Skills Gap Review: The Role of Architectural Practice Training

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Abstract

The architecture skills gap is a lack of knowledge and competency in professional practice activities and processes among graduates. However, Practice-Based Training (PBT) is supposed to bridge the gap between theoretical knowledge and professional practice experience. Therefore, this study aims to highlight PBT's role in the architecture skills gap. The systematic literature review and thematic analysis methodology were used to identify and analyse relevant literature to answer the research questions posed. The study identifies the challenges faced by interns during PBT as contributors to the skills gap. Thus indicating a relationship between the quality of PBT and the skills gap. Also, specific technical skills for architectural practice in Nigeria were identified from the Architects Registration Council of Nigeria (ARCON) PPE syllabus and Architects' conditions of engagement contract document as the indices for skill assessment. Further research opportunities were identified for developing a tool for evaluating the skills that students/interns and graduates lack. In conclusion, the inability of industry supervisors to train interns and the absence of a universally documented framework for PBT can be attributed as a significant contributor to poor-quality PBT. Therefore, a framework is recommended for effective architectural PBT in Nigeria.

Keywords*: Architecture; Skills Gap; Framework for Trainees.*

Introduction

There is a consensus among architects (industry practitioners and academics) on the skills gap among architecture graduates. Studies suggest that the intern's poor performance in the workplace indicates a lack of adequate knowledge and competency for professional practice (Ayofe et al., 2009; Gündeş, 2017a; Quinn, 2003; Urquía-Grande & Pérez Estébanez, 2020).

The skills gap is also reflected in the high failure and repeat rate of Architecture Professional Practice Examinations (PPE) candidates and the low number of registered architects in Nigeria since the inception of ARCON in 1969 (ARCON and Emmanuel et al. 2018). The number of registered architects stands at just over 5,000 at the time of compiling this research. It is, therefore, necessary to explore the cause of the problem.

The Architecture skills gap is a complex, multifaceted phenomenon that is not easily quantifiable. Variables (causes and aspects) identified in previous research on the issue can be broadly categorised as follows: Stakeholder perspective (perceptions of students, interns, graduates, and PPE candidates); academic curriculum and pedagogy; PBT perspective (Intern experiences, industry supervision, and quality of work environment); indices of assessing skill level (technical skills or generic soft skills), (Ayarkwa et al., 2012; Ayofe et al., 2009; Cook et al., 2015; Dare-Abel et al., 2015; Gündeş, 2017b; Ikechukwu et al., 2014; Maina, 2018; Olabiyi et al., 2012; Omar et al., 2008; Orr & Gao, 2013). Therefore, an attempt to analyse the skills gap will require a multi-pronged approach based on multiple aspects to gain valuable insight.

Research indicates that inefficient PBT hurts interns (Leonard, 2015; Newton et al., 2015). These questions arise: Is there a relationship between the architecture skills gap and the quality of PBT? And what are the benchmark standards for training interns in Nigeria? Furthermore, studies indicate that the experience of architecture students during internship is under-researched, with only a few studies on schools of architecture identifying internship as a significant factor/variable.

There is a deficit of research on the technical skills architecture students learn during their internship (Ikechukwu et al., 2014; Orr & Gao, 2013). An extensive online search on academic databases (Google Scholar,

Scopus, and Web of Science) conducted by the researcher on the subject yielded no results on Nigerian studies that addressed the issue of the architecture skills gap based on proficiency in the technical skills and competencies required for architectural professional practice. Therefore, these are valid justifications for this study.

Analysing the Architecture skills gap first requires a qualitative approach to address research questions, generate new insights, identify key variables, and gain an in-depth understanding of the phenomena. This paper, therefore, explores the architecture skills gap issue based on the role and challenges of PBT. Using the following research questions as objectives: How are architects trained? What are the specific technical skills involved? Who is responsible for the architecture skills gap? What are the factors inhibiting the effectiveness of PBT?

A Systematic Literature Review (SLR) was used to identify, select, and evaluate relevant materials to address the research questions. The SLR methodology identifies, selects, and evaluates literature to answer the question that supports a theory or concept and has been adopted in the AEC research (Gough et al., n.d.; Mengist et al., 2020; Wuni et al., 2019, 2022; Wuni & Shen, 2019). First, an internet search using Google Scholar and the Google search engine was used to identify relevant materials. Google Scholar provides a wide range of results from other academic databases.

