User Satisfaction in E-assessment

Few studies have also examined user satisfaction in the context of e-assessment. For example, [28] in their study to explore the factors that influence examinees' satisfaction with e-quiz assessment in a survey of 283 respondents in Taiwan, 25 of whom were teachers, concluded that fairness of authentication mechanism and system accessibility is significantly associated with e-quiz satisfaction and credibility. Likewise, a study by [29] show how usability factors affect users' satisfaction with an online assessment in an academic institution. Multicriteria Satisfaction Analysis (MUSA) method was used by the researchers to obtain their results, which indicated that half of the participants insisted on the need to make changes on the interfaces. Likewise, [30] addressed students' satisfaction related to the use of an e-assessment system that uses Natural Language Processing in an Intelligent Tutoring System (ITS) using 27 students that have used the system in a Romanian university as respondents to an ISO questionnaire of satisfaction. The questionnaire measured the satisfaction in four sections that include navigation, interface, interaction, and assessment.

Earlier studies have shown that user satisfaction plays a significant role in encouraging students to use the system continuously based on attaining satisfaction. However, based on the reviewed literature, limited researches exist in this area of e-assessment satisfaction. That is the reason for conducting current research to address this gap.

3 RESEARCH METHOD

This study employed a qualitative approach (interview in particular) to identify factors that determine the successful implementation of the e-assessment system from the examinees' perspective. According to [31] qualitative area of a study is utilized to generate, describe, or use to test a theory. As a result, the focus here is the description of the antecedents and identify significant factors affecting the achievement of the e-assessment system.

The interview method was employed to collect deep information about the constructs of the research model. The interview was aimed at gathering views and opinions of examinees on the factors that affect the success of the system. The interview questions developed were scrutinized by

two experts in the research area. A semi-structured interview was used to ensure and deeply explore the research problem and its factors. The interview consists of nine questions whereby questions in which questions one and two were demographic, questions three, four, and five were for examinees experience, and questions six, seven eight, and nine were for users' perceptions based on their experience with the system.

3.1 Participants

The respondents were examinees who have experience with the computer-based test (CBT) of the Joint Admission and Matriculation Board (JAMB), an organization saddled with the responsibility of organizing, conducting, and matriculating students for Nigerian higher educational institutions. Considering the above, the type of sampling technique applied was a non-probability sampling technique of convenience sampling, where the sample is drawn based on their ease of availability [32]. Therefore, the respondents were from four higher education institutions in Kano state, North-west Nigeria, two universities, one polytechnic, and the college of education. More details of interviewees' information are presented in Table 1. Table 1 contains demographic data of the respondents and information on whether the respondent attended or participated in a training organized by the examination board before the examination. The researchers stopped the data collection process as the duplicated data were obtained, and data saturation is reached. Table 1 displays the demographic information of the respondents.

Table 1: Respondents' Information

	Categories	Frequency
Age	< 20	8
	20-25	17
Gender	Female	9
	Male	16
Type of Secondary School attended	Public	10
	Private	15
Training Participation	Participated	17
	Not participated	8

The interviews were conducted on 13th to 17th days within November 2019. Before commencing the interview, the consent of all respondents was sought for recording the interview session, of which

all respondents obliged. To minimize bias responses, we utilize multiple sources of data (different types of institutions), and all respondents were assured of the privacy of their information. A semi-structured interview was used in seeking the respondent's view to avoid over-detailed and focused on the topic of determining factors of their satisfaction with the e-assessment. All respondents were encouraged to answer the questions freely in their own words for the open-ended questions, which took averagely 10-15 minutes for each interview.

4 ANALYSIS

The analysis of the interview was done by employing qualitative content analysis. Hsieh & Shannon [28] defined qualitative content analysis as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns." Furthermore, eight steps were identified by [33] for content analysis. Firstly, the data was prepared so that the interview will be transcribed. After the transcription of the interviews as proposed by [33], we used Nvivo software to get some queries on the transcribed data and auto-coded themes, which will serve as a preliminary analysis of the transcribed data. Based on the auto-coded themes and literature, appropriate themes were assigned to each part of the interview. Eight different themes were identified, as shown in Table 2 and some with subthemes based on the direction of their response. Then, conclusions are drawn from the coded data, and the researchers derive meaning from the themes or identified categories and their properties. Then, the findings are finally reported.

