

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/356770401>

Challenges and Perceptions in the Use of ICT in Student Assessments During the Covid-19 Pandemic

Conference Paper · September 2021

DOI: 10.1109/ICITACEE53184.2021.9617480

CITATIONS

10

READS

1,062

5 authors, including:



[Sunday Adeola Ajagbe](#)

University of Zululand

137 PUBLICATIONS 1,392 CITATIONS

[SEE PROFILE](#)



[Ademola O. Adesina](#)

Olabisi Onabanjo University, Ago Iwoye Nigeria

48 PUBLICATIONS 397 CITATIONS

[SEE PROFILE](#)



[Le Thi Thanh](#)

Ho Chi Minh City University of Technology and Education

23 PUBLICATIONS 301 CITATIONS

[SEE PROFILE](#)



[Dang N. H. Thanh](#)

University of Economics Ho Chi Minh City

124 PUBLICATIONS 2,496 CITATIONS

[SEE PROFILE](#)

CHALLENGES AND PERCEPTIONS IN THE USE OF ICT IN STUDENT ASSESSMENTS DURING THE COVID-19 PANDEMIC

Sunday Adeola AJAGBE

Computer Engineering Department, Ladoko
Akintola University of Technology,
Ogbomoso, Nigeria.
saajagbe@pgschool.lautech.edu.ng

Ademola O. ADESINA

Department of Mathematical Sciences,
Olabisi Onabanjo University, Ago-Iwoye,
Nigeria.
ademola.adesina@oouagoiwoye.edu.ng

Oluwafisayomi A. ILUPEJU

Library Department,
Ajayi Crowder University, Oyo, Nigeria.
ewaifedare@gmail.com

Le Thi THANH

Department of Mathematics, Faculty of Applied
Sciences, Ho Chi Minh City University of Technology
and Education, Ho Chi Minh City, Vietnam
thanhlt@hcmute.edu.vn

Dang N. H. THANH

Department of Information Technology, School of
Business Information Technology, University of
Economics Ho Chi Minh City, Vietnam.
thanhdnh@ueh.edu.vn

Abstract — As part of the government's reaction to the covid-19 pandemic, educational institutions were suddenly closed to prevent the virus from spreading further. This has raised concerns about the global consequences of disrupted academic sessions. To ensure educational continuity, ICT (e-learning) has been implemented in universities all over the world. It is common knowledge that electronic learning eventually leads to electronic testing. E-examinations aim to remove limitations and provide answers to several questions that arise during pen-and-paper examinations. As a result, higher education institutions around the world should accept it. This study looked at how students and lecturers perceived the use of electronic examinations in universities during the pandemic. The data was collected using a descriptive survey research methodology and a structured questionnaire as the data collection instrument. Most respondents appeared to be familiar with ICT, according to the study's findings. Furthermore, most of the respondents tended to have favorable perception of e-examination as a platform for academic assessments in universities, according to the results. On the negative hand, poor internet access, unreliable power supply, unsupportive educational policies, fear of examination malpractices, and insufficient technical infrastructure to support e-examination are all major obstacles.

Keywords— *Computer-based test, Covid-19 pandemic, E-examination, E-learning, ICT, Perceptions, Learning management system (LMS).*

I. INTRODUCTION

The novel coronavirus outbreak that began in Wuhan, China in 2019 presents a grave and immediate threat to all. So far, the virus has wreaked havoc on economic, political, social, and educational activities. It is impossible to overestimate the pandemic's devastating effect on human life, health, economics, and education around the world. As a result, the World Health Organization (WHO) opined that it is a global pandemic on March 11, 2020. Due to the pandemic's repercussions, the government suddenly closed educational facilities to prevent further infections. As a result of the impact, numerous institutions' ongoing face-to-face class programs were deeply skewed. Without a doubt, according to [1, 2], closing these institutions would have a direct impact on students, higher education sectors, and countries' economic development. Interruptions in students' cognitive learning processes, delays in graduation, a proclivity to cancel academic sessions, and the possibility of students engaging in unwholesome behavior during the lockdown are all implications of such action. Universities across the continent devised strategies to mitigate the pandemic's consequences and ensure uninterrupted educational delivery. Many institutions have switched to e-

learning from face-to-face instruction. The pandemic's influence was felt not only in face-to-face learning but also in the high demand for e-exams to replace pen-and-paper exams.

