ASSESSING ARCHITECTURAL TECHNOLOGY CURRICULUM IN NIGERIAN POLYTECHNICS: TRAJECTORIES TOWARDS SUSTAINABLE DEVELOPMENT AND GLOBAL COMPETITIVENESS

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Abstract

The recently revised architectural technology curriculum approved for Nigerian polytechnics reflects deliberate efforts to align training with international best practices. However, the complex inter-dependencies within training and actual professional practices demand co-creative approaches to ensure the delivery of sustainable and functional human habitats. Since sustainable design principles and proficiencies in Building Information Modelling (BIM) are pivotal in assessing the curriculum in tandem with sustainable development and global competitiveness, this study examined the curriculum to identify factors that support the implementation of sustainable design principles within the built environment, particularly the scope of BIM training received by architectural technologists during the course of their training. A survey research design was adopted, and data were analysed using SPSS version 26 to generate percentiles, mean scores, and regression outputs. Findings indicate that students demonstrate a high level of awareness and application of sustainable design principles, particularly at the early stages of the design process. The study further reveals that 96% of graduates possess some level of BIM proficiency, with 56% acquiring these skills through formal education and 40% through post-graduation professional practice. Correlation analysis shows a statistically significant relationship between BIM proficiency and professional performance ($p < 0.01$). Overall, the study highlights a gap between curriculum intentions and the realities of practice, and recommends proactive collaboration among key stakeholders to foster effective synergy between curricular guidelines and their practical implementation.

Keywords: Architectural technology, Building Information Modelling (BIM), Curriculum, Sustainable Development

INTRODUCTION

To address the issues of sustainable development in the context of architecture, attention is usually directed to sustainable design which precedes sustainable housing. A beneficial starting point is to reflect on the definitions of these three key concepts; In the 1987 Brundtland Commission sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' The core focus of the Brundtland approach speaks to the resource-based elements that address development. Sustainable design on the one hand, is a combination of procedures that ensures that the built environment attains exceptional levels of ecological stability through innovative and retrofit construction techniques that ultimately aims for enduring viability and humanisation of architecture (Kim & Rigdon, 1998) . Three key principles of sustainable design are identified as; Economy of resources, Life cycle design and Humane Design, with the main goal to discover architectural solutions that ensure seamless equilibrium between built and natural environments. On the other hand, Edwards (2005) posited that sustainable housing is 'housing that meets the supposed and actual needs of the present in a resource efficient manner whilst providing attractive, safe and ecologically rich neighbourhoods.' The crux of the matter lies in the process of efficient utilization of resources in order to generate physical forms that comprehensively satisfies the present and considers the future. A key element in the implementation of sustainable design principles is the awareness and information professionals in the building industry received during training, in addition to relevance accorded novel suggestions that influence and subsequently develop the sustainable built environment. This infers that education plays a primary role and creating awareness during the learning stages is pivotal to implementation. Furthermore, technically advanced design process tools such as building information modelling (BIM) have been identified as instrumental to sustainable design and therefore essential to navigate the challenging situation and provide the required services.

In Nigeria, architectural technology programmes are exclusively offered in polytechnics and colleges of technology, and the certificated architectural technologist is trained as a practice-oriented professional equipped to support and enhance architectural production and construction delivery. Furthermore, the profession of the architectural technologist has evolved from the earlier draughtsman role to embrace a relatively modern discipline in UK and other advanced economies (Armstrong & Allwinkle, 2017; Sfintes & Sfintes, 2024). This is particularly so with the entry of Building Information Modelling (BIM) and the constantly increasing prominence accorded the process, which ensures that the role of the architectural technologist from the outset of the design process has become indispensable. Hence, to efficiently and strategically compete within the global space, architectural technologist's proficiency in BIM is germane. The capacity of this discipline to strategically control design in relation to construction processes during the lifespan of buildings reiterates its role in addressing environmental concerns that have plagued the building industry (Armstrong & Allwinkle, 2017).

