



REQUISITE SKILLS FOR GRADUATE SUCCESS: PERCEPTIONS OF THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract

The higher education institutions (HEIs) have been construed as a hub where skilled labour is produced for societal and global consumption. This is premised on the fact that pedagogy delivered at this level is key in improving human capital which broadens employment opportunities among construction graduates. However, there seems to be disparate views about the skills required and those possessed by graduates from various HEIs in Nigeria. Consequently, a number of present day graduates are either underemployed or jobless. Through a structured questionnaire survey, this paper identifies the various skills that enable graduates to succeed in the Nigerian construction industry. The sample for this study consisted of one hundred and twenty-six (126) respondents drawn from professionals in the Nigerian construction industry. Factor analysis reveals five clusters as the expected skills for graduate success, listed in the order of importance as critical thinking and workplace skills, academic and management skills, personal skills, work ethics and business skills, and technical and leadership skills. The study suggests that for present day graduates to meet the needs of the construction industry, HEIs are required to identify various approaches of upscaling construction education. Present day students should also seek to improve their non-academic skills to a reasonable extent before they transit into the construction industry. The study, therefore, recommends that the Nigerian university curriculum should be revisited and revamped to reflect key courses that will improve the skills of students so as to enable them to meet the rising needs of the Nigerian construction industry.

Keywords: *Nigerian construction industry, graduate skills, construction education, higher education intuitions, employability.*

Contact: caigbavboa@uj.ac.za. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper. Also, the authors declare that the submitted paper is their original work and that, upon publication, nothing contained in it will not constitute an infringement of any copyright. Paper received **25.05.2017**. Approved **30.06.2017**. This paper is licensed under the Creative Commons Attribution-Non Commercial-No Derives 3.0. License. This paper is published with Open Access at www.socioeconomica.info.

1. Introduction

With the various challenges facing the Nigerian construction industry today, the importance of skilled graduates cannot be over-emphasised. More than ever, the country is in need of skilled professionals who can work intelligently and flexibly, and who are also responsive to the various economic, social, cultural, technical and environmental changes. The Nigerian construction industry requires graduates who have the hands-on skills and knowledge to function effectively in their designated roles. However, effectively contributing to the progress in the construction industry means more than just possessing an academic degree and requisite technical skills. It also means engaging with employers of the construction industry as this increases the awareness of the requirements of the various roles within the industry. In order to achieve this, the curricula of Higher Education Institutions (HEIs) must be intuitive and be shaped in such a way so as to be responsive to the needs and demands of this global change by equipping students with the right skills. These requisite skills are essential in helping the future construction professionals such as architects, engineers, and surveyors, amongst others, in successfully designing, supervising and handling key areas of the construction process order to achieve positive and timely results. The possession of these skills is also essential for improving the employability, flexibility and adaptability of the graduates, affording them the opportunity to fit seamlessly into the construction industry. It is therefore germane that construction educators tasked with the dissemination of knowledge provide high quality construction education which will better prepare graduates with the key skills and competencies the industry requires. Since construction education is aimed at developing graduates with both academic and non-academic skills, this study is aimed at identifying the key skills needed for construction graduates to succeed from the perspective of the Nigerian construction industry.

A substantial number of studies conducted by researchers across the globe have shown that construction industry employers prefer to recruit graduates who possess key employability skills (non-academic skills) in addition to academic qualifications. The study carried out in Ghana by Boateng and Ofori-Sarpong (2002) found that construction industry employers often value graduates who possess the basic skills and competencies which enable them to thrive. Similarly, in South Africa, the study by Pauw, Ooshuizen and Westhuizen (2008) highlighted that employers often seek graduates who possess soft skills and necessary workplace readiness. The ability to display these skills and competencies often helps construction graduates to excel during recruitment tests and opportunities. According to Pitan and Adedeji (2012), the HEIs in Nigeria have witnessed an unprecedented increase in the enrolment of students and the level of graduate unemployment. Hence, this study investigates those employability skills which employers of the Nigerian construction industry rate highly.

2. An overview of the Nigerian construction industry

For the country to accomplish its target objectives of 2020, urgent attention must be given to the construction industry sector that contributes a very low percentage to the nation's GDP (1.4% as at 2011). This was a result of failed government policies to live up to their promises of domesticating the economy through skills' empowerment and indigenous patronage. Ede (2011:153) states that for the government to achieve its target vision, five major elements need to be focused on for economic development and sustainable growth, namely capital resources, technology, innovations, adequate manpower, and infrastructural facilities.

Since the oil boom in the early seventies, the Nigerian construction industry has experienced several changes through the years, both in terms of complexity and the volume of its activities. Various activities, including the construction of buildings, bridges, dams, highways and sewage plants, have been carried out on a large scale. These activities of the industry in developing the built environment lead to the industry occupying a focal point in Nigeria's economic growth. The increase of technological innovation in industrial companies and operations has seen the need for training and the constant development of graduates to deal effectively with these dynamics (Onjewu 2005). It has been observed that in developing countries such as Nigeria, the quality of skilled graduates has not been able to meet the level of industrial activities and development. Therefore, for the Nigerian construction industry to be fully effective, there is an urgent need for graduates from HEIs to be adequately skilled to meet industry needs.

