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Assessing Readiness of Universities to Synchronous Online Learning

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Abstract

During the recent COVID-19 pandemic, higher educational institutions (HEI) in developed economies quickly resorted to virtual learning methods for teaching and learning as a social distancing measure, while most of their peers in emerging economies, shut the doors of their HEI to teaching and learning activities. Surprisingly, University of Nigeria, Nsukka despite reputably having a Centre for Distance and e-Learning was shut down during the pandemic. In lieu of this, this research was borne to assess readiness of the University to synchronous online learning. It assesses the infrastructure and skill set readiness of the HEI by administering an online survey to 40 staff members of the Centre with the support of their leadership out of which 32 responded. This study shows that lack of consistent power supply, the University can boast of both the infrastructure and adequate personnel skillset required to mount synchronous learning during the pandemic. recent studies conducted at the University provided an insight that the students have requisite computer literacy skillsets, digital assets as well as internet access on their digital devices making them ready for all manner of virtual learning .It is the authors believe that this study willprovide knowledge on infrastructure gap and that of skillsets of the personnel of HEI required to conduct synchronous online learning according to available literature. This study concludes that the reason why University of Nigeria was shut down during the pandemic is not related to infrastructure and personnel skillset shortage required to mount synchronous online learning.

Keywords: Infrastructure, Skill Set, Higher Education Institution, Benchmark, Synchronous Online Learning

Introduction

The spontaneous growth of computers, the internet and other electronic devices provide global opportunities for education, especially for learning outside the school premises, (Owoye, 2009). One of such is the replication of synchronous face-to-face classroom teaching and learning in a virtual environment using video conferencing software and hardware systems. Synchronous online learning is one aspects of virtual learning, which involves using computer technologies to provide real-time virtualised education to those who due to various reasons are unable to enrol for a traditional face-to-face academic programme. This form of education has undeniably made learning more flexible and convenient in terms of time, cost and what is on offer (Okorafor and Ike (2012), Al-Gahtani (2016), Eyo (2007), Liverpool *et al. (2009).* Other existing works that support online learning include Price and Oliver in (2007), Okorafor and Ike (2012) that aimed at developing an e-learning framework for Nigeria's open and distance education programmes, while Olanike (2010) investigated the Nigerian undergraduate students' readiness for e-learning. Shonola *et al*., (2016) and Mojaye (2015) examined the impact of the educational use of mobile devices/technology in supporting the learning process in Nigerian Universities. However, despite the obvious advantages of this form of education, the issue of standard and quality control remains paramount.

A key aspect of the online learning is that it does not rank institutions, but rather acknowledges the reality that all institutions will have aspects of strength and weakness that can be learnt from and improvedupon (Mmeremikwu-Fiac and Onwukwe, 2018). The rapid growth in the technologies being used, the ways that they are being applied across an ever-widening group of academic disciplines and the evolving skills and experience of teachers and students means that online learning is a moving target. Therefore, any benchmarking approach that presumes online learning technologies or pedagogies is unlikely to meaningfully assess a range of institutions within a single country and beyond,(Marshall and Mitchell, 2007).

Virtual learning environment moves the citadel of learning from the traditional approach - (teacher-focused), to a module-driven, Information and Communication Technology (ICT)-based customisable learning approach (student-focused). Online learning, an example of virtual learning provides the framework and empowers students and teachers to produce, progress, and share learning content in a more regular structure (Wallace, 2003). The situation of COVID-19 forced urgent transitions as social distancing measures resulting to inadequate opportunities to design for a new medium. In lieu of this, Henriksen, Creely, Henderson (2020) suggested the reification and rejuvenation of Bruner's concept of folk pedagogies. The focus was on helping teachers in considering the affordances and constraints of different teaching and learning modalities in synchronous online settings. In Saudi Arabia, Khalil, *et al.* (2020) conducted a study that suggested that students are happy with online learning as they are found to be time saving and improved their performance due to enhanced time utilisation but had some methodological, content perception, technical and behavioural challenges. These findings were collaborated by the works of Rinekso and Muslim (2020) in Indonesia.On the impact of information technology tools in teaching and learning, Adedokun-Shittu (2015), Anekwe (2017), and a recent study by Olayemi *et al.* (2021) examined students' perception and readiness for online learning adaptation during the COVID-19 pandemic in Nigeria. This study provided empirical evidence that students are eager to migrate to virtual learning methods, and this was supported by the work of Legon & Garrett (2017). Khotimah and Khotimah aggregated the experience of students towards online learning during the pandemic and conclude that online learning between pedagogy, technology and organisational support has potential of effectively fostering appropriate learning experiences but cautioned that there is need to critically examine the benefits and limitations of the types of asynchronous, synchronous, and hybrid online learning encountered. In a study conducted in China by Yang *et al.* (2021) on prosthodontic education conclude that Synchronous online learning had a high number of participants but low learning progress and completion rates during the 2020 COVID-19 pandemic.

