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VARIABLES THAT MAY DETERMINE SECONDARY SCHOOL STUDENTS' PREPAREDNESS FOR UTME-CBT

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Abstract

During the past few years, technology has significantly reshaped the method of assessment. Educational measurement has been moving towards the use of CBT. The underlying purpose of this research is to evaluate the significance of students' access to a computer; students' attitude; students' perception; computer literacy skills and CBT acceptability as it affect secondary school student's preparedness for UTME-CBT. Data were collected with questionnaires distributed to 367 intending UTME candidates in Kwara State, using accidental sampling technique. Structural Equation Modeling (SEM) approach was adopted in understanding the respondents' preparedness process. The empirical evidence was based on a model fit from the result of factor analysis, regression analysis, and chi-square goodness-of-fit statistics. The result revealed that students' access to a computer (.014), students' attitude (.051), students' perception (.021), and CBT acceptability (.076) were significant at $p < 0.05$ hence these variables has an impact on secondary school students' preparedness for UTME-CBT. While students' computer literacy skills (.657), on the other hand, does not have an impact on their preparedness for UTME-CBT. It was recommended that government should make computers available and accessible to students at the primary and secondary school levels to enable them to learn and practice computer skills. It was also recommended that JAMB should provide tutorial packages on UTME to schools for students to practice before the actual examination.

Keywords: CBT; JAMB; UTME

1. Introduction

All over the world, test is an instrument used to measure what learners have learned at the end of a unit. It is also used as a screening tool in some organizations. In schools, test is used to measure what learners have learned at the end of a unit. The expansion of computer technology has created many possibilities for computer applications in the area of testing and assessment. Abubakar and Adebayo (2014) identified the paper-based test with many problems include tedious processes; high risks of accidents; subjective scoring and plausible manipulation of results; late release of results and missing grades among others. A reason while Chua (2012) suggests a technology option among a wide variety of options available for conducting test. In many academic domains, measurement has been moving towards the use of CBT. Atif (2014) defined CBT as a test or assessment that are administered by computer in either stand-alone or dedicated network or by other technology devices connected to the internet or World Wide Web most of them using multiple-choice questions.

The uses of CBT to test knowledge and problem-solving skills have been in existence since the 1960s (Mubashrah, Tariqb & Shamic, 2012). Instant scoring, flexibility in scheduling, and enhanced security are some of the advantages of CBT (Gordon, 2015). Virtually errorless high-speed data processing feature has made computers popular assessment tools in education. The Joint Admissions and Matriculation Board (JAMB), in 2013, introduced Computer-Based Testing (CBT) in the conduct of Unified Tertiary Matriculation Examination (UTME) in Nigeria. Researchers have performed large scale reviews of studies examining students' perspective of the CBT shown a number of mixed reactions. Previous research revealed that many students anticipated problems with the computer-assisted assessment (Okocha, Toluwani & Owolabi,

2017; Alabi, Issa & Oyekunle, 2012). The students' apprehension about CBT form of UTME is perhaps understandable given the poor infrastructure in the public institutions of learning, particularly in the rural communities in Nigeria. UTME is primarily taken by students in the final year of secondary schools (senior secondary three - SSIII) and by a large army of such candidates who had failed it, or who had not secured admission, in the previous year(s).

In general, several areas appear worthy of investigation, including issues related to quality factors that may influence performance and student perceptions regarding computer-based tests. The fact that students' perception of CBT for JAMB-UTME is an under-explored topic is apparent. As worldwide interest in CBT increases, it would be useful to know how to help students, especially secondary school students prepare for this transition. To date, variables that may influence students' preparation for CBT have not been properly reported in the education literature. The specific purpose of this study was to examine the relationship between students' preparedness for CBT of the JAMB-UTME examination and the following predictor variables: students' access to computers, attitude, perception, computer literacy skills, and CBT accessibility.