To ensure the reliability of the approach employed to analyze our data as proposed by [32], we confirm that: (i) the transcripts do not contain obvious mistakes, (ii) the codes were cross-checked by researchers to ensure that the codes were independently derived. (iii) absence of drift in the definition of codes by regular comparison of the data with the codes. For the validity, a process of determining whether the findings are accurate from the researcher's view, a triangulation method was applied where the data was collected from various sources that include universities, polytechnic, and the college of education [32].

Table 2: Emergent Themes

S/N	Theme	Codes
1	User computer experience	25
2	Service quality	24
3	System Quality	23
4	User satisfaction	20
5	Perceived enjoyment	6
6	Self-efficacy	4
7	Information quality	4
8	Anxiety	1

5 FINDINGS

5.1 System Quality

Quality of the system was identified as one of the essential themes second to service quality, as seen in Table 2. System quality refers to the user's perception of system performance [35]. From the perspective of the e-assessment system, quality is measured with regards to both the hardware available to the examinee and the software designed for the intended use and needs. The respondents referred to the reliability of the system as one of the factors. Unreliable e-assessment system performance that causes disruptions, breakdown, or unexpected long response time is likely to cause dissatisfaction or lead to frustration [36]. The respondents agreed that e-assessment reliability is one of the determining factors of user satisfaction with e-assessment, as portrayed by the following remarks:

- *After I have reached some minutes into my exam, I don't know what happen the system just shut down, and it has to restart again, and it affected me because I have to start the exam all over again*
- *About ten minutes after starting the exam all the systems in the exam hall shut down, and they come back after about thirty minutes, and the timer was not paused meaning we lost thirty-thirty minutes each*
- *Because of network instability, we could not write the examination on that stipulated day, and it has to be rescheduled to another day*
- *The biometric machine refuses to capture my fingerprints so I could not write the exam until another rescheduled day*

Another mentioned factor by the examinees was the complexity of the system.

Examinees prefer to use a system that is not so difficult and so complex. Also, a complex system would cause delay to examinees to learn an aspect of the system, therefore, causing a delay in the exam completion. The effect is that the user will feel stressed in completing the outstanding tasks within a limited time [36].

- *Somebody closed to me complained to me that he has unintentionally submitted his work while he has not finished*

Thirdly, the users mentioned the speed of the system as another factor. Many of them faced system speed hitches during the assessment as buttress by the following comments:

- *My computer refused to boot on time, so I have lagged my colleagues in starting the exam*
- *Network, Network, Network, please tell them to do something on it*
- *My network fluctuates*
- *Biometric machine too slow*

Referring to the literature, system speed, reliability, and complexity are all measures of system quality [37]-[38] which is one of the constructs of information system success model [4] and one of the variables that determines users satisfaction with an information system [39]-[40]-[25]. Therefore, system quality can also be considered as one of the determinants of examinees' satisfaction with e-assessment.

5.2 Service Quality

Technical support during the examination was one of the factors identified by the student for a successful e-assessment. This support could come from the invigilators appointed by the examination board or the exam center's technical staff:

- *Failure to adhere to the timing. We supposed to start the exam by 9:00 is but up to 11:00 am we have not begun.*
- *Some of the technical staff were not supportive and were uncooperative.*
- *Some of the staff are even harassing us instead of helping us*

The majority of the respondents complained about the unavailability of a conducive environment for the assessment. Their complaints are presented by the following feedback from the interviews:

- *I suppose to start my exam by 1:30 pm, but I couldn't begin till 3:30 pm because the*

center could not accommodate the required number of students at the stipulated time.

