Continuity of Academic Work through e-Learning during the COVID-19 Lockdown: The Case of Ghana

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Abstract: The outbreak of the Novel Corona Virus (COVID-19) pandemic took the whole world by surprise. It virtually brought everything to a standstill due to the lockdown. Though every sector of the global economy had its fair share of the dire consequences of the COVID-19, one of the most affected area included education. Educational institutions shut down to avoid the spread of the virus. The situation led to the compulsory adoption of E-Learning or online learning as a step in the gap to enable the continuation of academic work. The objective of the study was to categorize the technologies used by universities during the COVID-19 pandemic; determine the extent of use of these technologies during the lockdown; examine the effectiveness of these technologies for teaching and learning. The survey approach of research design was used to observe education institutions adoption of e-learning technology during the COVID-19 and interpreted the findings based on existing theory. The result shows that the strongest relationship amongst the factors was perceived usefulness and attitude towards use.

1 INTRODUCTION

Corona Virus (also called COVID-19) was first seen in the Wuhan region of China in the early part of December 2019 and since then it has spread across many countries, including Ghana (Shereen et al., 2020). The presence of this virus in nations has brought in its wake a number of stagnations, including restriction of movements of people (since it is believed to be transferred from human to human), the collapse of businesses (Ozili & Arun, 2020) and the disruption of academic calendars of most universities especially in Ghana just to mention a few (Haruna, 2020).

The Government of Ghana, in an attempt to check and control further spread of the virus closed all educational institutions in the country. In the interim, recommended E-Learning for the Tertiary Institutions. In this, each University in the country, either public or private, was expected to choose its own suitable online programme, train its teaching staff and students and then the teaching staff would use the virtual platform to train its learners till the end of the semester or till the virus was gotten rid of in the country. This shift completely changed the academic environment.

Online education is one of the methods of education in today's world of technology. It has, with time, become an important part of school education. Until now, E-learning has been used by most universities as a supplement to the traditional classroom or face-to-face teaching. Some universities are involved only in traditional methods of teaching, while others combine the traditional method with some amount of e-learning. In the wake of the COVID-19 pandemic, most schools up to the tertiary

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level had to continue academic work. The only option available in this current situation as an emergency response was to resort to some form of e-Learning as recommended by the president.

Responses by education providers have been varied from having no response to social isolation strategies on campus and rapid curriculum redevelopment for fully online offerings (Crawford et al., 2020).

The context of the problem is that Online education has become necessary in the wake of the COVID-19 pandemic, with most universities resorting to various online means of continuing academic work to avoid the disruption in the academic calendar. Schools rushed to convert teaching resources used with the traditional face-to-face method to online content as a necessary means of engaging students to minimize the effect on academic work during the COVID-19 pandemic. The challenge is the appropriateness and effectiveness of these technologies and the consideration of pedagogical issues that come with the use of these technologies. In the bid to continue academic work and prevent the disruption of most universities' academic calendar, responses were sudden and spontaneous.

With this background, this work seeks to find out the extent to which the technologies are used, how they were used, and the effectiveness of their usage as pedagogical tools.

The study's objectives are to categorize the technologies used by universities during the COVID-19 pandemic to determine the extent of use of these technologies during the pandemic and examine the effectiveness of these technologies for teaching and learning. The researchers put forward three research questions:

1. What categories of technologies were used by universities during the COVID-19 pandemic?
2. To what extent were these technologies used during the pandemic?
3. To what extent were these technologies effective for teaching and learning during the pandemic?

2 LITERATURE REVIEW

University education worldwide in the past had mostly taken the form of on-campus teaching/ learning (Osei & Mensah, 2011) with some Universities practising Distance Education, that is, an approach that focuses on opening access to education and training provision, freeing learners from the constraints of time and place and offering flexible learning opportunities to individuals and groups of learners (Patru et al., 2002).

In Ghana, when on-campus face to face teaching/ learning came to a standstill due to the outbreak of the coronavirus that was transmitted from human to human on 12th March 2020, the Government of the day recommended E-Learning, especially to the third cycle institutions of learning.