2. JAMB and Examination Assessments in Nigeria

Assessment is at the heart of education. Ojerinde (2015) asserted that test scores of assessment are used to measure student's academic strengths and weaknesses. The public relies on these scores to review the quality of their educational system. While others, such as policymakers, states, and federal lawmakers use the same yardstick to determine whether public schools meet the goals and aspirations of those who set them. Thus, test according to Ojerinde (2015) is one of the major "drivers" of the teaching-learning processes which shows assessment as an essential

companion to learning. The Unified Tertiary Matriculation Examination (UTME) as a selection assessment acts also as a tool for improving learning, monitoring and evaluating some aspects of the education system itself in Nigerian tertiary institutions.

Joint Admissions and Matriculation Board (JAMB) was established by the Federal military government through Act no. 2 of 1978. The main aim of JAMB was to conduct an entrance examination known as Unified Tertiary Matriculation Examination (UTME) for candidates seeking admission into any Nigerian tertiary institutions (Sanni & Mohammad, 2015). At inception, the Board examinations used the Paper-and-Pencil Testing (PPT) format. However, the PPT was faced with various challenges of examination malpractices, incomplete registration, and incomplete results (Ukomadu & Fabian, 2018). All these have impacted negatively on the reliability and sanctity of the Board. The trend of testing in today's technological advanced world is geared towards bringing about development and up-grade in the conduct of public examinations.

Ojerinde (2015) observed that the educational testing practices in Nigeria which have predominantly been paper – and – pencil may not prepare children to face global developments associated with the desired advancement in technology and education. Ubulom and Wokocha (2017) emphasized that the use of CBT simplifies the entire testing cycle, including generation, execution, evaluation, and presentation of test. The authors noted that CBT advantages including the standardization of test administration condition, offer test developers the opportunity to improve their productivity and lead to innovation in their fields and that no matter tests' population size, CBT helps developers to set the same test conditions for all participants.

In its bid to constantly reposition the education sector and make candidates realize their dream of acquiring tertiary education, in 2015, the Board moved from PPT to CBT. UTME-CBT as at today is a standardized achievement examination which measures the learning performance of individual candidates based on a specified syllabus, thus, determining their readiness and suitability for tertiary education. On this, therefore, JAMB is taking a lead in the emergence of CBT as a popular mode of institutions examination in Nigeria. By this feat, the era of long months of waiting results and its attendant consequences is over as most candidates now have their examination results released completely. The issue of unscannable scripts is almost eliminated. However, with the application of fingerprint detective device in registering and screening candidate before the UTME, checking and scanning photographs of candidates, providing normal mathematical sets and calculator for the candidates, it could be said that JAMB adopted these strategies to ensure credibility in its examination.

3. Statement of the Research Problem

The administration of examinations into tertiary education institutions in Nigeria is commonly done in the traditional paper and pencil test (PPT) form. However, the introduction of innovation in pedagogy has given rise to the computer-based test (CBT). Joint Admission Matriculation Board (JAMB) in 2013 introduced the computer-based testing (CBT) form of UTME and gave massive publicity and sensitization on it. However, as expected with any innovation, there were apprehensions and public outcry in the citizenry, among various stakeholders in education generally, and stakeholders in JAMB's mandate. On-the-spot candidates, prospective candidates, parents and guardians, teachers, social critics and commentators, parliamentarians and a cross-

section of the society rose to the task of either scrutinizing, querying or attacking this innovation by JAMB.

While some called for a complete withdrawal of the CBT system, others called for a delay in the CBT implementation. Although JAMB's CBT has come to stay and has been tacitly supported by government, it is necessary to find out the extent to which the critical stakeholders especially, Senior Secondary School students accept this innovation in the Nigerian education system. Hence, the purpose of this study was to identify variables such as students' access to a computer, students' attitude, students' perception, computer literacy skills and CBT acceptability that may determine secondary school student's preparedness for UTME-CBT. In addressing this situation, the following hypotheses were formulated and tested at 0.05 level of significance:

$H_0$1: There is no significant interactive effect of students' access to a computer on their preparedness for UTME-CBT

$H_0$2: There is no significant interactive effect of students' attitude on student's preparedness for UTME-CBT

$H_0$3: There is no significant interactive effect of students' perception on student's preparedness for UTME-CBT

