



Correlational Analysis between the Content of Computer Based Test and its Use

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ABSTRACT

The aim of this research is to explore the relationship between the Contents of computer based test and its use among students. CBT is being used by some tertiary institutions to assess the performance of their students; it is therefore believed that the content will play a significant role in influencing the use of the system. Convenient sampling method was used in choosing the surveyed sample from the students of Abubakar Tafawa Balewa University, Bauchi State, Nigeria. Of the 400 questionnaires distributed 265 were returned representing 66.3 % response rate. The outcome of the study revealed that Content has a statistically significant correlation with the use of computer based test among students, with a Pearson's r very close to 1 (0.873), and Sig. (2-tailed) value of 0.003, which is $< .05$. This study concludes that, rich, useful, playful and qualitative content will result in a tremendous success in the use of the CBT among the students.

Key words: Computer-Based Test, Content, Correlation, Nigeria, Use

INTRODUCTION

Computer Based Test (CBT) is becoming a highly widespread method to assess students' fulfilment at the university level. This study seeks to examine the correlation between the content of the CBT and use of Computer Based Test. Information Technology has been more and more incorporated into the classrooms to assist as well as improve students' learning. Ranging from course managing application to simulation as well as evaluation methods, academic institutions are actually purchasing systems meant to offer an educational benefit to students. Nevertheless, the good results of technology introductions cannot be accomplished when the students don not make use of the technology [1]. Information technology has substantially reshaped the way of evaluating students. For example, Computer as instrument for technology is actually utilized within multi-dimensional methods. In several educational sectors, educational analysis has moved towards the usage of computer based test (CBT), that is actually recognized as examinations or maybe assessments which are administered through the use of personal computer via technological gadgets connected with the Intranet as well as in a few instances Internet [2].

Inside Nigeria nowadays, the majority of educational institutions are actually deploying the usage of computer based method in examining their students. The General Studies (GNS) Directorate of Abubakar Tafawa Balewa Faculty (ATBU) Bauchi had during the 2015/2016 academic period used the services of computer based test (CBT) as a method of evaluating students. The growth and also rise in the usage of computer based test management information systems (CBMIS) inside educational institutions have led numerous scholars to take a look at the problems of system users. A CBT program (sometimes known as courseware) which contains the CBT contents may be provided through a program product placed on one computer system, via an educational or corporate intranet, or maybe through the Internet. CBT typically aid to make certain the candidate's identity within the examination hall is effectively cross checked. Additionally, it improves the reliability and also productivity of the tests.

Absolutely, CBT is exceedingly associated with the Content of the course. The questions of the CBT depend on the course content. Teachers use CBT to ascertain the progress of their students. In like manner, students have the chance to identify their shortcomings utilizing the CBT. Students may utilize CBT so as to learn and rehearse better the content of the course. In this study, we analyze the distinct elements of the Content. The first one is the course content. We assume that the content could influence CBT's usefulness and fun loving nature. Students assess their courses with respect to

their content. The content may influence if a course is difficult or simple, exciting or uninteresting, useful or not valuable. The second dimension concerns question's content in the CBT. Basic issues come up for the content of the questions. In our study, we look at if the questions were clear, justifiable and relative with the course's content. Hence we look at if the Content variable will have direct influence on the use of CBT.

Even though there are a great deal of advantages connected together with the usage of this process within educational facilities, in comparison with other destinations including South Korea along with Japan, CBT use in Nigeria remains at its infancy phase [2]. The use of e- assessment continues to be fairly lower in Nigeria when compared alongside developed nations. This however is not unconnected with the nature of the system's content. Accordingly, this study explores whether there is a correlation between content and the use of CBT by the students. Majority of the earlier studies have attempted to investigate the factors influencing CBT adoption via traditional acceptance models including technologies acceptance model (TAM), theory of planned behaviour (TPB) and also diffusion of innovation (DOI). Nevertheless, aside from a particular recently available study [3], there has been a general lack of strong empirical work to enable the establishment of the relationship between the content of the CBT and its use by students.