Yet, within the Nigerian milieu, our distinct economic and socio-cultural characteristics continue to influence the products of the programme, the style of practice, and awareness to emerging societal needs that are peculiar to our local setting, while still struggling to conform to global standards. This is largely due to the fact that, architectural practice in Nigeria is influenced on the one hand, by the drive to adopt technologically advanced techniques aimed at providing solutions to existing challenges within the built environment, and on the other hand by constantly emerging socio-economic variables associated with high population growth, urban migration, and the resultant explosions in housing needs. The Southeast region of the country represents the area of study. It accounts for 3.2% of the national landmass with a population of approximately 22 million people representing about 12% of the entire national population (National Population Commission , 2020) . After Lagos, the southeast region features the highest population densities and widest spread of urban migration growth across the country, which helps to explain the preponderance of challenges associated with the built environment that besiege the area. Advanced building technologies like mass production of pre-fabricated building types, which target efficient mass housing and demand innovative building proposals and technologies that challenge the architectural technologists and promote sustainable design of the built environment are yet to be explored generally in Nigeria and particularly in the southeast region. This is evident in the present construction processes, wherein approximately 90% of structures in the country are still constructed in-situ using sandcrete hollow blocks (Raheem, Momoh, & Soyingbe, 2012).

This study examined the academic curriculum contents of architectural design courses and computer courses to assess the degree to which students in the graduating class of the Higher National Diploma programme implement sustainable design principles, and the level of BIM training architectural technologists received in school and the effect on their practice performance. The aim is to determine the factors that influence their decisions in practice, which may or may not provoke ecological equilibrium within the built environment. To achieve this aim, the study investigated the course contents of the courses and the practice performance of graduates of the schools.

The results of this empirical study would highlight areas of the curriculum that still require necessary attention to attain such developmental target through emphasis on BIM applications. Again, the results would be beneficial to both regional as well as national development as part of solution strategies for mass housing needs. Furthermore, the results would highlight the prospects and constraints of architectural technology programme in Nigerian polytechnics in order to enable practitioners, professionals, educators and stakeholders make feasible decisions concerning the right course of action beneficial to Nigerian technological advancement agenda for sustainable development to thrive in the society.

LITERATURE REVIEW

The previous works reviewed in this study focused on two main aspects; the curriculum of architectural technology programme in polytechnics and the practice performance of products of the programme. The study referred to curriculum as an avenue for actualising detailed educational goals/objectives and concluded by identifying the way a curriculum is planned as one of the key factors that influence success and impact of the implementation (Shao-Wen, 2012) . Furthermore, for the purpose of this study, emphasis is on task performance which refers to an individual's proficiency with which professional jobs are executed which enhances the organisation's technical core (Marcel-Okafor, 2021) . Hence, the study focuses on BIM applications in training and proficiency in BIM during practice as an index.

Curriculum of Architectural Technology Programme

Architectural technology programme in Nigeria is regulated by NBTE, an acronym for National Board for Technical Education, which is the statutory regulatory body for the technical institutions. The recently revised NBTE curriculum and course specifications are used as a benchmark for standardising the academic course contents of courses being offered in these technical institutions (National Board for Technical Education, 2020). A pertinent issue in architectural education has been the nexus between what is taught in schools and the skills required for practice (Opoko & Oluwatayo, 2015; Legeny & Morgenstein, 2018; Singha OBE, 2021; Sasaki Associates, 2024). For the purpose of this study, focus is on the architectural design courses and the computer courses as prescribed in the curriculum. For the architectural design courses, the students are expected to grasp various factors to be considered in different buildings. This includes technical data relating to site location, functions, form, cost, locally available building materials, as well as environmental and cultural determinants. Specific learning objectives of the design courses include; implementation of anthropometry in defining sizes of various types of functional spaces, illustrate environmental and climatic determinants of the design among others.