The use of e-examination has a number of benefits, as it answers many questions and overcomes many shortcomings of conventional tests and exams. Significant test leakages and malpractices, lecturers' demands for reward and bribe-taking by supervisors of exams, among other things, have become more challenging over time. However, e-examination makes it simpler and more effective. E-examination can simply be described as an electronic examination— that is, an examination conducted using information and communication technology. According to [3] and Office of qualifications and examinations regulation (Ofqual), the use of any technical device to develop, distribute, store, and/or report students' assessment marks and feedback is referred to as e-assessment. Students' abilities and skills can now be assessed using emerging tools such as e-examination [4, 5].

In higher education, e-learning, which is the method of learning using ICTs such as desktop and/or laptop computers, apps, digital cameras, and so on, has grown in popularity [6, 7]. As a result, e-examination is a component of e-learning that has the potential to become a favored method of assessment over traditional assessments. E-assessment was not a formidable problem for countries in developing climes since many countries had begun to incorporate it into their education systems long before the pandemic. The problem was with developing countries, especially African countries, which have low internet connectivity, inadequate infrastructure, low computer literacy, and unsupportive educational policies, among other things. Nonetheless, due to the pandemic's mandatory lockdown, higher education institutions around the world were forced to re-order or modify their academic curriculum to accommodate e-learning, resulting in the use of e-examinations for tests.

As predicted, the change from the conventional mode of assessment to e-assessment in universities was fraught with difficulties and differing perspectives. This research examines how information technology was used in student evaluations in universities around the world during the pandemic, with an emphasis on e-examination. The challenges of using e-examination, as well as lecturers' and students' perceptions, are discussed further in this article. The research focused on determining the essence of perceptions about the usage of e-examination in universities during the Covid-19 pandemic. Other dependent variables in the diffusion and technical acceptance model are interrelated. The pace of acceptance is influenced by the degree of education and familiarity with technology. The essence of a

country's, state's, community's, or locale's perception of technology also influences the range of acceptance. In this regard, this study focuses on perception because it is the independent variable that triangulates the relationship. Since the majority of universities were unable to implement e-examination during the pandemic, the study is restricted to private universities in Oyo state. The remaining part of this research is organized thus: Sector 2 reviewed the relevant literatures, Section 3 discusses the methodology employed, Section 4 presents results and discuss the findings on challenges and perceptions in the use of ICT in student assessments in universities during the Covid-19 pandemic. Finally, Section 5 concludes the paper.

II. REVIEW OF RELATED WORKS

The term "examination" comes from the Latin word "**examinatio**" which means "**to examine**". In the early twentieth century, Henry Fischel, a professor of religious studies at Indiana University, was believed to have invented the standardized test. According to history, the Cambridge test was the first and oldest method of assessment used in 1958. Since then, evaluation/assessment has changed dramatically, and it is now known as comprehensive research, which focuses on the overall image that builds a candidate's actual competency rather than individual components [8]. Exams are one of the most popular tools around which the entire educational system revolves – every educational system uses exams as a success measure and to promote students to the next academic stage. An assessment is not only a means of evaluating students' success but also a motivator that allows students to understand their academic strengths and shortcomings, as well as allowing teachers to try out new teaching methods. Over time, the pen-to-paper method of measuring students has proven to be a reliable parameter for assessment and evaluation in primary, secondary, and tertiary education systems [9]. However, there has been a public outcry around the world about the integrity, authenticity, and efficiency of public examinations. ICT was used for evaluation processes in response to these concerns.

There are two types of e-examination available. The first is download delivery (offline e-examination), in which evaluation tasks/tests are downloaded into students' computers in appropriate examination centers at the appropriate date and time and published when the student arrives for the assessment – for example, Maple T.A. The second type is web-based delivery (online e-examination), which necessitates the use of e-platforms such as Google Meet, which allows students to access evaluation tasks from anywhere using the internet [10]. The download method is usually used for high-stakes tests.

