



# A Causal Model of Correlates of Attitude Towards Computer Based Testing Among Prospective University Students of the University of Calabar, Nigeria

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## Abstract

This is a casual model of some correlates of attitude towards computer based testing among prospective university admission candidates of the University of Calabar. Subjects comprised 426 prospective 2015 UTME candidates for admission in the university of calabar. Data was gathered through the researchers' developed questionnaire called attitude scale of candidates on the use of Computer Based Testing (CBT) through an accidental sampling, while multiple regressions (backward solution) was utilized to analyze the data. The result indicate that the five predictor variable (age, gender, school location, parental education and students exposure to computer) when taken together are significant predictors of attitude towards computer based testing. In all, -28.4% of the total effect of the predictor variables was direct while 99.96% was indirect. In view of the findings, it is recommended that tutorial packages on past UTME (CBT) examination should be sold to prospective university candidates to enable them prepare effectively for the exams. Both primary and secondary school students in Nigeria and in particular, Cross River State, should provide computer laboratories and make computer studies compulsory. In addition, government and other non-governmental agencies should assist to provide ICT gadget in every school as well as make provision for steady supply of power in both rural and urban schools.

**Keywords:** Computer-based Testing, Electronic Assessment, Assessment Attitudes, Direct and Indirect Effects.

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## INTRODUCTION

The importance of Computer based testing as a means of addressing key assessment challenges and improve on existing practice has been recognize and acknowledged. For instance Bodmann and Robinson (2004) observed that CBT can be used to (a) promote effective learning by assessing a wide range of skills; (b) improve reliability as it makes testing and marking easy and more reliable as compared to human marking; (c) provide instant feedback to students' greater flexibility with respect to time and location. In addition, Olamale and Shafil (2010) maintain that it aids the improvement of greater efficiency, where tens of thousands of answer scripts can be on a server as compared to the physical space required for paper scripts and offers an enabling environment to measure candidates' knowledge and reasoning that is not possible through traditional methods. Other strong points for its adoption according to Agbo, (2016); Ekuri and Agbor (2018) is that it has to do with reduction in examination crimes such as; impersonation, mass leakage of emanation, and bribe taking by supervisor and invigilators of examination.

The importance attached to electronic mode of assessment (CBT) underscores the need for research on CBT. Earlier researches in this domain have shown that many students anticipated issues with the use of computers based testing that actually had them develop a negative attitude towards CBT (Darrell, 2003). Darrell's research also noted that although fewer students are being confident about CBT before completing the assessment; more students stated a preference for CBT after wards. Some studies reported the main disadvantages as being increased anxiety amongst those unfamiliar with the use of Computer (Erle, Benjamin & Raymond, 2006). The challenges to examine a candidate by means of micro-computers demands appropriate software design. To comply with this demand, students' beliefs, attitude and perception of a computerized test are important since user attitude, perceptions and criticism are crucial in the acceptance, implementation and improvement of computerized tests.

Furthermore, while recognizing the level of advantages associated with CBT, it is important to explore the relationship between assessment mode and the behavior of the candidates being assessed. If the term affordance is used to describe what is made possible and facilitated; and what is made difficult and imitated by a medium of assessment. It is possible that the affordances offered by CBT may affect the attitude of candidates involved in computer- based assessment differently than if they were engaged in paper-based assessment (Johnson & Green, 2004). This background therefore provides impetus for conducting a study on the attitude of testees towards CBT.

Available literature indicates that students related variables such as sex, age, parental education, and computer exposure are important variables in understanding attitude towards CBT from the perspective of the testee. Although, considerable work has been done on how these variables influence attitude to CBT, but most of these studies have utilized either univariate or bivariate analytical statistical procedure. Lacking in literature are studies that utilized multivariate analytical procedure to determine composite, relative and interactive effects of variables that could explain attitude towards CBT. In fact, statistical approaches that could isolate the direct and indirect effect of predictor variables on attitude towards CBT are of high necessity. The present study examines the effect and magnitude of five correlates of attitude towards computer based testing among prospective University Students of the University of Calabar.