$H_0$4: There is no significant interactive effect of students' computer literacy skills on student's preparedness for UTME-CBT

$H_0$5: There is no significant interactive effect of CBT acceptability on student's preparedness for UTME-CBT

4. Conceptual Model

Figure 1 (see Appendix II) presents the conceptual model adopted for the study. In the centre of the model are the latent variables (access to computer (ATC), students' attitude (STA), students' perception (SPE), computer literacy skills (CLS), CBT acceptability (CBTA), and students' preparedness (STP)) represented with circles, and towards the perimeter are manifest variables (ATC_1... ATC_n, STA_1... STA_n, SPE_1... SPE_n, CLS_1... CLS_n, $CBTA_1$... $CBTA_n$) represented with squares. The lines with an arrow in one direction show a hypothesized direct relationship between the variables. It should originate at the causal variable and point to the variable that is caused. For every endogenous variable, a residual term is added in the model.

5. Research Method

5.1 Instrumentation

A 30-item questionnaire, called Variables that May Determine Secondary School Students' Preparedness for UTME-CBT (VMDSSSPP) was the instrument used for data collection. The questionnaire consisted of 8 sections. Section A elicited respondents' demographic characteristics such as age, and gender. Section B comprised items that sought to determine respondents' access to a computer. Section C was on question-related to respondents' basic skills in computer operations. Section D comprised of items to explore students' attitude towards CB examinations based on their personal experiences. Section E contained statements to depict student's perceptions of UTME-CBT on the bases of their personal experiences. And Section F comprised items that sought to determine the respondents' acceptability of the CBT form of UTME. Finally in section G, the respondents were asked to rank in order of preference the

factors considered most important in determines their preparedness for CBT form of UTME amongst the five major variables (access to computer (ATC), students' attitude (STA), students' perception (SPE), computer literacy skills (CLS) and CBT acceptability (CBTA)) using a scale of one (1) to five (5). One (1) being the most preferred factor while five (5) the least.

Before the questionnaire was conducted, and to ascertain the validity of the VMDSSSPP scale, items were generated from prior exploratory interviews across groups of some UTME candidates during various interactions in formal and informal settings. Only concerns shared by over 50% of such candidates were included as questionnaire items. To further ascertain the validity of the instrument, the questionnaire was referred to experts in the field of Measurement in Education for vetting to ensure its appropriateness, relevance, and clarity. To ascertain the reliability of the VMDSSSPP instrument, the Cronbach's alpha was used to determine the consistency. The analysis yielded the reliability index of; ATC (α = 0.610), STA (α =0.634), SPE (α =0.808), CLS (α = 0.719), CBTA (α = 0.841).

5.2 Data Collection

The population of this study consisted of all 71, 672 JAMB/UTME candidates in the Kwara state of Nigeria. Yamane (1967) random sampling method was used to select a sample for this study. It was expressed as thus: $n \geq \frac{N}{1+Ne^2}$ where 'n' is the sample size, 'N' is the population size (total number of 2019 JAMB applicants in Kwara State) and 'e' is the sampling error (0.05). So therefore, $n \geq \frac{71,672}{1+71,672(0.05)^2}$ = 406.81. By and large, 410 UTME candidates were accidentally selected from the 21 JAMB-CBT across the state with five (5) research assistants. The need to

use accidental sampling became imperative as these students could only be reached at the CBT centers where they gathered to process their UTME form.

5.3 Data Analyses

In all 410 copies of the questionnaire distributed only 367 (89.5%) copies were retrieved and used for analysis. First, a frequency distribution was carried out on all variables. Afterward, the variables used to measure the influencing factors (access to computer, students' attitude, students' perception, computer literacy skills and CBT acceptability) using the 5-point Likert scale were re-coded as (1=strongly disagree + 2=disagree) = (1=disagree), (3=strongly agree + 4=agree) = (2=agree), and undecided = 3. Next, Factor Analysis was performed to explore the underlying factors associated with all the items. The aim was to bring out the parsimonious few variables that can absorb the other variables. These variables were grouped into three namely; students' attitude, students perception, and students' computer literacy skills.