E-examination is becoming more common and accepted by many examination bodies and higher education institutions [11, 12]. On this foundation, researchers set out to perform various studies to determine the feasibility, relevance, acceptability, and potential challenges that the e-examination system could face, as well as public expectations of its adoption, but all before the emergence of Covid-19 pandemic. Ezugwu, et al (2016) [13] carried out a study to improve the standard and quality of education in order to re-establish students' confidence and close loopholes that allow for malpractice to flourish in the university system. The

study's findings revealed that the number of electronic examinations conducted influences the quality of students generated in universities. He said that the advent of electronic examinations was largely responsible for the major victories against examination malpractices. Finally, the researcher concludes that electronic examinations are the way forward for educational institutions globally.

Osang, (2012) [14] conducted research on how e-examinations in the assessment process of students' study circles, as well as the architecture for electronic examinations as applied, which can be used by any other ODL institution, with a focus on the "perception of Academic Staff on E-examinations" This supports the claim made by [15] that lecturers' expectations of technology have a significant impact on its acceptability. In his research, Osang discovered that 81.9 percent of lecturers are computer literate, while the remaining 28.4% are still learning basic computer skills, implying that the majority of academic workers (lecturers) employed are computer literate and therefore can value e-exams. It was also discovered that 63 percent of Lecturers found maple T.A. (the program used) to be very difficult, while 47.3 percent found it to be quite simple with time after training, implying that there is still work to be done to make the e-exam platform more user friendly for Lecturers. Hung *et al*, (2021) [7] investigated the use of an automated method to perform examinations. This entails the development of an electronic review system that uses a Client–Server approach on an intranet to handle multiple choice multiple answers and multiple choice single answers questions.

Students' performance on the computer-based test was found to be superior to their performance on the paper-pencil test. [16] looked into the possibility of e-examination implementation in globally. Huge examination leakages, teachers' demands for gratification, and bribe-taking by supervisors and invigilators of examinations prompted their study, which has resulted in a general decline in educational quality in many countries. As a result of the lack of trust in the conduct of the entrance exams, many universities have resorted to conducting post-entrance "Post-JAMB" examinations/screening. They suggested a model that is simple to use and that candidates will become accustomed to overtime. Examination time may be spaced without jeopardizing their accuracy or credibility. Similarly, Ayo, Akinyemi, Adebisi, & Ekong, (2007) [16] conducted an empirical study for evaluating students' perception in universities of the Joint Admission and Matriculation Board (JAMB) Computer Based Examination. The investigation was focused on five goals. Students viewed the JAMB computer-based assessment as a concrete and satisfying experience, with computer-based examinations being more enjoyable than paper-based examinations, according to the report. The study also discovered that low computer literacy influences students' perceptions of computer-based exams, as well as a lack of well-designed computer-based exam instruction [17, 18]. Based on these results, it was determined that the JAMB's management should consider students' attitudes toward computer-based examinations in order to fully implement groundbreaking techniques globally. Students should be encouraged to develop their computer literacy in order to increase their versatility during the JAMB computer-based test, according to the recommendation.

Though some developments are more noticeable than others, information technology has had a significant impact on how people view the environment. As sensational as some of these events might be, they have elicited a broad range of reactions from the general public, which views technology as a primary means of transformation in all aspects of life, developments in technology shape the advancement of society. "This implies that, rather than a society determining the needs that form the basis for introducing specific technologies, technology innovation is seen as independent of societal needs". Some proponents of technological determinism have argued that technological advances have a direct effect on culture and shape it. Technological determinism is a belief that educational technology is influenced by both the user and his environment, as well as the technology itself, meaning that technologies are not neutral in learning processes. Is it possible to conclude that the covid-19 pandemic triggered any technological changes globally? Yes, technology has a significant impact on every aspect of life, especially education. During the pandemic, education sectors had no choice but to adjust and adapt to the abrupt shift from traditional modes of teaching and learning to the use of ICT (e-learning) for educational continuity, which naturally led to the use of web-based e-examination.

III. METHODOLOGY OF THE STUDY

The descriptive survey research method with a structured questionnaire that has been proven as one of the instruments for qualitative research was employed for the study. The data collection comprises 814 undergraduate students and 90 lecturers from private universities in Oyo State Nigeria completed the survey, resulting in a total of 904 respondents.