The following keywords and phrases were used: "Architecture Internship Training,"; "Practice-Based Training,"; "Architecture Professional Practice Training,"; "Internships"; "Industrial Work Experience Scheme,"; "Work Based Learning "Professional Practice Examination,"; "Nigeria." The initial results of the search were refined using the criteria of materials published in English. Then, the abstracts/introduction, outline of contents, and conclusions sections were screened for relevance.

Finally, content analysis based on the thematic methodology was used to identify relevant information to bolster and provide answers to the research questions posed. The thematic literature review identifies and analyses the major themes and perspectives that emerge from a collection of relevant literature supporting a research question, concepts, ideas, and arguments (Creswell, 2012). The first step is to identify the research question, search and select relevant

literature, read and code literature to identify relevant information and perspectives supporting the answer, synthesise and organize themes and information, (Leedy & Ormrod, 2015). This approach aids the researchers in extracting meaningful insights and connections from the collective body of literature.

This paper consists of three sections. Following this introduction is the literature review section, which explores and discusses relevant topics and themes on the subject matter to identify the causal factors/challenges of PBT that limit its capacity to transfer knowledge and skills to interns. The paper culminates with the conclusion and recommendations section.

Literature Review

Architectural Training

The first research question posed in this study is "How are Architects trained?". Answering this question will provide insight into the aspects of architectural training where challenges exist. Architecture knowledge is specialized and peculiar, demanding extensive education from the academic and training from the professional world (Quinn, 2003). Consequently, a synergy is required between academia and industry practitioners to effectively train architects to be proficient in the skills required for professional architectural practice. Even after acquiring professional registration, architects still require participation in Continuous Program Development (CPD) to renew their practice licenses in Nigeria and other countries.

Quinn further asserts that architectural education requires a myriad of highly complex skills and equally varying training consisting of formal education. Internships and professional exams are the avenues for acquiring practical skills (Quinn, 2003). The classroom setting cannot simulate and provide the conditions necessary for instilling knowledge through practical experience. Training in professional courses usually involves theoretical knowledge from institutions and practical knowledge from the industry through Practice-Based Training (PBT).

Therefore, there is a greater emphasis on practical skills acquired from theory and practice (Little & Brennan, 1996). This is why students are required to participate in the mandatory Students Industrial Work Experience Scheme (SIWES) in the course of their undergraduate education and undergo another 2years of post-academic tutelage under the supervision of a registered

architect to be eligible for the Professional Practice Examinations (PPE).\\

PBT is, therefore, the primary means for bridging the skills gap, as academia alone cannot teach students every skill required for professional practice. PBT is an essential part of the architectural education system, as it provides practical knowledge and experience to students that cannot be learned in a classroom setting. Internship programs enhance the frictionless shift from academia to professional practice (Gündeş, 2017a). PBT is designed to complement academic knowledge by enabling students to transfer academic theoretical knowledge into practical issues and expose them to technology and facilities used in industry.

PBT, therefore, reinforces and consolidates theoretical knowledge (Beggs, 2008; Cord et al., 2010; Hurst & Good, 2010). The internship provides students with experience in their fields of study as interns gain job-specific skills and generic employability skills, work ethics, career guidance, and access to employers, which increases their potential for employment (Cook et al., 2015; Cord et al., 2010; Hurst & Good, 2010).

In Nigeria, the Students Industrial Work Experience Scheme (SIWES) and the graduate tutelage training (required for licensure) form the primary platforms for PBT as they facilitate the transfer of professional practice knowledge to interns by industry practitioners. This implies that the burden of training architects is not on the academia alone but also upon the practicing professionals, whose mentoring can reinforce the theoretical knowledge acquired from the academia.

The academia; in efforts to improve the quality of education, has over the years conducted developments and reviews of the academic curriculum standards from the Minimum Academic Standards (MAS) in 1989 to the Bench Mark Academic Standards (BMAS) in 2007, and recently the Core Curriculum and Minimum Academic Standards (CCMAS) for the Nigerian University System, (NUC, 2022).

However, there has not been any published and universally adopted documented strategy on the part of industry practitioners/associations to improve the quality of mentorship provided to students and graduates of architecture. Therefore, a practical framework for PBT is required to enable industry supervisors and interns to maximise the relatively short period of practical training.