The transition from traditional drawing tools to the use of Computer Aided Design and Draughting (CADD) has affected the trajectory of training relevant for the architectural technologist, consequently computer courses have gained prominence. Particularly, since advances in CADD such as building information modelling (BIM) have accentuated the roles architectural technologists play in providing sustainable development within the built environment (Armstrong & Allwinkle, 2017; Uzun & Cakir, 2022; Shahverdi, Mostafavi, Roodkoly, & Zomorodian, 2024) . As an extensive approach to design, construction and procedures in the building industry, BIM contains broad spectrum of models, tools and workflows which are essential to be learned and applied by professionals in the industry (Succar & Sher, 2013; Uzun & Cakir, 2022). In addition, implementation of BIM has the potential to expunge wastages occurring at inception of design, challenges arising from discordant relationships among professionals that may hinder work progress, as well as create expertise at design and construction stages (Eadie, Browne, Odeyinka, & Mckeown, 2014). BIM offers robust potential for improvement of procedures of design conception, development, and actualisation of modern structures. Proficiencies with BIM applications hold an indispensable opportunity for technological advancement in the building industry. Hu (2017), observed that the paucity of conversation and empirical data of prevailing building technology brought to light barriers to advancements in sustainable building technologies. Again, Kouider, Salman, and Paterson (2018) revealed from their study, that specific tools taught had direct link to the area of curriculum with the discipline, noting that AutoCAD/Photoshop and Revit were taught to architecture and architectural technology students, who displayed exceptional abilities in adapting to the BIM software applications. This is particularly relevant, since further studies also revealed that because architectural practice in Nigeria has been largely computerised, only the graduates proficient in Computer aided design and draughting (CADD) are relevant and employed, setting the stage for global competition (Oladapo, 2017; Ezeji, 2017; Maina, 2018).

Architectural Technology Practice realities in Southeast Nigeria

The Southeast region is situated within the humid tropical rainforest zone characterised by high rainfall, high humidity, and steadily warm temperatures, with direct implications for sustainable architectural design. Hence, for architectural technology and design, this geoclimatic zone demands distinct passive cooling and moisture-control strategies in design and construction. However, explorations of required innovative building proposals and technologies that challenge the architectural technologists and promote sustainable design of built environment are gradually evolving in Southeast region. Energy consumption is a key index in the economy of resources, and majority of electricity consumers are concentrated in the building sector with residential buildings accounting for over 70% of total electricity consumption in the country (IAEA, 2014). A clear reduction of energy necessary to cool and light buildings can be achieved by adoption of eco-friendly design techniques with efficient active systems (Arup (Madrid & Lagos offices), 2010). It is therefore imperative to use active systems that maximise potentials inherent in the eco-climatic patterns of the region. The aim and objectives of the curriculum focus on producing technologists with competence in a wide range of skills and highlights fundamental design principles such as orientation, landscape, spatial arrangements and fenestrations which in the context of the Nigerian environment are key elements that promote sustainable designs. Critical research questions posed therefore are the responsiveness of the curriculum to address evolving urban challenges, and the buoyancy of the curriculum to produce relevant skilled manpower required to proffer sustainable solutions to both existing and emerging challenges.

METHODOLOGY

The survey research design was adopted in this study. Structured questionnaires were used to elicit data from the respondents that comprised the academic staff in the departments, students in the Higher National Diploma (HND) graduating class, the architectural technologists that graduated from the schools and the architectural firms that employ these graduates within Southeast Nigeria. Based on the forgoing, this study adopted the format of the evaluation stated in the literature (Alagbe, Aderonmu, Opoko, Oluwatayo, & Dare-Abel, 2014) in the following format:

i. The data on CADD proficiency was a three-point rating scale: 1-none (no technical mastery of software package), 2-basic proficiency (elementary technical mastery of software package), 3-expert proficiency (full technical and creative mastery of software package).

ii. The data variables on relevance of the course contents were evaluated on a five-point Likert scale: 1-strongly disagree, 2-disagree, 3-uncertain, 4-agree, 5-strongly agree.

The first batch of questionnaires administered to the graduating class students concentrated on five key aspects of sustainable design principles that focused on economy of resources; orientation, fenestration, use of shading devices, preference for locally available building materials, and preference for soft landscape as variables used to measure the students' awareness of sustainable design principles anchored on energy efficiency in relation to the environment. The aim was to discover key aspects of sustainable design principles that the students readily considered in design procedures. The second batch of questionnaires administered to the teaching staff concentrated on assessing the students' proficiencies in BIM applications.