Content as a construct based on our review has not been presented before in testing its correlation with the use of CBT. Our assumption for an immediate correlation of the Content on Intention to use CBT was not affirmed. Hence, there's necessity for investigation on CBT to become concentrated especially from point of view of developing nation as Nigeria, specifically on the content, so as to establish whether there is a relationship between the variables. The objective of this particular analysis would be to fill pre-existing analysis gap by empirically examining the correlation between content and use of CBT in Nigeria.

LITERATURE REVIEW

Conceptualization of Computer Based Test

Computer Based Test (CBT) is a method of administering tests in which the responses are electronically recorded, assessed, or both. As the name implies, Computer-Based Test makes use of a computer or an equivalent electronic device such as a cell phone or PDA. CBT systems enable educators and trainers to author, schedule, deliver, and report on surveys, quizzes, tests and exams. Computer- Based Test may be a stand-alone system or a part of a virtual learning environment, possibly accessed via the World Wide Web [4]. It is often used as an extended synonym for any course of instruction whose primary means of delivery is a computer using internet, intranet and/or extranet [1]. Bull and McKenna [4] defines the term that covers all forms of assessment, whether summative or formative, as software used for educational purposes, to manage the process of setting, collecting, scoring and providing feedback.

General advantages of CBT systems over traditional Paper-and-Pencil testing here after referred to as (PPT) have been demonstrated in several comparative works and include: increased delivery, administration and scoring efficiency; reduced costs for many elements of the testing lifecycle; improved test security resulting from electronic transmission and encryption; consistency and reliability; faster and more controlled test revision process with shorter response time; faster decision-making as the result of immediate scoring and reporting; unbiased test administration and scoring; fewer response entry and recognition errors; fewer comprehension errors caused by the testing process; improved translation and localization with universal availability of content; new advanced and flexible item types; increased candidate acceptance and satisfaction; evolutionary step toward future testing methodologies [5].

Content

Content is a construct that analyzes student's perspectives concerning the CBT's corresponding course and CBT's quizzes. This is a perception that is regularly connected with the test relating to the course syllabus, free from typographic errors and other technological related errors. Usually CBT users feel more comfortable writing examination whose questions in form of contents are well worded and straightforward than the one that has many errors. It has been investigated that students with higher interest for a particular course will have higher intentions to use the corresponding CBT [6-9]. Content computer system uses ICT so as to computerize content transmission. In view of that, [10] proposed Content as one of the factors that influence e-learning fulfillment. Wang's items in the development of the Content analyzed if the content was up-to-date, adequate, and valuable and if the content fitted clients' needs. Also, [11] suggested that System Content variable has extraordinary value in students' satisfaction. They additionally mentioned the need of non-technical specialists, for example, instructors during the development, the operation and the upkeep of the system. Certainly, CBT is highly correlated with the content of the course [6]. Content was investigated in previous studies to have significant relationship with CBT use [3, 10]. Thus, it is proposed that: *Hi: Content has significant correlation with the use of CBT.*

Theoretical Bases

Computer based test and the factors that influence students' intention behavior have been studied in the literature. Different learning assessment methods used in higher education were investigated using a sample of 736 undergraduate students from four well-known universities in [12]. The results showed that the most common used assessment method used is the paper-pencil test while some scientific and medical colleges used other assessments but, still use paper-pencil tests. Moreover, the study suggests the use of modern assessment tools and methods to improve traditionalism in

higher education assessment methods. Another research group conducted a study at Ilorin university-Nigeria on undergraduate chemistry students [13]. A sample of 48 chemistry students was evaluated using Computer Based Test (CBT). Findings showed that 95.8% of the students were satisfied with the use of CBT while 75% complained about anxiety of using computers. On the other side, about 29.2% did not fully accept the test mode. From the testing analysis, it is obvious that satisfaction about immediate scoring, fastness and transparency in marking exists.

