PROFESSIONAL COMPETENCIES OF ARCHITECTURE GRADUATES: PERCEPTIONS FROM GRADUATES, ACADEMICS AND EMPLOYERS IN THE NIGERIAN CONSTRUCTION INDUSTRY

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ABSTRACT

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The clamour for better quality graduates by architects in the Nigerian Construction Industry (NCI) necessitates a look into the core competencies and the adequacy of architecture education in preparing architecture graduates for professional practice. 116 self-report likert-scale questionnaires from architecture graduates (2009-2015), academics and employers were analysed to establish core competencies developed by the graduates while in school. Descriptive statistics, t-tests as well as Mann-Whitney tests for differences in ratings were employed for the study. Results reveal the perceived adequacy of architecture education for the future career of graduates from the academic perspective. Graduates were most proficient at design related competencies while AutoCAD was still considered the most important CAD competency for architecture graduates in the NCI. The study recommends more frequent evaluations of competencies for employability in collaboration with industry as well as embracing BIM related software in line with global best practices.

Keywords: *Academics, Architecture, Employers, Graduates, Professional competencies, NCI*

INTRODUCTION

The debate on professional competencies has gained limelight in recent years through mainstream media and academia. In Nigeria, the issue has become topical in part due to the recent recession faced by the economy (Nigerian Bureau of Statistics, 2016; Noko, 2016). With high unemployment rates, organizations hiring employees prefer the best and most competent of workers to ensure optimum value for money. "In times of high unemployment, employers have more choice of applicants and will favour those with well-rounded employability skills" (Liverpool Hope University, 2016, p. 6). Research has however shown that many employers of labour decry the quality of graduates produced by Higher Educational Institutions (HEIs). Among graduates seeking employment, a mismatch of skills required for actual practice is often cited as an impediment to hiring graduates (Pitan & Adedeji, 2012; Saludin & Salahudin, 2014; Maina & Salihu, 2016). While many young people are acquiring HE qualifications, they seldom acquire the requisite skills for a changing labour market (Butler, 2015). McCowan (2014) notes that although graduate unemployment rates remain high globally, employers in Sub-Saharan Africa complain of the lack of basic, technical and transferable skills. "A university degree certificate can open doors, but without a rich learning experience underpinning the degree, it cannot change lives, release potential and transform societies." (ibid, p.13).

The NCI is a vast employer of labour, and has come under criticism owing to the insistent cases of collapsed buildings attributed to incompetence and professional lapses, amongst other factors (Oyedele & Tham, 2005; Ede, 2010). Professional bodies including the Nigerian Institute of Architects (NIA) recently called for a Federal Government (FG) audit of regulatory agencies to ensure the relevance of built environment professionals in national development (Nwannekanma, 2017). Architects are seen as leaders and managers in the Construction Industry (Yadollahi, Mirghasemi, Zin & Singh, 2014). Architects are also perceived to be responsible for appropriate designs, efficient

construction supervision and successful delivery of buildings (Oyedele & Tham, 2005). Consequently, the successes of many projects are often perceived to depend on the efficiency and competency of the architect. Kwofie, Amos-Abanyie and Botchway (2016) however note that in spite of benefits accruing from the development of competency profiles in other sectors of the economy notably business, manufacturing and insurance, the construction industry especially in developing countries is yet to identify and develop the competency profiles of key professionals such as architects. This is important in light of the observed decline of architecture graduates in Nigeria (NIA, 2017). "With the increase in the number of schools offering architectural programs, there has also been a steady decline in the quality of graduates from Nigerian schools as most employers have painfully realised" (ibid, p. 64). Although a few studies address the competency of architects in other developing countries especially Ghana, it is unclear which professional competences graduate architects are perceived to possess in relation to employability and the labour market in the NCI. This is important because professional competencies have been directly linked to the quality of education (Pool & Sewell, 2007; Omar, Manaf, Mohd, Kassim & Aziz, 2012; McCowan, 2014; Mtebula, 2014). Graduate architects in this study refer to Masters graduates from accredited schools of architecture that qualify for the Nigerian Institute of Architects Professional Practice Exams (NIAPPE) after the statutory two years' apprenticeship in registered architectural firms. These categories of graduates are those entering the labour market after completing the stipulated courses for the Part I requirement towards full registration as architects. The NIAPPE is a qualifying and licensing examination aimed at testing the competence of prospective members of the institute (Babadoye, Adewale, Olabode & Aribisola, 2013).