The Southeast zone in Nigeria, which represents the study area, has five polytechnics (research population) spread across five states that offer Architectural technology programmes fully accredited by the regulatory body; National Board for Technical Education (NBTE). Based on ownership structure, three (3) out of the five (5) polytechnics are owned by the Federal Government, while the remaining two (2) are owned by respective State Governments wherein the Polytechnics are domiciled. Owing to this heterogeneous structure, the stratified random sampling was adopted in defining the samples of this research population (Kothari, 2012) . Two (2) homogenous groups comprising the State-owned institutions and the Federal-owned institutions were derived. A random sample was drawn in the ratio 1:2 for the State and Federal owned schools. From the pilot survey conducted to investigate the number of the teaching staff and students in the graduating classes at the sampled polytechnics, the result revealed that the three polytechnics had a total number of forty (40) academic staff and one hundred and forty (140) students in the final level of the HND programme (Marcel-Okafor, 2021).

To derive the sample size, study adopted the approach based on precision rate and confidence level which availed it of a mathematical solution for determining sample size 'n' (Kothari, 2012) . Hence using the Yamane's simplified formula to calculate sample size with 95% precision level 'e' and the population size 'N', the sample size was determined as follows:

$$n= \frac{N}{1+N(e)^2} \qquad (1)$$

The total number of students in the graduating class of the Higher National Diploma (HND) programme which form the population size 'N' is 140 students. Applying the above formula, a sample size of 104 students was derived. However, with an allowance of 5% given for envisaged low response, a total of 109 copies of the questionnaires at the rate of 36 copies per department were administered to the students in the three polytechnics.

From the pilot survey conducted to observe the number of HND graduates from each school in each year spanning six (6) years for the study, the total number of HND graduates was 358 graduates which formed the population size 'N'. To determine the size of the sample (n) from the research population of the graduates, the study adopted the aforementioned mathematical (Equation 1). Where; 'n' is the sample size, 'N' is the population size, and 'e' is the level of precision. However, not all the graduates are working in firms within the study area and not all are working under registered firms. Therefore, an assumption of 50% of the total number of HND graduates (179 graduates) is used to determine the population size 'N'. Applying the above formula as follows;

$$n= \frac{179}{1+179(.05)^2} = \frac{179}{1.4475} = 123.661 \approx 124 \qquad (2)$$

Hence, 124 copies of questionnaire representing the sample size, were supposed to be administered to the technologists, however, with an allowance of 5% given for envisaged low response, a total of 130 copies of the questionnaire were administered to the HND graduates in practice within the five states that constitute the study area. This was done according to first contact basis which was obtained from the list of graduate members registered with the respective state chapters of the Nigerian Institute of Architects (NIA), and some were sent as soft copies via their email address.

The size of the sample 'n' for the last research population (the employers) was based on desired accuracy with a population percentage or variability of 50%, confidence level of 95%, and a 5% margin of error (Gill, Johnson, & Clark, 2010) in (Taherdoost, 2017). Gill et al. (2010) presented sample size appropriate for specified permutations of precision, confidence levels and a population percentage or variability of 50%. Hence, the study adopted 63 registered architectural firms as the sample size. However, owing to the uneven spread of the firms across the study area, copies of the questionnaire were randomly administered to 3 firms in Abia State, 5 firms in Anambra State, 43 firms in Enugu State and 12 firms in Imo State. The data collected were analysed at three levels: the univariate level which involved frequency distribution analysis using descriptive techniques. The second level was the bivariate analysis, wherein the correlations amongst the variables were established. The third and final level was the multivariate, wherein regression analysis was carried out.

FINDINGS

Results from the analysis carried out captured key aspects that address sustainable design that are critical to the climatic conditions of the region. The results of demographic data showed that the largest proportion of respondents (36%) were students from Federal Polytechnic Nekede, respondents from Abia State Polytechnic represented 33% of the total proportion, while the remaining 31% came from Federal Polytechnic Oko.