- *The examination venue is not conducive*
- *Our power generator shut down during the exam which resulted in systems shut down*
- *During registration even if you go to the registration centers by 5:00 am you will still meet some people there as if they slept there*

Literature support exists for the mapping of this theme to service quality, which is among the variables of information system success model [4]. The concept is borrowed from marketing, and service quality is conceptualized in IS as "the overall support delivered by the service provider, applies regardless of whether this support is delivered by the IS department, a new organizational unit, or outsourced to the internet service provider" [4]. Therefore, in the context and scope of this study, service quality can be defined as the overall support provided by the examination center support personnel and the JAMB staff to the examinees of UTME. Researches exist which established the influence of service quality in attaining satisfaction by users of the information system [25]. From Table 1, we can see that user computer experience followed by service quality were the themes with the highest perception from the respondents and, therefore, can determine examinees' satisfaction with the e-assessment.

5.3 Information Quality

Another factor mentioned by the examinees was the quality of the output of the e-assessment as these respondents commented below:

- *My system calculator cannot perform all scientific calculations*
- *I could not find Questions 15-20 in one of the subject combinations. So, I called a technical staff who restored them for me*

Information quality, as defined by [41], is "a function of the value of the output produced by a system as perceived by the user." Its measurements are associated with the variety of the content, completeness of the information, detailed and accurate information, timely information, reliable information, and appropriate format [41]. All these measures are quite crucial in the e-assessment system, and they are associated with the quality of information obtained from the system.

5.4 User Computer Experience

Computer experience is another theme that is linked to the examinees' ability to perform a required task during the e-assessment with the computer.

Computer experience is defined as "the degree to which a person understands how to use a computer" [42], while [43] described it as "the amount and type of computer skills a person acquires over time." The computer experience that is at least expected from all UTME examinees in the CBT training (a computer training before the examination for the examinees) and a mock CBT examination for the examinees. So, conceptually, we can define computer experience as the amount and type of computer skills an examinee acquired from CBT training and CBT mock examination and other relevant skills. Some responses from the examinees showed that a low level in computer experience affected their use of the e-assessment, which made them face some challenges and complexities. The following students' remarks explained that:

- *My main challenge was I don't know how to operate a computer up to the day of the examination*
- *I could remember a girl sitting closed to me asked me how to enter her name and registration number into the system*
- *My neighbor did not know where to click to start the exam*
- *Somebody in our venue shouted "I submitted while I have not finished"*
- *I am not familiar with computers, so I must attend the training*

However, some of the examinees expressed having previous experience with computers either from their home or from schools.

- *I did not participate in training because I already have computer experience*
- *I did not go to training because I have little experience with computer*
- *I have a computer at home that I use, that's why I did not write the mock exam.*

Previous empirical researches have shown that previous computer experience has a direct and indirect influence on user satisfaction with information systems [44]. Some studies established the influence of prior computer experience on the test performance of examinees with computer experience accounted for a significant amount of variance in the test scores [45]. Therefore, there is discrimination of test scores against those who have not worked with computers before the examination. Also, [46] argued that students with less computer experience achieve lower scores. Therefore, this

theme of computer experience is significant as it is associated with user satisfaction [22].

5.5 Computer Anxiety

Another theme attributable to examinees identified factors that determine system success is the examinees' display of computer anxiety. According to [48], Computer anxiety is a "fear for computers when using the computer, or when considering the possibility of computer use." Some interviewees believed that they exhibited emotional fear in the examination venues.

- *I felt nervous about entering the venue because I have never operated a computer system before.*

Evidence exists in the literature that linked computer anxiety with user satisfaction with the educational information system either directly or indirectly [47]-[49]. Even though based on Table 2, not many examinees exhibited anxiety during the examination.

5.6 Self-efficacy

The user's confidence in his ability to perform a particular task is referred to as self-efficacy. Computer-self efficacy as a special self-efficacy is ones' belief in his capability to use the computer [50]. Another theme mentioned by the examinees is the belief of their confidence in using the e-assessment even without prior experience with the e-assessment either through CBT training or mock examination. The following comments explained that:

- *I knew I am confident of myself.*
- *I felt the task would not be difficult.*
- *I believe that when I practice on my own, I could be able to do it.*

Computer self-efficacy studies in e-assessment are mostly related to students' performance [51]. But some studies established the relationship between computer self-efficacy and e-learners satisfaction in the e-learning system [52].