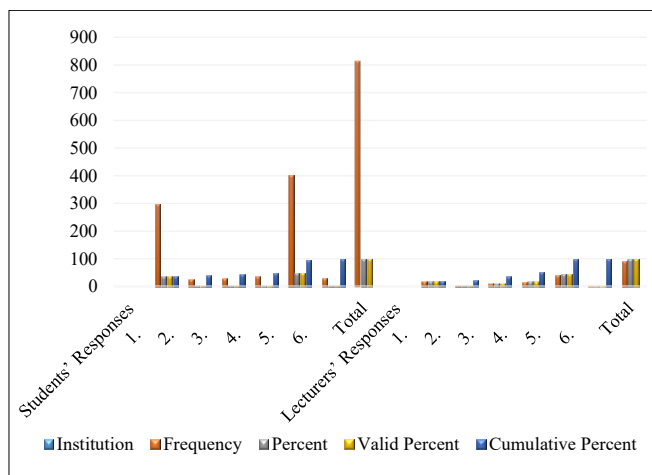


Fig. 1. Distribution of Respondents by Institution

A. Study Design

This study adopts a descriptive survey design of the "expost facto" type, which is a research method in which groups with qualities that exist already are compared on some dependent variable. This method is the most suitable to this type of study because it seeks to establish the influence of dependent variables on independent variables.

B. Data Collection

This research employed the use of primary data to implement its findings. The primary data was collected through a self-designed questionnaire to elicit information

regarding the tested variables in the research. The data was collected from six (6) private universities in Oyo State, Nigeria, and it was collected from both students and lecturers.

IV. RESULT PRESENTATION AND ANALYSIS

The results of this research were analyzed and discussed in the following sections. The following is the order in which the data is analyzed and interpreted:

A. Results

Figure 1 displays the respondent's demographic details. The majority of the respondents, 403 (49.5 percent) respondents in the first group (students) were between the ages of 21 and 25, followed by 257 (31.6 percent) respondents between the ages of 15-20, and 148 (18.2 percent) respondents between the ages of 26 and 30. While only 6 (7%) respondents were within the age of 30 and above; 491 (60.3%) of the respondents were females while their male counterparts were 323 (39.7%); a majority of the respondents 319 (39.2%) were 300 level students, followed by 234 (28.7%) respondents that were 200 level students, followed by 149 (18.3%) respondents in 400 level, followed by 60 (7.4%) respondents that were 100 level students, with the least 52 (6.4%) respondents that were 500 level students, thereby making 814 (100%) respondents in all. From the second category of respondents (lecturers), it was revealed in the table above that majority of the respondents were within the age range of 36-40 (40%), followed by those within 40 years and above (27.8%), followed by 24 (26.7%) respondents who were within 31-35 years and 5 (5.6%) who were within 25-30 years of age; 46 (51.1%) of the respondents were males while the females were 44 (48.9%); the respondents with the highest frequency 28 (31.1%) were in the cadre of Lecturer I, followed by 25 (27.8%) in the category of Senior Lecturer, followed by 23 (25.6%) respondents in the category of Lecturer II, followed by 6 (6.7%) respondents that were Associate Professors, followed by 5 (5.6%) respondents in the cadre of Graduate Assistant, while the least was 3 (3.3%) respondents that were Professors; 50 (55.6%) respondents had 6-10 years working experience, 29 (32.2%) had 0-5 years working experience, 8 (8.9%) had 11-15 years working experience, while only 3 (3.3%) respondents had 15 years and above working experience, thereby making it a total of 90 (100%) respondents in all.

Analysis of Research Questions on Application of ICT in Students' Assessment in Universities during Covid-19 is shown in figure 3, out of the total respondents in the students' category, 99.8% (812) agreed that they heard about e-examination and are familiar with e-examination platforms, 98.3% (800) agreed that to have good knowledge of ICT, 97.7% (795) agreed ICT is applied in performing academic activities such as assessments in their schools, 92.1% (750) said they prefer e-examination to paper-based examination, 86.2% (702) agreed that their schools conducted e-examinations during the lockdown. While the remaining percentage of the respondents disagreed with all the statements. From the lecturers' category, the majority of the respondents 90 (100%) agreed that they have good knowledge of ICT, they have heard about e-examination and are familiar with e-examination platforms, their institution have facilities to run e-examination, they have adequate

knowledge of e-examination; 57 (63.3%) agreed that they invigilated the e-examination conducted by their institution during the pandemic. unlike 33 (36.7%) that disagreed with this statement. The result pointed out that most respondents were greatly aware of e-examination and its application on students' assessment during the pandemic in universities was to a greater extent. Figure 2 presents the demography of the respondents in the research.