The overarching aim of this study is to establish the effectiveness of university architectural training towards producing core professional competencies of its graduates in the NCI. Consequently, this study poses following research questions:

i. How adequate is the education received at university for future careers of architecture graduates from academia notably graduates and academic staff?
ii. Which professional competences are architecture graduates in Nigeria proficient at?
iii. Are there differences in rating of professional competencies between academics in HEIs and employers of labour in the NCI?
iv. Which software competences are considered important for architectural practice in the NCI?

The paper is structured into five sections after the introduction. The literature reviews the concepts of professional competencies expected of architecture graduates while section three outlines the methodology employed for the study. Section four presents findings and discussions accruing from the study, followed by conclusions and references in sections five and six respectively.

LITERATURE REVIEW

Employability and Competence

Employability denotes the "possession of relevant knowledge, skills and other attributes that facilitate the gaining and maintaining of worthwhile employment" (McCowan, 2014, p. 5). It is the capacity of an individual to gain and maintain employment as well as obtain a new one if need be (Hillage & Pollard, 1998). Kamal (2006) asserts that employability is the propensity of graduates to exhibit attributes employers anticipate for the future effective functioning of organizations. These and similar definitions in literature however focus on the abilities of the individual as responsible for securing a job, leaving out other external parameters such as availability of jobs and characteristics of the labour market (de Oliveira & Guimaraes, 2009). Pool and Sewell (2007) note that there is so much more to employability than the abilities and educational qualification of an individual. The authors define employability as "having a set of skills, knowledge, understanding and personal attributes that make a person more likely to choose and secure occupations in which they can be satisfied and successful" (ibid, p. 280). This definition is employed as a basis in the development of an employability model which has five basic components namely Degree subject knowledge, understanding and skills; Generic Skills; Emotional Intelligence; Career development learning and

Experience in work and life. In essence, university education alone does not always guarantee employability but a combination of these components. Many studies however note that being competent and knowledgeable in discipline specific skills offers better prospects to securing jobs within professional circles (ibid). To be professionally competent means possessing the requisite expected capabilities expected of a specific field of work, which are laid down goals of professional education and practice regulations.

Competency has been defined in several ways in literature. It is a composition of skills, knowledge, personal attitudes and traits (Grzeda, 2005). This denotes the capability of an individual after receiving some training and education to carry out specific tasks to a satisfactory level. It is a combination of relevant attributes that underlie aspects of successful professional performance (Moore, Cheng, & Dainty, 2002). Competence is the "ability of an individual to perform his duties effectively and efficiently, which requires the possession of specific knowledge, skills and personal attributes deemed important to both the job requirements and context of the industry" (Salleh, Yusoff, Amat, Noor & Suredah, 2013, p. 44). It therefore follows that a strong relationship exists between the overall competency of professionals and their ability to be employable.

Professional competencies of Architecture graduates

Professional competencies of architects fall under two general categories in literature. The first category is practice oriented, revolving around Design and Management (Amos-Abanyie, Botchway & Kwofie, 2014; Kwofie, Amos-Abanyie & Botchway, 2016) while the second accrues from objectives of architecture education and training (UIA, 2011; UIA, 2014; AACA, 2015). The latter are competencies, capabilities and skills expected at graduation for architecture students entering the labour market. Three competency/capacity themes re-occur within these two categories namely Design, Management and Knowledge competencies. A complementary skill from literature essential to professional architectural practice were CAD/office management related skills (Salleh et al, 2013).

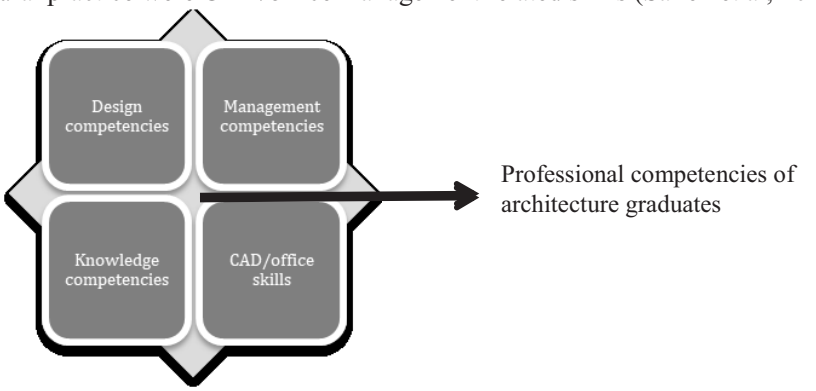

Figure 1: Framework comprising four themes of architectural professional competencies/skills. Source: Author