Many researchers focus on studying the effect of some influencing factors such as Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness [6, 7, 14-17]. Thelwall introduced a survey on the reasons of using computer assessment and focus on randomly generated open access test [16]. The students are allowed to practice in their own free time before applying the same test in real. The study concludes that random-based tests have major advantages over fixed ones. Moreover, this research paper proofs the flexibility of CBT as a learning tool. Another study measures and examines the effectiveness of Interactive Multimedia (IMM) using a quasi-experimental pretest/post-test [18] where the results showed a significant increase in knowledge, attitude, and total scores between pre and post tests for the intervention participants, and they had greater increases than control group. The study supports the use of IMM in nutrition education and it's considered as the basis to continue developing computer-based test. Mayer [19] studied the assessment of computer in problem solving by referring to Bloom's taxonomy for learning and teaching and assessing. The study examines the cognitive consequences of participating in after-school computer club. The researcher proves the possibility to produce computer-based tests of problem-solving transfer in different ways like: assessment of computer literacy (Near Transfer) and assessment in problem-solving strategies for new games (Far Transfer). The study discovers the usefulness of taxonomy in creating assessments that covers the range of problem-solving transfer when the goal is to include problem solving transfer measurements.

Later on, a Web-based Educational System (WEAS) based on Bloom's theory was introduced and tested on science courses [20]. The system facilitates Human-Computer Interaction (HCI) techniques between students and teacher. A review of 18 key empirical studies on online assessment in higher education from year 2004 to year 2011 was carried out by [21]. The survey focuses on the application of formative assessment within blended and online context. The main findings were extracted from the literature; the enhancement of the learner engagement with high experience and valuable background due to effective online formative assessment. Terzis and Economides [6] built a model to investigate students' intention to use Computer Based Assessment (CBA) called computer Based Assessment Acceptance Model (CBAAM). The model was built upon previous acceptance models like: Technology Acceptance Model (TAM), Theory Planned Behavior (TPB), and Unified Theory of Acceptance and Use of Technology (UTAUT). They added two additional variables (Content and Goal Expectancy) on the current measurement variables. A survey questionnaire was applied on a sample of 173 participants enrolled in introductory course about informatics for the purpose of test data. Findings showed that Perceived Ease of Use and Perceived Playfulness directly affected CBT, while other variables have indirect effect on CBT. Terzis et al [7] study extends the previous model (CBAAM) by considering the gender in the measurements. The results showed that both genders are motivated to use CBT while it is playful and has clear contents relative to the course. This present study uses only one construct of the CBAAM model (Content) for simplicity purpose [22], because the main aim of this research is to explore the direct correlation between content and use of CBT by students.

METHODOLOGY

Procedure

The participants were the 200 and 300 levels Students of the Abubakar Tafawa Balewa University, Bauchi State, Nigeria. These categories of students were chosen because they had already used the institutions CBT system more than once. Accordingly, they have its experience and are in a better position to respond to the questionnaire. 400 questionnaires were personally administered to the students who were randomly chosen from the various faculties of the University to represent the population of the study. Convenience sampling technique was used in choosing the sample.

Instrument Development

The first part of the questionnaire involves nominal scale items which cover demographic information consisting of gender and age. The second part of the questionnaire includes the conceptual variables which were measured using five-point Likert scales, ranging from (1) "strongly disagree" to (5) "strongly agree". The items in the questionnaire were adapted from existing literatures. The questions were modified to fit the context of CBT. Content was measured with 4 items adapted from [9-10]. Students' intention to use CBT with 4 items adapted from [9, 23].

RESULTS AND DISCUSSION

Profile of the Respondents

The researchers distributed four hundred (400) questionnaires personally to the target respondents; however, two hundred and sixty five (265) were returned duly filled, indicating 66.3% response rate. The first section dealing with the results about the demographic information of the respondents is presented in Table 1. The results show that male respondents have the highest participation of 196 (74.0%) over female counterpart with 69 (26.0%). In terms of age,

21–25 years of age were the highest 104 (39.2%) followed by the 26 – 30 age group with 81 (30.6%), then 31–35 category 40 (15.1%), 15 – 20 age group 32 (12.1%), while 36 – 40 age group were the least with 8 (3.0%).