Half of the total proportion of respondents spread across the polytechnics rated the importance of orientation from the outset of their design process above the average mark. One-quarter (25%) of respondents marked average, while the remaining respondents (22%) marked below average. Over two-thirds of the total proportion of respondents rated the importance of numbers and placement of windows from the outset of their design process from the average mark and above. While close to one-quarter (24%) of respondents marked below average. Close to one-third of the total proportion of respondents rated the importance of provision of shading devices in design at the average mark (50% - 60%). However, a greater proportion of the respondents marked below average. On preference for use of locally available building materials, respondents were evenly divided by their views. Results of analysis further revealed that over two-thirds of the responses indicated higher preference for soft landscape.

Basic data related to the respondents as academic staff of the respective departments and lecturers of the students that graduated were obtained and presented in this section. The extent of the responses across available categories were specified as aggregated data obtained from the departments of the sampled Polytechnics and presented in percentages (%) as follows:

From the results of the analysis of aggregated data on *Relevance of course contents in computer courses (RCCP)* revealed that two-thirds (66.6%) of the respondents agreed that the course contents in Computer courses are relevant to practice. However, the remaining one-third of the respondents comprised the group that were uncertain about the relevance of the course contents and the group that disagreed on the relevance of course contents in computer courses to practice as illustrated in Figure 1.

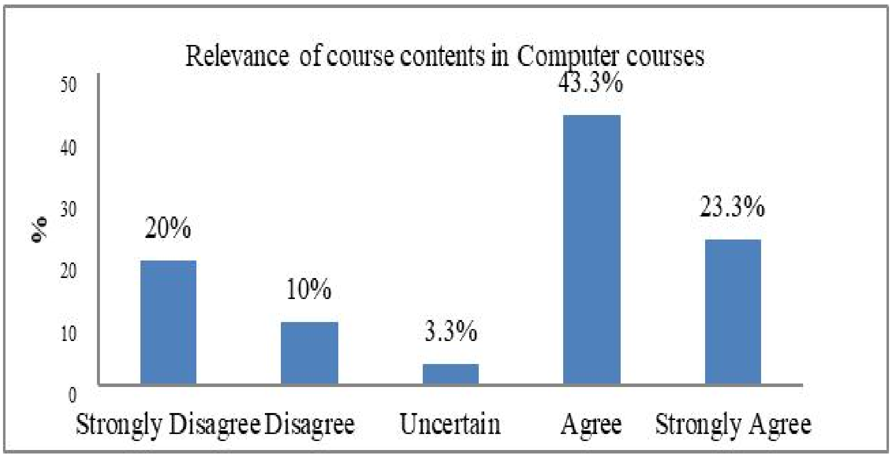

Figure 1: Relevance of Course Contents of Computer Courses

The results of the analysis of data on *Style of Studio draughting* in the firms showed that over two-thirds of the firms where the respondents practiced, operated with solely contemporary computer workstations, while the remaining proportion of respondents which constituted less than one-third of the total proportion practiced in firms that adopted both the traditional drawing tables and computer workstations as style of draughting in the studios as shown in Figure 2. This revealed a general shift in favour of the contemporary style of studio draughting amongst the architectural firms where the respondents practiced.