Specific Architectural Skills for Practice

In discussing the architecture skills gap, it is important to identify the specific architectural technical skills. In other words, 'What are the variables for assessing architectural skills?' The answer to this question can be found in the PPE syllabus and Architects' services outlined in the Conditions of Engagement developed by the Architects Registration Council of Nigeria. The Architects Registration Council of Nigeria (ARCON) organizes the Professional Practice Examinations – which was formally the Architects Competence Programme (ACP) and later termed the Architects Professional Competence Evaluation (APCE). Candidates require two years of post–academic PBT under the mentorship of a registered architect/firm to be eligible for the examinations. According to ARCON, the goal of the APCE is to evaluate candidates based on the realities of professional practice and experience (ARCON, 2018, 2021). The ARCON PPE syllabus, with over a hundred topics, extensively encompasses all professional practice activities (see Table 1).

Table 1: ARCON PPE Syllabus.

Paper 1.0: Pre-Design, Planning and Practice Management (PPP)	
1. Professional Practice	10 sub-sections
2. Planning and Pre-Design	2 sub-sections
3. Design and Design Management	13 sub-sections
4. Computer-Aided Design Systems e.g. BIM, Revit, AutoCAD, ArchiCAD etc	4 sub-sections
5. Environment	9 sub-sections
Paper 2.0: Project Delivery & Contract Administration (PDCA)	
1. Working Drawings and Details	5 sub-sections
2. Workshop Drawings and Technical Details	3 sub-sections
3. Tendering Process and Tender Documents	4 sub-sections
4. Contract Administration	7 sub-sections
5. Building Materials, Construction and Technology	5 sub-sections
6. Project Management	10 sub-sections
7. Post Construction	5 sub-sections
Paper 3.0: Professionalism and Ethics (PE)	
1. Theory and Trends in Architecture	4 sub-sections
2. ARCON Act	2 sub-sections
3. Code of Professional Conduct and Ethics for the Architectural Profession	5 sub-sections
4. Ethics and Architectural Practice	4 sub-sections
5. Health Safety and Environment	5 sub-sections
6. Impact of Architectural Schemes	5 sub-sections
7. Project Financing	1 section

Source: Adopted from ARCON (2018)

Furthermore, the ARCON (2016) conditions of engagements contract document comprehensively outlines the services that an architect can provide according to the design, construction, and maintenance life cycle of a building/project (see Table 2). The services outlined are based on the project lifecycle of a building from the design stages, contract procurement, contract administration, and project construction management up to the post-construction stage. The outline of services, therefore, indicates the architect's skill set.

Table 1: Architects Professional Services.

STAGE	SCOPE OF SERVICES
Design Stage 1	**Phase 1**: • Design brief development (Client meeting and assessment of client's needs) • Feasibility study & reporting (Site visits, evaluation of opportunities, potential problems) • Environmental Impact Assessment report **Phase 2**: • Design concept development (Sie planning, space allocations/schedules, functional relationships, materials selection & services intended to be used)
Design Stage 2	**Phase 3**: • Production of complete sets of detailed architectural working drawings & construction details & specifications according to building codes, standards & regulations required for planning/development control approvals • Coordinating designs & drawings with other allied professionals (Structural, M&E etc.) **Phase 4**: • Construction documents: Compiling & coordinating with other professionals in the following: • Conditions of contract (Selection of appropriate type of building contract e.g JCT form of contract) • Specification writing; BOQ & other cost estimates/building cost analysis • Coordinating & compiling structural, M&E drawings • Architects Project Registration Number (APRN), ARCON seal & security stamps. Building Permit Approval (BPA) application & processing
Tendering & Award	• Invitation to tender/Contract advertisement/Call for bids. Tender Opening • Tender evaluation (Analyse, negotiate, report & make recommendations on submitted bids). Contract award
Construction Stage	• Contract administration (Duties, responsibilities & liabilities of client; Architects; contractor; subcontractor & clerk of works) • Contractor's possession of the site. Contractor's programme of works • Site visits (Building construction inspection to ensure adherence to standards & specifications & general project monitoring & progress reporting) • Site meetings. Interim valuations & variation. Progress Reports • Architect's payment certificates (APC)/ Interim certificates • Architect's Site Instructions (ASI). Architect's Material & Component Sample Approvals (AMCSA) & material test approvals. Site handover & certificates • Schedule of defects & defects liability period • Architects Practical Completion Certificate (APCC)/Final certificate • Final account. Architect's Final Payment Certificate (AFPC).
Post Construction Stage	• As-built drawings • Maintenance manuals. Facility management • Building Performance Appraisals, Post Occupancy Evaluation/Analysis

Source: Adopted from ARCON (2016)

The contents of the ARCON PPE syllabus and conditions of engagement comprehensively outline the skills, knowledge, and competencies required for professional architectural practice from project inception to completion. They can be considered as the benchmark standards for evaluating graduates' architectural/technical skills. Therefore, the architecture skills gap can be measured based on the outline of technical skills as variables.