This study aims to conduct an exploratory study to assess why University of Nigeria, Nsukka despite reputably having a Centre for Distance and e-Learning was shut down during the pandemic. The central objective is to provide first step towards developing a framework that will help Universities in emerging economies assess their level of preparedness in mounting synchronous online learning. While the specific objectives are to assess infrastructure readiness of University of Nigeria in mounting synchronous online learning and to assess skill set readiness of University of Nigeria in mounting synchronous online learning. It is expected that this work will provide a pointer for other studies that will culminate in the ability of higher educational institutions in developing economies self-assess their readiness for online learning particularly, Synchronous online learning.

The rest of the work is organised as follows: Section Two – Research Methodology that provides the setup by which the authors achieved their research objectives such as the research model and procedure, research context and sample population, instrument and their validations and data analysis. Section two details the results achieved in the areas of adequacy of contents of online learning, infrastructure readiness in mounting synchronous online learning, infrastructure index in mounting synchronous online learning, skill readiness index in mounting synchronous online learning, relationship between infrastructure readiness and skill readiness and so on. Section three discusses the result and the paper concluded in Section four with recommendations and future research direction.

Research Methodology

Research Model and Procedure: This structure provides a clear and systematic approach to presenting research model and procedure used for this stu*dy*.

Research Model: The questionnaire design method suggested by (Marshall and Mitchell, 2007) was used.

Procedure: In this survey, the data were gathered from the staff of distance and e-learning. The staff were chosen based on the number of years of experience and appraised based on the goals of the research. They were assuredconfidentiality on the data provided and no enticement was given to the participants. The data collected for this study was through an online survey and the questionnaire was created through Google forms and sent to the emails of the participants. The data were gathered when students were at home because of the COVID-19 Pandemic. A total of 40 questionnaires were given out and 32 were returned. The duration of the survey was three months.

Research context and sample: This methodology involves questionnaire development and the analysis. The analysis of parameters used in developing the questions were measured with the approved Nigerian University Commission's benchmark adapted for e-learning in the survey and a total of 32 respondents took part in this study. These participants were staff of the Centre for Distance and e-Learning. This centre is a section in the university that handles all online activities at the University of Nigeria, Nsukka.

Instrument used and their validation: The material selection for this work involved an ordered and systematic process in analysing and eliminating unsuitable materials and identifying the ones which are the most suitable for this analysis. The material used for this analysis involved the design, development, distribution, and response collection of questioners containing the parameters of e-learning indicators.

Data analysis: The research instrument consists of five sections. The first section dwells on online learning and contains eleven questions accessed with a YES or NO answer. Questions like "Does the content of the material used for facilitation meet the requirement of online learning?", "Is the content interactive"? to mention but a few. The second unit of the questionnaire cantered on "INFRASTRUCTURE" which is accessed with a five-point Likert scaleranging from 1 (indifferent) to 5 (agree) and contains nine questions. The third section was also accessed with a five-point Likert scale ranging from 1 (indifferent) to 5 (agree). It comprises five questions. Sections four and five were also accessed on a five-point Likert scale, the range is as in sections two and three above. Section four has to do with "SKILL SET" while section five cantered on "HARDWARE AND NETWORK CONNECTIVITY".

Section four comprises just two questions while section five covers four questions. The questions in unit four are; "The University of Nigeria Nsukka can boast of qualified Technologists and Engineers to man the ICT in their various campuses"? and " University of Nigeria Nsukka can boast of qualified content editors across all fields to drive the courseware for e-learning"? while in section five questions like "University of Nigeria Nsukka can boast of quality computer Systems to mount e-learning"?, and "To what extent can the University of Nigeria Nsukka boast of the quality software platform in ICT to mount e-learning? "

Comparative analysis of the results: The response from the questionnaire were analysed using the Nation Universities Commission (NUC) benchmark to inform our recommendation.
We used mainly descriptive statistics and correlation coefficient to analyse our data. We used the Likert-type to collect data on infrastructure and skill readiness. The scales are coded as follows:

1. Strongly disagree = 1
2. Disagree = 2
3. Indifferent = 3
4. Agree = 4
5. Strongly agree = 5

The cut-off point for infrastructure and skill readiness is 3. That is the sum of the scales divided by the number of scales.

$$\frac{Sum\ of\ the\ scales}{Number\ of\ scales} = \frac{1+2+3+4+5}{5} = 3$$

Therefore, any item/question having a mean score of 3 and above receives an affirmative remark, while any with mean score of less than receives a negative remark.The index for infrastructure readiness was computed by summing the total rank for each infrastructure item and dividing by the number of observations.Also, the skill readiness index was computed by summing the total rank for each skill readiness item and dividing by the number of observations.We used Spearman rank correlation to determine the relationship between/among variables where the levels of measurement were ordinal and used the Pearson correlation to ascertain the relationship between variables (infrastructure and skill readiness indexes) measured in continuous scale. The formula for Pearson correlation coefficient (r) is written as follows:

$$\boldsymbol{r} = \frac{\sum(X_i-\bar{X})(Y_i-\bar{Y})}{\sqrt{\sum(X_i-\bar{X})^2\sum(Y_i-\bar{Y})^2}} \qquad \text{equation 1}$$

r = Pearson correlation coefficient
$X_i = values\ of\ skill\ readiness\ index$
$\bar{X}$ = mean of skill readiness index
$Y_i = values\ of\ infrastructure\ index$
$\bar{Y} = mean\ of\ infrastructure\ index$