## **Purpose of study**

The general purpose of this study is to evaluate the interrelationship among some correlate of attitude towards CBT among prospective University students of the University of Calabar. Specifically, the study sought to answer the following research questions:

- What are the significant paths in the five variable model through which the dependent variable determine attitude prospective University students' response to CBT.
- What is the most meaningful causal model involving the five correlates variables and attitude of prospective University student towards CBT?
- What are the direct and indirect effects of the correlate variables on attitude of prospective University students towards CBT?
- What proportions (%) of the total effects are direct and what proportion are indirect?

## **METHODOLOGY**

### **Subject**

The subject of this study involves 426 prospective University candidate selected through accidental sampling approach. From a population of 8,520 candidates who chose University of Calabar as their first choice and scored 200 and above in the 2015 Unified Tertiary Matriculation Examination (UTME).

### **Measures**

Questionnaire was used for data collection. The questionnaire consisted of three major part. The first part sought information about the students' demographic variables (gender, age, parent educational level, and location) the second part of the questionnaire was on candidate exposure, while the third part was the attitude scale of candidate or the use of CBT with 24 items respectively. The instrument was validated by experts based in face and content validates. The reliability coefficient of 0.99 as a measure of internal consistency was established through the use of split half method of reliability and correlated using spearman brown prophesy formula (rft). The questionnaires were administered to subject with the assistance of two research assistants.

### **Procedure for data analysis**

The path analysis was utilized to explain students' attitude towards CBT from demographic factors of candidates such as gender, age, school location and exposure indicators. The statistical procedures (utilizing the statistical package for the social science program (SPSS) was computed to provide answers to the research questions. The linear relationship between the five demographic factors of candidates. Variable and the dependent variable (prospective University student attitude toward CBT) form the basis for hypothesizing a theoretical model shown in Figure 1, with five variables under consideration. According to Blalock (1964), it is a techniques for selecting those variable that are perceived to be (causes) of the effects and then attempting to isolate the separate contributions to the effects made by each cause through the application of path analysis technique.

The purpose of path analysis is to help researchers understand the pattern of relationship between the five personal factors of candidates' variable and the dependent

variable. The assumption underlying the use of path analysis as put forward in a study. Kerlinger (Kerlinger and Pedhazur 1973 and Pedhazur (1984) are as follows:

- The relation among the variables in the model are linear, additive and causal;
- There is a one way causal flow in the system, that is, reciprocal causation between variable is outlined;
- The residuals are not correlated among themselves and with the variables preceding them in the model
- Each of the dependent variable is directly related to all the variables preceding it in the hypothesized causal sequence.

The hypothesized path model, which addressed the linkage between the sets of variable in the study is presented in Figure 1.

However, the hypothesized model presented here is not the only version possible. Turner and Stevens (1959) opined that in a study involving only three variables with at least one being exogenous (independent), there are six possible path models, while for a four variable, 65 diagrams are possible and so on. The use of a confirmatory model therefore requires the selection of the more meaningful path diagram for all possible ones.