Bartlett's Test of Sphericity and the Kaiser Mayer Olkin (KMO) was applied to test the validity of the constructs and also measured the sampling adequacy by analyzing the strength of association among the variables. The KMO helped to determine which variable was to be dropped from the model due to multicollinearity problem. It also determined the suitability of performing factor analysis. The value of KMO varies from 0 to 1. Regression analysis was used to determine the strength of association among the variables. The hypotheses were tested at 0.05% level of significance. The multiple-regression was adopted because the study was assessing the relationships between a set of independent variables and a dependent variable. This was in line with Dayton's suggestions (Nicholas, Aveek & Lars, 2018). The analysis will be done using the Statistical Product and Service Solutions (SPSS Version 20).

6. Result

6.1 Demographic Characteristics of the Respondents

The demographic characteristics of the respondents revealed that males accounted for 122 (33.2%), while 245 (66.8%) were females. The largest proportion of 285 (77.7%) of the respondents was within the age group of 15-19 years.

6.2 Factor Analysis

Table 1 (see Appendix I) shows that the result of the Barlett's Test of Sphericity and the KMO statistics for each group: access to computer (ATC), students' attitude (STA), students' perception (SPE), computer literacy skills (CLS) and CBT acceptability (CBTA) were quite significant and hence, show a good measure of adequacy. STA had the least KMO value (0.45) and CBTA had the highest KMO statistics (0.68). To determine the minimum loading necessary to include an item in its respective constructs, items with the loading of 0.50 or greater were acceptable. However, to narrow the factors, the principal axis factoring was carried out on the variables in each of the constructs of ATC, STA, SPE, CLS, and CBTA. The results show the dimensions that loaded into five different factors.

6.3 Descriptive Analysis of Components Extraction and Factor Loadings

Table 2 (see Appendix I) present the summary of the principal axis factoring extracted variables that may determine the students' preparedness for UTME-CBT with their factor loadings and the corresponding mean and standard deviation. From the table, "My computer connected to the Internet" has the highest mean score (1.95) compared to other factors within the group. "I have

personal computer" has the greatest deviation from the mean with a standard deviation of .476. Their cumulative eigenvalues accounted for (61.3%) of the total variation which is sufficient to represent the group.

Under service quality section, "I preferred CBT because it makes me more concentrate during my examination" has the highest mean score (1.94) with a standard deviation of (0.506), while "I don't like CBT because it doesn't allow me to attend to all my questions during examination" has the least mean (1.44) and the highest standard deviation (0.497). Together the four components extracted accounted for (68.688%) of the total variability and is considered sufficient to represent that group. In the students' perception section, "Computer-based reduce cheating by a difficult shuffle of questions available for each student" had the highest mean score of 1.94 and "CBT mode of examinations are insecure technique of assessment" had the least mean score (1.53) as well as the highest deviation from the mean (0.6). The four components extracted accounted for (67.69%) of the total variability and are considered sufficient to represent that group.

In the Computer Literacy Skills section, six variables were extracted, while "Ability to work on database management/filing program" has the least mean score (1.47), the "Knowledge of functions of different keys on the Word Processing" had highest mean score of 1.98 with standard deviation from the mean (0.545). The six components accounted for about (65%) of the total variation and are therefore considered sufficient to represent the group. The CBT Acceptability section, "I fear that I may not know what to do on the computer during the CBT exam" has the highest mean score (2.08) and least standard deviation of (0.496). "CBT examination is a means of increasing students' failure rate", has the least mean score (1.86) and

deviation from the mean (0.55). The six components together represented (65.6%) of the overall variability. This number is sufficient to represent the variables in that group.