The formula for Spearman rank correlation coefficient (ρ) is written as follows:

$$\rho = 1 - \frac{6\sum d^2}{n(n^2-1)} \qquad \text{equation 2}$$

ρ = Spearman rank correlation coefficient
n = number of observations
d = difference between the ranks of the two variables

Results

The survey sought to find out from the participants the readiness of University of Nigeria, Nsukka for Synchronous Online Learning with respect to infrastructure and skill set. Our findings are shown as tables and discussed in the subsequent section below:

Adequacy of Contents of Online Learning

Table 1 presents the percentage distribution of adequacy of the contents for online learning.The table shows that majority of the respondents agreed that the content of the material used for facilitation meet the requirement of online learning (71.9%), the contents are interactive (78.1%), the contents are learner-centred (78.1%), the contents are presented in a conservational style (68.8%), the contents have in-text questions (78.1%), contents have a periodic assessment (81.3%), pedagogical principles of teaching-learning arrangements and methods followed (78.1%), pedagogical principles of general learning principles followed (71.9%), expected learning output achieved (84.4%), pedagogical principles of expected skills and attitudes followed (68.8%), and objectives of learning online achieved (84.4%).

Table 1: Percentage Distribution of Adequacy of the Contents for Online Learning

Items	Frequency	Percentage
Does the content of the material used for facilitation meet the requirement of online learning	23	71.9
Are the contents interactive	25	78.1
Are the contents learner-centered	25	78.1
Are they presented in a conversational style	22	68.8
Does the content have in-text questions	25	78.1
Does the content have a periodic assessment	26	81.3
Do pedagogical principles of teaching-learning arrangements and methods followed	25	78.1
Do pedagogical principles of general learning principles followed	23	71.9
Was the expected learning output achieved	27	84.4
Do pedagogical principles of expected skills and attitudes followed	22	68.8
Were the objectives of learning online achieved	27	84.4

Infrastructure readiness in mounting synchronous online learning

Table 2 presents the descriptive statistics result of infrastructure readiness in mounting synchronous online learning. The table shows that the university can boast of infrastructure to implement online learning. The mean scores of all the items under infrastructure readiness passed the cut-off point (3.00).

Table 2: Descriptive Statistics of Infrastructure Readiness in Mounting Synchronous Online Learning

	Infrastructure readiness	N	Mean	Std. Deviation	Skewness	Kurtosis
Y1	During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	32	3.09	1.17	0.06	-1.51
Y2	The UNN has an e-learning laboratory for courseware development	32	3.72	0.99	-0.87	0.69
Y3	The UNN possesses enough Internet equipment to drive e-learning	32	3.16	1.35	-0.05	-1.42
Y4	There is a poor power supply at the UNN.	32	3.41	1.36	-0.40	-1.23
Y5	The UNN can afford a steady supply of Broadband to drive online learning	32	3.59	1.04	-0.90	0.01
Y6	More than one department conduct examination concurrently in the CBT hall.	32	3.81	1.09	-1.04	0.36
Y7	We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	32	4.13	0.79	-1.89	6.96
Y8	The UNN has a computer-based Test Center.	32	4.44	0.72	-1.46	2.92
Y9	It ispossible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	32	4.09	0.96	-1.59	3.02
Y10	There is high-speed broadband access for online learning at the UNN.	32	3.69	1.23	-0.69	-0.85
Y11	The UNN can boast of quality computer Systems to mount e-learning.	32	3.59	1.24	-0.77	-0.61
Y12	The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	32	3.47	1.34	-0.52	-1.04
Y13	To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	32	3.31	1.20	-0.65	-0.80

Infrastructure readiness index in mounting synchronous online learning

Table 3 presents the descriptive statistics result of infrastructure readiness index in mounting synchronous online learning.The table shows that the mean score of the infrastructure readiness further confirms that in-terms of infrastructure for online learning, the University of Nigeria Nsukka is ready. The mean score (3.65) also passed the cut-off point (3.00).

Table 3: Descriptive Statistics of Infrastructure Readiness Index in Mounting Synchronous Online Learning

	N	Mean	Std. Deviation	Skewness	Kurtosis
Infrastructure Index	32	3.65	0.49	-0.40	-0.56

Skill readiness in mounting synchronous online learning

Table 4 presents the descriptive statistics result of skill readiness in mounting synchronous online learning.The table shows that the university has adequate skills to mount online learning from the results. The mean score of each skill readiness indicator passed the cut-off point (3.00). Having qualified technologists and engineers to man the ICT (4.25) happens to be highest skill set of the university to mount online learning, followed availability of qualified content editors across all fields to drive the courseware for e-learning (4.16), followed by guaranteeing periodic training and retraining of their staff (4.09),followed by manpower to create e-learning courseware (4.00), followed by manpower to ensure that learning takes place in the area they facilitate (3.88), followed by subscription to reliable e-learning platforms such as Moodle, Blackboard (3.84), and capacity to maintain the equipment in the ICT center (3.69).