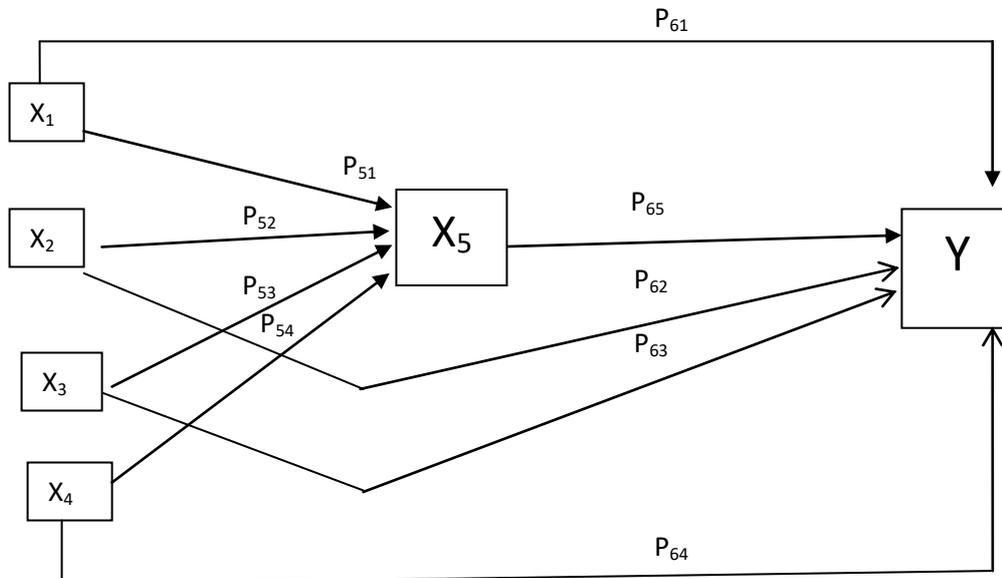


Figure 1: Hypnotized Model

Variable in the model

- X<sub>1</sub> = Sex
- X<sub>2</sub> = Age
- X<sub>3</sub> = Parent Edu.
- X<sub>4</sub> = Location
- X<sub>5</sub> = Candidates Exposure
- Y = Attitude

P<sub>51</sub>, P<sub>52</sub>, P<sub>53</sub>, P<sub>54</sub>, P<sub>61</sub>, P<sub>62</sub>, P<sub>63</sub>, P<sub>64</sub>, P<sub>65</sub> are paths drawn from variables taken as causes (independent) to variable taken as effect (dependent).

## Identifying and Trimming the Parts in the Model

The investigators identified the important parts in the model by constructing the resultant structural equations using the techniques of the path analysis theorem and weights law. For the trimming of the paths in the model, the criteria of statistical significant and meaningfulness were used. These two criteria were applied to properly trim the model in order to provide a more adequate testing of the theory under consideration. To be meaningful, the absolute value of the path coefficients should be at least .05 as recommended by land (1969).

## Structural Equation for the Hypothesized Model

The equation implied in the hypothesized model in figure 1 are:

$$X_1 = e_1$$

$$X_2 = e_2$$

$$X_3 = e_3$$

$$X_4 = e_4$$

$$X_5 = p_{54}X_4 + p_{53}X_3 + p_{52}X_2 + p_{51}X_1 + e_5$$

$$X_6 = p_{65}X_5 + p_{64}X_4 + p_{63}X_3 + p_{62}X_2 + p_{61}X_1 + e_6$$

## RESULTS

To determine the path coefficient in the hypothesized path model, path analysis procedure was utilized. Table 1 show the various path coefficients (expressed in beta weights) in the path model and their level of significant. Path whose coefficient are significant at .05 probability level were retained. Otherwise they were trimmed.

Table 1: Various path coefficients (expressed in beta weights)

Path	Path coefficient ( $\beta$ )	$\rho$ - level
P <sub>51</sub>	-.042	.380 ns
P <sub>52</sub>	-.190	.000
P <sub>53</sub>	.158	.001
P <sub>54</sub>	-.121	.014
P <sub>61</sub>	.108	.028
P <sub>62</sub>	-.001	.989 ns
P <sub>63</sub>	-.054	.270 ns
P <sub>64</sub>	.007	.885 ns
P <sub>65</sub>	.219	.000

ns = Not Significant\* significant at .05

Table 1 shows the paths in the hypothesized recursive model, the standardized path coefficient and the level of significance for each of the path co-efficient. The result shows that the standardized path coefficient ranged from -.042 for P<sub>51</sub> to .121 for P<sub>54</sub>. The result also show that out of nine paths in the hypothesized models (P<sub>52</sub>, P<sub>53</sub>, P<sub>54</sub>, P<sub>61</sub> and P<sub>65</sub>) were significant at 0.05 while four (P<sub>51</sub>, P<sub>62</sub>, P<sub>63</sub>, P<sub>64</sub>) were not significant. On the basis of these result; five paths significant at .05 were retained while 4 paths (P<sub>51</sub>, P<sub>62</sub>, P<sub>63</sub>, P<sub>64</sub>) were trimmed since they were considered weak paths not strong enough to be included in the new mode.