Design competencies "refer to the skills and knowledge applied in the design process to evolve a design product that meet both regulatory requirements and technical soundness" (Amos-Abanyie, Botchway, & Kwofie, 2014, p. 12). From the architecture education perspective, design competencies relate to the ability to engage imagination creatively and reconcile divergent factors, integrate knowledge and apply skills in the creation of a design solution (UIA, 2014). This competence is sublime, often subjective and difficult to assess, dependent on personal talent but tangible in the design outcome. While it can be developed within the course of educational training, it is inherent, differs from person to person and can be influenced by client requirements and goals.

Management competencies on the other hand deal with the coordination of information and relationships between stakeholders of the industry and are indispensable throughout the design and construction process. They are "managerial concepts, skills and proficient knowledge necessary to successfully manage, control, evaluate and deliver the product from the design" (Amos-Abanyie,

Botchway & Kwofie, 2014, p. 12). In broad terms, this subsumes issues relating to relationships with other professionals and the general public, statutory obligations, legal, socio-cultural matters as well as preparing briefs for a design project. It encompasses all aspects of environmental and human relations on and off-site. Because this competency deals with the actualisation of the building, the vast majority of literature reviewed on architectural practice focus on identifying project management related competencies (Ahadzie, Proverbs & Sarkodie-Poku, 2014; Kissi, Ahadzie & Badu, 2014; Yadollahi, Mirghasemi, Zin & Singh, 2014; Kwofie, Adinyira & Botchway, 2015).

Knowledge competencies relate to all forms of facts, information and skills acquired through education or experience. They form the bulk of the objectives of architecture education and consist of understanding culture, theory, history, professional practice, technical, building construction, structural systems, finance, cost control, project delivery methods as well as issues relating to sustainability, thermal comfort, building requirements and the environment.

The last aspect of professional competencies from literature relate to the acquisition of Computer Aided Design (CAD) and office management related software considered indispensable for practice today (Salleh et al., 2013). These include AutoCAD, Revit, Ecotect, ArchiCAD, SketchUp, 3DS Max, Adobe Photoshop as well as Microsoft office package (Word, EXCEL, Power Point). CAD related software are usually employed to produce 2D and 3D drawings, although Building Information Modelling (BIM) software applications such as Revit are also employed for more complex designs and construction management purposes (Ibrahim & Abdullahi, 2016).

METHODOLOGY

To assess the perception of stakeholders in the NCI regarding university education and professional competencies, 250 questionnaires were distributed to graduates, all academic staff at the department of Architecture, Ahmadu Bello University Zaria (ABU) as well as employers of architecture graduates from the department between February and December 2015. Half the number of questionnaires (125) were targeted at students who had graduated between 2009/2010 session to 2015. There were 44 academic staff in the department while employers were located in Abuja, Kaduna and Zaria which are the closest cities to the department of architecture in Zaria. The criterion for selection of employers was that they must have worked with or supervised graduates of architecture from ABU in the last five years, ending in 2015. The architecture department at ABU was chosen for this study because it is the oldest department of Architecture in Nigeria. 118 self-administered questionnaires (47.2%) were retrieved. Two questionnaires were invalid, thus 116 (46.4%) were employed for analysis in SPSS v.21 and EXCEL spreadsheets.

The self-ad mistered questionnaire contains three sections. The first is based on the Tuning template which assesses basic demographic profile of respondents for information on category of respondent, gender, employment status as well as two standard questions on the adequacy of university education to graduate future career prospects as well as the employability potential of the degree earned by the graduate (Spiridonidis, 2007; Generic skills questionnaire, n. d.). Responses to the last two questions were supplied as rankings on a five point likert scale. These were employed to address the first research question. A Mann-Whitney test was conducted to compare rankings from graduates (G) and academic staff (A) as distributions of scores were significantly different from normal distributions, in part because of the small sample size from both categories of respondents (G =50, A = 22, Table 2). Results are presented as mean scores (M), median scores (*Mdn*), *U* score, the standardised *z* statistic as well as the *p* value which establishes level of significance of the test. A *p* value equal to or less than 0.05 is considered significant in this study.