3. Skill requirements for graduates in the Nigerian construction industry

According to Fagbenle et al. (2012:1), the Nigerian construction industry is one of the biggest employers of the country's workforce, which signifies that it is labour intensive. It is widely known that one of the foremost resource inputs into the industry are construction skills. A skill is the capability to comfortably carry out a task to great effect. Adeyemo (2009) describes it as specific means of utilising capacities to achieve tasks in relation to societal or environmental demand. Skills are often divided into two kinds: (i) generic skills or transferable skills which are needed to function across various occupations, and (ii) vocational skills or technical skills which are needed to function effectively within an occupation. The term 'skills' mismatch' always arises in the construction industry context. It is understood as the various imbalances or gaps regarding skills which could be qualitative or quantitative in nature. It describes the difference between the ability of graduates and the employers' expected skill needs. There are various generic skills which industry employers seek in graduates in addition to an academic degree. These are decision-making skills, problem-solving skills, critical thinking skills, analytical skills, interpersonal skills, information technology skills (IT), numeracy skills, and learning skills, amongst others (Pitan, 2015). Studies have also shown that the possession of an academic degree gives the employers an idea of the background of the potential recruits as it displays the graduate's ability to be motivated and surmount various test and examination hurdles (Aluko, 2014).

The ability of the Nigerian construction industry to undertake and deliver complex and innovative industry projects is driven by the participation and involvement of highly skilled graduates from HEIs. It is a well-known fact that the country's economic and social problems can be drastically reduced by the influx of skilled graduates, thereby further encouraging national growth. Developed countries around the world have thrived on the development of HEIs and their activities to further improve the quality of life for the populace. Researchers such as Dabalen et al. (2000:3) and the National University Commission (2004) stressed that, apart from academic qualifications, industry employers require graduates with non-academic skills and competencies. According to them, the skills needed are good communication skills, personal skills, interpersonal skills, technical skills, and analytical skills, amongst others. These needs of the construction industry therefore suggest that it is not only seeking graduates with an academic degree, but rather graduates with the hands-on skills required for the fulfilment of the industry's needs. The only way to improve the employability of graduates is to ensure the upscaling of construction education as it empowers the youth to meet industry needs and ultimately eradicate poverty.

In recent times, it has been revealed that the responses from the Nigerian construction industry on the performance and skills' level of graduates from the HEIs have been dissatisfactory (Adebakin et al., 2015:117). They reiterate that graduates from HEIs possess theoretical knowledge and principles of the technical disciplines, but lack the technical skills, critical thinking and problem-solving abilities to address industry problems (Pitan & Adedeji, 2012:91-92; Akinyemi et al., 2012: 259). This has led construction industry employers to believe that academic standards have dropped considerably in recent times and that possessing a certificate is no longer a guarantee of possessing the necessary skills that the industry requires (Aliu & Aigbavboa, 2017). This assertion has led to HEIs graduates being commonly regarded as "half baked" (Pitan & Adedeji, 2012:91). This lack of non-academic skills among graduates has posed a serious problem to the nation as well as our higher educational system, thereby increasing the need for this study. It is also reported that construction industry employers are in search of graduates who are already skilled and job-ready because of the competitiveness of the market and the high cost of on-the-job training. More than ever, the country is in search of graduates who are responsive to the social, economic, technological and technical environment changes and who can work intelligently and display skills' competency across all fronts (Aliu & Aigbavboa, 2016). The highly skilled graduates the construction industry needs include architects, engineers, quantity surveyors, and builders, amongst others, and these are produced by the HEIs in Nigeria.

Generally, HEIs have been identified as the custodians of knowledge in training and developing the future workforce for the construction industry. They are responsible for imparting skills and developing the abilities of students as they prepare them for the world of work. Their activities in teaching, training, research, and collaboration with industry help contribute to national development. They are further identified as the conductors of applied research and initiators of innovation which are relevant to industries. The importance of HEIs in creating and upgrading the skills of graduates spurred the Nigerian Government on to create a university system.

Table 1 below presents a summary of some key skills which graduates need, according to the various sources of literature:

Table 1: Essential skills for graduates

IDENTIFIED SKILL	LITERATURE SUPPORT	FUNCTIONS
Communication skills	Washer (2007) Archer and Davidson (2008) Farooqui and Ahmed (2008)	i. Being able to speak with clarity and confidence
	Arain (2010) Graham et al. (2010) Jackson and Chapman (2012)	ii. Being able to write effectively
	Ma and Sun (2013) Matlay and Rae (2007)	iii. Possessing good listening abilities and responding in like manner
		iv. Utilising technology during presentation of ideas or reports