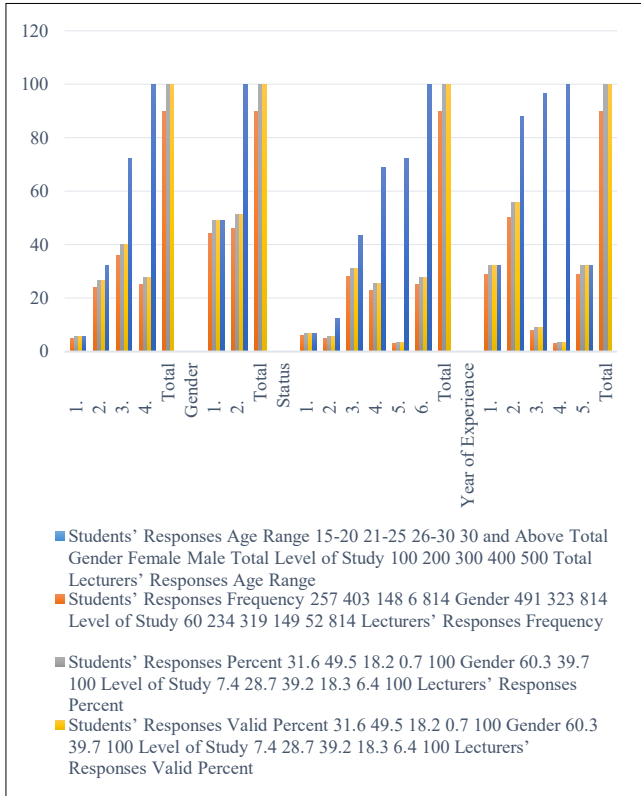


Fig. 2: Presents the demography data of the respondents

Figure 3 presents the analysis of the advantages of using e-examination during Covid-19 pandemic. It is obvious from the students' category that the most significant advantages of using e-examination are: 'e-examination provides students with easy means of writing exams.' as 59.6% (485) respondents strongly agreed to this, E-examination saves costs of printing exam booklets, and time.' as indicated by 57.7% (470) respondents, closely followed 56.5% (460) respondents strongly agreed that 'e-examination provides immediate feedback on students' performance', 'e-examination system is flexible and handy to use' as 43.2% (353) respondents agreed with this statement, 'e-examination eliminates challenges of geographical locations' as agreed to by 42.3% (344) of the respondents. The result from the second category of the respondents (lecturers) indicated that 'e-examination saves costs of printing exam booklets and time', as 91.1% (82) respondents strongly agreed to this, followed by 90.0% (81) respondents that strongly agreed that 'e-examination is an effective solution for mass education evaluation.', 85.6% (77) strongly agreed that 'e-examination system is flexible and handy to use, 23.3% (21) of the respondents agreed that 'E-examination reduces exam malpractices', 'e-examination provides automatic grading to reduce complex manual grading' as agreed upon by 21.1% (19) respondents, while only 6.6% (6) respondents disagreed

with this statement. These results imply that e-examination is a way forward for smooth assessments in universities, majorly because of its flexibility and cost-effectiveness.