Table 4: Descriptive Statistics of skill readiness in mounting synchronous online learning

	Skill Readiness	N	Mean	Std. Deviation	Skewness	Kurtosis
X1	The UNN can boast of manpower to create e-learning courseware.	32	4.00	1.06	-1.31	1.27
X2	The UNN has the manpower to ensure that learning takes place in the area they facilitate.	32	3.88	1.10	-1.45	1.68
X3	The UNN can guarantee periodic training and retraining of their staff.	32	4.09	1.03	-1.91	4.06
X4	The UNN ensures subscription to reliable e-learning platforms such as Moodle, Blackboard.	32	3.84	1.14	-0.93	-0.01
X5	The UNN can boast of qualified Technologists and Engineers to man the ICT in their various campuses.	32	4.25	1.08	-1.36	0.57
X6	The UNN boasts of qualified content editors across all fields to drive the courseware for e-learning.	32	4.16	0.92	-1.12	0.79
X7	The UNN can boast of the capacity to maintain the equipment in the ICT center.	32	3.69	1.12	-0.50	-1.09

Skill readiness index in mounting synchronous online learning

Table 5 presents the descriptive statistics result of skill readiness index in mounting synchronous online learning.The table shows that the mean score of skill readiness (3.98) is more than the cut off (3.00). This further confirms the availability of skills to mount online learning at the University of Nigeria Nsukka.

Table 5: Descriptive Statistics of Skill Readiness Index in Mounting Synchronous Online Learning

	N	Mean	Std. Deviation	Skewness	Kurtosis
Skill readiness index	32	3.98	0.719	-0.95	0.16

2.1 Relationship between infrastructure readiness and skill readiness

Table 6 presents the result of the correlation coefficients of infrastructure readiness index versus skill readiness index.The table shows that there is a significant and strong and positive relationship between infrastructure readiness and skill readiness. This means that infrastructure readiness significantly determined skill readiness. The higher the infrastructure readiness the better the skills to implement online learning in the University.

Table 6: Correlations of Infrastructure Readiness Index Versus Skill Readiness Index

Correlation	Infrastructure readiness versus skill readiness	N
Pearson Correlation Coefficient	0.727***	32
Spearman Correlation Coefficient	0.578***	32

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

Relationships among individual infrastructure readiness items/indicators

Table 7 presents the Spearman rank correlation coefficients of the relationships among individual infrastructure readiness indicators. The table shows that during COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning is positively and significantly related to the University having an e-learning laboratory for courseware development and having high-speed broadband access for online learning at the UNN. The UNN has an e-learning laboratory for courseware development is positively and significantly associated with the UNN having a computer-based Test Center, the UNN boasting of quality computer Systems to mount e-learning, UNN boasting of a quality software platform in ICT to mount e-learning; but negatively/inversely related to poor power supply at the UNN.The UNN possesses enough Internet equipment to drive e-learning is negatively and significantly related to poor power supply at the UNN, but positively and significantly related to the UNN affording a steady supply of Broadband to drive online learning; UNNmaking use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others; the UNN having a computer-based Test Center; and the UNN boasting of quality computer Systems to mount e-learning.Poor power supply at the UNN is negative and significantly associated with UNN having a computer-based Test Center, and the UNN boasting of a quality software platform in ICT to mount e-learning. The UNN can afford a steady supply of Broadband to drive online learning is positively and

significantly associated with the UNN boasting of quality computer Systems to mount e-learning, and the UNN boasting of standard network facilities in the ICT center to carry the e-learning platform.UNN making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others is positively and significantly associated with existence of high-speed broadband access for online learning at the UNN; the UNN boasting of quality computer Systems to mount e-learning; the UNN boasting of standard network facilities in the ICT center to carry the e-learning platform; and UNN boasting of a quality software platform in ICT to mount e-learning. Existence of high-speed broadband access for online learning at the UNN is positively and significantly associated with the UNN boasting of standard network facilities in the ICT center to carry the e-learning platform. The UNN boasting of quality computer Systems to mount e-learning is positively and significantly associated with the UNN boasting of standard network facilities in the ICT center to carry the e-learning platform, and UNN boasting of a quality software platform in ICT to mount e-learning. The UNN boasting of standard network facilities in the ICT center to carry the e-learning platform is positively and significantly associated with the UNN boasting of a quality software platform in ICT to mount e-learning.