Ethical professionalism	Arain (2010) Mat and Zabidi (2010) Ma and Sun (2013)	i. Understanding the effects of economic and environmental factors on professional practice ii. Upholding building codes and regulations
Problem solving /Analytical/Critical thinking/ Creative/ Decision-making skills	Archer and Davidson (2008) Wickramasinghe and Perera (2010) Ahn et al. (2012)	i. Displaying creativity and practicality in solving industry problems ii. Being able to identify and analyse complex situations to achieve positive results iii. Being able to think widely and dig deeply to find alternative solutions to arising problems
Technical skills	Farooqui and Ahmed (2008) Arain (2010)	i. Being to understand construction and its operations ii. Being able to interpret construction and contract documents iii. Being able to analyse data using statistics
Inter-personal skills/Individual values	Russell et al. (2007) Arain (2010)	i. Being able to promote coordination and excellent working conditions ii. Exhibiting, hard work, enthusiasm, commitment and positive feelings
Leadership qualities	Russell et al. (2007) Graham et al. (2009) Arain (2010) Jackson and Chapman (2012)	i. Being able to lead a project team to achieve results ii. Exhibiting confidence and supervise team members
Adaptability	Arain (2010) Ma and Sun (2013)	i. Being able to self-adjust to changing industry situations ii. Remaining constantly updated with the trends in the construction industry
Technology skills	Christodoulou (2004) Russell et al. (2007) Arain (2010)	i. Possessing computer skills and knowledge of software ii. Being able to use latest technology to solve

			construction industry problems
Numeracy skills	Russell et al. (2007) Matlay and Rae (2007) Arain (2010) Durrani and Tariq (2012)	i.	Being able to carry out number functions such as estimating, costing
Teamwork/collaborative skills	Russell et al. (2007) Archer and Davidson (2008) Arain (2010) Jackson and Chapman (2012) Wickramasinghe and Perera (2010)	i.	Building good rapport with other people towards achieving common goals
Work experience	Callanan and Benzing (2004) Gault et al. (2010) Hopkins et al. (2011)	i. ii.	Possessing previous experience in the construction industry Displaying vast knowledge in handling construction responsibilities
Lifelong learning	Lees (2002) Washer (2007)	i.	Developing an inquiring mind and the continual yearning for attaining knowledge
Planning and organizational/time management skills	Archer and Davidson (2008) Farooqui and Ahmed (2008) Jackson and Chapman (2012)	i. ii.	Being able to maintain goals, think critically and work effectively to achieve timely results Being able to organise themselves to achieve set out tasks and be resourceful
Time management skills	Washer (2007) Archer and Davidson (2008) Farooqui and Ahmed (2008)	i.	Being able to plan and exercise conscious control of time to increase effectiveness

4. Research methodology

This study adopted the descriptive survey design. This design was deemed appropriate because it was effective in providing both quantitative and numeric description of the respondents on the issue of interest in the study. For this current study, the target population was construction professionals in the Nigerian construction industry, namely architects, builders, engineers, quantity surveyors, estate surveyors and valuers, land surveyors, and town planners. These construction professionals were selected because they are likely to have a considerable amount of knowledge in contributing to the objectives of this study. This study adopted the random sampling technique and it was preferred to the cluster sampling, stratified sampling or the sampling using multiple probability techniques. Because random sampling gives all the participants an equal chance to be selected for the study with the same criteria, this study was prompted to adopt this technique. The criterion for participation in this study was that each participant had to be a construction professional in the Nigerian construction industry. Most times this method is used when the target

population presents the same characteristics, or the sampling size is too large to represent the entire population efficiently, and each member of the entire population has an equal chance of being selected as a sampling respondent. Hence, a total of 126 respondents took part in this study. The main instrument of data collection was a structured questionnaire which was designed by the researchers following a review of extant literature. The instrument was validated by giving it to experts in the construction industry before using it for the study. In addition, focused group discussions were held with key stakeholders in HEIs, including construction lecturers and educators and curricula planners. The data collected was analysed using descriptive statistics.

Respondents were requested to indicate the degree of importance of each of the roles of collaboration between the higher education institutions (HEIs) and the construction industry in upscaling construction education, based on a five-point Likert scale (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5). One hundred and twenty-six completed questionnaires were received, signifying an 84% response rate. Findings from the 126 usable questionnaires revealed that a total of 98 males took part in the study which represents 77.8 % of the total population. A total of 22 (22.2%) females took part in the study.

Only 3.2 % of the respondents were between 21-25 years old; 10.3 % of the respondents were between 26 and 30; 13.5 % were between 31 and 35; 17.5 % were between 36 and 40; 23.0 % of the respondents were between 41 and 45 years old; 11.1 % were between 46 and 50 years old; 11.9 % were between 51 and 55 years old and 9.5 % of the respondents were above 56 years old.

It was revealed that 0.8 % of the total respondents had less than a year's work experience and 4 % had less than two years of work experience. It also revealed that 23.8 % had experience that ranged from three to five years; 27 % had experience in the range of six to ten years; 12.7 % had experience that ranged from 11 to 15 years; 17.5 % had experience that ranged from 16 to 20 years; 12.7 % had experience that ranged from 21 to 25 years and only 1.6 % of the respondents had more than 25 years of industry experience. The years of experience of respondents were sufficient to provide useful responses to achieve the purpose of the study as 95.3 % of the respondents for this study have over three years of work experience in the construction industry.

4.1 Data analysis

Factor analysis was used in establishing which of the variables could be measuring the same underlying effect. The procedure, findings and relevant discussion follows.

Factor analysis for graduate skills

Factor analysis is useful for identifying clusters of related variables and thus ideal for reducing many variables into a more easily understood framework (Norusis, 2006). Table 2 presents the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. In this study, the KMO value of 0.877 was recorded. This is considered sufficient to conduct a factor analysis as any value above 0.6 (the cut-off point) is considered acceptable (Eiselen et al., 2007).