Table -1 Demographic Profile of the Respondents

Construct	Frequency	Percentage
Gender		
Male	196	74,0
Female	69	26.0
Total	265	100
Age		
15-20	32	12.1
21-25	104	39.2
26-30	81	30.6
31-35	40	15.1
36-40	8	3.0
Total	265	100

Source: Field Survey (2019)

Scale Reliability and Factor Analysis

In order to be sure of the measurement instrument, Cronbach's alpha co-efficient was computed for all variables and it confirmed the reliability of the instrument that had been used in the study because all variables showed values above 0.7 [24]. Validity was obtained using Content Validity Index in which Kaiser-Meyer-Olkins (KMO) and Bartlett's test of sphericity ranges from 0.705 to 0.821 above the acceptable limit of 0.7 and .000 respectively. Similarly, other indicators as anti-image, communalities were all adequate and greater than the cut off value of .5 as shown in table 2, 3 and 4.

Table -2 Assessing Factorability

Constructs	KMO-MSA	BTS Sig.	Minimum anti-image correlations/items
CT	0.821	0.000	0.768 item 1
UCBT	0.705	0.000	0.671 item 2

Source: Field Survey (2019)

Table -3 Eigenvalues, Range of Factor Loadings % of Variance Explained

Variables	1st factor eigen values	2nd factor eigen values	Ratio	Range of Factor loading	% of Variance Explained
CT	2.754	0.581	3.178	0.504-0.766	57%
UCBT	2.412	0.681	3.512	0.548-0.719	48%

Source: Field Survey (2019)

Table 4: Factor Loading and Cronbach's Alpha

Content	Factor Loading	Cronbach's Alpha
CT1 CBT's questions were clear and understandable.	0.756	0.759
CT2 CBT's questions were easy to answer.	0.747	
CT3 CBT's questions were relative with the course's syllabus.	0.766	
CT4 CBT's questions were useful for my course	0.543	
CT5 The CBT system provides up-to-date content	0.510	
CT6 The CBT system provides content that exactly fits your needs	0.632	
CT7 The CBT system provides sufficient content	0.504	
CT8 The type of questions available (multiple choice, true/false, etc.) fit the needs of the content area	0.536	
Use of CBT		
UCBT1 I take more than three different computer based tests	0.548	0.741
UCBT2 Given the opportunity, I will use CBT for my assessment	0.719	
UCBT3 I am likely to use CBT in the near future	0.561	
UCBT4 I intend to use CBT when the opportunity arises	0.620	

Source: (Field Survey, 2019)

Correlation Analysis

What is the relationship between content and use of CBT?

A Pearson moment correlation was computed in order to examine the bivariate relationships between the two variables Content (CT) and Use of CBT (UCBT). The results of the correlation coefficients between the variables revealed that Pearson's r for the correlation between content (CT) and use of CBT (UCBT) is 0.873 as shown in table 5. This means that there is a strong relationship between the two variables, since Pearson's r is very close to 1. This means that changes in one variable are strongly correlated with changes in the second variable. For this reason, it can be concluded that there is a strong relationship between CT and UCBT variables.

Similarly, since the Pearson's r is positive (0.873). This means that as one variable increases in value, the second variable also increase in value. It implies that when Content of the course and questions increase in quality (the first variable), Use of CBT (the second variable) also increases. In other words, the more students perceived the content to be useful and playful the more they use the CBT.

Table 5: Pearson's Correlation Analysis of the Variables

Correlations			
		Content (CT)	Use of CBT (UCBT)
Content (CT)	Pearson Correlation	1	0.873**
	Sig. (2-tailed)		0.003
	N	265	265
Use of CBT (UCBT)	Pearson Correlation	0.873**	1
	Sig. (2-tailed)	0.003	
	N	265	265

** . Correlation is significant at the 0.01 level (2-tai led).

Hypothesis Testing

Hi: Content has significant correlation with the use of CBT.