E-learning is seen as an innovative approach for delivering well-designed, learner-centred, interactive, and facilitated learning environment to anyone, anyplace, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open, flexible, and distributed learning environment (Khan, 2005). It is the act whereby telecommunication technology is used in the delivery of training and education (Goyal, 2012). This medium liberates both parties involved in the training from limitations of time and space through learning network models (P.-C. Sun et al., 2008). It would also ensure that the academic work was not disrupted. Different authors have used other terms to describe E-Learning, such as online teaching (Dhull, 2019), virtual learning system (Kimovski et al., 2001), distributed-learning (Victor & Hart, 2016), and web-based learning (Poon et al., 2004). The "E" in E-Learning stands for "Electronics". It stands for all electronic devices that are used in the teaching/ learning activity such as mobile phone, laptops, Internet, Intranet, web just to mention a few. In other words, E-Learning incorporates all educational activities carried out by individual or groups online or offline.

E-Learning activities are classified into two modes, namely synchronous and asynchronous modes. In the former, classes take place at an agreed time, and one can observe communication between the instructors and the learner through teleconferencing. In the latter, learners access educational material in their convenient time anywhere at any time they wish (Nadia, 2006). From this classification, it becomes evident that the Government call on lecturers' use of online teaching is about using the synchronous mode.

Modalities of E-learning activities are classified into four: individualized self-paced E-Learning online where the learner uses the internet to access learning materials and the Individualized self-paced E-Learning offline, where individual accesses learning materials without been connected to the internet. The others are synchronous E-Learning, where a group of learners are working together at an agreed time via the Internet (Shaikh, 2011). In this also we observe that what the Government meant for

the tertiary institutions is the group-based E-Learning synchronously. Talking about which model to use, it is noted that several models have been put forwards by researchers in the field of E-Learning. While one group of model emphasizes on the interactions between the teacher, student and the content, the other one focuses on embedding tacit knowledge in pedagogical model to enhance the e-learning activities. For instance Anderson and others proposed a model in which the instructor and the learner would be represented. In this also they recommended that the material resource should be made available to the learner to access on the Internet. Another writer puts forward a pedagogical model with three phases namely for E-Learning activities namely: the content organization phase where the content of the study are collected and organized based on the requirements of the industry or institution, the quality assessment phase where theoretical and experimental methods are used to analyze and access the contents. The final stage is the content delivery phase, where the learner is assessed to find out his aptitude and level (Irfan & Shaikh, 2008). Pedagogy, the act of teaching, is founded on some psychological theories.

Other studies that focused on how theories, practices and assessments were applied to online learning and carried out on 47 published works and researches on online teaching/learning in 2008 using the qualitative content analysis Method concluded that effective online instruction is dependent upon three factors, namely: well-designed course content and motivated interaction between the learners and instructors; creation of a sense of online learning community; and the rapid advancement of technology (A. Sun & Chen, 2016).

3 THEORETICAL FRAMEWORK

Adoption of technology to be used to perform any kind of task can be viewed from an individual or institutional perspective. In this study, we consider e-learning as the technology and its adoption for teaching and learning as a stop-gap measure during the Corona Virus Disease (COVID-19) pandemic. The study takes a look at both individual and institutional factors of e-learning adoption. There are several Information System (IS) theories which researchers use to determine the factors which affect technology adoption and use depending on the objective of the study.

Some of the theories which have been used in e-learning studies are the Technology Acceptance Model 1, 2 & 3 (TAM 1, TAM 2 & TAM 3) (Davis, 1985;

Hanif et al., 2018), Unified Theory of Acceptance and Use of Technology 1 & 2 (UTAUT 1 & UTAUT 2) (Chang, 2012; Huang & Kao, 2015) and Theory of Reasoned Action (TRA) (Ajzen, 1991; Fishbein, 1979). The rest is the Theory of Planned Behaviour, Innovation Diffusion Theory, Model of PC utilization and General Extended TAM for E-Learning (GETAMEL) (Abdullah & Ward, 2016a). The theoretical underpinning of this study focuses on TAM, UTAUT and GETAMEL to establish a conceptual framework based on the objectives of the study.