Table 2: KMO and Bartlett’s test for graduate skills

Kaiser-Meyer-Olkin measure of sampling adequacy	0.877
Bartlett's test of sphericity	2534.491
Approx. chi-square	
Df	253
Sig.	0.000

Table 3: Communalities

	Initial	Extraction
B7.1 Communicate effectively in reading, speaking, listening and writing	0.511	0.319
B7.2 Work in a team	0.524	0.358
B7.3 Interpret construction documents e.g. drawings, schedules, bills	0.453	0.392
B7.4 Interpret contract documents e.g. tenders, building codes	0.666	0.618
B7.5 Show creativity in problem solving	0.727	0.641
B7.6 Lead responsibly	0.757	0.677
B7.7 Have sound understanding of numbers and related applications	0.717	0.671
B7.8 Display coordination in achieving industry tasks	0.733	0.669
B7.9 Think critically and work effectively	0.665	0.775
B7.10 Possess a sense of responsibility to society	0.737	0.666
B7.11 Exhibit interpersonal skills such as honesty and self -confidence	0.700	0.589
B7.12 Adapt to changing work environments	0.838	0.855
B7.13 Be conversant with various computer operations	0.872	0.846
B7.14 Possess business acumen	0.837	0.792
B7.15 Achieve tasks timeously with positive results	0.769	0.692
B7.16 Display willingness to learn	0.798	0.867
B7.17 Work with little supervision	0.722	0.557
B7.18 Understand different methods of project delivery	0.781	0.704
B7.19 Possess work experience prior to graduation (Internship)	0.794	0.716
B7.20 Possess general knowledge about local and global trends	0.873	0.849
B7.21 Possess sound/excellent academic record	0.874	0.884
B7.22 Possess good management skills	0.842	0.742
B7.23 Exercise professional judgment always	0.847	0.748

Extraction method: Principal axis factoring

Scree plot

An inspection of the scree plot in Figure 1 reveals a break after the fourth factor. The steep slope shows the large factors while the gradual trailing off shows the rest of the factors that have an eigenvalue lower than 1. Five clusters of factors are positioned on the steep slope and they were retained.

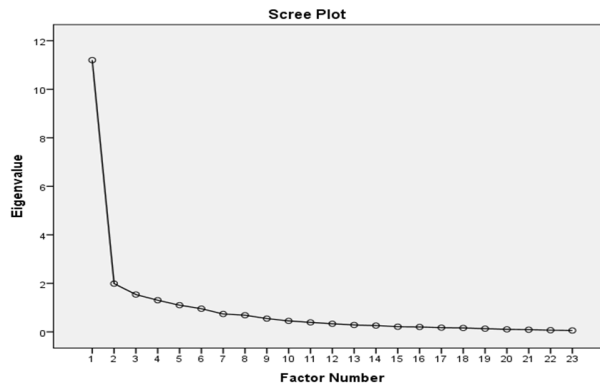


Figure 1: Scree plot for skills to enable graduates to succeed in the Nigerian construction industry

Total variance explained

Table 5 shows the number of graduate skill factors and their respective eigenvalues and obtained using Oblimin rotation. The eigenvalue and factor loading were set at conventional high values of 1.0. The latent root or Kaiser’s criterion of retaining factors with eigenvalues greater than 1.0 was employed. Hence, five clusters of factors with eigenvalues exceeding 1 were retained, resulting in 11.203, 1.990, 1.539, 1.305 and 1.100 selected which explains 47.441%, 7.497%, 5.366%, 4.327% and 3.307% of the variance respectively. This implies that the first cluster of skill factors accounted for 47.441% of the total importance expected skills required for industry success. In the same vein, the second cluster of skill factors accounted for 7.497%, the third cluster of skill factors accounted for 5.366%, the fourth cluster of skill factors accounted for 4.327% and the fifth cluster of skill factors accounted for 3.307%. These five clusters of skill factors together have a total cumulative percentage of 67.939% of the total importance which highlights their significance in terms of the twenty-three skill factors shown.

Table 4: Total variance explained

Factor	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.203	48.707	48.707	10.911	47.441	47.441
2	1.990	8.652	57.359	1.724	7.497	54.938
3	1.539	6.692	64.050	1.234	5.366	60.304
4	1.305	5.672	69.723	0.995	4.327	64.631
5	1.100	4.784	74.506	0.761	3.307	67.939
6	.955	4,153	78,660			
7	.738	3,209	81,868			
8	.688	2,991	84,860			
9	.549	2,385	87,245			
10	.452	1,967	89,212			
11	.391	1,699	90,911			
12	.335	1,454	92,366			
13	.285	1,241	93,607			
14	.261	1,136	94,742			
15	.213	,928	95,670			

16	.204	,886	96,556		
17	.175	,763	97,319		
18	.161	,702	98,021		
19	.134	,581	98,602		
20	,105	,455	99,057		
21	,091	,394	99,451		
22	,069	,301	99,752		
23	,057	,248	100,000		