## Structural Equations for the New Parsimonious Model

$$X_1 = e_1$$

$$X_2 = e_2$$

$$X_3 = e_3$$

$$X_4 = e_4$$

$$X_5 = p_4 x_4 + p_3 x_3 + p_2 x_2 + e_5$$

$$X_6 = p_5 x_5 + p_1 x_1 + e_6$$

Based on the equation above, the new parsimonious model was obtained as shown in figure 2. Figures 2 shows that only five out of nine hypothesized paths survived the trimming exercise. The numbers of each pathway are the coefficients and the zero order correlation coefficients are in parentheses.

### Validation of the new model

To verify the efficiency of the new model, the reproduced correlation coefficients (using the new paths) were compared to the original correlation coefficient. Table 2 shows the original and reproduced coefficients.

Table 2 shows that the discrepancies between the original and reproduced correlations are very negligible. This is an indication that the pattern of correlations in the observed data is consistent with the more parsimonious model. The more parsimonious model is thus tenable in explaining the interrelationships between the independent variables ( $x_1.. x_5$ ) and dependent variable (Y or  $X_6$ ). Figure 2 therefore depicts the most meaningful causal model involving the five predictor variables and the criterion variable (attitude towards CBT).

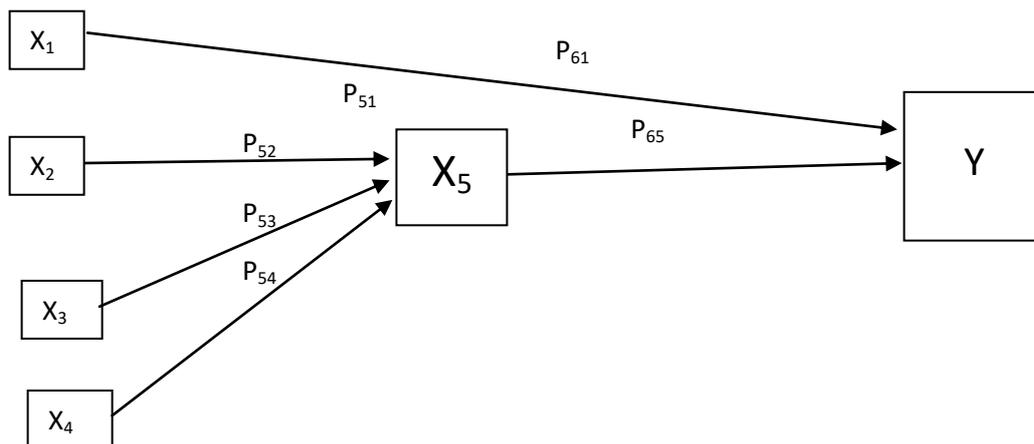


Figure 2: The Trimmed Model

Table 2: The original and Reproduced correlating of students' demographic variables and attitude of prospective University students towards CBT

Paths	Paths	Zero order	Disparency
P <sub>51</sub>	-.042	.030	0.072
P <sub>52</sub>	-.990	-.221	0.031
P <sub>53</sub>	.158	.192	0.034
P <sub>54</sub>	-.121	-.191	-0.07
P <sub>61</sub>	-.001	.106	-0.002
P <sub>62</sub>	-.001	-.064	-0.063
P <sub>63</sub>	-.054	.000	0.054

P <sub>64</sub>	.007	-.037	-0.044
P <sub>65</sub>	.219	.210	-0.009

Table 3: Proportions of totals and indirect effect

Variables	Direct effect	Indirect effect	Total effect	%Direct effect	%Indirect effect
P <sub>51</sub>	-.042	0.072	.030	-50	-122.0
P <sub>52</sub>	-.190	-0.031	-.221	-226.2	52.5
P <sub>53</sub>	.158	0.034	.192	188.1	-57.63
P <sub>54</sub>	-.121	-0.07	-.191	-144.0	118.6
P <sub>61</sub>	.108	-0.002	.106	.129	3.39
P <sub>62</sub>	-.001	-0.063	-.064	-1.19	106.8
P <sub>63</sub>	-.054	0.054	.00	-64.29	-91.53
P <sub>64</sub>	.007	-0.044	-.037	8.33	-74.58
P <sub>65</sub>	.219	-0.009	.210	260.7	15.25
	0.084	-0.059	0.025	-28.4	99.96
% direct effect = -28.4		% indirect effect = 99.96			