Responsibility for the Skills Gap

Another important issue is 'Who then is responsible for the architecture skills gap?' There has been a lot of blame trading between academicians and industry practitioners on this issue. Studies indicate that industry practitioners often question the quality of architecture graduates by criticizing the academic curriculum and suggesting it is incapable of addressing professional practice issues. This implies that academia has failed to provide students with the requisite skills to transition into the real world (Dare-Abel et al., 2015; Olabiyi et al., 2012; Omar et al., 2008).

However, it can be argued that academics are not solely responsible for the training of architects. This argument is bolstered by the fact that the architectural training includes Practice-Based Training (PBT)/Internship Training (IT) at undergraduate (Student Industrial Work Experience Scheme - SIWES) and graduate levels Pre–licensure training under the tutelage of a licensed architect).

A study suggested that graduates lacked experience and employability skills due to poor training (Itohan et al., 2017). Considerably, students of architecture feel that academic education fails to prepare them for professional practice '(Ikechukwu et al., 2014). Another study observed that architecture graduates find it difficult to relate design and construction to real-world practice '(Saxena et al., 2017).

The training of architects involves practical and experiential aspects beyond the scope of theoretical education. Therefore, academia alone cannot and should not be expected to reproduce the practical field experiences necessary for professional practice skill development. The role of PBT and supervisors cannot be overlooked, and it is irrational to expect the academia alone to produce 'practice–ready' graduates.

Furthermore, technological advancements are beyond the capacity of academia to keep

up (Gündeş, 2017a). This is prevalent in other professions, such as Information Technology (IT), where industry practitioners criticize the curriculum and expect academia to train students in the latest technology (Ayofe et al., 2009). There are always advancements in technology and evolving systems of practice in any industry. However, these advancements are not always initiated nor originate from the academia but are usually the industry's products. Therefore, industry practitioners have a role in updating interns on the latest building design and construction technologies.

Studies on internships have shown variations between students' estimation of their skill level and industry practitioners' perceptions/estimation of their skills (Beggs, 2008; Maina, 2018). This indicates unrealistic expectations from interns by industry practitioners, as inexperienced interns cannot expect' practice readiness'. If the industry practitioner is only focused on the firm's core business, then 'intern neglect' is inevitable. Therefore, it is imperative to question the quality of education industry practitioners provide students.

The professional practice industry is critical in supporting academic education through mentorship. However, poor mentoring also replicates inferior education from academia during internships (Bergström, 2014; James. Cramer, 2012). This implies that transitioning into the real world involves transferring and deploying theoretical knowledge from the classroom to real-life issues. This process naturally takes time and depends on adequate exposure to real-life problems and effective mentoring.

Therefore, it is logical to assume that there is a relationship between the quality of internship training and the architecture skill gap. Thus, assessing the quality of education and training provided in the workplace is necessary. Furthermore, the gap in skills and knowledge required for professional architectural practice can be explored from two perspectives – the role of industry practitioners/intern supervisors and that of students/interns.

Factors Inhibiting the Effectiveness of Practice-Based Training

PBT training is the primary means for bridging the architecture skills gap as it provides practical knowledge & experience to students that cannot be learned in a classroom setting. However, studies indicate challenges/shortcomings in PBT, suggesting

that industry supervisors lack adequate knowledge transfer skills to train interns (Leonard, 2015; Newton et al., 2015) effectively. An unstructured PBT with poor supervision/mentorship has a negative impact on interns (Hurst & Good, 2010). This begs the questions: 'Is there a relationship between the architecture skills gap and the quality of PBT?'; 'What are the benchmark standards for training interns in Nigeria?'

Studies have shown that architecture interns face challenges such as poor mentorship and learning environments and the misuse of interns (Ayarkwa et al., 2012; Cramer, 2012; Gündeş, 2017a). This is an indication that industry supervisors lack knowledge transfer and feedback skills to effectively pass on their experiential knowledge and skills to interns (Leonard, 2015; Newton et al., 2015).