Table 5: Pattern matrix

	Factor				
	1	2	3	4	5
B7.9 Think critically and work effectively	.841	,088	-,020	-,146	,034
B7.8 Display coordination in achieving industry tasks	.565	-,211	-,110	-,112	-,051
B7.7 Have sound understanding of numbers and related applications	.535	-,209	-,084	,066	-,279
B7.2 Work in a team	.371	-,071	-,113	-,064	-,164
B7.1 Communicate effectively in reading, speaking, listening and writing	.297	-,224	-,107	-,045	-,082
B7.21 Possess sound/excellent academic record	-,023	-.894	,109	-,068	-,112
B7.23 Exercise professional judgment always	,075	-.890	-,062	,031	,145
B7.20 Possess general knowledge about local and global trends	-,029	-.875	,073	-,067	-,093
B7.22 Possess good management skills	,087	-.854	,011	,002	,060
B7.19 Possess work experience prior to graduation (Internship)	-,082	-.736	-,062	-,040	-,152
B7.18 Understand different methods of project delivery	,023	-.559	-,324	-,061	-,059
B7.16 Display willingness to learn	,114	,098	-.903	-,020	-,047
B7.15 Achieve tasks timeously with positive results	-,010	-,081	-.756	-,088	,012
B7.17 Work with little supervision	,086	-,231	-.469	-,115	-,057
B7.12 Adapt to changing work environments	,043	-,001	-,118	-.889	,100
B7.13 Be conversant with various computer operations	-,132	-,096	-,190	-.769	-,097
B7.11 Exhibit interpersonal skills such as honesty and self - confidence	,224	,042	,124	-.675	-,061
B7.14 Possess business acumen	-,148	-,238	-,335	-.488	-,157
B7.10 Possess a sense of responsibility to society	,232	-,235	,160	-.467	-,191
B7.4 Interpret contract documents e.g. tenders, building codes	-,113	-,087	,009	-,054	-.763
B7.5 Show creativity in problem solving	,059	-,019	-,085	-,051	-.701
B7.3 Interpret construction documents e.g. drawings, schedules, bills	,060	,039	,059	,012	-.639
B7.6 Lead responsibly	,194	,028	-,313	,004	-.562

Extraction method: Principal axis factoring

Rotation method: Oblimin with Kaiser normalization

a. Rotation converged in 12 iteration.

Factor analysis reporting the five cluster graduate skill factors

- i. Five items loaded onto Factor 1. It is evident from Table 7 that these five items all relate to critical thinking and displaying work-place abilities needed to achieve construction industry success. This factor loads ‘think critically and work effectively’, ‘display coordination in achieving industry tasks’, ‘have sound understanding of numbers and

- related applications’, ‘team work’ and ‘communicate effectively in reading, speaking, listening and writing’. This set of skills involves the ability of graduates to achieve quality results through well-articulated and conveyed ideas. The possession of this group of skills is fundamental in contributing solutions to project-based problems and contributing to the growth of the construction industry. Thus, they were labelled ‘**Critical thinking and workplace skills**’. With a total variance of 47.441% of the total variance, this set of graduate skills was identified as the most important for construction industry success.
- ii. A total of six items loaded onto Factor 2. Table 7 shows that these six items relate to possessing industry knowledge from an academic perspective. Most of these skills here can be improved during academic programmes through the provision of courses to relate their importance. This factor loads ‘possess sound/excellent academic record’, ‘exercise professional judgment at all times’, ‘possess general knowledge about local and global trends’, ‘possess good management skills’, ‘possess work experience prior to graduation (internship)’ and ‘understand different methods of project delivery’. This factor was labelled ‘**Academic and management skills**’. With a total variance of 7.497% of the total variance, this set of graduate skills is important but was ranked low in respect to other graduate skills.
 - iii. From Table 7, it is clear that the three items that loaded onto Factor 3 relate to skills that are inherent in certain individuals. This factor loads ‘display willingness to learn’, ‘achieve tasks timely with positive results’ and ‘work with little supervision’. This factor was labelled ‘**Personal skills**’ with a total variance of 5.366%.
 - iv. According to Table 7, a total of five factors loaded onto Factor 4 which relates to various work values that create a certain professional awareness among graduates to achieve industry success. This factor loads ‘adapt to changing work environments’, ‘conversant with various computer operations’, ‘exhibit interpersonal skills such as honesty and self-confidence’, ‘possess business acumen’ and ‘possess a sense of responsibility to society’. With a total variance of 4.327%, this factor was labelled ‘**Work ethics and business skills**’ with a total variance of 4.327%.
 - v. Items for Factor 5 represent the various skills that graduates are to possess to meet the increasing needs of the construction industry. This factor loads ‘interpretation of contract and construction documents’, ‘displaying creativity in problem solving’ and ‘exhibiting leadership skills’. With a variance of 3.307%, this factor was labelled ‘**Technical and leadership skills**’.