The second section of the questionnaire addressed the second and third research questions regarding level of proficiency of architecture graduates for professional competencies. The list for professional competencies in line with the international standards of university education was obtained from UIA (2011) which lists 16 competencies and skills expected from architecture graduates. An additional skill, Continuing Professional Practice (CPD) was found to be essential from literature (Salleh et al., 2013; UIA, 2014). This was added to the professional competencies, bringing the total to 17. Respondents were requested to rate the level to which each of these competencies were proficiently developed by architecture graduates they had worked with from ABU. Results from this section are presented in the standard format for likert scale items, which include counts and

percentages for each of the five likert responses as well as means, standard deviations and standard error of the mean (Field, 2013; Sullivan & Artino, 2013; Warmbrod, 2014). Each of the 17 professional competencies were categorized under the three scales established from literature namely Design competencies (three items), Management competencies (four items) and Knowledge competencies (ten items). The last scale, CAD skills comprise eight items from literature (Table 4). A likert scale is a summation of individual responses to multiple items describing a construct being measured. The scale mean and reliability of the scale are also presented, the latter expressed as Cronbach's alpha, α (Cronbach, 1951; Cronbach & Shavelson, 2004; Warmbrod, 2014). A scale is considered reliable if α is equal to or greater than 0.7 (Field, 2013). All scales in the study were therefore deemed reliable for further analyses as they all recorded α of 0.7 and above (Table 3).

To establish which professional competencies architecture graduates are proficient at in response to research question two, individual competencies were ranked based on a relative proficiency index (RPI) calculated as the ratio of actual total scores for each item from all respondents and maximum possible scores for the item. A similar procedure was employed for research question four relating to important CAD skills for the profession. Results from these sections are presented as descriptive statistics-N, Sum, M, SD, RII (relative importance index for research question four) as well as the rank. Ranking is based on the RII and are interpreted using the guide provided in Table 1. Additionally, means of scores above 3.5 are considered high in this study. To ascertain if differences exist between rankings of professional competencies from academics and employers (research question three), a *t*-test was conducted as distributions of scores were found not to be different from normal distributions. Results from the aforementioned analyses are presented in the next section.

Table 1: Guide to degree of proficiency and importance

Degree of Proficiency/Importance	RPI score/rating
Highly proficient/important	0.76 above
Proficient/ important	0.66-0.75
Low proficiency/importance	0.45-0.65
Not proficient/important	0.44 – below

Adapted from Waziri & Vanduhe (2013)

RESULTS AND DISCUSSION

Results

Results from the demographic profile of respondents reveal that 43% of the respondents are graduates, 19% were academic staff while 38% were employers of the graduates (Table 2). More than half the graduates (56%) were employed. A large proportion (88%) of employers did not disclose the size of their organization.

In response to research question one, rankings for adequacy of university education received for the future career of graduates (*Mdn* = 4.00) did not differ significantly from and academic staff rankings (*Mdn* = 4.00), U = 588.5, z = 0.664, *p* = 0.507. Rankings for employability potential of the architecture degree likewise did not significantly differ for graduates (*Mdn* = 3.00) and academic staff (*Mdn* = 4.00), U = 422, z =0.797, *p* = 0.425. In essence, graduates and academic staff generally rank university education in architecture at ABU as adequate for the future career of graduates. This trend is likewise observed for employability potential of the graduates (Table 3).

Table 2: Demographic profile of respondents (N 116)

Category of respondent	N	
Graduate (G)	50	43%
Academic Staff (A)	22	19%
Employer (E)	44	38%
Employment status (G) N = 50		
Employed	28	56%
In school for additional qualifications	4	8%
Unemployed	18	36%
Size of organization (E)		
1-10 people	5	4%
11-20 people	12	10%
21-30 people	4	3%
30+ people	7	6%
Missing	88	76%
Gender of respondent (all categories)		
Male	90	78%
Female	22	19%
Missing	4	3%
Motivation for studying architecture (G) N = 50		
Self	37	32%
Parents, family	7	6%
Peers	2	2%
Teachers	1	1%
Others	2	2%
Missing	67	58%