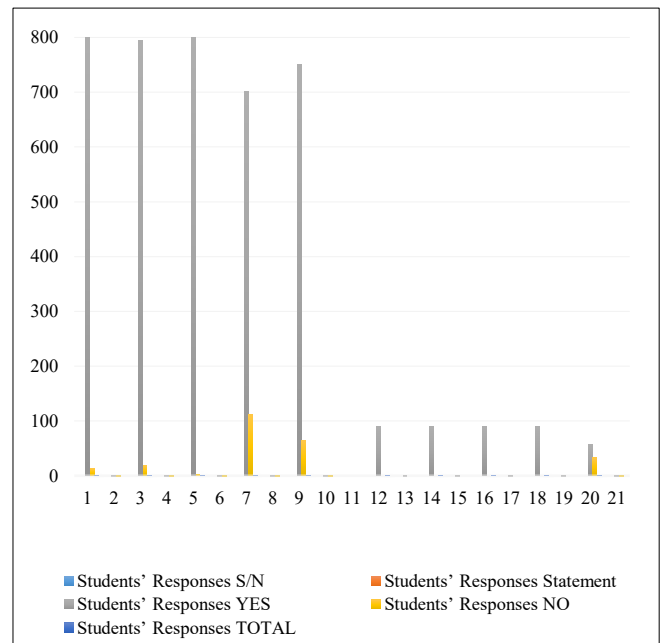


Fig. 3. Advantages of using e-examination during the pandemic

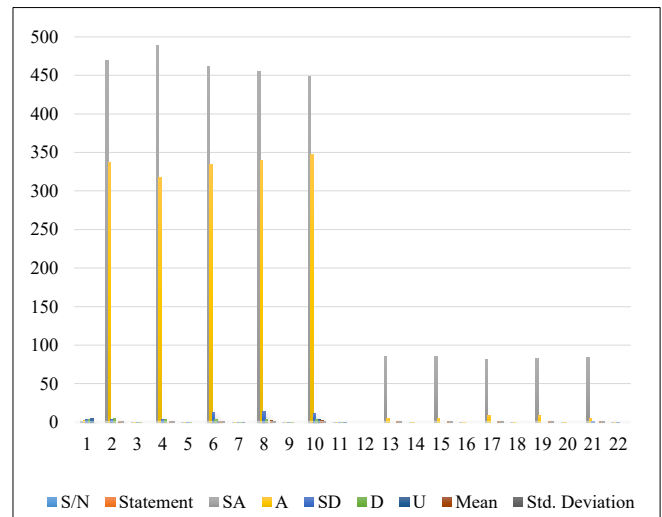


Fig. 4: Challenges Arising from using e-examination during the pandemic

Figure 4 shows the analysis of the challenges arising from the use of e-examination in universities during the pandemic. From the result presented in the table, 60.1% (489) of the respondents in the students' category strongly agreed that poor internet connection poses a challenge to e-examination processes, 57.6% (469) indicated that erratic supply of electricity is a serious challenge to conducting e-examination, closely followed by 56.8% (462) out of the respondents strongly agreed that the level of computer illiteracy is one of the major challenge of e-examination, followed by 42.8% (348) of the respondents that agreed that unexpected damage or breakdown of technical facilities is a challenge to e-examination, 41.8% (340) of the respondents agreed that lack of funds and technical facilities to support the adoption, implementation and maintenance of e-examination systems is a challenge. However, 1.7% (14) respondents respectively disagreed that lack of funds and technical facilities to support

the adoption, implementation and maintenance of e-examination systems is a challenge, and 1.4% (11) respondents strongly disagreed that unexpected damage or breakdown of technical facilities is a challenge to e-examination.

From the second category of respondents (lecturers), the major challenges arising from using e-examination during Covid-19 pandemic as strongly agreed upon respectively by 94.4% (85) of the respondents are that: erratic supply of electricity is a serious challenge to e-examination, and poor internet connection poses a great challenge to e-examination activities. 83.3% (84) respondents agreed that unexpected damage or breakdown of technical facilities is a challenge to e-examination, 91.1% (82) of the respondents strongly agreed that lack of funds and technical facilities to support the adoption, implementation and maintenance of e-examination systems is a challenge. Likewise, 90.0% (81) of the respondents respectively strongly agreed that the level of computer illiteracy is one of the major challenges of e-examination. Considering the total number of respondents that either strongly agreed or agreed to the questions in the table above, it is obvious that lots of challenges revolving around poor ICT infrastructures arose from using e-examination in universities during Covid-19 pandemic.

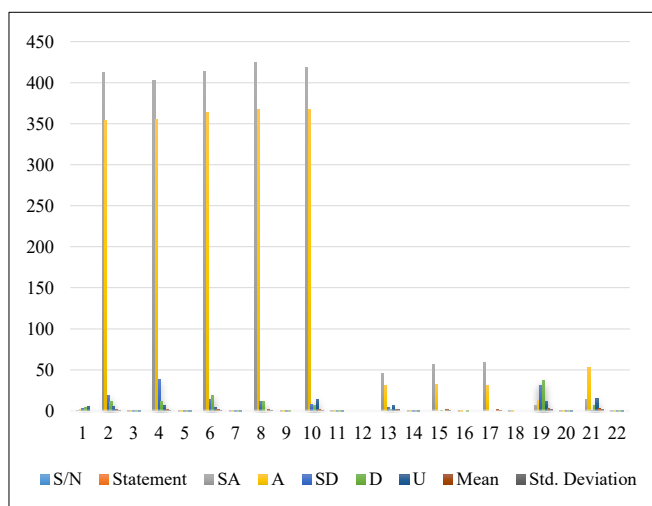


Fig. 5. Lecturers' and Students' Perceptions on the use of E-Examination during Ovid-19 Pandemic