5.7 Perceived Enjoyment

Enjoyment refers "to the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right aside from the contributory value of the technology" [53]. Some respondents express their enjoyment in using the system for the assessment through some of the following comments:

- *all other things are ok*
- *Well, the system is ok but needs improvement*
- *The system is ok*

- *everything was ok as per as the exam is concerned.*

Besides, other interviewees express displeasure on their interaction with the e-assessment system through the following responses:

- *The experience was not pleasant at all*
- *I did not enjoy the system*

Previous researches have established the positive impact of user's enjoyment with an IS on user satisfaction. In a blended e-learning system, it was empirically established that perceived enjoyment with the e-learning system has a significant influence on e-learners' satisfaction [54]. If e-learners achieve satisfaction by enjoying the system, so also examinees of e-assessment since e-assessments are an essential part of e-learning.

5.8 Satisfaction

On their evaluation of the system in general, a satisfaction theme was identified. Almost twenty-four expressed their satisfaction or otherwise, as shown in Table 2. User satisfaction is defined as an evaluation mechanism to which end-users believe the information system available meets their information requirements [20]. The examinees have assessed and evaluated the system through the following supportive comments:

- *I am really satisfied with the conduct of the examination*
- *I am satisfied with the system.*
- *I am satisfied with the system, but there is a need for improvement*
- *Sincerely speaking, I am satisfied because of the fast release of the result.*

- *I am satisfied with the system because it reduces the level of examination malpractice.*

Conversely, others expressed opposing remarks on their level of satisfaction with the system as follows:

- *But overall, I am not satisfied*
- *I am not satisfied with the system*
- *I am not satisfied with the whole system*
- *I am not satisfied particularly with shutdown incidence, and I know all my colleagues will attest to that.*

6 DISCUSSION

In this section, we are going to classify the identified themes into different groups. This study explained that the examinee's satisfaction is influenced by several factors. Eight themes were identified based on the interviews' results. These themes can be categorized into individual (examinee), system (e-assessment), environmental characteristics (examination venues), and perception as tabulated in Table 3.

Table 3: Categorization of Coding

Categories	Explanations	Coding Themes
Technology	These are characteristics and conditions which are related to the e-assessment system itself.	<ul style="list-style-type: none"> ▪ System Quality ▪ Information Quality
Examinee	These are characteristics and conditions which are related to the examinees.	<ul style="list-style-type: none"> ▪ User computer experience ▪ Computer Anxiety ▪ Computer self-efficacy
Environmental	These are characteristics and conditions which are related to the examination venue's conditions, staff, and facilities.	<ul style="list-style-type: none"> ▪ Service Quality
Perceptions	These are feeling expressed by the examinees who are related to the system.	<ul style="list-style-type: none"> ▪ Satisfaction ▪ Enjoyment

The category of technology includes themes that are related to the e-assessment system. Based on this category, it is shown that some of the e-assessment features are important in the success of the e-assessment. System quality, together with information quality, is found under this group. The reliability and speed of the system are features of the e-assessment that support the use of the e-assessment to achieve user satisfaction. Moreover, the quality of the content and output of the e-assessment is related to the system features, as the examinees are expected to utilize all related examination functionalities fully. Therefore, they are categorized under technology characteristics. User computer experience, computer self-efficacy, and computer anxiety are under the examinee category. This group is concerned with the examinee's ability to use the system fully to achieve maximum satisfaction. Environmental impact on the success of e-assessment is another category. It mainly deals with facilitating conditions of the examination centers and the kind of technical support obtainable at the centers during the examinations. Lastly, enjoyment and satisfaction with the system are under the category of perceptions.

The findings of this study were supportive of research already conducted in studies about e-assessment satisfaction [28]- [29]- [30]. Consistent with past studies, system quality was found to be one of the determinants of e-assessment satisfaction [28]- [29]- [30]. However, this study revealed and emphasized the significant influence of service quality as most of the e-assessment services and facilities are provided by third parties [7]. Thus, this is an explanation of the importance of quality service to be provided by the third parties involved (especially the CBT centers) in the provision of facilities and services for the examination. The research contributes to the literature by showing the importance of previous computer experience in determining user satisfaction with e-assessment as past studies overlooked human factors in evaluating e-assessment satisfaction.