Table 7: Spearman Rank Correlations for infrastructure readiness items/indicators

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Y1	1.000	0.346*	0.223	-0.081	0.023	-0.008	0.118	0.199	0.215	0.334*	0.288	0.051	0.216
Y2	0.346*	1.000	0.093	-0.392**	0.070	-0.056	0.251	0.347*	0.071	0.152	0.554**	0.173	0.575**
Y3	0.223	0.093	1.000	-0.319*	0.342*	-0.145	0.518**	0.336*	0.003	0.145	0.435*	0.129	0.153
Y4	-0.081	-0.392**	-0.319*	1.000	-0.042	0.351**	-0.044	-0.354**	0.326*	0.225	-0.212	0.016	-0.366**
Y5	0.023	0.070	0.342*	-0.042	1.000	-0.013	-0.049	0.119	0.002	0.210	0.429*	0.318*	0.133
Y6	-0.008	-0.056	-0.145	0.351**	-0.013	1.000	0.034	-0.084	0.153	0.075	0.036	-0.229	-0.141
Y7	0.118	0.251	0.518**	-0.044	-0.049	0.034	1.000	0.074	0.130	0.415**	0.316*	0.415*	0.317*
Y8	0.199	0.347*	0.336*	-0.354**	0.119	-0.084	0.074	1.000	-0.015	-0.056	0.077	-0.113	0.061
Y9	0.215	0.071	0.003	0.326*	0.002	0.153	0.130	-0.015	1.000	0.257	0.224	-0.064	0.115
Y10	0.334*	0.152	0.145	0.225	0.210	0.075	0.415**	-0.056	0.257	1.000	0.248	0.515**	0.133
Y11	0.288	0.554**	0.435**	-0.212	0.429**	0.036	0.316*	0.077	0.224	0.248	1.000	0.306*	0.619**
Y12	0.051	0.173	0.129	0.016	0.318*	-0.229	0.415**	-0.113	-0.064	0.515**	0.306*	1.000	0.335*
Y13	0.216	0.575**	0.153	-0.366**	0.133	-0.141	0.317*	0.061	0.115	0.133	0.619**	0.335*	1.000

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*

Relationship among individual skill readiness items

Table 8 shows the relationships among individual skill readiness items. The table shows that boasting of manpower to create e-learning courseware is positively and significantly related to having the manpower to ensure that learning takes place in the area they facilitate andboasting of qualified Technologists and Engineers to man the ICT in their various campuses. Having the manpower to ensure that learning takes place in the area they facilitate is positively and significantly related to ensuring subscription to reliable e-learning platforms such as Moodle, Blackboard, boasting of qualified Technologists and Engineers to man the ICT in their various campuses, and boasting of the capacity to maintain the equipment in the ICT center. UNN guaranteeing periodic training and retraining of their staff is significantly and positively associated with University ensuring subscription to reliable e-learning platforms such as Moodle, Blackboard, the University boasting of qualified Technologists and Engineers to man the ICT in their various campuses, the University boasting of qualified content editors across all fields to drive the courseware for e-learning, and the University can boasting of the capacity to maintain the equipment in the ICT center. The UNN ensuring subscription to reliable e-learning platforms such as Moodle, Blackboard is positively and significantly associated with the University boasting of qualified Technologists and Engineers to man the ICT in their various campuses, and the University boasting of qualified content editors across all fields to drive the courseware for e-learning. The UNN can boast of qualified Technologists and Engineers to man the ICT in their various campuses is positively and significantly related to the University boasting of qualified content editors across all fields to drive the courseware for e-learning, and the University boasting of the capacity to maintain the equipment in the ICT center.

Table 8: Spearman Rank Correlations for skill readiness items

	X1	X2	X3	X4	X5	X6	X7
X1	1.000	0.772***	0.155	0.133	0.306*	0.188	0.210
X2	0.772**	1.000	0.108	0.384***	0.481**	0.066	0.363**
X3	0.155	0.108	1.000	0.554***	0.351**	0.540***	0.352**
X4	0.133	0.384***	0.554***	1.000	0.696***	0.619***	0.277
X5	0.306*	0.481***	0.351**	0.696***	1.000	0.423**	0.409**
X6	0.188	0.066	0.540***	0.619***	0.423**	1.000	0.062
X7	0.210	0.363**	0.352**	0.277	0.409**	0.062	1.000

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*

Relationship between infrastructure readiness and manpower to create e-learning courseware

Table 9 presents result of the spearman correlations of infrastructure readiness versus manpower to create e-learning courseware. The table shows that making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, and availability of standard network facilities in the ICT center to carry the e-learning platform significantly and positively influenced availability manpower to create e-learning courseware

Table 9: Spearman Correlations of Infrastructure Readiness Versus Manpower to Create E-Learning Courseware

Infrastructure readiness items	Manpower*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	-0.257
The UNN has an e-learning laboratory for courseware development	0.210
The UNN possesses enough Internet equipment to drive e-learning	0.221
There is a poor power supply at the UNN.	-0.168
The UNN can afford a steady supply of Broadband to drive online learning	0.196
More than one department conduct examination concurrently in the CBT hall.	-0.101
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.315*
The UNN has a computer-based Test Center.	0.136
It is possible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	-0.005
There is high-speed broadband access for online learning at the UNN.	-0.002
The UNN can boast of quality computer Systems to mount e-learning.	0.241
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.527***
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.240

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Manpower = The UNN can boast of manpower to create e-learning courseware.*

Relationship between infrastructure readiness and manpower to ensure that learning takes place in the area they facilitate

Table 10 presents result of the spearman correlations of infrastructure readiness and manpower to ensure that learning takes place in the area they facilitate.The table shows that possession of enough Internet equipment to drive e-learning, affordability of a steady supply of broadband to drive online learning, making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, availability of quality computer Systems to mount e-learning, and availability of standard network facilities in the ICT center to carry the e-learning platform all significantly

and positively influenced UNN having the manpower to ensure that learning takes place in the area they facilitate.

