Influence of Cyber-Security Problems in Digital Assessment on Students'AssessmentOutcome: Lecturers' Perspective

Abstract

The increasing use and continuing growth of e-Learning systems has been documented by abundant studies but, little attention has been given to the cyber-security issues in digital-assessment. In fact, there are dearth of studies on research and education about lecturers' perspective towards the influence of cyber-security problems in digital-assessment on assessment outcome. The current investigation targeted this research gap. Thus, a descriptive survey research was conducted with 200 lecturers purposively drawn from education discipline of government owned degree awarding tertiary institutions in Anambra state, Nigeria. Instrument used for data collection was an 8-item questionnaire developed by the researchers. Descriptive as well as inferential statistics were applied in the data analysis to answer one research question and two hypotheses. Analysis was by SPSS version-23. A p-value ≤ 0.05 was taken as significant. The results from this study revealed that cyber-security problems in digital assessment mars negatively on students' assessment outcome.There were significant differences on lecturers' perspective on the influence of security problems in digital-assessment on students' assessment outcome based on level and cadre but not on gender. Cyber-security problems in digital assessment mars negatively on students' assessment outcome and it was significantly influenced by academic level and cadre. Further research is needed to check the consistency of findings and to identify whether the relationship is causal.

Keywords: Lecturers, awareness, cyber-security problems, digital-assessment, assessment outcome

1.0

Introduction

Assessment as a major tool employed in the process of appraising candidates' achievement plays a major role in the educational process or development. It helps ascertain the extent to which the educational policy is successful and could also be a sort of quality control for checking the educational policy vis-à-vis the curriculum. Educational assessment according to Crocker is the totality of the processes involved in making valid judgments about what behavioral characteristics and changes a learner has acquired through the process of teaching and learning [1]. It is regardeda**s** an important

lens through which education is viewed and a motivator of student performance [2].Educational assessment/evaluation has many purposes, both in theeducationsector and in the society at large.Assessment induces motivation for learning, which in turn produces good study habits. An assessment enables the teacher to determine the extent to which behavioral objectives have been achieved [1, 3]. Without assessment student learning will not be completed.

With the developments in technology, technological innovations in educational learning assessmenthave advanced [4, 5].Assessment of student learning can now occur digitally. Regular and diverse assessments have been made possible in the e-learning environment, compared to the conventional learning environment[6]. Digital assessment otherwise known as e-assessment, electronic assessment, computer-based assessment, or online assessment is an important component of any e-learning system. Digital assessment involves the use of digital technologies to develop, administer, assess and provide assessment feedback for formative, summative, diagnostic or self-assessment etc.,[7]. That is, the use of ICTs to simplify the assessment process - the designing and distribution of assessment materials, marking, reporting, storing of the results, making statistical analysis and passing value judgement. It is predicted that within five years, education,both formal and informal education will make use of on-screen assessments/digital assessments [8]. Considering the exponential growth in modern technologies in the 21st century, digital assessment has become the innovative means of assessing students learning and providing feedback [6, 9].

Although digital assessment is one of the most effective applications of Information and Communication Technology (ICT) and gradually becoming popular among the educational institute,the backbone of the digital assessment system is not secure enough in most cases[10, 11].Digital assessment according to Miguel et alhas been marked with obstacles ranging from plagiarism, poor scoring, and cyber-security susceptibilities, such as irregular authentication[12]. This is in line with the findings of Shonola and Joy which revealed thatcyber-security in digital assessment for e-learning

poses a threat to confidentiality, integrity, validity, reliability and privacy of the assessment data as well as learners' assessment outcome[13]. Shonola and Joyfurther pointed out certain cyber-security problems that cannegatively influencedigital assessment actionsas virus/malware attack, student exploiting security breach/privacy issues, data interception for malicious acts, unauthorized access to assessment content, and unpermitted sharing of copyright digital assessment materials.