Interestingly, the author observed these challenges firsthand during internship supervisory visits. For instance, interns are tasked with one type of assignment throughout. Failure of supervisors to adequately engage interns and explain the 'why and how?' of a task/assignment. Misuse of interns – where interns are sent on errands or tasked with duties unrelated to their professional training. Absence of a designated industry supervisor and, in worst cases – organizations without fixed office address/space and organizational structure. After PBT, the interns lack adequate experience and relevant architectural professional practice skills and knowledge. Such challenges indicate that architectural PBT is conducted without benchmark standards or guidelines to ensure that interns are properly trained.

Another challenge is the misalignment between academic education and professional practice training, as there are problems of inferior training from supervisors/mentors ——(Cramer, 2012; Gündeş, 2017). A study auditing internships observed that student placements were not aligned with the academic course, the goals of the internship were not defined, supervision was minimal, and the benefits of the training were not outlined (Little & Brennan, 1996). These problems are not exclusive to the architectural profession but all fields involving PBT.

Therefore, industry practitioners/supervisors must have a curriculum/framework to inform their training/mentoring activities. Some institutions failed to provide students with

placement support regarding information on organizations for internship training, as such students had to fend for themselves in sourcing for placement.

Moreover, organizations proposed training/work programs based on their needs without consultation with the institutions and consideration of students (Garcia & Puig, 2011). Consequently, institutions need to develop a relationship network with reputable architectural firms that provide students with a catalogue of such firms. The schools also need to inform the architectural firms on the specific training, skills, and knowledge areas the interns require. This will avoid a situation where firms focus on their core business alone and neglect the needs of the interns.

Another study observed inadequate interaction between supervisor and intern rushed explanations, and communication without feedback fails to encourage learner reflection. They were implying that supervisors lacked knowledge transfer and feedback skills (Newton et al., 2015). Proficient practitioners will testify that 'experience' developed their technical skills but may fail when required to pass the knowledge to others (Leonard, 2015). Based on students' perceptions, Gündeş (2017) observed that poor knowledge transfer strategies from industry supervisors Another study showed no significant academic performance in students after their internship training(Cord et al., 2010).

Newton et al. (2015) observed that the quality of the learning environment and the availability of the supervisor to mentor interns play a role in the quality of training. Training lacking a proper plan, clear standards, and structure of activities, with good mentorship, produces undesirable experiences for interns (Cook et al., 2015; Hurst & Good, 2010).

Urquía-Grande & Pérez Estébanez (2020) observed that interns were seen as cheap labour and, therefore, overworked with repetitive work and often not provided financial remuneration. These challenges indicate that industry practitioners may be skilled and proficient but not necessarily good teachers/mentors. Also, even good teachers and mentors need a curriculum/framework to teach effectively. Therefore, the challenges outlined pose a major inhibition to the capacity of the PBT to effectively transfer experiential knowledge to interns.

Conclusion and Recommendations

The study reviewed the role of Practice-Based Training (PBT) in the architecture skills gap. Highlighting the issues of architectural training and specific skills needed for professional practice, the role of academics and industry practitioners, and the factors inhibiting the effectiveness of PBT.

The study identified academic and PBT as the two main training pedagogies and outlined PBT as the primary bridge between theoretical and experiential knowledge. However, the study observed no universally adopted documented strategy for training interns.

The study also identifies the contents of the ARCONN PPE syllabus and professional services outlined in the conditions of the engagement contract document as the benchmark standards for architectural technical skills. Furthermore, the study highlights the roles of academicians and industry practitioners in educating students and training architecture graduates. While also emphasizing the contributions of industry practitioners toward providing the requisite practical and experiential skills needed for graduates to transition into the world of professional practice smoothly. Finally, the study identified the challenges interns face during an internship as the main limitations to effective PBT and a major contributor to the skills gap.

Further research on the subject can explore developing and deploying a tool/research instrument for identifying the specific architectural technical skills that students/interns and graduates lack for assessing their level of knowledge on professional practice issues. In addition, the perceptions and expectations of industry supervisors on their expectations of the performance of graduates/interns can also be explored, as well as an analysis of interns' experiences to identify the shortcomings and challenges of PBT and a comparative exploration of the academic curriculum against the PPE syllabus.

Finally, the absence of a universally adopted documented strategy/framework for effective internship training can be attributed as a major contributor to the poor quality of PBT. This also presents a research opportunity to develop such a framework to address PBT issues in Nigeria.

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