Table 10: Spearman Correlations of Infrastructure Readiness and Manpower to Ensure that Learning Takes Place in the Area they Facilitate

Infrastructure readiness items	Manpower**
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	-0.157
The UNN has an e-learning laboratory for courseware development	0.255
The UNN possesses enough Internet equipment to drive e-learning	0.336*
There is a poor power supply at the UNN.	-0.209
The UNN can afford a steady supply of Broadband to drive online learning	0.358**
More than one department conduct examination concurrently in the CBT hall.	0.111
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.369**
The UNN has a computer-based Test Center.	0.226
It is possible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	-0.064
There is high-speed broadband access for online learning at the UNN.	-0.015
The UNN can boast of quality computer Systems to mount e-learning.	0.360**
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.332*
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.272

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Manpower2 = The UNN has the manpower to ensure that learning takes place in the area they facilitate.

Relationship between infrastructure readiness and periodic training and retraining of their staff

Table 11 presents result of the spearman correlations of infrastructure readiness versus periodic training and retraining of their staff. the table shows that possibility of a learners' management system to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices, availability of high-speed broadband access for online learning at the UNN,and availability of quality computer Systems to mount e-learning all significantly and positively influenced UNN guaranteeing periodic training and retraining of their staff.

Table 11: Spearman Correlations of infrastructure readiness versus periodic training and retraining of their staff

Infrastructure readiness items	Training*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	0.181
The UNN has an e-learning laboratory for courseware development	0.186
The UNN possesses enough Internet equipment to drive e-learning	0.257
There is a poor power supply at the UNN.	-0.052
The UNN can afford a steady supply of Broadband to drive online learning	0.214
More than one department conduct examination concurrently in the CBT hall.	0.206
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.272
The UNN has a computer-based Test Center.	0.047
It is possible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	0.340*
There is high-speed broadband access for online learning at the UNN.	0.694***
The UNN can boast of quality computer Systems to mount e-learning.	0.311*
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.270
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.187

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Training = The UNN can guarantee periodic training and retraining of their staff.*

Relationship between infrastructure readiness and subscription to reliable e-learning platforms such as Moodle, Blackboard

Table 12 presents result of the spearman correlations of infrastructure readiness versus subscription to reliable e-learning platforms such as Moodle, Blackboard. The table indicates that during COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning, possession of enough Internet equipment to drive e-learning, more than one department conduct examination concurrently in the CBT hall, possibility of a learners management system to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices, making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, availability of high-speed broadband access for online learning at the UNN, availability of quality computer Systems to mount e-learning, all positively and significantly influenced ensuring subscription to reliable e-learning platforms such as Moodle, Blackboard.

Table 12: Spearman Correlations of Infrastructure Readiness Versus Subscription to Reliable E-Learning Platforms such as Moodle, Blackboard

Infrastructure readiness items	Subscription*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	0.317*
The UNN has an e-learning laboratory for courseware development	0.117
The UNN possesses enough Internet equipment to drive e-learning	0.428**
There is a poor power supply at the UNN.	0.027
The UNN can afford a steady supply of Broadband to drive online learning	0.273
More than one department conduct examination concurrently in the CBT hall.	0.491***
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.436**
The UNN has a computer-based Test Center.	0.113
It is possible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	0.442**
There is high-speed broadband access for online learning at the UNN.	0.475***
The UNN can boast of quality computer Systems to mount e-learning.	0.411**
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.086
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.134

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Subscription = The UNN ensures subscription to reliable e-learning platforms such as Moodle, Blackboard*

Relationship between infrastructure readiness andqualified Technologists and Engineers to man the ICT in their various campuses

Table 13 shows the result of the spearman correlations of infrastructure readiness versus qualified Technologists and Engineers to man the ICT in their various campuses. The table indicates that possession of enough Internet equipment to drive e-learning, availability of afford a steady supply of Broadband to drive online learning, more than one department conduct examination concurrently in the CBT hall, making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, UNN having a Computer-based Test Center, and availability of high-speed broadband access for online learning at the UNN all significantly and positively determined the availability of qualified Technologists and Engineers to man the ICT in their various campuses.