These categories (dimensions) are used to assess the factors determining examinees' satisfaction with e-assessment [49]. The categorization can contribute to helping the examination board to find the source of the factors that determine the satisfaction of the system, which can be of concern to the examinees, the e-assessment system, and the public. Determining the sources is

useful for the examination board to facilitate the techniques for improving the usage of the system.

As it was depicted in Table 3, most of the issues are addressed by the Delone & McLean [4] model, which serves as a model of information success model which uses satisfaction to measure system success [4]. Therefore, for this study, the ISS model will be selected as the underlying model, which captures the majority of e-assessment related issues. However, it has been noted that in four cases of user computer experience, computer self-efficacy, computer anxiety, and enjoyment, the ISS model shows some limitations. Therefore, as the last step toward completing the objectives of this study, the ISS model will be extended by four constructs namely user computer experience, computer self-efficacy, computer anxiety, and enjoyment that the said model lacks, to propose a new model that addresses user satisfaction with the e-assessment experience.

Based on the categorization above, a preliminary model for the research is hereby proposed in Figure 1.

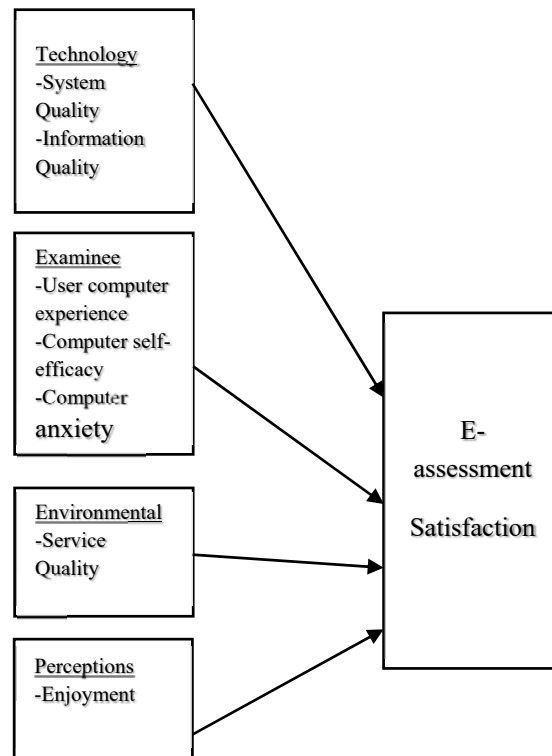


Figure 1: A Preliminary Conceptual Model

7. CONCLUSION AND RECOMMENDATION FOR FUTURE WORKS

The background of e-assessment satisfaction has been studied in this qualitative study which aimed at finding the determinants of e-assessment satisfaction from the examinees' perspective and eight themes were identified. The eight themes were connected to four main groups which are related to the characteristics of the examinees, e-assessment system and environmental conditions and examinees' perception. And it is established that system quality and service quality are the most important factors determining user satisfaction with e-assessment in Nigeria. It is advised that these factors should be considered by the examination board, system developers and designers and the examination centres owners.

One of the study's limitation was the small sample size. Therefore, a study should be conducted for the factors with larger sample size quantitatively. Besides, most of the feedbacks are about aspects of IT artefacts itself (e.g. reliability, complexity, and completeness of information) but did not provide guidance about how to influence usage through design and implementation. Since our themes were developed based on JAMB CBT users, therefore, we cannot generalize our findings outside JAMB CBT context. Also, the results cannot be generalized to other subgroups with quite heterogeneity as two-third of respondents here are of the same age group (20-25 years), and all the respondents are undergraduates that have experience with JAMB CBT systems for e-assessment. Therefore, the relationships between these factors and satisfaction with-assessment need to be investigated in future researches.