Table 3: Adequacy of university education and employability potential of degree

Question	Respondent	N	Mean	Median	Std. t stat	p.
Adequacy of University Education	Graduates	49	3.69	4.00	0.664	*0.507*
	Academic Staff	22	3.59	4.00		
Employability potential of degree	Graduates	50	3.64	3.00	0.797	*0.425*
	Academic Staff	22	3.45	4.00		

Results in Table 4 reveal that architecture graduates from the sample are averagely more proficient at Design (M = 3.7) and Management competencies (M = 3.6) than Knowledge competencies (M = 3.3) and CAD software skills (M = 3.1). Rankings for the CAD software skills may have been low in part because these skills are often subsumed within Design and Management skills in architectural practice (Salleh et al, 2013).

Table 4: Professional Competencies of architecture graduates

Category/ Scale	Competence	1 (V. Low)	2 (Low)	3 (Fair)	4 (High)	5 (V. High)	Missing	Scale Mean	α
1. Design competencies	D1 Ability to create architectural designs that satisfy both aesthetic and technical requirements	3 (3%)	5 (4%)	35 (30%)	44 (38%)	28 (24%)	1 (1%)	3.7	0.7 (3 items)
	D2 Design skills necessary to meet building user's requirements within constraints of cost and regulations	1 (1%)	15 (13%)	34 (30%)	43 (37%)	23 (20%)	0 (0%)		
	D3 Creative competence in building techniques and construction methods related to architecture	2 (2%)	12 (10%)	40 (35%)	37 (32%)	22 (19%)	3 (3%)		
2. Management competencies	M1 Understanding relationships between people and buildings, environment, human needs and scale	3 (3%)	13 (11%)	35 (30%)	39 (34%)	25 (22%)	1 (1%)	3.6	0.8 (4 items)
	M2 Understanding the architectural profession and role of architect in society, preparing briefs taking social factors into account	2 (2%)	13 (11%)	32 (28%)	36 (31%)	31 (27%)	2 (2%)		
	M3 Understanding methods of investigation and preparation of briefs for a design project	4 (3%)	15 (13%)	33 (28%)	39 (34%)	24 (21%)	1 (1%)		
	M4 Awareness of responsibilities toward human, social, cultural, urban, architectural and environmental values and architectural heritage	4 (3%)	14 (12%)	39 (34%)	41 (35%)	18 (16%)	0 (0%)		
3. Knowledge competencies	K1 Knowledge of the history and theories of architecture and the related arts, technologies and human sciences	1 (1%)	9 (8%)	37 (32%)	45 (39%)	22 (19%)	2 (2%)	3.3	0.83 (10 items)
	K2 Knowledge of the fine arts as an influence on the quality of architectural design	4 (3%)	22 (19%)	41 (35%)	36 (31%)	9 (8%)	4 (3%)		
	K3 Adequate knowledge of urban design, planning and skills involved in the planning process	5 (4%)	18 (16%)	38 (33%)	43 (37%)	9 (8%)	3 (3%)		
	K4 Understanding structural design, construction and engineering problems associated with building design	0 (0%)	23 (20%)	38 (33%)	37 (32%)	17 (15%)	1 (1%)		
	K5 Knowledge of physical problems and technologies, function of buildings to provide internal conditions of the comfort and protection against climate	0 (0%)	14 (12%)	49 (42%)	27 (23%)	25 (22%)	1 (1%)		
	K6 Knowledge of industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning	1 (1%)	19 (16%)	44 (38%)	26 (22%)	25 (22%)	1 (1%)		
	K7 Knowledge of means of achieving ecologically responsible design and environmental conservation and rehabilitation	5 (4%)	17 (15%)	40 (35%)	28 (24%)	23 (20%)	3 (3%)		
	K8 Knowledge of project financing, management, cost control and methods of project delivery	4 (3%)	28 (24%)	41 (35%)	27 (23%)	15 (13%)	1 (1%)		
	K9 Training in research techniques as an inherent part of architectural learning	7 (6%)	24 (21%)	43 (37%)	29 (25%)	12 (10%)	0 (0%)		
	K10 Engagement in self-managed. Life-long learning, Continuing Professional Development	9 (8%)	21 (18%)	34 (30%)	25 (22%)	26 (22%)	1 (1%)		
4. CAD Skills	C1 AutoCAD	1 (1%)	7 (6%)	25 (22%)	44 (38%)	29 (25%)	10 (9%)	3.1	0.86 (8 items)
	C2 Revit	5 (4%)	22 (19%)	28 (24%)	25 (22%)	24 (21%)	12 (10%)		
	C3 Ecotect	26 (22%)	21 (18%)	28 (24%)	10 (9%)	6 (5%)	23 (20%)		
	C4 ArchiCAD	30 (25%)	16 (14%)	26 (22%)	16 (14%)	10 (9%)	18 (16%)		
	C5 SketchUp	15 (13%)	17 (15%)	32 (28%)	25 (22%)	13 (11%)	14 (12%)		
	C6 3Ds Max	33 (28%)	25 (22%)	14 (12%)	17 (15%)	7 (6%)	20 (17%)		
	C7 Photoshop	33 (28%)	18 (16%)	25 (22%)	15 (13%)	7 (6%)	18 (16%)		
	C8 MS Office (Word, Excel, PPT	3 (3%)	6 (5%)	36 (31%)	28 (24%)	32 (28%)	11 (10%)		