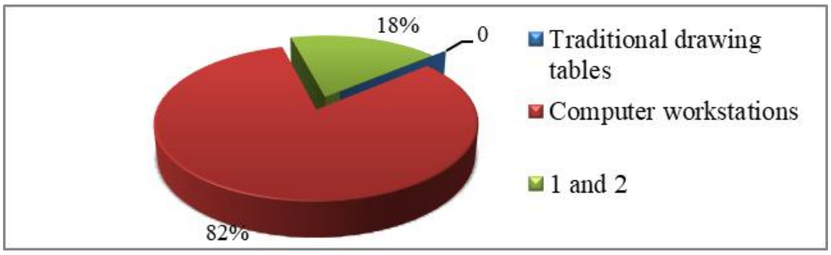

Figure 2: Style of Studio Draughting in the Firms

The results of aggregated data on *Criteria for employing architectural technologists (CFE)* (see Figure 3) show that more than two-thirds of respondents (80.3%) considered both the certificate and proficiency in Computer Aided Design and Draughting (CADD) as qualifying criteria for employing the technologists. However, the remaining proportion which was less than one-third of the respondents comprised of those that considered the HND certificate alone (4.9%) as the qualifying criteria for employing the technologists, those that considered proficiency in CADD alone (1.6%), as well as those that considered other attributes such as strength of communication among others in addition to certificate and CADD proficiency (13.1%) as qualifying criteria for employing the technologists.

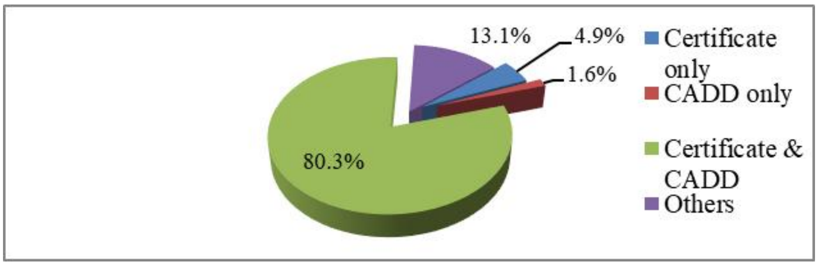

Figure 3: Criteria for employing architectural technologists in the firms

The results of aggregated data on *Graduates' proficiency in using AutoCAD (PAU)* showed that close to two-thirds of the respondents stated that the employed graduates exhibited basic proficiency in the use of AutoCAD. Close to one-third of the respondents reported that the graduates displayed expert proficiency in using the application. However, the remaining proportion of the respondents which was not up to one-tenth of the total respondents were of the view that the employed graduates did not display proficiency in the use of the software application as shown in Figure 4.

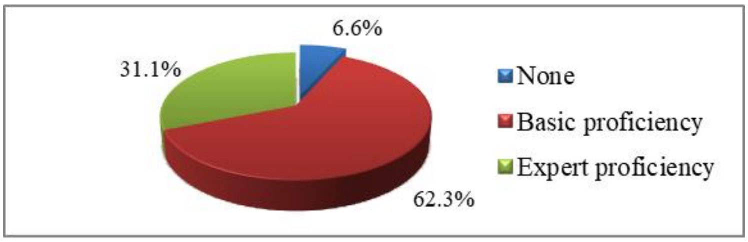

Figure 4: Graduates' proficiency in using AutoCAD

The variable *Graduates' proficiency level in using ArchiCAD (PAR)* was investigated. Results revealed that more than half of the respondents (54.1%) stated that the employed graduates exhibited basic proficiency in the use of ArchiCAD, while less than half of the respondents (41%) reported that the employed graduates displayed expert proficiency in using the application. However, the least proportion comprised barely one-twentieth of the respondents (4.9%), were of the view that the graduates employed did not demonstrate proficiency in the use of the application. This is shown in Figure 5.

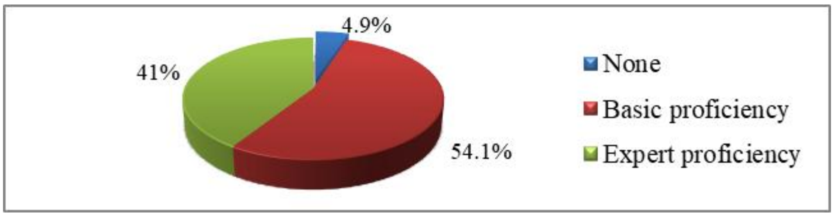

Figure 5: Graduates' proficiency in using ArchiCAD

The results of analysis of aggregated data on *Graduates' proficiency level in using Revit (PRE)* showed that close to half of the respondents (47.5%) stated that the graduates employed exhibited basic proficiency, while 34.4% displayed expert proficiency in the use of Revit. Close to one-fifth of the respondents that remained were of the view that the graduates employed did not display any proficiency in the use of the software application as illustrated in Figure 6.