The results of the correlation coefficients revealed that Pearson's r for the correlation between the Content (CT) and Use of CBT (UCBT) is 0.873 as shown in table X.X. This means that there is a strong relationship between the two variables, since Pearson's r is very close to 1. Furthermore, as shown in table V, Sig. (2-tailed) value is 0.003. This value is $< .05$. Accordingly, it means that there is a statistically significant correlation between CT and UCBT variables. Overall, there is a positive statistical relationship between the two variables tested (Content significantly contributes to the Use of CBT among the undergraduate students). Hence, rich, useful, playful and qualitative content will result in a tremendous success in the use of the CBT itself. Accordingly, the hypothesis that states: **Hi:** Content has significant correlation with the use of CBT is accepted.

Discussion

The result of the correlation coefficients between Content (CT) and Use of CBT (UCBT) is 0.873. Meaning that, there is a strong relationship between the two variables, since Pearson's r is very close to 1. This result is supported by [10] who asserted that content has significant correlation with the use of CBT. This finding is further strengthened by another study which found that content is one of the strongest determinants of CBT use, there will be an improved adoption and utilization of computer based test by the undergraduate student of universities [3, 8]. Therefore, since there is a positive relationship between the two variables, it implies that changes in one variable are strongly correlated with changes in the second variable. Similarly, since the Pearson's r is positive (0.873), it means that as one variable increases in value, the second variable also increase in value. This means that when content quality in terms of richness, usefulness and playfulness increases, Use of CBT also increases. In other words, Content has a solid influence on Behavioural Intention to use CBT. In light of our outcomes, when a CBT's Content is structured cautiously, CBT would be progressively valuable and fun loving for the students, thereby encouraging its utilization.

Implication of the Study

The main aim of this study is to examine the correlation between Content and CBT use among the students of tertiary institution in Nigeria. The findings contribute significantly to the existing literature in the field of Computer Based Test, where Content was found to have a significant correlation with the use of CBT. This is a significant contribution as very scanty literature exists on correlational analysis between the use of CBT and its Contents, especially from the point of view of developing country like Nigeria. Practically, findings from this study suggest that the regulatory authority in the education sectors should concentrate on strategizing towards improving the quality of the CBT's content, by making sure that the way students interact with the CBT system has been made very easy and playful so as to attract more usage.

CONCLUSION

Our study demonstrates that content is a significant factor when it comes to the acceptance and use of Computer Based Test by the students. Instructors ought to likewise provide content that is rich, playful and valuable. In order to ensure a fruitful application of the CBT, it is necessary that the students have belief for getting a better performance. Instructors ought to build up students' hope through the courses and through the successful assistance during the school session. The study concludes that a CBT system is more likely to be used by students if its contents are playful and helpful. CBT is more likely to be playful when it is easy to use and useful. Finally, researchers need to investigate the correlation of CBT with other variables that affect the Intention to use it.