7. Test of Hypotheses

The results of the hypotheses for this study were presented in this section. Figure 2 (see Appendix II) depicts the full model of the five (5) paths hypothesized. Students' access to computer (.014), students' attitude (.051), students' perception (.021), and CBT acceptability (.076) was significant at $p < 0.05$ while students' computer literacy skills (.657) was not. From Figure 2, it shows that students' access to a computer (ATC) has a direct effect on students' preparedness for UTME-CBT. The results ($r^2 = .014$, $p<0.05$) shows the degree of significance. Therefore, the null hypothesis is rejected at $p > 0.000$. Also, students' attitude (SAT) directly affects student's preparedness for UTME-CBT i.e. ($r^2 = 0.051$, $p<0.05$), therefore, the null hypothesis is rejected at 0.5 level of significance, $p > 0.000$ and we, therefore, infer that students' attitude significantly influences student's preparedness for UTME-CBT.

Furthermore, it was shown from the figure 2 that students' perception (SPE) does have a significant effect on student's preparedness for UTME-CBT and thus we reject the null hypothesis ($r^2 = 0.012$, $p< 0.05$). On students' computer literacy skills (CLS), the result shows that CLS does not have a positive impact on student's preparedness for UTME-CBT. Therefore, we do not reject the null hypothesis and conclude that computer literacy skills (CLS) have no significant influence on student's preparedness for UTME-CBT ($r^2 = 0. 657$, $p > 0.05$). Finally, on CBT acceptability, the result from the figure shows that CBTA influences their preparedness for UTME-CBT. The null hypothesis is therefore rejected. ($r^2 = 0.076$, $p<0.05$).

8. Discussion

The purpose of this study was to identify variables that may determine secondary school student's preparedness for UTME-CBT. From the result, it shows that among all the identify variables, students' access to a computer (ATC) was the most important factors that significantly influence students' preparedness for UTME-CBT, this was followed by students' perception (SPE), students' attitude and CBT acceptability (CBTA). Conversely, it was discovered from the study that CLS was not "choice indicators" and hence, did not significantly influence students' preparedness for UTME-CBT.

This finding corroborates with Olafare, Akinoso, Omotunde, and Annenne (2017) submission that students' positive attitude to CBT will lead to an increase in the use of CBT in Nigerian universities. Besides, Samson and Okon (2015) and Sanni and Mohammad (2015) indicated that the level of students' readiness for CBT has been influenced by their high positive attitude toward CBT. The report of this study also coincides with Okocha, Toluwani, and Owolabi (2017) who reported that the students' CBT acceptability rate was due to their positive perception toward CBT. Jimoh, Abdulyakeen, and Kawu (2012) reported that the majority of students said their access to computers has led to their acceptance of CBT. Furthermore, the report of this study confirms with Ubulom and Wokocha (2017) who in their study indicated that the level of secondary students' readiness was influenced by their CBT acceptability. Finally, the report of this study supports Dammas (2016) report that students' competence in basic computer literacy skills has no influenced in their CBT acceptability.

9. Conclusion and Recommendations

This study examined the factors that played a significant role in the students' preparedness for UTME-CBT. Empirical evidence shows that students' access to a computer (ATC) was the most important factors that significantly influence students' preparedness for UTME-CBT, while CBT acceptability (CBTA) is the least preferred. On a general note, this study indicates that some students do not feel prepared for the computer-based version of the UTME. However, implementation of activities designed to increase preparation for examination content, improve opinions about computers, and increase CBT experiences may help to mitigate lack of preparedness. Finally, this study believe that the self-report data obtained from the participants in the present study are conceptually sound hence, findings from this study could be useful to JAMB administrators to find out what has been the student's constraint in the use of computer-based testing or any form of e-testing and to also improve on their mode of setting question in e-testing. The outcome of this study will also be useful to universities management, secondary school teachers, professional organization, researchers, and students. This study may, also, create awareness to other examinations bodies such as WAEC and NECO to know students' perception of e-testing.

Based on this background, the following recommendations are made:

- The government should make computers available and accessible to students at the primary and secondary school levels to enable them to learn and practice computer skills.
- JAMB should provide tutorial packages on UTME to schools for students to practice before the actual examination.