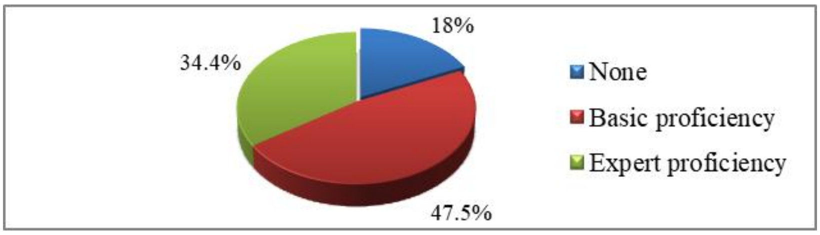

Figure 6: Graduates' proficiency in using Revit

For the bivariate analysis, two weighted variables: *Practice performance of technologists (PPT)* and *Proficiency in CADD software (PCS)* were investigated and Spearman Rho correlation analysis tool was used to test the significant relationship. The result of analysis showed that correlation between the variables is significant ($p<0.01$) as illustrated in Table 1.

Table 1: Spearman Rho correlation analysis of relationship between Practice performance of technologists (PPT) and Proficiency in CADD software (PCS)

		Proficiency in CAD software
Practice performance of students	Pearson Correlation	.371**
	P-Value	.003
	N	61

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

Source: (Marcel-Okafor, 2021)

For the regression analysis of *Practice performance of technologists*, the categorical regression (CATREG) analysis tool was used to investigate the interactions between the dependent variable *Practice performance of technologists* and the following independent variables; *Proficiency in using AutoCAD (PAU); Proficiency in using ArchiCAD (PAR);*

Proficiency in using Revit (PRE) thereby characterise their relationship. The variables were introduced using the forced entry method into the model. The results revealed those whose contributions were significant in affecting the dependent variable. The result of the model summary as illustrated in Table 2 showed that the model explains 49.2% of the residual variation ($R^2 = .492$, $R^2_{Adjusted} = .348$)

Table 2: Model Summary for dependent variable Practice performance of technologists (PPT)

Model Summary				
	Multiple R	**R Square**	**Adjusted R Square**	**Apparent Prediction Error**
Standardized Data	.701	.492	.348	.508

Source: (Marcel-Okafor, 2021)

The results for ANOVA were likewise outputted for the entry of variables as illustrated in Table 3. The results of the analysis showed that there was significant correlation of dependent variable with all independent variables collectively ($F(13, 46) = 3.425$, $p<0.5$).

Table 3: ANOVA results for dependent variable Practice Performance of technologists (PPT)

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	29.513	13	2.270	3.425	.001
Residual	30.487	46	.663		
Total	60.000	59			

Source: (Marcel-Okafor, 2021)

The results of regression coefficients revealed the level of significance of each individual variable. As shown in Table 4, the independent variable *Proficiency in using ArchiCAD (PAR)* was found to have significant correlation with *Practice Performance of technologists (PPT).*

Table 4: Regression Coefficients table for Practice Performance of technologists (PPT)

Coefficients					
	Standardized Coefficients		**df**	**F**	**Sig.**
	Beta	**Bootstrap (1000) Estimate of Std. Error**			
Proficiency in using AutoCAD	.178	.117	2	2.318	.110
Proficiency in using ArchiCAD	.209	.107	2	3.809	.029
Proficiency in using Revit	.112	.147	2	.585	.561

Source: (Marcel-Okafor, 2021)

DISCUSSIONS

This study has empirically shown that the importance ratings indicated by the students reflects the extent of their awareness of the basic principles of sustainable design and by extension the degree to which they are likely to implement such principles. The CADD software apps were limited to three and the proficiency ratings showed a prevalence of basic knowledge, which is more critical in the State-owned polytechnic. It further revealed that there is significant relationship between practice performance of graduates and proficiency in CAD software. This has also been cited in literature that technology, particularly computers and information systems, plays a critical role in most work environments. The findings also support previous studies that revealed that only graduates proficient in CAD are sought after and employed (Oladapo, 2017; Ezeji, 2017; Maina, 2018).