Results from the survey also reveal that the graduates are highly proficient at creating architectural designs, which satisfy aesthetic and technical requirements (Table 5). This competence is at the core of design and arguably considered a critical competence of any architect. Two CAD software competencies also rate very highly in this regard - AutoCAD and Microsoft Office packages. The three competencies are the only items with a RPI equal to or above 0.76 (refer to Table 1). Architecture graduates were found to be proficient at 19 other competencies spread across the four scales including CAD skills in the following software: Revit, SketchUp, ArchiCAD, Photoshop, Ecotect and 3Ds Max (Table 4).

Table 5: Ranking of Professional competencies of architecture graduates

No.	Competency	N	Sum	Mean	SD	RPI	Rank
D1	Creation of architectural designs satisfying aesthetic/technical requirements	115	434	3.77	0.956	0.76	1
M2	Understanding the profession/role of architects in society	114	423	3.71	1.045	0.74	2
K1	Knowledge of History/theories of Architecture and related arts	114	420	3.68	0.905	0.74	2
D2	Design skills to meet user requirements, costs and building regulations	116	420	3.62	0.975	0.72	4
M1	Understanding relationship between people, buildings and environment	115	415	3.61	1.032	0.72	4
D3	Creative competence in construction methods related to architecture	113	404	3.58	0.98	0.72	4
M3	Understanding methods of investigation/brief preparation	115	409	3.56	1.069	0.71	6
K5	Knowledge of physical problems, tech, function of buildings	115	408	3.55	0.966	0.71	6
K6	Knowledge of industries, org, regulations, planning procedures	115	400	3.48	1.037	0.70	8
M4	Responsibility towards arch. Heritage, human, social, cultural, urban values	116	403	3.47	1.008	0.69	9
K4	Understanding structural design, construction, engineering issues	115	393	3.42	0.973	0.68	10
K7	Knowledge to achieve ecologically sustainable design	113	386	3.42	1.108	0.68	10
K10	Engagement in self-managed life-long learning, CPD	115	383	3.33	1.233	0.67	13
K3	Knowledge of Urban design/planning process	113	372	3.29	0.97	0.66	14
K2	Knowledge of the fine arts as an influence on quality of arch. Design	112	360	3.21	0.972	0.64	15
K8	Knowledge of project financing, management, cost control, delivery	115	366	3.18	1.056	0.64	15
K9	Training in research techniques as part of architectural learning	115	360	3.13	1.056	0.63	17
	CAD Software Competencies	*N*	*Sum*	*Mean*	*SD*	*RPI*	*Rank*
C1	AutoCAD	106	411	3.66	0.92	0.78	1
C8	Microsoft Office applications/Document processing	105	395	3.76	1.04	0.75	2
C2	Revit	104	353	3.39	1.19	0.68	3
C5	SketchUp	102	315	3.09	3.15	0.62	4
C4	ArchiCAD	98	264	2.69	1.4	0.54	5
C7	Photoshop	98	249	2.54	1.3	0.51	6
C3	Ecotect	93	234	2.52	1.3	0.50	7
C6	3DS Max	96	238	2.48	1.4	0.50	7

Three competencies fall in the low competency category (RPI=0.65 and below). These are knowledge of the fine arts as an influence on quality of architecture design, knowledge of project financing, project management, cost control and methods of project delivery as well as training in research techniques as an inherent part of architectural learning (Table 5).