Abdullah et al. developed The General Extended Technology Acceptance Model for E-Learning (GETAMEL) to investigate relevant external factors of the Technology Acceptance Model (TAM) within the context of e-learning adoption (Abdullah & Ward, 2016b). GETAMEL identified five external factors as having a significant influence on Perceived Usefulness and Perceived Ease of Use, According to the proponents of GETAMEL, Experience (XP), Subjective Norm (SN), Enjoyment (ENJOY), Computer Anxiety (CA) and Self-Efficacy (SE) are significant external factors which impact on TAM in the adoption of e-learning.

3.1 Conceptual Framework

The conceptual framework takes its theoretical background from TAM, UTAUT -2 and GETAMEL. In this study, it is acknowledged that the mass adoption of e-learning technology for teaching and learning was necessitated under a state of emergency of the COVID-19 lockdown as a stop-gap measure to continue academic work. This came as a surprise to most educational institutions, especially those who have not been doing e-learning. Because of this, the Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) which influence attitude toward using and behavioural intention to use e-learning technology in this context are further influence by external factors. In our investigation, we propose that Subjective Norm (SN), Price Value (PV) and System Accessibility (SA) are some external factors that influence the factors of TAM as shown in figure 1. The conceptual framework is to show that Subjective Norm (SN), Price Value (PV) and System Accessibility (SA) have a correlation with Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude and Intention to use e-learning system. In similar works, using TAM, UTAUT-2 and GETAMEL have shown that there exist to some extent, a degree of correlation between the external factors and the core constructs of TAM and UTUAT.
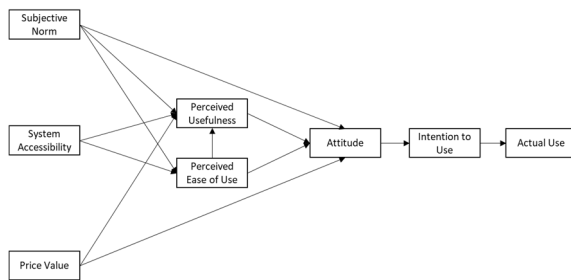
Figure 1: Conceptual Framework.

3.1.1 Subjective Norm

Subjective norm (SN) is the social behaviour of how people act based on their beliefs and assumptions of how other people think of them. The adoption of e-learning, in this case, was not optional; therefore, the subjective norm (SN) might not be an influencing factor. However, selecting a particular e-learning technology can be significantly influenced by subjective norm (SN). In this situation, the hypothetical assumption is that the adoption of a particular e-learning system by a school on behalf of faculty and students is influenced by what other peer or higher esteemed schools are using. The schools' decision in this context represents that of faculty and students to use a specific e-learning system. The hypothesis for this external factor is as follows:

H5: Subjective norm (SN) influence attitude toward usage (ATU).

H6: Subjective norm (SN) influence perceived usefulness (PU).

H7: Subjective norm (SN) influence perceived ease of use (PEOU).

3.1.2 Price Value

Price value (PV) is a trade-off between what the user stands to benefit from the technology and the sacrifice to make. Findings from related research show that price value (PV) is vital in influencing consumers intention to use. It also shows that price value (PV) tends to have a positive influence on the intention to use when the benefit from the technology is far more than the monetary commitment. Venkatesh et al. explain price value (PV) as the cognitive trade-off of the consumer between the anticipated benefits of the technology and the financial cost. From the marketing background price value (PV) has two dimensions: financial cost and nonfinancial cost. The financial cost is the value that is derived in contrast to the price that the consumer pays for the technology while the nonfinancial cost is the value that is obtained in return for time and efforts expended. In this study, the price

value (PV) is evaluated using both the financial and nonfinancial values to explore the influence on schools attitude toward using particular e-learning technology with the following hypothesis.

H1: Price value (PV) influence perceived usefulness (PU).