Table 6: Reliability of the factors of the expected skills for graduate success

Cluster factors	Cronbach’s alpha coefficient
Factor 1 – Critical thinking and workplace skills	0.837
Factor 2 – Academic and management skills	0.944
Factor 3 – Personal skills	0.848
Factor 4 – Work ethics and business skills	0.904
Factor 5 – Technical and leadership skills	0.819

Table 7: A summary of the skills with selected factors

Cluster factor groupings	Factor loadings	Eigen values	Percentage of variance	Mean
<i>Factor 1 – Critical thinking and workplace skills</i>				
		11.203	47.441	4.40
Think critically and work effectively	0.841			4.40
Display coordination in achieving industry tasks	0.565			4.26
Have sound understanding of numbers and related applications	0.535			4.26
Work in a team	0.371			4.35
Communicate effectively in reading, speaking, listening and writing	0.297			4.71
<i>Factor 2 – Academic and management skills</i>				
		1.990	7.497	4.20
Possess sound/excellent academic record	-0.894			4.14
Exercise professional judgment always	-0.890			4.21
Possess general knowledge about local and global trends	-0.875			4.21
Possess good management skills	-0.854			4.26
Possess work experience prior to graduation (Internship)	-0.736			4.19
Understand different methods of project delivery	-0.559			4.21
<i>Factor 3 – Personal skills</i>				
		1.539	4.327	4.29
Display willingness to learn	-0.903			4.28
Achieve tasks timeously with positive results	-0.756			4.29
Work with little supervision	-0.469			4.29

Factor 4 – Work ethics and business skills	1.305	7.497	4.24
Adapt to changing work environments	-0.889		4.31
Be conversant with various computer operations	-0.769		4.21
Exhibit interpersonal skills such as honesty and self-confidence	-0.675		4.35
Possess business acumen	-0.488		4.06
Possess a sense of responsibility to society	-0.467		4.26
Factor 5 – Technical and leadership skills		3.307	4.32
Interpret contract documents e.g. tenders, building codes	-0.763		4.37
Show creativity in problem solving	-0.701		4.29
Interpret construction documents e.g. drawings, schedules, bills	-0.639		4.33
Lead responsibly	-0.562		4.31
Total variance explained		70.069	

5. Discussion of results

From the factor analysis, five factors emerged and they are discussed as follows:

Cluster Factor 1 - CRITICAL THINKING AND WORKPLACE SKILLS

The five extracted items loaded onto cluster factor 1 were ‘think critically and work effectively’ (0.841), ‘display coordination in achieving industry tasks’ (0.565), ‘have sound understanding of numbers and related applications’ (0.535), ‘team work’ (0.371) and ‘communicate effectively in reading, speaking, listening and writing’ (0.297). This cluster accounted for 47.441% of the variance. These loaded items all relate to critical thinking and displaying work-place abilities needed to achieve construction industry success, as stated by Love et al. (2002); Archer and Davison (2008), and Wickramasinghe and Perera (2010). This set of skills

involves the ability of graduates to achieve quality results through well-articulated and conveyed ideas. Considering the dynamics of the 21st century construction industry, it is important that graduates of today possess critical thinking skills as these lead to creativity and practicality in solving construction industry problems (Jackson & Chapman, 2012; Pitan, 2015:31). Critical thinking skills provide graduates with the ability to identify and analyse problems arising in complex situations to achieve positive results (Ahn et al., 2012). Graduates who possess this skill can proffer ideas and alternative solutions to construction industry challenges and display coordination in completing construction industry tasks (Jackson & Chapman, 2012). Also, in working effectively in the construction industry, it is essential for graduates to possess numeracy skills (Russell et al., 2007; Pitan, 2015:31). Possessing this skill involves the ability to carry out number functions effectively, understand mathematical techniques such as estimation and approximation, and understand basic finance (Durrani & Tariq, 2012; Washer, 2007:62). Teamwork or collaborative skills improve communication among members (Archer & Davidson, 2008) and improve job performance (Love et al., 2002). Teamwork skills also help graduates to assume various roles within the construction industry to achieve solutions in an ethical and professional manner (Russell et al., 2007; Arain, 2010; Ahn et al., 2012). This skill further enables graduates to work productively with people from different races, ages, cultures, genders and lifestyles (Jackson & Chapman, 2012). The importance of communication skills cuts across all levels of employment in the construction industry. The capacity to communicate effectively and clearly is a requisite skill for construction industry success (Archer & Davidson, 2008; Farooqui & Ahmed, 2008; Arain, 2010; Pitan, 2015:31). The construction industry is a vibrant industry which is built on relating with team members and professionals alike which highlights the need for communication skills (Love et al., 2002; Ahn et al., 2012). This entails speaking with clarity and confidence, the ability to write effectively, the ability to possess listening skills and respond in like manner, and the ability to use non-oral skills (Love et al., 2002; Archer & Davison, 2008; Wickramasinghe & Perera, 2010). The possession of this group of skills is fundamental in contributing solutions to project-based problems and contributes to the growth of the construction industry.