REFERENCES

- [1]. F Akbar, What affects students' acceptance and use of technology? A test of UTAUT in the context of a higher-education institution in Qatar information systems, *Mediterranean Journal of Social Sciences*, 2013, 5(2), 47-56.
- [2]. T Olumorin, O Charles, M Fakomogbon, A Michael, YA Fasasi, Y Olawale and O Festus, Computer-Based Tests: A System of assessing academic performance in University of Ilorin, *American Academic & Scholarly Research Journal*, 2013, 5(2), 346 – 357
- [3]. HY Abduh, AC Hussei and KI Adenuga, Preliminary Model for Computer Based Assessment Acceptance in Developing Countries. *Journal of Theoretical and Applied Information Technology*, 2016, 85 (2), 192-206.
- [4]. J Bull and C McKenna, *Blueprint for computer assisted assessment*, London: Rutledge and Falmer, 2004.
- [5]. FM Bandari, *Adoption of Computer Based Testing and Assessment in National Examinations in Kenya*, University of Nairobi, Kenya, 2014.
- [6]. V Terzis and AA Economides, The acceptance and use of computer based assessment, *Computers and Education*, 2011, 56 (211) 1032–1044
- [7]. V Terzis, CN Moridis and AA Economides, How Student's Personality Traits Affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM. *Computers in Human Behavior*, 2012, 28, 1985-1996. <http://dx.doi.org/10.1016/j.chb.2012.05.019>
- [8]. V Terzis, CN Moridis, AA Economides and G R Mendez, Computer Based Assessment Acceptance: A Cross-Cultural Study in Greece and Mexico. *Educational Technology and Society*, 2013, 16, 411-424.
- [9]. J Mulvaney, *Computer-based Assessment and the Effects it has on Middle School Aged Students*, University of Wisconsin-Stout, 2011, Accessed June 2, 2019. Available at <http://www2.uwstout.edu/content/lib/thesis/2011/2011mulvaneyj.pdf>
- [10]. Y Wang, Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management*, 2003. 41(1), 75–86.
- [11]. DY Shee and YS Wang, Multi-criteria evaluation of the web-based e-learning system: a methodology based on learner satisfaction and its applications. *Computer & Education*, 2008, 50(3), 894–905.
- [12]. MF Alquraan, Methods of Assessing Students' Learning in Higher Education: An Analysis of Jordanian College and Grading System. *Education, Business and Society: Contemporary Middle Eastern Issues*, 2012, 5, 124-133. <http://dx.doi.org/10.1108/17537981211251160>
- [13]. RG Jimoh, AK Shittu and YK Kawu, Students' Perception of Computer Based Test (CBT) for Examining Undergraduate Chemistry Courses. *Journal of Emerging Trends in Computing and Information Sciences*, 2012, 3, 125-134.
- [14]. T Deutsch, K Herrmann, T Frese and H Sandholzer, Implementing Computer-Based Assessment—A Web-Based Mock Examination Changes Attitudes, *Computers and Education*, 2012, 58, 1068-1075. <http://dx.doi.org/10.1016/j.compedu.2011.11.013>
- [15]. CC Ko and CD Cheng, Flexible and Secure Computer-Based Assessment Using a Single Zip Disk, *Computers And Education*, 2008, 50, 915-926. <http://dx.doi.org/10.1016/j.compedu.2006.09.010>
- [16]. M Thelwall, Computer-Based Assessment: A Versatile Educational Tool, *Computers & Education*, 2000, 34, 37-49. [http://dx.doi.org/10.1016/S0360-1315\(99\)00037-8](http://dx.doi.org/10.1016/S0360-1315(99)00037-8)
- [17]. T Teo, Modeling Technology Acceptance in Education: A Study of Pre-Service Teachers. *Computers & Education*, 2009, 52, 302-312. <http://dx.doi.org/10.1016/j.compedu.2008.08.006>
- [18]. C Jantz, J Anderson and SM Gould, Using Computer-Based Assessments to Evaluate Interactive Multimedia Nutrition Education among Low-Income Predominantly Hispanic Participants. *Journal of Nutrition Education and Behavior*, 2002, 34, 252-260. [http://dx.doi.org/10.1016/S1499-4046\(06\)60103-6](http://dx.doi.org/10.1016/S1499-4046(06)60103-6)
- [19]. RE Mayer, A Taxonomy for Computer-Based Assessment of Problem Solving. *Computers in Human Behavior*, 2002, 18, 623-632. [http://dx.doi.org/10.1016/S0747-5632\(02\)00020-1](http://dx.doi.org/10.1016/S0747-5632(02)00020-1)
- [20]. L He and P Brandt, WEAS: A Web-Based Educational Assessment System. *Proceedings of the 45th Annual Southeast Regional Conference, ACM*, New York, 2007, 126-131. <http://dx.doi.org/10.1145/1233341.1233365>
- [21]. JW Gikandi, D Morrow and NE Davis, Online Formative Assessment in Higher Education: A Review of the Literature. *Computers and Education*, 2011, 57, 2333-2351. <http://dx.doi.org/10.1016/j.compedu.2011.06.004>

- [22]. P Luarn and HH Lin, Toward an understanding of the behavioral intention to use mobile banking, *Computer in Human Behaviour*, 2005, 21(6), 873-91.
- [23]. V Venkatesh, MG Morris and FD Davis, User acceptance of information technology: Toward a unified view, *MIS Quarterly*, 2003, 27 (3), 425-478.
- [24]. JC Nunnally, *Psychometric theory* (2nd ed.). New York: McGraw-Hill, 1978.