H2: Price value (PV) influence attitude toward usage (ATU).

3.1.3 System Accessibility

System accessibility (SA) is when a user can have access to use the technology conveniently and frequently without obstructions. The challenge of a lack of required technical infrastructure, including unstable internet connection makes it difficult for the user to access and conveniently use the technology. Students relent to use e-learning platforms when it has network connectivity, speed and access reliability problems. Accessibility technically is a factor which affects the usability and success of an e-learning system. Consequently, system accessibility (SA) is one of the significant external factors that other studies have shown using TAM to determine e-learning adoption. An e-learning system which has poor system accessibility, irrespective of a positive attitude toward usage and intention to use, the system will not be usable. The hypothesis for this factor is as follows:

H8: System accessibility (SA) influence perceived ease of use (PEOU).

H9: System accessibility (SA) influence perceived usefulness (PU).

3.1.4 Perceived Usefulness

Perceived Usefulness (PU) is the extent to which a user of any technology believes that using that technology can facilitate his/her job performance. This is one of the core constructs of TAM, which has proved a significant favourable influence on attitude toward usage and intention to use. How useful faculty and students perceive the e-learning system will influence their attitude toward usage and behavioural intention to use. The hypothesis to evaluate this construct is:

H3: Perceived usefulness (PU) influence attitude to use (ATU).

The conceptual framework expands the research questions as follows to achieve the objective of the study based on the identified hypothesis.

To determine the technology used by schools

Q1: What technologies were adopted by schools?

Q2: What factors influenced the decision to adopt the technologies?

To examine the effectiveness of these technologies

Q3: How effective were the technologies for teaching and learning?

To determine the extent of use of these technologies

Q4: How were the technologies used for teaching and learning?

Q5: What were the roles and responsibilities of faculty and students in using the technologies?

Q6: What were the factors which influenced the use of technology by faculty and students?

Q7: How useful were the technologies?

3.1.5 Perceived Ease of Use

Perceived ease of use (PEOU) is the extent to which a person thinks that it is easy to use a particular technology to perform a task. Existing research shows that PEOU has a positive influence on attitude toward usage and perceived usefulness (PU). Similarly, we are hypothesizing that faculty and students perceived ease of use of the e-learning system would influence their attitude toward the use and perceived usefulness of the system as follows:

H4: Perceived ease of use (PEOU) influence attitude to use (ATU).

4 METHODOLOGY

4.1 Research Design / Method

To a large extent, the scientific validity of any empirical study depends on the research design. The research design is what provides the scientific basis for interpreting the findings based on a specific philosophical world view. In this study, the survey approach of research design is used to observe education institutions adoption of e-learning technology during the COVID-19 and interpret the findings based on existing theory. The world view which forms the basis for this research design is more of post-positivism. Because of this, the quantitative research strategy of inquiry is chosen as a means for creating knowledge.

Although there are several stakeholders within the tertiary education ecosystem, the research was centred around the three (3) main stakeholders – Students, Faculty and Administrative staff because of their involvement in the use of the e-learning platform during the COVID-19 pandemic. This formed the basis for the population sample, data source and data analysis. The selected stakeholders who constituted the participants, performed different roles with the e-learning platform. Therefore they had different user experiences, which helped in appreciating their perspectives.

4.2 Data Source

The population for the study was students, faculty, and administrative staff from university institutions in Ghana, which served as the data source. The participation of members of the population sample was mainly individual decision and willingness to take part in the study. Because of this, the sample is convenient and does not constitute a representative sample of all the universities in Ghana. The respondents were not given any incentive for their participation.

4.3 Data Collection Instrument

Google forms was used to prepare an online questionnaire which was posted on the internet for the participants to respond. Three (3) different sets of questionnaires were developed for the various groups of participants. The sections of the questionnaire included technology adoption, usage, usefulness, ease of use and demography, among others. The questionnaires were all administered at the same time for a period of six (6) weeks. In all 344 students, 33 faculty and 6 administrative staff responded representing 90%, 9% and 1% respectively of the total respondent from nine (9) universities.