Table 13: Spearman Correlations of Infrastructure Readiness Versus Qualified Technologists and Engineers to Man the ICT in their Various Campuses

Infrastructure readiness items	Tech Staff*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	0.230
The UNN has an e-learning laboratory for courseware development	0.135
The UNN possesses enough Internet equipment to drive e-learning	0.397**
There is a poor power supply at the UNN.	0.046
The UNN can afford a steady supply of Broadband to drive online learning	0.333*
More than one department conduct examination concurrently in the CBT hall.	0.491***
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.395**
The UNN has a computer-based Test Center.	0.431**
It is possible for a learners' managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	0.285
There is high-speed broadband access for online learning at the UNN.	0.296*
The UNN can boast of quality computer Systems to mount e-learning.	0.291
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.237
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.204

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Tech Staff = The UNN can boast of qualified Technologists and Engineers to man the ICT in their various campuses*

Relationship between infrastructure readiness andqualified content editors across all fields to drive the courseware for e-learning

We presented the result of spearman correlations of infrastructure readiness versus qualified content editors across all fields to drive the courseware for e-learningin Table 14. The table reveals that making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, learners management system to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices, availability of high-speed broadband access for online learning at the UNN, and quality computer Systems to mount e-learning all significantly and positively determinedavailability of qualified content editors across all fields to drive the courseware for e-learning.

Table 14: Spearman Correlations of Infrastructure Readiness Versus Qualified Content Editors Across all Fields to Drive the Courseware for e-Learning

Infrastructure readiness items	Editors*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning.	0.042
The UNN has an e-learning laboratory for courseware development	-0.049
The UNN possesses enough Internet equipment to drive e-learning	0.187
There is a poor power supply at the UNN.	0.148
The UNN can afford a steady supply of Broadband to drive online learning	0.057
More than one department conduct examination concurrently in the CBT hall.	0.229
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.383**
The UNN has a computer-based Test Center.	-0.086
It is possible for a learners' management system to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	0.688***
There is high-speed broadband access for online learning at the UNN.	0.434**
The UNN can boast of quality computer Systems to mount e-learning.	0.292*
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.154
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.058

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
Editors = The UNN boasts of qualified content editors across all fields to drive the courseware for e-learning*

Relationship between infrastructure readiness andcapacity to maintain the equipment in the ICT center

We presented the result of spearman correlations of infrastructure versus capacity to maintain the equipment in the ICT center in Table 15. The table shows that possession of enough Internet equipment to drive e-learning, affordability of a steady supply of Broadband to drive online learning, making use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others, availability of high-speed broadband access for online learning at the UNN, availability of quality computer Systems to mount e-learning, availability of standard network facilities in the ICT center to carry the e-learning platform, quality software platform in ICT to mount e-learning, all positively and significantly influenced the capacity to maintain the equipment in the ICT.

Table 15: Spearman Correlations of Infrastructure Versus Capacity to Maintain the Equipment in the ICT Center

Infrastructure readiness items	ICT Tools*
During COVID-19, the entire learner support infrastructure at the UNN has had to pivot from mostly face-to-face to complete online learning	0.003
The UNN has an e-learning laboratory for courseware development	0.125
The UNN possesses enough Internet equipment to drive e-learning	0.680***
There is a poor power supply at the UNN.	-0.278
The UNN can afford a steady supply of Broadband to drive online learning	0.559***
More than one department conduct examination concurrently in the CBT hall.	-0.085
We have made use of the following authoring tools during the courseware development: MS PowerPoint, MSWord processor, text, audio, animation, others.	0.484***
The UNN has a computer-based Test Center.	0.145
It is possible for a learners managementsystem to stay simple enough to be a component of everyday teaching, while at the same time supports sophisticated and diverse learning practices	-0.066
There is high-speed broadband access for online learning at the UNN.	0.339*
The UNN can boast of quality computer Systems to mount e-learning.	0.370**
The UNN can boast of standard network facilities in the ICT center to carry the e-learning platform.	0.452***
To what extent can the UNN boast of a quality software platform in ICT to mount e-learning?	0.347*

** Correlation is significant at the 0.10 level (2-tailed).*
*** Correlation is significant at the 0.05 level (2-tailed).*
**** Correlation is significant at the 0.01 level (2-tailed).*
ICT Tools = The UNN can boast of the capacity to maintain the equipment in the ICT center*

Discussion

In our assessment of synchronous online learning readiness of the University of Nigeria, the study focused on two major components which the authors deemed necessary for an effective online learning, namely, infrastructure and technical skill (skillset). In line with our study, it was also asserted in (Coopasami & Knight, 2017) that although e-Learning could be used in nursing education, technological and equipment readiness need attention before an effective implementation can be done in the institution.

In this study, the authors were able to achieve the aim and expectedobjectives and the study noted that the HEI's online learning contents have a periodic assessment andwere interactively designed. With regards to the adequacy of the contents for online learning, learner-centred contents appeared to be the most common observations of the respondents, and these have correlation to the establishment of a reputable Centre for Distance and e-Learning. This implies that the HEI's Distance and e-Learning programmes have been effective and has progressed over time. Tables 1, 2 and 3provided a clear indication that most of the questions asked to find out readiness of University of Nigeria for synchronous online learning on the aspect of skillset and infrastructure had favourable responses. That is, high percentage of the participants rated the University well in most of the items required for skillset and infrastructure readiness through their responses.