10. Study Limitations and Future Studies

One of the limitations of this study was inadequate of Nigerian studies in this area. The second limitation was that all the secondary school students used for this study were already familiar with the PPT format; whereas the CBT format was new for almost all of them particularly those that have never attempted UTME-CBT. The third limitation of this study was the time and sample size. Finally, this study was carried out among prospective UTME candidates; therefore, the results cannot be generalized.

Further studies could be made using a larger sample. This study did not observe the significance of demographic factors such as location, gender, age, and previous secondary school attended by the students among others hence, further studies could help to unravel how demographic characteristics could influence students' preparedness for UTME-CBT. In addition, this study used only five factors to determine students' preparedness for UTME-CBT. Undoubtedly, there might also be other factors that could influence students' preparedness for this important examination. Further studies could, therefore, focus on more indicators capable of influencing students' preparedness.

Declaration

- **Availability of Data and Material**

All data generated or analyzed during this study are included in the appendix of this article.

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Not applicable

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Appendix I

Table 1: KMO measure of Sampling Adequacy for the 5 constructs

	ATC	STA	SPE	CLS	CBTA
Kaiser-Mayer Olkin Measure of Sampling Adequacy	.470	.450	.473	.501	.682
Barlett's Test of Sphericity Approx.					
Chi-sq	262.561	131.612	135.623	159.731	472.588
Df	6	15	15	15	15
Sig	.000	.000	.000	.000	.000

Table 2: Components Extracted with Mean, Standard Deviation (SD) and Factor Loadings

s/n	Item Statements	Mean	SD	F1	F2	F3	F4	F5
Access to Computer (ATC)								
1	I have a personal computer	1.65	.476	.589				
2	My computer connected to the Internet	1.95	.401	.552				
3	I have access to a computer at school	1.17	.375	-.567				
4	I have an e-mail address	1.79	.408	.377				
	Students Attitude (SAT)							
5	I don't like CBT because it doesn't allow me to attend to all my questions during the examination	1.44	.497		.756			
6	I am willing to take my next exam with CBT due to its usefulness	1.76	.476		-.587			
7	I prefer the conventional way of writing examination than CBT	1.77	.502		-.400			
8	I preferred CBT because it will enhance my effectiveness in academics	1.81	.464		.416			
9	I am not confident to take CBT	1.79	.498		.844			
10	I preferred CBT because it makes me more concentrate during my examination	1.94	.506		.779			
Students Perception (SPE)								
11	CBT mode of examinations are an insecure technique of assessment	1.53	.599			-.811		
12	Computer negatively effect on thinking the potential of students' during the paper	1.91	.429			.764		
13	Computer-based testing is the worst tool of assessment	1.91	.440			.519		
14	Using computers in examinations does not have any effect on students.	1.58	.626			-.712		
15	Computer-based reduce cheating by a difficult shuffle of questions available for each student	1.94	.602			.736		
16	Using computers in preparing and declaring results minimize clerical mistakes	1.77	.535			.817		
Computer Literacy Skills (CLS)								
17	Knowledge of basic terms used in MS Excel and other Statistics/Spreadsheet programs	1.86	.483				.660	
18	Ability to work on database management/filing program	1.47	.734				.589	
19	Ability to search and look for things on the Internet	1.91	.548				.731	
20	Ability to play a game on a computer	1.64	.670				-.804	

21	Ability to send and receive information (e.g. mail) with a computer	1.96	.606				.489	
22	Knowledge of functions of different keys on the Word Processing	1.98	.545				.742	
CBT Acceptability (CBTA)								
23	The application of CBT for examination is a welcome development	1.90	.696					.804
24	CBT examination is a means of increasing students' failure rate	1.86	.550					.514
25	I fear that I may not know what to do on the computer during the CBT exam	2.08	.496					.650
26	I fear that the computer may shut down or malfunction when CBT form is going on.	1.94	.871					.797
27	I don't think I have received sufficient information about the uses of CBT for examination	1.91	.640					.779
28	I support JAMB to administer UTME only in the CBT form	1.96	.687					.745