5 FINDINGS

5.1 Research Model and Hypothesis

Having discussed the objectives and purpose of this study, the research model for this study adapts the Technology Acceptance Model. The model was adopted to ascertain relationships between the factors and how it applies to the continuity of academic work through e-learning during the COVID-19 lockdown. Figure 2 illustrates the research model:
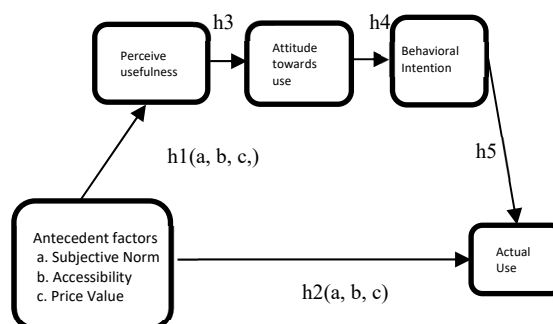

Figure 2: Research Model for the study. Source: Author.

Guided by the trust path model, the study adopted the quantitative survey research methodology. The tested model comprises seven constructs, each having multiple items that are measured using a seven-point the likert scale ranging from one to seven where 1= strongly disagree | 2 = disagree | 3 = neutral | 4 = agree | 5 = strongly agree. Respondents were asked to respond to a series of questions using the likert scale ranging from one to seven where 1= strongly disagree | 2 = disagree |3= neutral |4 = agree | 5 = strongly agree. Table 4.1 illustrated below shows the factors, the number of items under each scale, reliability assessment of pilot study using cronbach alpha.

Table 1: Questionnaire Development.

Factors	No. of questions	Cronbach Alpha
Subjective Norm	5	0.53
Perceived ease of use	4	0.80
Perceived usefulness	4	0.93
Behavioural intention to use	5	0.91
Accessibility	5	0.81
Attitude towards use	4	0.91
Price Value	4	0.75
Actual use	3	0.86

For the student survey the instrument was divided into two sections. The first section covered the demographic details, the second section highlights the path model of that contains eight factors that include; Subjective Norm (SN), Perceived ease of use (PEOU), Perceived usefulness (PU), Behavioural intention to use (BI), Accessibility (AC), Attitude towards use (AT), Price Value (PV) and Actual use (AU).

5.2 Demographic Analysis

Out of the 344 valid questionnaires retrieved, the data showed that 137 respondents were male, representing 39.8% and 207 were female representing 60.2% of the dataset, respectively. Again from the data set, it was shown that the age bracket from 25-34yrs constituted majority of the respondents representing 51.2% whereas the least participating respondents were the 45 -54 ae bracket representing 1.7% of the data set. In terms of different programmes that the respondents belonged to within the education sector, it was also shown that e-learning was prevalent within the Humanities field since it constituted 49.1%, followed by them were those that belonged to the

Health Sciences field, which constituted 31.1% respectively. The least percentage of respondents in the data set was from the Education sector, which constituted 0.3%.

Furthermore, the dataset received more respondents from private universities than public ones. From the data, 276 of the respondents from the private universities constituted 80.2% of the respondents, whereas 68 respondents representing 19.8% of the dataset were from public tertiary institutions. Again, from the Covid-19 period, 37 respondents from tertiary institutions representing only 10.8% admitted to have used more than five (5) technological platforms for virtual learning. 25.6% represented by 88 respondents did not use technology-enabled learning at all. However, more than 43.9% represented by 151 respondents form tertiary institutions used between 2 and 3 technology platforms for teaching and learning.

In terms of contact hours for e-learning, 60.8% of the respondents admitted that the maximum contact hours used for virtual learning was 1hr 30 mins per lecture, whereas 9.3% of the respondents that their maximum contact hours were less than 30mins of lecture but 27.9% of the respondents admitted to have had maximum contact hours from between 30 to 60mins.