Consequently, in a survey of cybersecurity awareness level among Northeastern University students in Nigeria,Siraj, Othman andGarba identified cybersecurity threats where the students have some basic knowledge of and those that the students have moderate or little knowledge of [14]. Cybersecurity threats like cyberbully, self-protection and, internet addiction require urgent intervention or the awareness program. Thus, they suggests an urgent need for a good plan implementation of cybersecurity awareness programs to address those cybersecurity issues in order that the students might not fall victim of cyber-attacks especially the female's students. To improve cybersecurity awareness, a study by Algahtani on cybersecurityawareness based on software and e-mail security revealed that a thorough understanding of software security - paying attention to updating the software or application manually or automatically - can raise cybersecurity awareness by up to 19.2%. Also their findings shows that having a thorough understanding of email security - taking precautions such as not responding to unknown senders and rejecting any account that requests personal information - can raise cybersecurity awareness by up to 31.3%[15].

Cyber-security problems in digital learning and assessment can be part of national security and thus university lecturers should be well informed with the basic knowledge of cyber-security and its influence on students' assessment outcome.To ensure that a fair test is taken and that assessment outcome is fair, Marais,Argles andSolms pointed out that authenticity of the person taking the test, e-assessment taken in the correct/supervised location, test visibility that prevents copying, e-assessment integrity that deters electronic corruption, privacy and confidentiality, non-deniability of e-

assessment submissions are certain rules to be applied while using digital assessment[16].It is essential that the university lecturers identify and apply these digital assessment rulesin order to offer solutions to cyber-security problems in digital assessment and improve the validity and reliability of students' assessment outcome.Butwhat are the perspectives of the lecturers in tertiary institutions concerning the influence of cyber-security problems in digital assessment on students' assessment outcome?

However, while there is anabundance of research on teachers' awareness and attitudes toward e-assessments, there is scarcity ofstudies on lecturers' perspective towards the influence of cyber-security problems in digital assessment on students' assessment outcome[17, 18, 19, 20].The current investigation targeted this research gap to investigate into the lecturers' perception onthe influence of cyber-security problems in digital assessment on students' assessment outcome.The objective of this study is to investigate the influence of cyber-security problems in digital assessment on students' assessment outcome as perceived by the lecturers in tertiary institutions.

1.1

Research question

The following research question guided the study:

1. What is the influence of cyber-security problems in digital assessment on students' assessment outcome as perceived by lecturers in tertiary institutions?

1.2

Hypotheses

To carry out the study, the researchers tested the following formulated research hypotheses for rejection or otherwise at 5% level of significance:

Ho 1: There is no significant difference between male and female lecturers' perceived influence of cyber-security problems in digital assessment on students' assessment outcome.

Ho 2: There is no significant difference between the perceived influence of cyber-security problems in digital assessment on students' assessment outcome of lecturers on professorial and non-professorial cadre.

Ho 3: Thelecturers' perceived influence of cyber-security problems in digital assessment on students' assessment outcome did not significantly vary based on levels.

2.0 Method

This study followed a descriptive quantitative methodological approach to assess the lecturers' perspective towards the influence of cyber-security problems in digital assessment on students'assessment outcome. This study used a descriptive survey designed to collect relevant information since Creswell said surveys are always suitable strategies of inquiry within quantitative approaches[21].

2.1

Population and sample: The target population was the 903 lecturers in education discipline from government owned, degree awarding tertiary institutions in Anambra state, Nigeria. Two hundred (200) lecturers werepurposively selected from the target population as the study sample.The 200 lecturers comprised of different gender, levels and cadre.The lecturers' levels are - assistant lecturers, lecturer II, lecturer I, senior lecturers, readers and professors. The lecturers' cadre was categorized as professorial and non-professorial. The professorial cadre includes readers and professors, while thenon-professorial cadre includes assistant lecturers, lecturer II, lecturer I, and senior lecturers (See Tables 1& 2).

2.2

Instrument: The researchers constructed an8-item questionnaire to measure lecturers' perspective towards the influence of cyber-security problems in digital assessment on students' assessment outcome. Section A elicits information from the personal data of the respondents while section B elicits responses from the respondents to answer the research questions. Astructured four-point Likert scale of Strongly Agree (SA-4points), Agree (A-3points), Disagree (D-2points) and Strongly Disagree (SD-1point) was employed to measure respondents' level of perception on each item.