In response to research question three, although employers (E) rated professional competencies slightly higher ($M = 3.42$, $SE = 0.11$) than academics (A), ($M = 3.10$, $SE = 0.14$), the difference, -0.33, was not significant t (59) = -1.909, $p = 0.934$. This result is generally reflected in the comparisons between individual items of design, management and knowledge competencies (Table 6), with the exception of two competencies-knowledge of fine arts as an influence on architectural design as well as knowledge of project financing, project management, cost control and methods of project delivery. These competencies are two of the three least developed competencies from the sample (Table 5). In both cases, employers averagely record higher means than academics in architecture schools (Table 6).

Table 6: Comparison of Design, Management and Knowledge Competencies between Academics and Employers

No.	Competency/Skill	Academics (M)	Employers (M)	Diff in Mean	t	p
D1	Creation of architectural designs satisfying aesthetic/tech requirement	3.32	3.85	-0.53	-1.85	0.07
K1	Knowledge of History/theories of Architecture and related arts	3.47	3.85	-0.38	-1.11	0.27
K2	Knowledge of the fine arts as an influence on quality of arch. Design	2.89	3.53	-0.64	-2.43	0.013 *
K3	Knowledge of Urban design/planning process	2.95	3.24	-0.29	-1.05	0.3
M1	Understanding relationship between people, buildings and environment	3.47	3.24	0.23	0.8	0.43
M2	Understanding the profession/role of architects in society	3.21	3.62	-0.41	-1.3	0.2
M3	Understanding methods of investigation/brief preparation	3.05	3.53	-0.48	-1.7	0.96
K4	Understanding structural design, construction, engineering issues	3.16	3.15	0.01	0.41	0.97
K5	Knowledge of physical problems, tech, function of buildings	3.32	3.59	-0.27	-1.02	0.31
D2	Design skills to meet user requirements, costs and building regulations	3.16	3.38	-0.22	-0.94	0.35
M4	Knowledge of industries, org, regulations, planning procedures	3.05	3.44	-0.39	-1.26	0.21
K6	Responsibility towards arch. Heritage, human, social, cultural, urban values	3.16	3.35	-0.19	-0.65	0.52
K7	Knowledge to achieve ecologically sustainable design	3.16	3.38	-0.22	0.69	0.5
D3	Exhibit creative competence in construction methods related to architecture	3.11	3.68	-0.57	-1.99	0.52
K8	Knowledge of project financing, management, cost control, delivery	2.58	3.21	-0.63	-2.5	0.046 *
K9	Training in research techniques as part of architectural learning	2.95	2.82	0.13	0.45	0.66
K10	Engagement in self-managed life-long learning, CPD	2.79	3.15	-0.36	-1.18	0.25

** Significant at 0.05 (2 tailed)

The most important CAD software skills according to stakeholders in the NCI are AutoCAD, Revit, Microsoft Office applications and SketchUp, which record RPIs above 0.76 (Table 7). This result is consistent with rankings for the top four most developed CAD skills from the sample (Table 5). Ecotect is considered the least important CAD software skill in part because it is specialist software package whose use can easily be outsourced if need be in practice.

Table 7: Important CAD software competencies

Rank	Software	N	Sum	Mean	SD	RII
1	AutoCAD	114	507	4.45	0.92	0.89
2	Revit	113	476	4.21	1.03	0.84
2	Microsoft Office applications/Document processing	113	472	4.18	1.02	0.84
4	SketchUp	109	427	3.92	1.2	0.78
5	3DS Max	106	400	3.77	1.33	0.75
5	ArchiCAD	106	399	3.76	1.26	0.75
7	Photoshop	105	392	3.73	1.18	0.75
8	Ecotect	100	342	3.42	1.33	0.68