5.3 Measurement Model

The Confirmatory Factor Analysis (CFA) was used as an assessment of fit to ascertain dimensionality and internal consistency for construct measurement. CFA is applied to confirm a good representation of the proposed items of constructs and the conceptual model (Hair, Ringle, & Sarstedt, 2011). Hence, the essence of a CFA test is to ascertain whether the proposed research model and the data collected are consistent or agree together in simple terms. About this study. The fit statistics values for the structural model were all within acceptable limits. The minimum discrepancy or χ^2 (Chi-square) = 176.7, df (Degree of Freedom) = 329, the Standardized Root Mean Square Residual (SRMR) = 0.04, Root Mean Error of Approximation (RMSEA) = 0.05, χ^2/df ratio = 1.74, Comparative Fit Index (CFI) = 0.98, Goodness Fit index (GFI) = 0.94, Incremental Fit Index (IFI) = 0.98, Tucker-Lewis Index (TLI) = 0.97 and Normed Indices of Fit (NFI) = 0.95.

5.4 Structural Model

In assessing the structural model, the data should support the model's specified theoretical relation-

ships (Bagozzi & Yi, 2012). The hypothesis testing was conducted in these parts; Hypotheses 1(a, b, c); to assess the relationship between perceived usefulness(PU) and its antecedent factors; Hypotheses 2(a, b, c); to assess the direct relationships between the Subjective Norm(SN), Accessibility (AC), Price Value (PV) and Actual Use (AU) respectively. Hypotheses 3; assesses the relationship between Price value (PV) and Actual Use (AU); Hypothesis 4, assesses the relationship between Attitude towards Use (AT) and Behavioural Intention to use (BI); and lastly, Hypothesis 5, determines the relationship between Behavioural Intention to use (BI) and Actual Use (AU). The results revealed that except for the relationship between SN and PU, SN and AU, PV and AU, all the other relationships were found to be significant. This implies that apart from H1a, H1c H2a, and H2c, all the other hypothesis H1b, H1c, H2b, H3, H5, H5, H6 were all significant. Hence, path analysis of the structural model as shown in Table below.

Table 2: Indices for the structured model.

Hypothesized Path	Standardized Coefficients	t-value	p-value	Results
H1a: Subjective Norm - Perceived Usefulness	0.18	0.219	0.827	Unsupported
H1b: Accessibility-Perceived Usefulness	0.64	7.76	***	Supported
H1c: Price Value - Perceived Usefulness	-0.29	.583	.827	Unsupported
H2a: Subjective Norm-Actual Use	0.11	5.8	0.12	Unsupported
H2b: Accessibility-Actual Use	0.20	5.8	***	Supported
H2c: Price Value - Actual Use	0.002	0.29	9.77	Unsupported
H3: Perceived Usefulness – Attitude towards Use	0.88	15.79	***	Supported
H4:Attitude Towards Use - Behavioral Intention to Use	0.90	11.53	***	Supported
H5: Behavioral Intention to Use - Actual Use	0.50	9.83	***	Supported

*p< 0.05, **p < 0.01, ***p <0.001

5.5 Mediation Analysis

As indicated in the table below, by using Baron and Kenny approach the results produced no mediation and partial mediation. From the table below, three main mediators of the model were assessed. These are

perceived usefulness and Attitude towards Use and Behavorial Intention to Use. As shown from below it was found that PU produced a No Mediation between Subjective Norm and Attitude. Again PU also produced a No mediation between Price Value and Attitude towards Use.

Table 3: Mediation Effect.

| Relationships	Direct without mediator	Direct with mediator	Mediation effect
Subjective Norm → Perceived Usefulness → Attitude towards use	0.037(0.64)	0.23(0.68)	No Mediation
Price Value → Perceived Usefulness → Attitude towards Use	0.006(0.9)	0.038(0.4)	No Mediation
Accessibility → Perceived Usefulness → Attitude towards Use	0.67(***)	0.26 (***)	Partial Mediation
Perceived Usefulness → Attitude towards Use → Behavioural Intention to Use	0.86(***)	0.91(***)	Partial Mediation
Attitude towards Use → Behavioural Intention to Use → Actual Use	0.62(***)	0.68 (***)	Partial Mediation