2.4

Data collection:A pilot version of the survey questionnaire was initially administered to a limited number of respondents with similar characteristics to establish the effectiveness of the designed items. The trial testing helped ensure that the used terms were easily understood, as well as to check for validity (i.e., whether the items were asking what we wanted to study). The researchers adopted the Direct Delivery Method (DDM) to administer copies of the questionnaires to the lecturers, which gave them the opportunity to collect back the instrument immediately. Member checking was also used to check the accuracy of the data collected. All 200 responses were collected and considered for data analysis.

2.5

Data analysis: The collected data were analyzed in accordance with research questions, and the results were presented in several tables. Descriptive as well as inferential statistics were applied in the data analysis.Mean and Standard deviation were used to answer research question 1. Mean scores from 2.50 and above was accepted as positive while mean scores below 2.50 was taken as negative response. Mann-Whitney U test and Kruskal-Wallis H test was used to test the hypotheses. Analysis was by Statistical Package for Social Sciences version 23 (SPSS v 23.0). A p-value ≤ 0.05 was taken as significant.

Table 1: Demographics

Categories	**Frequency**	**Percentage (%)**

Gender		
Male	86	43.0
Female	114	57.0
Level		
Assistant lecturer	14	7.0
Lecturer II	83	41.5
Lecturer I	12	6.0
Senior lecturer	39	19.5
Reader	4	2.0
Professor	48	24.0
Cadre		
Non-professorial	148	74.0
Professorial	52	26.0

Table 2: Demographics

Crosstabulation

Count

		Gender		
		Male	**Female**	**Total**
Level	Assistant Lecturer	4	10	14
	Lecturer II	40	43	83
	Lecturer I	6	6	12
	Senior Lecturer	18	21	39
	Reader	2	2	4
	Professor	16	32	48
Total		**86**	**114**	**200**
Cadre	Non-professorial	68	80	148
	Professorial	18	34	52
Total		86	114	200

FIG 1: Graphic representation of the study population.

3.0
Results and Discussion

The collected data were analyzed and the resulting outcomes presentedin Tables 3, 4, 5, 6, 7, 8,and 9 based on the stated research questions.

3.1

Research question 1: What is the influence of cyber-security problems in digital assessment on students' assessment outcome as perceived by lecturers in tertiary institution?

In Table 3 is presented the frequencies and mean ratings of the influence of cyber-security problems in digital assessment on students' assessment outcome as perceived by lecturers in tertiary institution.

Table 3: Frequencies and Mean Ratings of the Influence of Cyber-Security Problems in Digital Assessment on Students' Assessment Outcome as Perceived by the Lecturers

S/N	Cyber-Security problem in digital assessment	N	Mean	Std. Deviation	Remarks
1	improves validity of the assessment outcome	200	1.81	1.105	**Disagree**
2	improves reliability of the assessment outcome	200	2.22	0.717	**Disagree**
3	mars confidentiality of assessment outcome data	200	3.38	0.860	**Agree**
4	reduces availability of assessment outcome data	200	2.87	0.675	**Agree**
5	ensures easy access to assessment outcome data	200	2.37	0.803	**Disagree**
6	increases students' exam participation positively	200	1.99	0.821	**Disagree**
7	increases availability of assessment materials	200	2.06	0.720	**Disagree**
8	enhances recoding of assessment data	200	2.25	0.819	**Disagree**
	Cluster Mean		**2.37**		

Data in Table 3 shows that the respondents disagree to items 1, 2, 5, 6, 7 and 8, and agree to items 3 and 4which mean ratings were above the cut off mean of 2.50.Thisrevealed that the lecturers in Anambra state disagree thatcyber-security problems in digital assessment improves validity of the assessment outcome, improves reliability of the assessment outcome, ensures easy access to assessment outcome data, increases students' exam participation positively, increases availability of assessment materials and enhances recoding of assessment data, but agree that cyber-security problems in digital assessment mars confidentiality of assessment outcomedata and reduces availability of assessment outcomedata.The cluster mean is 2.37. This further implies thatcyber-security problems in digital assessment mars negatively on students' assessment outcome as perceived by lecturers in Anambra state.No wonderMarais et.alidentifies security vulnerabilities unique to e-assessment and recommends that it is

addressed especially as e-assessments are being used more and more to replace paper-based tests[22].