DISCUSSION

Results from the study confirm that stakeholders from academia consider architecture education adequate for the architectural profession and future careers of the graduates. The lack of significant differences between employer and academic ratings of professional competencies supports this general viewpoint (Table 5). While this finding is reassuring for architecture graduates from the sample and their employers from 2009 to 2015, this may not necessarily reflect the current state of opinion within

the profession as employers in architectural firms decry the declining quality of graduate architects from Nigerian schools of architecture (NIA, 2017). Indeed, this contrast in opinion is not limited to the architecture profession. Fern's 2012 study of graduates, academics and employers of a health and humanities program in Australia notes that while academic staff were found to be confident in teaching and assessing the employability capabilities of their students, "feedback from all stakeholders, including staff, suggests there is a significant gap in the acquisition of these skills among graduates" (ibid, p. 86). This trend underscores the need for constant review and evaluation of the curicula in schools of architecture as well as collaboration between academia and practice, as advocated in several studies and professional publications (Abdulkarim, 2011; Suleiman & Abubakar, 2015; Maina, 2015; NIA, 2017).

Secondly, architecture graduates were most proficient at design related competencies (Table 3). Design and the architectural design studio are at the core of architecture education (Bashier, 2014). Everything the architect does is tailored towards producing a good design, making this finding a positive one. However, knowledge competencies, which subsume the majority of items of professional competencies (Table 3) were on average lower than design and management competencies. Knowledge competencies support design and management competencies and are taught within the architecture curricula at master's level (Maina, 2015). The lower average suggests a tendency of students to pay attention to competencies perceived to be most critical in architecture, namely design. It is expedient therefore that students are made to understand the value of other related competencies for a successful and holistic professional practice in their future careers.

Thirdly, results from the study confirm the importance of AutoCAD and Revit software in the NCI. This supports findings in literature (Salleh et al., 2013, Ryal-Net & Kaduma, 2015). It is however pertinent to note that AutoCAD is ranked first, while Revit, a Building Information Modeling (BIM) software widely known in the NCI is ranked third (Table 5), underscoring the relatively slow uptake of BIM by architects in the NCI and its continued use as the industry standard. This finding supports Kori and Kiviniemi (2015) as well as Ryal-Net and Kaduma (2015) who note that among different building professionals such as architects, quantity surveyors and civil engineers, the move to adopt BIM in Nigeria's private and public sectors has been slow. This is in spite of the advantages BIM holds especially in boosting productivity and efficiency in the NCI which has in the last two years suffered a decline in part owing to the economic situation in the country (Olaleye, Garba & Lawal, 2017). As leading professionals in the built environment, architects need to be more proactive in the move towards embracing BIM in the NCI. This is important as BIM is now being accepted as the global standard for construction and professional practice (Isah, 2015; Abubakar, 2017; Abubakar, Muhammed & Abdulrazaq, 2017).

CONCLUSION AND RECOMMENDATIONS

In conclusion, this study set out to establish the effectiveness of university architectural training towards producing core professional competencies of its graduates in the NCI. Findings reveal the adequacy of university education for the future careers of graduate architects from stakeholders in academia for the period the study was conducted. Furthermore, architecture graduates were revealed to be proficient at design competencies, which were rated higher than knowledge competencies by respondents. Additionally, AutoCAD was revealed to be the most important software for architectural practice, suggesting the slow uptake of BIM software such as Revit in the NCI, which was rated relatively lower than AutoCAD by respondents.

Recommendations from the study fall into two categories targeted at academia in HEIs as well as the professional body NIA and architects in practice. First, it is important that frequent evaluations on competencies be conducted in school to provide valuable feedback for the improved training of future architects. This point cannot be overemphasized. It is also imperative that such research be conducted in collaboration with employers of graduates to adequately establish gaps in the training of graduates and skills expected in practice. Academics also need to reiterate the importance of a holistic knowledge base for graduates while in school within the taught curriculum to ensure a competent architectural graduate to adequately practice after leaving school.

Secondly, architects in practice need to become proactive in embracing current technology notably BIM despite the barriers to its adoption identified in literature (Abubakar, Muhammed &

Abdulrazaq, 2017). Importantly, more studies need to be conducted regarding the level of awareness of BIM in architecture firms and schools as well as problems encountered in the profession regarding its use as many of such studies have been undertaken in other allied disciplines such as quantity surveying and engineering (ibid).

A limitation for the present study is the small number of graduates and employers from a single department of architecture in Nigeria. Findings accruing from similar researches employing a larger sample size will be beneficial towards future generalization of results.

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