Figure 5 presents lecturers' and students' perceptions on e-examination during covid-19 pandemic in universities. From the result of the first category of respondents (students) majority of the respondents agreed that students performed better in e-examination conducted during Covid-19 pandemic than paper-based examination (Mean score = 1.61). Other perceptions the respondents have on e-examination are that: concerns on conduct, authenticity and reliability of paper-based examinations are resolved with e-examination; e-examination reduces anxiety and requires less time than paper-based exams; e-examination improves students' cognitive skills; and e-examination is more technical and requires computing skills with calculated mean scores of (1.60; 1.57; and 1.52) respectively.

From the second category of respondents (lecturers), the majority of the respondents disagreed that e-examination is a reliable and an accurate method for measuring student's performances. (Mean scores = 3.27). 53 (58.9%) of the respondents agreed and 14 (15.6%) strongly agreed that e-

examination reduces examination malpractices (Mean score = 2.51), followed by the respondents that strongly agreed or agreed that students performed better in e-examinations conducted during Covid-19 than paper-based examinations; concerns on conduct, authenticity and reliability of paper-based examinations are resolved with e-examination; and e-examination ease the bulk load of marking with calculated Mean Scores of (1.81; 1.39; and 1.34) respectively. With all indications, e-examination is perceived to be a better tool for assessments because it can resolve the problems of the traditional mode of assessment such as examination malpractice, victimizations in the examination hall, workloads that come with supervision, and markings, costs of printings, etc. The result also revealed that students performed better in e-examination during Covid-19 pandemic than paper-based examinations.

B. Discussion of Findings

- According to the findings, the use of ICT in education is becoming more relevant. This is in line with [5], who stated that e-examination is gaining acceptance by examination bodies and higher institutions of learning.

- Despite all the advantages of e-examination, the study discovered that universities face numerous challenges while using the method. This problem is primarily caused by the country's lack of ICT infrastructure growth. This is in line with the findings of [3] report, in which the country's gross inadequacy of ICT infrastructure was identified as the primary challenge.

- The study found that e-examination is a better method for assessments because it can address issues with conventional modes of evaluation such as examination malpractice, victimization in the exam room, workloads associated with supervision and markings, printing costs, and so on.

- It was also discovered that students performed better in e-examinations than in paper-based examinations during the Covid-19 pandemic. This is in line with [7], who discovered in their research that students perform better on computer-based tests than on paper-pencil tests.

V. CONCLUSIONS

Globalization has resulted in several shifts, one of which is a shift in educational processes. Individualized learning, which can take place anywhere, at any time, and at the learner's ease and speed, is increasingly displacing conventional face-to-face contact. E-learning, which leads to e-examination, drives and supports this. As a result, global integration and standardization of educational processes were achieved. This paper addressed the use of e-examination, especially during the Covid-19 pandemic, as well as its advantages, challenges, and lecturers' and students' perceptions toward it. The electronic examination system removes the administrative headaches and malpractices that come with conventional pen and paper exams. As a result, the government must do everything possible to popularize and enforce the e-examination system (particularly the web-based type) throughout the country. This can be accomplished by establishing adequate ICT infrastructures, beginning with a reliable internet link.