Appendix II

Structural Equation Model Specification

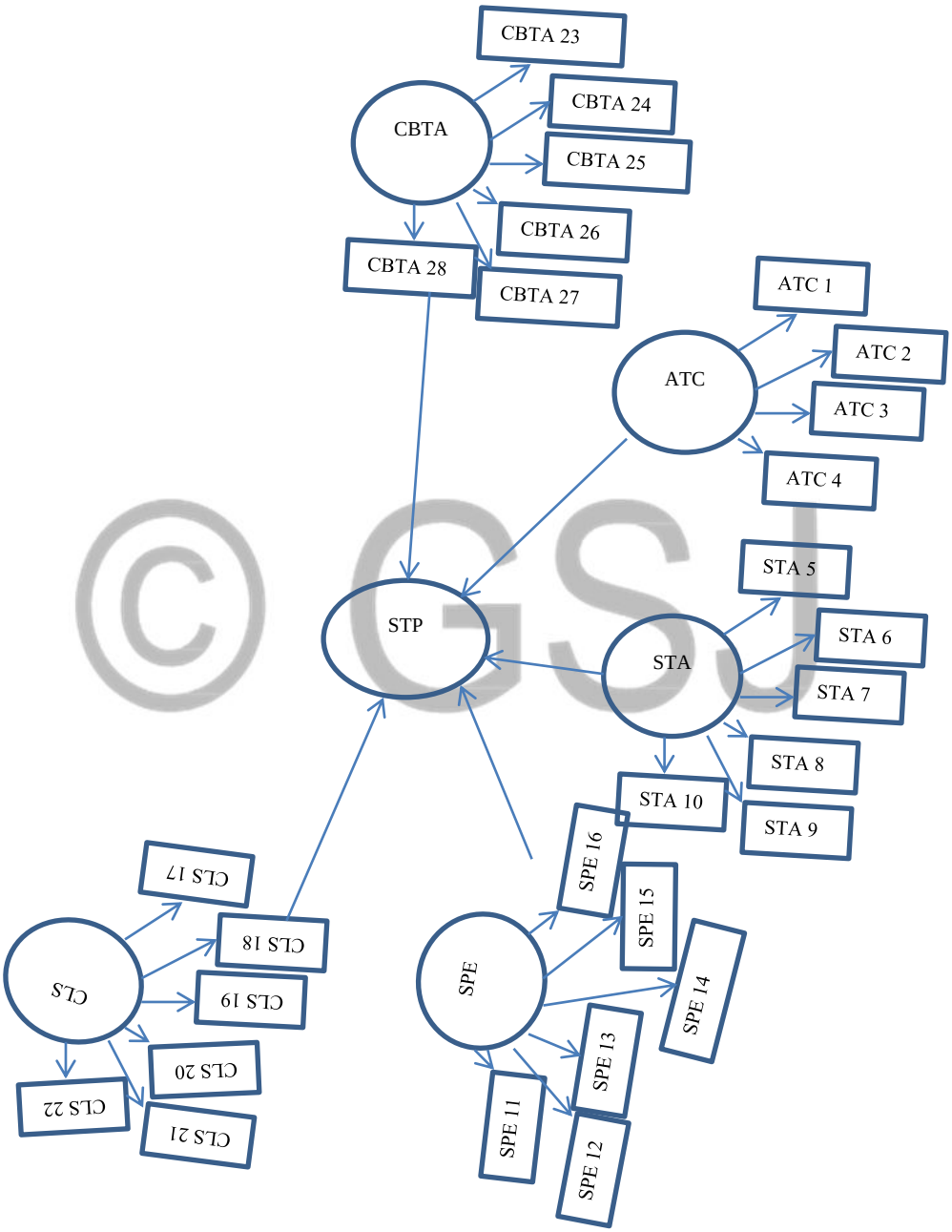

Fig. 1 Structural Equation Model specification of the degree of interactive effect between students' access to computer (ATC), students' attitude (STA), students' perception (SPE), computer literacy skills (CLS), CBT acceptability (CBTA), and students' preparedness for UTME-CBT.