Cluster Factor 2 - ACADEMIC AND MANAGEMENT SKILLS

The six extracted items loaded onto cluster factor 2 were ‘possess sound/excellent academic record’ (0.894), ‘exercise professional judgment always’ (0.890), ‘possess general knowledge about local and global trends’ (0.875), ‘possess good management skills’ (0.854), ‘possess hands-on project experience prior to graduation’ (0.736) and ‘understand different methods of project delivery’ (0.559). This cluster accounted for 7.497% of the variance. These loaded items all relate to academic and management skills, as discussed by Dabalén et al. (2000:3) and Finch et al. (2013:685). Most prospective employers in the construction industry tend to value graduates who possess sound academic qualifications as it is a performance indicator which reflects the graduates’ resilience (Love et al., 2002; Finch et al., 2013:692). Their academic performance can be a major factor when securing a job in the construction industry. Arain (2010:46) also admits that graduates who are academically sound demonstrate a capacity to learn informal and formal methods to extend their knowledge base when addressing arising challenges. This capacity to learn further improves their general knowledge about local and global trends (Russell et al., 2007) and their ability to make decisions (Jackson & Chapman, 2012). According to Love et al. (2002:7), the ability to exercise professional judgment is developed by practical job experience and construction site experiential learning. These work experiences provide students

with a better view of the various construction methods, materials, and realities of the construction industry (Ross & Elechi, 2002:298-299). Moreover, possessing hands-on project experience prior to graduation also updates the students with the needs and expectations of the construction industry (Omar et al., 2008) and improves the students' rapport with construction industry professionals (Mihail, 2006:29; Tatum, 2010:186-187). Furthermore, the opportunities presented to students during this period of training prepare them for understanding various concepts in construction operations regarding project delivery and project management (Arain, 2010).

Cluster Factor 3 – PERSONAL SKILLS

The three extracted items loaded onto cluster factor 3 were 'display willingness to learn' (0.903), 'achieve tasks timeously with positive results' (0.756) and 'work with little supervision' (0.469). This cluster accounted for 5.366% of the variance. These loaded items all relate to personal values or skills as discussed by Samavedham and Ragupathi (2008:4) and Wickramasinghe and Perera (2010). It is important that graduates, whether experienced or not, possess this set of values or behaviours as they are essential in enhancing productivity in the construction industry. Personal attributes also help to promote harmony and excellent working conditions. These include time management, hard work, enthusiasm, loyalty, reliability, commitment, and positive feelings (Arain, 2010; Ayarkwa et al., 2012; Finch et al., 2013). The growing pace of activities in the construction industry requires graduates who possess the ability to develop cultural competence and exhibit self-confidence in dealing with the challenges that come with industry activities (Samavedham & Ragupathi, 2008:4; Jackson & Chapman, 2012). This set of skills also highlights the ability to display willingness to learn, work under pressure and work with little supervision (O'Leary, 2016:3). Other examples of these skills are self-efficacy, self-awareness, lifelong learning, self-discipline and work-life balance which are all necessary to build relationships and display social sensitivity (Jackson & Chapman, 2012; Farooqui & Ahmed, 2009). Furthermore, the ability to develop an inquiring mind to receive new ideas is identified in a study by Washer (2007) as a personal skill.

Cluster Factor 4 – WORK ETHICS AND BUSINESS SKILLS

The five extracted items loaded onto cluster factor 4 were 'adapt to changing work environments' (0.889), 'be conversant with various computer operations' (0.769), 'exhibit interpersonal skills such as honesty and self-confidence' (0.675), 'possess business acumen' (0.488) and 'possess a sense of responsibility to society' (0.467). This cluster accounted for 4.327% of the variance. These loaded items all relate to work ethics and business skills as discussed by Samavedham and Ragupathi (2008:4) and Wickramasinghe and Perera (2010). 'Adapting to changing work environments' emerged as the highest factor in this grouping and conforms to the study by Tatum (2010) who highlights the dynamism of the construction industry. Factors such as technology, innovations, increased global competition, and construction projects sophistication constantly make the construction industry unpredictable (Tatum, 2010:184-185). Regarding self-adjusting to the ever-changing work environment, there is a need for graduates to possess adaptability skills (Love et al., 2001; Ahn et al., 2012).

Considering the technological trends in the construction industry, 'possessing technology skills' also loads high in this grouping. Possessing these skills involves knowledge of various computer skills and software, willingness to re-train and adapt to rapid technological changes and apply recent technological knowledge to manage construction projects (Archer & Davidson, 2008;

Ahn et al., 2012). In the technologically-driven 21st century construction industry, the possession of these skills helps graduates stay competitive, manage information competently and use a range of methods to explore, develop, and exchange information (Washer, 2007:61; Arain 2010; Ahn et al., 2012). The capacity to apply technology to solve emerging problems gives graduates an edge in the construction industry (Russell et al., 2007). Additionally, the interactive nature of the construction industry makes interpersonal skills important as graduates are required to deal with people at technical, operational and strategic levels (Ahn et al., 2012:128). Apart from communicating clearly and concisely, this set of skills helps build networks, and promotes coordination and excellent working conditions in the construction industry (Love et al., 2002:4). This set of skills also helps graduates to apply knowledge of business processes and understand the financial requirements of core business practices (Arain, 2010). Findings also reveal that possessing business acumen is requisite for graduates to succeed in the construction industry. These findings were similar to the findings by Jackson and Chapman (2012). Furthermore, possessing a sense of responsibility is another key skill graduates need. It involves graduates behaving in a way that is morally and socially responsible and always accepting the responsibility for actions and project outcomes (Jackson & Chapman, 2012).