REFERENCES

- [1] Li, J., & Snow, C. E. (2013). A survey of diverse students' orientations toward using social media to literacy learning in inner-city schools. *Conference: Proceedings of Social media and teacher learning: The 2012 Annual Ontario Conference proceeding on Teacher Education*. Oshawa, Ontario.
- [2] Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, 25, 5261–5280. DOI:doi.org/10.1007/s10639-020-10219-y
- [3] Mura, G., & Diamantini, D. (2014). The Use and Perception of ICT Among Educators: The Italian Case. *Procedia - Social and Behavioral Sciences*, 141, 1228-1233. DOI:10.1016/j.sbspro.2014.05.211
- [4] Barnes, J., & Kennewell, S. (2017). Investigating teacher perceptions of teaching ICT in Wales. *Education and Information Technologies*, 22, 2485–2497. DOI:10.1007/s10639-016-9549-y
- [5] Zalat, M. M., Hamed, M. S., & Bolbol, S. A. (2021). The experiences, challenges, and acceptance of elearning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS One*, 16(3), e0248758. DOI.org/10.1371/journal.pone.0248758
- [6] Charles, B., & Issifu, Y. (2015). Innovation in education: Students' perceptions of implementing ICT in learning in second-cycle institutions in Ghana. *Procedia - Social and Behavioral Sciences*, 197, 1512 – 1519. DOI:10.1016/j.sbspro.2015.07.103
- [7] Hung, N. Q., Phung, T. K., Hien, P., Dang.N.H. Thanh (2021). AI and Blockchain: potential and challenge for building a smart E-Learning system in Vietnam. In IOP conference series: Materials Science and Engineering, 2021.
- [8] Garira, E. (2020). Needs assessment for the development of educational interventions to improve quality of education: A case of Zimbabwean primary schools. *Social Sciences&Humanities Open*, 2(1), 1-7. DOI:10.1016/j.ssaho.2020.100020
- [9] Isiyaku, D. D., Ayub, M. A., & AbdulKadir, S. A. (2018). Antecedents to teachers' perceptions of the usefulness of ICTs for business education classroom instructions in Nigerian tertiary institutions. *Asia Pacific Education Review*, 19, 337–352. DOI:10.1007/s12564-018-9525-x
- [10] Slechtova, P. (2015). Attitudes of undergraduate students to the use of ICT in education. *Procedia - Social and Behavioral Sciences*, 171, 1128 – 1134. DOI:10.1016/j.sbspro.2015.01.218
- [11] Bas, G., Kubiakto, M., & Sünbül, A. M. (2016). Teachers' perceptions towards ICTs in teaching-learning process: Scale. *Computers in Human Behavior*, 61, 176-185. DOI:10.1037/t53684-000
- [12] I. Bamimore and S. A. Ajagbe (2020) “Design and implementation of smart home for security using Radio Frequency modules”, *International Journal of Digital Signals and Smart Systems (Inderscience Journal) Vol.4, Issue 4, Pp 286-303*. DOI: 10.1504/IJDSS.2020.111009
- [13] Ezugwu, A. E., Ofem, P. O., Rathod, P., Agushaka, J. O., & Haruna, .. (2016). An Empirical Evaluation of the Role of Information and Communication Technology in Advancement of Teaching and Learning. *Procedia Computer Science*, 92, 568-577. DOI:10.1016/j.procs.2016.07.384
- [14] Osang, F. (2012). Electronic examination in Nigeria, Academic Staff perspective-case study:National Open University of Nigeria. *International Journal of Information and Education Technology*, 2(4), 304-307
- [15] Apuke, O. D., & Oyendo, T. O. (2018). University students' usage of the internet resources for research and learning: forms of access and perceptions of utility. *Heliyon*, 4(12). DOI:10.1016/j.heliyon.2018.e01052
- [16] Ayo, C. K., Akinyemi, I. O., Adebisi, A. A., & Ekong, U. O. (2007). The prospects of e-examination Implementation in Nigeria: Administration and Management. *Turkish Online Journal of Distance Education*., 3(6), 47-152. DOI:10.17718/TOJDE.49840
- [17] Oyediran, W. O., Omoare, A. O., Owoyemi, M. A., Adejobi, A. O., & Fasasi, R. B. (2020). Prospects and limitations of e-learning application in private tertiary institutions amidst COVID-19 lockdown in Nigeria. *Heliyon*, 6, 1-8. DOI:doi.org/10.1016/j.heliyon
- [18] Pande S., Khamparia A., Gupta D., Thanh D.N.H. (2021) DDOS Detection Using Machine Learning Technique. In: Khanna A., Singh A.K., Swaroop A. (eds) Recent Studies on Computational Intelligence. Studies in Computational Intelligence, vol 921. Springer, Singapore. DOI: doi.org/10.1007/978-981-15-8469-5_559