### Proportions of Direct and Indirect Effects

Path analysis procedure was also utilized to provide data on the total effect, total direct effect, and total indirect effect. Based on these, the percentage of direct and indirect effect relative to the total effect were determined. The summary of result of the analysis presented in Table 3 shows the total effect (direct and indirect) of all the nine predictor variables as well as the percentages of direct and indirect effects. The results in the table show that of the 4 students' demographic variables, three (age, parents educational level and location) exert both direct and indirect effect on the dependent variable. However, one variable (sex) exerts only indirect on the dependent variable. No direct effect was observed with respect to these variables. The table also shows the proportion of the total effect that is direct (-28.4%) and indirect (99.96%) respectively. These percentage indicate that the four demographic variable used in the study exert more of indirect effect than direct to attitude of prospect University student towards CBT.

## DISCUSSION

The result of the path analysis in table 1 revealed that the demographic variable showed that three variables (sex, parental education and location) out of the four variables contributed significantly to the explanation of students' attitude towards CBT. Since the magnitude of beta weights is taken to be directly proportional to the degree of effects of the independent variable, it can be seen from table 3 that 3 variables ( $x_1$ ,  $x_3$ ,  $x_5$ ) have direct causal effect on students' attitude effective causal effect on attitude response towards CBT. As shown in the 3 variable  $x_1$  has a path coefficient of -.42 significant level at .05 level. This empirical finding is not surprising because of the link between gender and attitude. It has been observed that male students exhibit a more positive attitude towards electronic and other computer gadgets as compared to their female counterparts. These differences in their belief and practice will no doubt influence their attitude toward CBT. (Darrel, 2003).

Another direct cause of variation in students' attitude towards CBT is parents' educational level (variable  $x_3$ ). The path coefficient of this variable is - .054 significant level at .05 level is in agreement with Johnson and Green (2004), who opined that the affordances offered by CBT may affect the attitude of candidates involved in computer-based assessment differently than if they were engaged in paper-based assessment.

## CONCLUSION

Judging from the results of this study, it could be deduced that sex, parental education and exposure to computer had the most significant influence on students' attitude to CBT. This implies that that attitude towards CBT can be explained by sex, parental education and students' exposure to computer. Further studies showed focus on the effect of the school and home factors on attitude to CBT.

## REFERENCES

- Agbo, O. E. (2016). Attitude of prospective university admission candidates toward the use of computer based testing in the University of Calabar. Unpublished master's degree thesis, Faculty of Education, University of Calabar, Nigeria.
- Blalock, H. J. M. (1964). Causal influence in non- experimental research. Chapel Hill, NC: University of North Carolina Press.
- Bodmann, S. M., & Robinson, D. H. (2004). Sized and performance difference among computer Based and paper pencil test. *Journal of Educational Computer Research* 31(1), 51- 60.
- Darrel, L. B. (2003). *The impact of computer based testing attitudes and behavior, the technology source*.
- Erle, L., Benjamin, O., Einar, W. S., & Raymond, S. (2006). Computer-based versus pen and paper testing: *Students perception*. *Ann acad. Singapore* 35, 599-603.
- Johnson, M., & Green, S. (2006). Online Mathematics Assessment: The impact of mode of performance and Question Answering strategies: *Journal of Technology, learning and Assessment* 4(5) *Eric's Document Reproduction Service No. EJ843854*.
- Kerlinger, F. N., & Pedhazur, E. J. (1973). *Multiple regression in behaviour research*. New York: Holt, Rinehart and Winston.
- Land, K. C. (1969). Principles of path analysis. In E. F. Bongatta (Ed), *Sociological methodology*. San Francisco, CA: Jossey-Bass.
- Olawale, A., & Shafil, M. A. (2010). E-exam system for Nigeria Universities with emphasis on security, result and integrity. The seventh international conference on e-learning for knowledge based society. Thailand.
- Pedhazur, E. J. (1984). *Multiple regressions in behavioural research: Explanation and prediction* (2<sup>nd</sup> Edition). New York: Holt, Rinehart and Winston.
- Turner, M. E., & Stevens, C. D. (1959). The regression analysis of causal paths. *Biometrics* 15, 232-236.

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