3.2

Hypothesis 1: There is no significant difference between male and female lecturers' perceived influence of cyber-security problems in digital assessment on students' assessment outcome.

In Table 4 is presented the mean rank and sum of ranks of lecturers' perspectives on the influence of cyber-security problems in digital assessment on students' assessment outcome for the two groups tested (i.e., the male and female lecturers):

Table 4: Mean Ranks of the Influence of Security Problems in Digital Assessment on Students' Assessment Outcome as Perceived by the Lecturers Based on Gender

	Gender	**N**	**Sum of Ranks**	**Mean Rank**
Perceived	Male	86	9383.00	109.10
Influence	Female	114	10717.00	94.01
	Total	200		

The Table 4, indicates in overall, that the male lecturerscan be considered as having the higher perspectivethatcyber-security problems in digital assessment impacts negatively on students' assessment outcome.That is, the groupwith the highest mean rank. Statistical result of the Mann-Whitney U test of significance difference in the mean ranks of male and female lecturers' perspective on the influence of cyber-security problems in digital assessment on students' assessment outcome based on gender is portrayed in Table 5.

In Table 5 is presented the actual significance value of the test. Specifically, it provides the test statistic, *U* statistic, as well as the asymptotic significance (2-tailed) *p*-value of the difference in the perceived influence of cyber-security problems in digital assessment on students' assessment outcome based on lecturers' gender.

Table 5: The Test Statistic, *U* Statistic, and Asymptotic Significance (2-tailed) *p*-value

Test Statistics[a]	
Mann-Whitney U	4162.000
Wilcoxon W	10717.000
Z	-1.890
Asymp. Sig. (2-tailed)	.059

a. Grouping Variable: Gender

From Table 5, it can be deduced that the observed mean rank difference in theperceived influence of cyber-security problems in digital assessment on students' assessment outcome for themale and female lecturers in tertiary institution was not statistically significantly ($U = 4162$, $p = .059$). This implied that, the lecturers of both genders equally believed that cyber-security problems in digital assessment impacts on students' assessment outcome negatively. This could be expected since according to Okoye and Okwuoguboth male and female lecturers of public tertiary institutionsequally use ICT in educational activities[20].

3.3

Hypothesis 2: There is no significant difference between the perceived influence of cyber-security problems in digital assessment on students' assessment outcome of lecturers on professorial and non-professorial cadre.

In Table 6 is presented the mean rank and sum of ranks of lecturers' perspectives on the influence of cyber-security problems in digital assessment on students' assessment outcome for the non-professorial and professorialcadres.

Table 6: Mean Ranks of the Influence of Cyber-Security Problems in Digital Assessment on Students' Assessment Outcome as Perceived by the Lecturers Based on Cadre

	Lecturer Cadre	N	Sum of Ranks	Mean Rank
Perceivedinfluence	Non-Professorial	148	15884.00	107.32
	Professorial	52	4216.00	81.08
	Total	200		

From Table 6, itindicates in general, that the lecturersin non-professorial cadre can be considered as having the higher perspective that cyber-security problems in digital assessment impacts negatively on students' assessment outcome. That is, the groupwith the highest mean rank. Statistical result of the Mann-Whitney U test of significance difference in the mean ranks of male and female lecturers' perspective on the influence of cyber-security problems in digital assessment on students' assessment outcome based on cadre is portrayed in Table 7.

In Table 7 is presented the actual significance value of the test. Specifically, it provides the test statistic, *U* statistic, as well as the asymptotic significance (2-tailed) *p*-value of the difference in the perceived influence of cyber-security problems in digital assessment on students' assessment outcome basedon lecturers' cadre.