The result of the analysis showed that correlation between *practice performance of technologists (PPT)* and *proficiency in CADD software (PCS)* is significant ($p<0.01$). The implication is that practice performance of technologists within the study area increased with increase in proficiency in CADD software. It also supports the results of correlations presented by Hamma-Adama and Kouidder (2018) and the standpoint that the higher the software sophistication, the higher the proficiency level of training received and acquired by students. The aggregated data findings on variables: *Proficiency in using AutoCAD (PAU); Proficiency in using ArchiCAD (PAR)* and *Proficiency in using Revit (PRE)* which represented graduates' proficiencies in computer software applications revealed that the larger number of graduates exhibited basic proficiency in all three software packages used in the assessment. This supports the standpoint that specific tools taught were directly connected to the area of curriculum with the discipline (Kouider, Salman, & Paterson, 2018) . This reveals a gap in the curriculum contents of computer courses taught. Furthermore, the area-wise analysis of graduates' overall proficiency in using AutoCAD revealed that 62.3% of the graduates displayed basic proficiency and 31.1% displayed expert proficiency. The area-wise analysis of graduates' overall proficiency in using ArchiCAD showed that 54.1% of the graduates displayed basic proficiency and 41% displayed expert proficiency. The results of area-wise analysis of graduates' overall proficiency in using Revit showed that 47.5% displayed basic proficiency and 34.4% displayed expert proficiency. However, a notable 18% of the graduates displayed no proficiency in using Revit. The implication is that a preponderance of graduates displayed expert proficiency in using ArchiCAD, while majority also displayed basic proficiency in using AutoCAD. This is in agreement with findings of correlations between use of CAD in design studio/assignments and attained CAD proficiency amongst students (Ezeji, 2017).

Implication to Practice and Recommendations

Though, the learning outcomes used as variables for this study did not emphasise the quest for technologically advanced skillset as a prerequisite for accomplishing the tasks. Yet, the architectural technologist works within a sector characterised by constantly evolving technical developments, and equally emerging social factors that demand continuous technological advancements. Technically advanced design process tools such as building information modelling (BIM) have been identified as a relevant tool to pilot the challenging situation and provide the required services (Armstrong & Allwinkle, 2017). In the light of the current conditions the study recommends;

i. Adequate provisions of computer software packages recently prescribed in the revised curriculum in the departments and subsequent regular training of the staff in appreciation and application of the packages. It is important for the departments to acquire original versions of these applications to avail the staff and students of the opportunity to use the original copies. The adoption of these software packages, particularly BIM, enhances digitalisation of design and construction methods which is needed to foster accelerated and efficient delivery of building products and processes.

ii. Adoption of customized workstations for students in HND level of the programme, which will accommodate a laptop and personal items. This is intended to enable departments completely transit from traditionally equipped studios to contemporary teaching and learning environments. This will also reduce the overall volume of space which traditional drawing tables occupy and provide the studios with lean interior furnishings. Especially since there are varied software programmes available and obtainable, for free hand sketching skills, which has been at the core of arguments by proponents of the traditional drawing methods. This is crucial because in order to prepare the students for professional practice, and global competition, it is only appropriate that architectural technology design studios at HND level should reflect the working environment obtainable in practice.

CONCLUSION

In this study, a theoretical balance was struck between normative perspectives derived from adoptions by different interest groups concerning principles guiding practice that encourages palpable sustainable products and actual practice performances that target global competitiveness. With the increased prominence accorded building information modelling (BIM) tools, it is expedient that the entire academic process encompassing staff, students and, learning environment be ICT-compliant. This has been explicitly demonstrated in the recently revised curriculum. However, the successful implementation and the resultant effect in the performance of the graduates demands a concerted effort from the entire academic environment. Hence, with this study as a foundation, further research activities can be pursued in other zones of the country, with deeper insights to other aspects of sustainable design principles, as findings could help develop standards for performance measurements for architectural technologists across Nigeria.

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