REFERENCES

- [1] C. K. Ayo, I. O. Akinyemi, A. A. Adebisi, and U. O. Ekong, "THE PROSPECTS OF E-EXAMINATION IMPLEMENTATION IN NIGERIA," no. October, pp. 125–134, 2007.
- [2] J. C. Cassady and B. E. Gridley, "The Effects of Online Formative and Summative Assessment on Test Anxiety and Performance," *J. Technol. Learn. Assess.*, vol. 4, no. 1, 2005.
- [3] E. Hettiarachchi and M. Huertas, "E-Assessments and How it can be Adapted to Mathematical E-Learning," *Math. E-Learning (E-MATH ...)*, 2011.
- [4] W. H. DeLone and E. R. McLean, "The DeLone and McLean model of information systems success: A ten-year update," *J. Manag. Inf. Syst.*, vol. 19, no. 4, pp. 9–30, 2003.
- [5] V. Terzis, C. N. Moridis, and A. A. Economides, "Continuance acceptance of computer based assessment through the integration of user's expectations and perceptions," *Comput. Educ.*, vol. 62, pp. 50–61, 2013.
- [6] Y. Wang, K. K. F. So, and B. A. Sparks, "Technology Readiness and Customer Satisfaction with Travel Technologies: A Cross-Country Investigation," *J. Travel Res.*, vol. 56, no. 5, pp. 563–577, 2017.
- [7] O. Adebayo and S. M. Abdulhamid, "E- Exams System for Nigerian Universities with Emphasis on Security and Result Integrity," *Int. J. Comput. Internet Manag.*, vol. 18, no. 2, pp. 1–12, 2010.
- [8] A. Fluck, O. S. Adebayo, and S. M. Abdulhamid, "SECURE E-EXAMINATION SYSTEMS COMPARED: CASE STUDIES FROM TWO COUNTRIES," *online exams Serv. ETH Zurich. EUNIS 2014, Umeå, Sweden June 11 – 13. Retrieved from http://www.eunis.org/download/2014/papers/eunis2014_submission_69.pdf*, vol. 16, pp. 107–125, 2017.
- [9] D. Joosten-ten Brinke *et al.*, "Modeling assessment for re-use of traditional and new types of assessment," *Comput. Human Behav.*, vol. 23, no. 6, pp. 2721–2741, 2007.
- [10] V. Terzis and A. A. Economides, "The acceptance and use of computer based assessment," *Comput. Educ.*, vol. 56, no. 4, pp. 1032–1044, 2011.
- [11] D. Alyahya and N. Almutairi, "The Impact of Electronic Tests on Students' Performance Assessment," *Int. Educ. Stud.*, vol. 12, no. 5, pp. 109–119, 2019.
- [12] M. P. Escudier, T. J. Newton, M. J. Cox, P. A. Reynolds, and E. W. Odell, "University students' attainment and perceptions of computer delivered assessment; a comparison between computer-based and traditional tests in a 'high-stakes' examination," *J. Comput. Assist. Learn.*, vol. 27, pp. 440–447, 2011.
- [13] a. a. Sanni and M. F. Mohammad, "Computer Based Testing (CBT): An Assessment of Student Perception of JAMB UTME in Nigeria," *Comput. Inf. Syst. Dev. Informatics Allied Res. J.*, vol. 6, no. 2, pp. 1–16, 2015.
- [14] S. Farzin and H. M. Dahlan, "An empirical study of the behavioral factors affecting students' perception on adopting electronic assessment system," *J. Theor. Appl. Inf. Technol.*, vol. 96, no. 1, pp. 100–117, 2018.
- [15] C. G. Parshall, J. A. Spray, J. C. Kalohn, and T. Davey, *Practical considerations in computer-based testing*. New York: Springer, 2002.
- [16] P. Masouras, "E-Assessment: an E-Business Enabler in Higher Education," *Elev. Int. Conf.*