Structural Equation Model Diagram

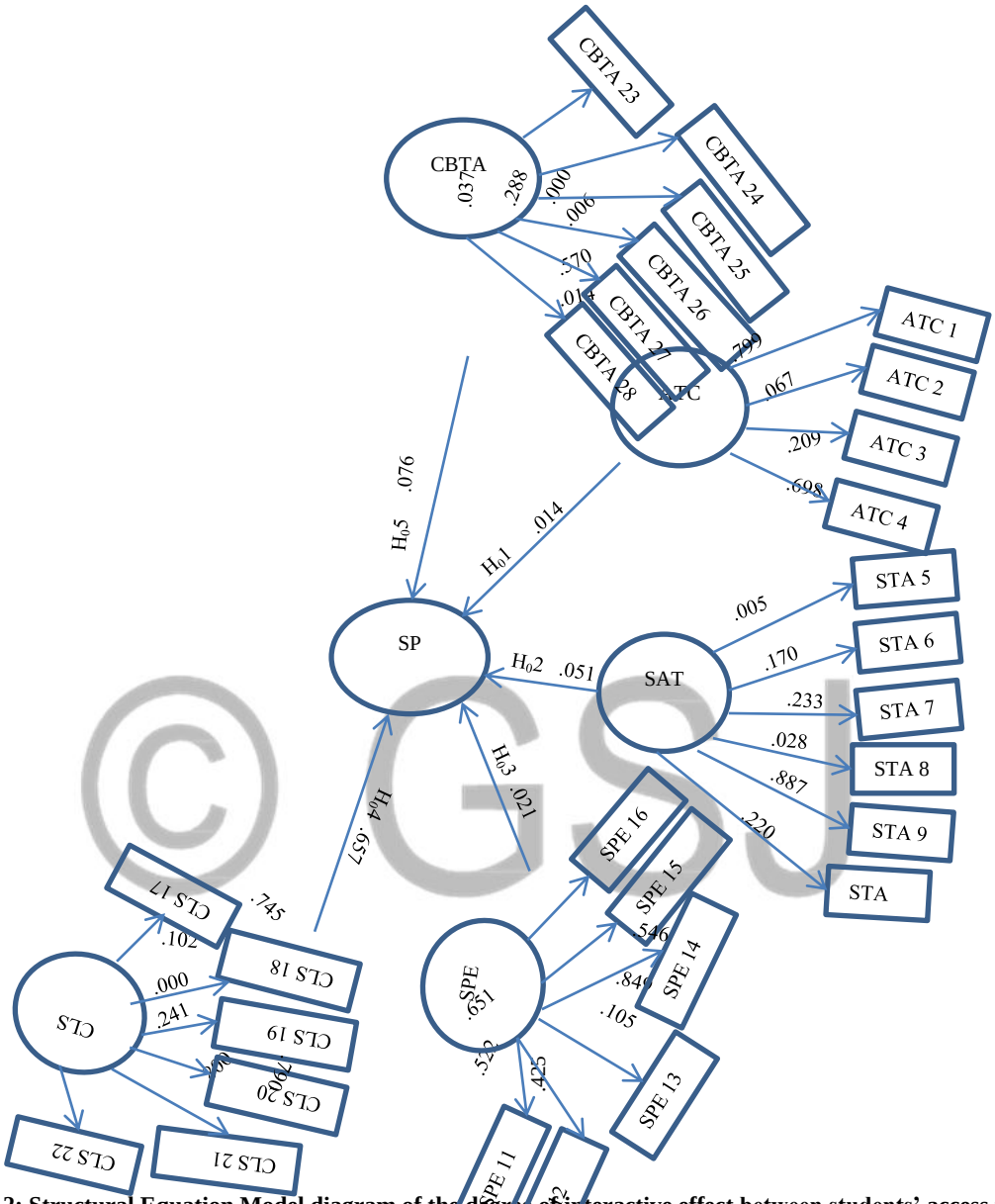

Figure 2: Structural Equation Model diagram of the degree of interactive effect between students' access to computer (ATC), students' attitude (STA), students' perception (SPE), computer literacy skills (CLS), CBT acceptability (CBTA), and students' preparedness for UTME-CBT.