This finding agrees with the result of (Firmansyah, *et al*., 2021) in which a rural University in Indonesia was found ready for online learning.

Infrastructurereadiness in mounting synchronous online learning

E-learning is dependent on basic infrastructure which includes the Internet, computers, software, and a responsible administrative unit (Saekow & Samson, 2011). According to (Aydin& Tasci, 2005) for an institution to embark on e-Learning, such institution should have the required hardware (access to computers) necessary to facilitate the process. This assertion was concurred in (Oliver & Towers, 2000) as the authors observed that without adequate and required equipment, it is difficult if not impossible to adopt and establish e-Learning within an institution.

All the infrastructure readiness indicators (Y1 – Y13) passed the mean score (3) indicating affirmative statement by implication the university is infrastructure ready. This is further supported by the mean score of the overall infrastructure readiness indicator (3.65) reported in Table 3. All the same, item Y4 shows poor power supply at the University with a mean score of above 3.00. This result aligns with the finding in (Firmansyah, *et al*., 2021), which reports that Telkom University is ready to implement e-learning in terms of infrastructure. On the other hand, our result contracts the finding in (Saekow & Samson, 2011), which found infrastructure inconvenient for e-learning process. According to (Saekow & Samson, 2011), about 60% of the lecturers, 59.3% of technicians and about 50% of students found the foundation infrastructure (hardware, software, and internet) in adequate for online learning.

Skillset readiness in mounting synchronous online learning

For e-learning users to be able to utilise the system properly, there is need for them to possess the needed technical skills (Oketch, Njihia & Wausi, 2014). According to (Oketch, Njihia & Wausi, 2014), while the study proved that e-learning to be an exciting way of learning, the challenge was that not every student had the necessary computer skills to enable them to benefit from e-Learning. This section discusses the skillsetreadiness of University of Nigeria, Nsukka in mounting synchronous online learning. From the results, all the skillset readiness indicators (X1 – X7) passed the mean score (3) indicating the university is skillset ready. Interestingly, some indicators are as high as 4.25, 4.16, 4.09. 4.00 showing that there are abundant skillsets requisite for a synchronous online learning. This is further supported by the high score of overall skillset readiness index (3.98) reported in Table 5. It could also be deduced from the results that University of Nigeria Nsukka can boast of qualified Technologists and Engineers to man the ICT in their various campuses. This largely contributed to the higher rating of skillset readiness, implying that the University has the required technical skills to mount online learning and it concurs with the finding in (Firmansyah, *et al*., 2021) in which technical skill was found sufficient for e-learning. However, our finding here varies with that of (Prihastiwi, Prastuti, & Eva, 2020) where the data showed that students are dissatisfied with using e-learning because they did not receive a detailed explanation of the material. Also, findings in (Saekow & Samson, 2011), which found technical skill to be lacking among the respondents disagree with our result.

Furthermore, the resultspresented in Table 6 shows thatinfrastructure and skillset are significantly positively correlated and that one supports the existence of the other. This implies that as the mean infrastructure rating

is high, the skill set is also high but that does not mean that one causes the other.Looking at the result in Table 5, it can be drawn that the respondents gave a high rating to the skillset. Therefore, it could be concluded that UNN is considered being ready for synchronous online learning.

Conclusion, Limitations, and Direction for Future Research

Online learning is emerging in the Nigerian Higher Education system because of the effect of COVID-19 pandemic which has changed the narrative of learning in universities worldwide. For University of Nigeria Nsukka to not have opened her doors to teaching learning during the COVID-19 pandemic according to this study is not related to inadequacy of ICT infrastructure and relevant personnel skillset. This study establishes that the University has requisite infrastructure and personnel skillset needed to mount synchronous online learning but for the poor power supply in the campus. This by these findings, this study provides a benchmark for assessing individual University's readiness to synchronous online learning, using the University of Nigeria, Nsukka as a case study.

Limitations

The limitations obstruct compliance to international e-learning best practices in Nigerian higher education and it would have multiple effects on the academic progress of the institutions and could further create a socio-economic skills gap for the nation. Globally, e-learning has been identified as an indispensable intervention to cushion the impact of the COVID-19 pandemic and has revolutionized the education system with the rapid growth and development of any nation.

Direction for Future Research

For efficient e-learning to succeed in Nigerian high institutions, there needs to build on the essential pillars of infrastructure and technical skills. The advantages of e-learning include wide coverage, cost-effectiveness, uniformity, fast teaching and learning process, and rapid economic development through e-commerce. It is hereby recommended that compliance with e-learning in the tertiary institutions should go beyond the COVID-19 lockdown period while continuous technical skill training and infrastructure capacity building should be continued in the higher institutions of learning. Future researchers should address other challenges limiting e-learning administration in tertiary institutions: stable power supply, encouraging local industries to manufacture some ICT accessories to lessen the cost of acquisition arising from importation.

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