*p< 0.05, **p < 0.01, ***p <0.001
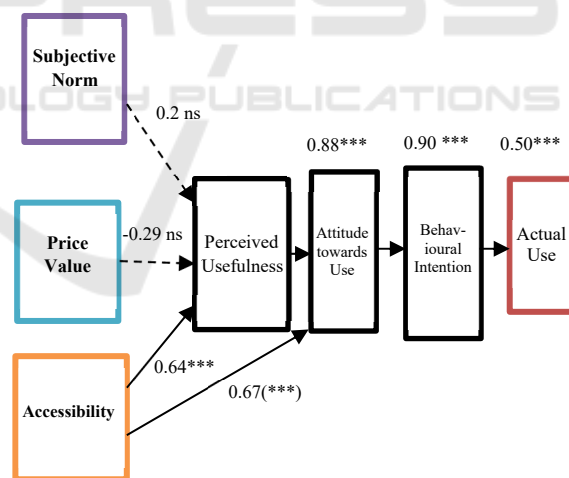
Source Author.

Figure 3: Final Structural Model for Antecedents' Factors and Outcome of Trust.

From the figure above, it can be deduced that, when e-learning was introduced, the strongest relationship amongst the factors was perceived usefulness and attitude towards use. This means that once, tertiary institutions and it stakeholders realize that a technology or virtual platform is useful, it will influence their attitude towards using. As it can be

seen that the relationship between perceived usefulness and attitude towards use is 0.9 with significance. Secondly, accessibility remains the strongest determinant to perceived usefulness. Accessibility is the only factor that has a strong positive influence on perceived usefulness. Secondly, it is the only factor that directly has a strong relationship with Attitude towards use without a mediator. From then on, it is clearly seen that PU has a strong positive relationship with AU with a significant value of 0.88, AU also has a strong positive relationship with BI with a value of 0.90 and BI also has a moderate relationship with the resultant variation with a regression weight of 0.50.
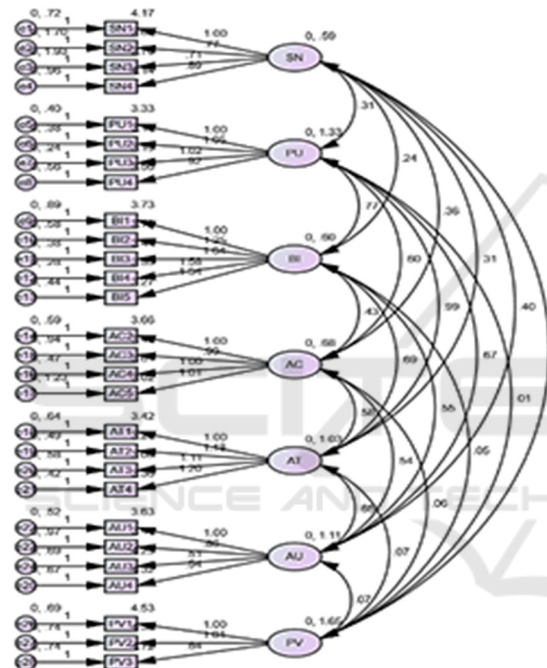
χ^2 **(Chi-square) = 176.7, df (Degree of Freedom) = 113, SRMR = 0.03, RMSEA = 0.95, χ^2/df ratio = 1.56, CFI = 0.98, GFI = 0.95, IFI = 0.98, TLI = 0.98 NFI = 0.96**

Figure 4: Stage One: Measurement Model.

6 CONCLUSIONS

In conclusion, the study shows that accessibility has direct positive influence on both perceived usefulness and attitude toward use. The main constructs perceived usefulness and attitude towards use also showed strong relationship toward behavioural intention to use. The findings provide a clear relationship between SN and PU, SN and AU, PV and AU, and further shows that all the other relationships are significant. Therefore, it implies that hypothesis H1b, H1c, H2b, H3, H5, H5, and H6 are significant.

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