Cluster Factor 5 – TECHNICAL AND LEADERSHIP SKILLS

The four extracted items loaded onto cluster factor 5 were ‘interpretation of contract (0.763) and construction documents’ (0.639), ‘displaying creativity in problem solving’ (0.701) and ‘exhibiting leadership skills’ (0.562). This cluster accounted for 3.307% of the variance. These loaded items all relate to technical and leadership skills as discussed by Arain (2010) and Ayarkwa et al. (2012). ‘Interpretation of contract and construction documents’ emerged as the highest factor in this grouping and conforms to the study by Farooqui and Ahmed (2009) which highlights the importance attached to this skill by the construction industry. This is in line with the fact that the construction industry is built around different types of contracts. This skill is essential for graduates as it enhances their knowledge of the construction industry’s varying codes and regulations as well as their ability to interpret construction documents (Arain, 2010:46; Ayarkwa et al., 2012; Farooqui & Ahmed, 2009). This skill also involves possessing knowledge of construction processes, methods, materials, planning, scheduling, and equipment as appraised by Ahn et al. (2012).

In addition, the capacity to proffer solutions to solve emerging construction industry problems is another skill that was grouped in this cluster factor. Washer (2007) and Finch et al. (2013) all state that possessing this skill enables graduates to display creativity and practicality in the face of construction industry challenges. The skill also highlights the ability of graduates to think critically, analyse situations, come up with ideas and provide alternative solutions to industry problems (Archer & Davidson, 2008; Wickramasinghe & Perera, 2010; Jackson & Chapman, 2012; Pitan, 2015:31). This skill further incorporates a range of other competencies, including creativity (Kilgour & Koslow, 2009), critical thinking skills (Reid & Anderson, 2012) and leadership skills. The ability to lead a project and understand basic theories on leadership is another skill that was loaded onto this grouping. According to Ahn et al. (2012), graduates who possess leadership skills effectively bring out the best in people and help motivate team members to achieve common goals. A good leader in the construction industry provides vision and guidance, strives for team members’ satisfaction and builds good relationships to achieve success (Arain, 2010).

Implication of findings

The theoretical review is consistent with the empirical findings of this research study. This is evident from the empirical findings which revealed that the respondents considered critical thinking and workplace skills as the most important skills necessary for graduates to effectively meet the growing needs of the Nigerian construction industry. These skills involve critical thinking skills, numeracy skills, teamwork skills, and communication skills. The literature reviewed has noted the role these skills plays in helping graduates thrive in the world of work. The dynamism of the 21st century construction industry today requires graduates to possess this set of skills as it provides creativity and practicality in solving Nigerian construction industry problems. In further meeting the needs of the Nigerian construction industry, it is crucial that graduates of today possess hands-on project experience prior to graduation as work activities update students with the needs, expectations and realities of the construction industry. These work opportunities further provide graduates with ample understanding of various concepts in construction operations regarding project delivery and project management.

Given the competitive nature of the Nigerian construction industry today, it is essential for construction students to have a résumé that includes actual industry exposure which gives them an added advantage. The empirical findings further revealed that apart from possessing a sound academic record, most prospective employers in the Nigerian construction industry today require graduates to possess other non-academic skills such as personal skills, technical skills and leadership skills. With the growing pace of activities in the Nigerian construction industry, employers seek graduates who possess the ability to develop cultural competence and exhibit self-confidence in dealing with the challenges as these are essential in enhancing productivity in the construction industry. With regard to technological innovations, increased project-based works and the need for improved and timeous results, the construction industry of today further seek graduates with sound technical knowledge. Hence, it is imperative that HEIs around the country integrate more construction experience into their curricula to better equip the future employees of the Nigerian construction industry.

6. Conclusions and recommendations

The main purpose of the study was to identify the skills that are prerequisite to enable graduates to succeed in the Nigerian construction industry. From the study, it is clear that the Nigerian construction industry is continually evolving because of new trends, increased project-based works, new (?) technologies and improved delivery methods which increase its need for adequately skilled construction graduates. It is well known that possessing an academic degree is no longer a guarantee for present-day construction graduates to deal with industry problems effectively in the Nigerian construction industry. Present-day employers seek graduates who, in addition to academic skills, possess non-academic skills such as technical skills, problem-solving skills, critical thinking skills, numeracy skills, teamwork skills, management skills, and communication skills, amongst others, to solve rising construction industry needs. Given the economic and political challenges of our times, students will also need plenty of work experience to develop and fine-tune their 21st century skills to become better problem solvers and more creative innovators. For students, graduating without the prerequisite skills necessary to thrive in the industry not only disadvantages them but also thwarts the increasing expectations of the Nigerian construction industry. Therefore, the curricula of HEIs need to strike a sufficient balance

between theoretical knowledge and work reality to provide a holistic approach in the upscaling of construction education.

There were a few limitations during the execution of this research study. Firstly, the researcher was able to collect data from construction professionals based in only two cities in Nigeria, namely Abuja and Lagos. This study did not include construction professionals from other states in Nigeria as this research was conducted on a limited budget. As one of the most populous countries in the world, Nigeria is made up of 36 states and the Federal Capital Territory, so that visiting all states across the country to obtain data and figures would be both time-consuming and financially demanding. Hence, the findings from this research study cannot be generalised to the greater population. To do so, the study would need to have been conducted on a more diverse sample from across Nigeria to make it more representative. Selecting a larger, more diverse sample may also counter any potential bias that may result from a self-administered questionnaire.

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