- E-bus.*, no. November, pp. 1–6, 2016.
- [17] R. Obeidallah, A. Al Ahmad, F. Farouq, and S. Awad, “Students authentication in e-assessment sessions: A theoretical biometric model for smartphone devices,” *Int. J. Bus. Inf. Syst.*, vol. 19, no. 4, pp. 450–464, 2015.
- [18] R. M. Cyert and J. G. March, *A Behavioral Theory of the Firm*. NJ: Prentice-Hall, 1963.
- [19] J. Evans, “Measures of Computer and Information Systems Productivity: Key informant interviews,” Pittsburgh, PA, 1976.
- [20] B. Ives, M. H. Olson, and J. J. Baroudi, “The measurement of user information satisfaction,” *Commun. ACM*, vol. 26, no. 10, pp. 785–793, 1983.
- [21] V. P. Aggelidis and P. D. Chatzoglou, “Hospital information systems: Measuring end user computing satisfaction (EUCS),” *J. Biomed. Inform.*, vol. 45, no. 3, pp. 566–579, 2012.
- [22] M. Igbaria and S. A. Nachman, “Correlates of user satisfaction with end user computing. An exploratory study,” *Inf. Manag.*, vol. 19, no. 2, pp. 73–82, 1990.
- [23] N. Au, E. W. T. Ngai, and T. C. E. Cheng, “A critical review of end-user information system satisfaction research and a new research framework,” *Omega*, vol. 30, no. 6, pp. 451–478, 2002.
- [24] W. DeLone and E. McLean, “The DeLone and Mclean model of information systems success: A ten-year update,” *J. Manag. Inf. Syst.*, vol. 19, no. 4, pp. 9–30., 2003.
- [25] T. Ramayah and J. W. C. Lee, “System characteristics, satisfaction and e-learning usage: A structural equation model (SEM),” *Turkish Online J. Educ. Technol.*, vol. 11, no. 2, pp. 196–206, 2012.
- [26] H. Mohammadi, “Investigating users’ perspectives on e-learning: An integration of TAM and IS success model,” *Telemat. Informatics*, vol. 32, no. 4, pp. 701–719, 2015.
- [27] S. B. Eom, “Understanding eLearners’ satisfaction with Learning Management Systems,” *Bull. IEEE Tech. Comm. Learn. Technol.*, vol. 16, no. 2, pp. 10–13, 2014.
- [28] R. S. Chen, K. K. Hsieh, and C. Tsai, “The implementation of face recognition technology and its effect on e-quiz credibility,” *Asian J. Qual.*, vol. 11, no. 2, pp. 125–136, 2010.
- [29] S. Vairamuthu and S. M. Anuncia, “Reconnoitering Students’ Satisfaction of an Online Based Assessment System to Improve Usability using PSO: An Examination into a Problem Solving and Programming Course,” *Eng. Technol. Appl. Sci. Res.*, vol. 6, no. 5, pp. 1207–1211, 2016.
- [30] I. Dobre, “STUDENTS’ SATISFACTION ANALYSIS RELATED TO AN E-ASSESSMENT SYSTEM THAT USES NATURAL LANGUAGE PROCESSING,” in *The 11th International Scientific Conference eLearning and Software for Education*, 2015, pp. 21–28.
- [31] R. K. Yin, *Case Study Research- Design and Methods b*, 3rd Editio. CA: SAGE Publications. Inc., 2003.
- [32] H. F. Hsieh and S. E. Shannon, “Three approaches to qualitative content analysis,” *Qual. Health Res.*, vol. 15, no. 9, pp. 1277–1288, 2005.
- [33] Y. Zhang and B. M. Wildemuth, *Qualitative Analysis of Content*, vol. 49, no. 10. Westport, CT: Libraries Unlimited: In B. M. Wildemuth (Ed.), 2009.
- [34] J. Schilling, “On the pragmatics of qualitative assessment designing the process for content analysis,” *Eur. J. Psychol. Assess.*, vol. 22, no. 1, pp. 28–37, 2006.
- [35] R. D. Freeze, K. a Alshare, P. L. Lane, and H. Joseph Wen, “IS success model in e-learning context based on students’ perceptions,” *J. Inf. Syst. Educ.*, vol. 21, no. 2, p. 173, 2010.
- [36] H. B. Ibrahim, “THE DETERMINANTS OF END-USER SATISFACTION WITH HRMIS AND ITS INFLUENCE ON INDIVIDUAL PERFORMANCE September 2016,” no. September, 2016.
- [37] S. Hamilton and N. L. Chervany, “Evaluating information system effectiveness - Part I: Comparing evaluation approaches,” *MIS Q. Manag. Inf. Syst.*, vol. 5, no. 3, pp. 55–69, 1981.
- [38] J. E. Bailey and S. W. Pearson, “Development of a Tool for Measuring and Analyzing Computer User Satisfaction,” *Manage. Sci.*, vol. 29, no. 5, 1983.
- [39] Y. H. Fang, C. M. Chiu, and E. T. G. Wang, “Understanding customers’ satisfaction and repurchase intentions: An integration of IS success model, trust, and justice,” *Internet Res.*, vol. 21, no. 4, pp. 479–503, 2011.
- [40] D. I. Maditinos and K. Theodoridis, “Satisfaction determinants in the Greek online shopping context,” *Inf. Technol. People*, vol. 23, no. 4, pp. 312–329, 2010.
- [41] M. N. Bin Masrek, “Measuring campus portal effectiveness and the contributing factors,” *Campus-Wide Inf. Syst.*, vol. 24, no. 5, pp. 342–354, 2007.
- [42] D. Potosky and P. Bobko, “The Computer Understanding and Experience Scale: A Self-Report Measure of Computer Experience,” *Comput. Human Behav.*, vol. 14, no. 2, pp. 337–