Table 7: The Test Statistic, *U* Statistic, and Asymptotic Significance (2-tailed) *p*-value

Test Statistics[a]	
Mann-Whitney U	2838.000
Wilcoxon W	4216.000
Z	-2.912
Asymp. Sig. (2-tailed)	.004

a. Grouping Variable: Lecturer Cadre

From Table 7, it can be deduced that the observed mean rank difference in the perceived influence of cyber-security problems in digital assessment on students' assessment outcome for thelecturers in professorial andnon-professorialcadre in tertiary institutionwas statistically significantly ($U = 2838$, $p = .004$). This implied that, the lecturers' perspective that cyber-security problems in digital assessment impacts on students' assessment outcome negatively was significantly higher in lecturers of non-professorial cadre than that of lecturers in professorial cadre. This study result is possible since more of the youth lecturers are in the non-professorial cadre, and the youth according to Hamat, Embi and Hassan are more conversant with the modern technological advancements in digital assessment[23]. Likewise,the youth to Alharbi and Tassaddiqare more familiar with cyber-security threats in e-learning[24].

3.4

Hypothesis 3: Thelecturers' perceived influence of cyber-security problems in digital assessment on students' assessment outcome did not significantly vary based on levels.

In Table 8 is presented the mean ranks of lecturers' perspectives on the influence of cyber-security problems in digital assessment on students' assessment outcomebased on level, while the extent of its significance is portrayed in Table 9.

Table 8: Mean Ranks of Perceived Influence of Cyber-Security Problems in Digital Assessment on Students' Assessment OutcomeBased onLecturers' Level

	Lecturer Level	**N**	**Mean Rank**
Perceived influence	Assistant Lecturer	14	122.29
	Lecturer II	83	116.17
	Lecturer I	12	108.33
	Senior Lecturer	39	82.81
	Reader	4	195.00
	Professor	48	71.58
	Total	200	

Table 9: Kruskal-Wallis test

	Test Statistics[a,b]
Chi-Square	37.056
Df	5
Asymp. Sig.	.000

a. Kruskal Wallis Test
b. Grouping Variable: Lecturer Level

From Tables 8 and 9, the Kruskal-Wallis H test showed that there was a statistically significant difference in lecturers' perspectives on the influence of cyber-security problems in digital assessment on students' assessment outcome between the different lecturer levels, χ^2 (5) = 37.056, P = .000, with a mean rankperceived influence score of 122.29 for assistant lecturer, 116.17 for lecturer II, 108.33 for lecturer I, 82.81 for senior lecturer, 195.00 for reader, and 71.58 for professors. To the best of our knowledge, this study is the first to examine lecturers' perspectives on the influence of cyber-security problems in digital assessment on students' assessment outcome.

4.0
Conclusion

Based on the study findings, the researchers concluded thatmajority of the lecturers from both genders, level and cadre disagree that cyber-security problems in digital assessment improves validity of the assessment outcome, improves reliability of the assessment outcome, ensures easy access to assessment outcome data, increases students' exam participation positively, increases availability of assessment materials and enhances recoding of assessment data, but agree that cyber-security problems in digital assessment mars confidentiality of assessment outcome data and reduces availability of assessment outcome data. The cyber-security problems in digital assessment mars negatively on students' assessment outcome as perceived by lecturers in tertiary institution.

The researchers also concluded that level and cadre of the lecturersin higher institutions but not lecturers' gender exerts significant impact on their perspectives of the influence of cyber-security problems in digital assessment on students' assessment outcome.

5.0
Recommendations

The following recommendations were made by the researchers based on the study findings;

1. The need for school administrators, educational evaluation agencies, institution-based ICT operators etc., to organize intensive training and retraining in form of workshops to educate thelecturers especially from the professorial cadrewith maximum information on the influence of cyber-security problems in digital assessment on students' assessment outcome.
2. Further research is needed to check the consistency of findingsusing larger data size.

6.0

Study Limitations

Though the resultsoffered in this studyoffervitalopinions for developing cognizance of the influence of cyber-security on student assessment outcome, some limitations need to be emphasized,of which the researchers plan to improve in the future studies. The items covered in the survey questions should be checked by cyber-security experts. The study data produced valuable outcomes; however, further research needs to be carried out on different lecturer populations intertiary institutions of different geographical area. The sample size can be increased, which may improve the findings.

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