- 348, 1998.
- [43] B. Smith, P. Caputi, N. Crittenden, R. Jayasuriya, and P. Rawstorne, "Review of the construct of computer experience," *Comput. Human Behav.*, vol. 15, no. 2, pp. 227–242, 1999.
- [44] J. W. Henry and R. W. Stone, "A Structural Equation Model Of End-User Satisfaction With A Computer-Based Medical Information System," *Inf. Resour. Manag. J.*, vol. 7, no. 3, pp. 21–33, 2014.
- [45] Y. Jin and M. Yan, "Computer Literacy and the Construct Validity of a High-Stakes Computer-Based Writing Assessment," *Lang. Assess. Q.*, vol. 14, no. 2, pp. 101–119, 2017.
- [46] P. Siozos, G. Palaigeorgiou, G. Triantafyllakos, and T. Despotakis, "Computer based testing using 'digital ink': Participatory design of a Tablet PC based assessment application for secondary education," *Comput. Educ.*, vol. 52, no. 4, pp. 811–819, 2009.
- [47] M. Igbaria, "End-User Computing Effectiveness: A Structural Equation Model," vol. 18, no. 6, pp. 637–652, 1990.
- [48] S. L. Chua, D. T. Chen, and A. F. L. Wong, "Computer anxiety and its correlates: a meta-analysis," *Comput. Human Behav.*, vol. 15, no. 5, pp. 609–623, 1999.
- [49] P. C. Sun, R. J. Tsai, G. Finger, Y. Y. Chen, and D. Yeh, "What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction," *Comput. Educ.*, vol. 50, no. 4, pp. 1183–1202, 2008.
- [50] D. R. Compeau and C. A. Higgins, "Computer self-efficacy: Development of a measure and initial test," *MIS Q. Manag. Inf. Syst.*, vol. 19, no. 2, pp. 189–210, 1995.
- [51] A. G. Balogun and A. S. Olanrewaju, "Role of computer self-efficacy and gender in computer-based test anxiety among undergraduates in Nigeria," *Psychol. Thought*, vol. 9, no. 1, pp. 58–66, 2016.
- [52] S. B. Eom, "Effects of LMS, self-efficacy, and self-regulated learning on LMS effectiveness in business education," *J. Int. Educ. Bus.*, vol. 5, no. 2, pp. 129–144, 2012.
- [53] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace' FRED D. DAVIS~," 1992.
- [54] Y. Dang, Y. Zhang, S. Ravindran, and T. Osmonbekov, "Examining student satisfaction and gender differences in technology-supported, blended learning," *J. Inf. Syst. Educ.*, vol. 27, no. 2, pp. 119–130, 2016.