INFRASTRUCTURE PROCUREMENT SKILLS GAP AMONGST PROCUREMENT PERSONNEL IN NIGERIA'S PUBLIC SECTOR

Purpose - Procurement of public infrastructure that is fit for purpose partly depends on the competencies of procurement personnel. In many developing countries in Sub-Saharan Africa, including Nigeria, there is a deficit in the quantity and quality of infrastructure and their procurement is further riddled with deficiencies in the capacity of public procuring entities. It is, however, unclear from the extant literature, what are the critical skills development needs of public personnel involved in the procurement of infrastructure in Nigeria.

Design/methodology/approach – Based on a quantitative research strategy, this study sought to address the knowledge gap through a survey of public infrastructure procurement personnel (*n*=288) in different tiers of government (i.e. state and local government) and geopolitical contexts (north and south) in Nigeria.

Findings - Of the 45 procurement skill areas operationalised, there is need for further development in 38 of them including: computing/ICT; problem solving; communication; decision making; health and safety management; quality management; relationship management; team building; project monitoring and evaluation; time management; and procurement planning.

Originality/value - A key implication of this study is for policy makers in state and local government to formulate and implement infrastructure procurement capacity development reforms that address the competency gaps of procurement personnel. Such reforms need to take into account the suitable methods for developing procurement competencies. Additionally, the procurement skill areas operationalised in this capacity assessment study could serve as a useful blueprint for studying capacity deficiencies amongst public infrastructure procurement personnel in other developing countries.

Keywords: Developing country; procurement skills; infrastructure; Nigeria; sub-Saharan Africa.

Introduction

Whilst the provision of municipal services is crucial to the attainment of the United Nations Sustainable Development Goals (SDGs), such as the provision of good health and well-being, clean water and sanitation, quality education, and affordable and clean energy for urban populations and communities (United Nations Economic and Social Council, 2016), it is dependent on the effective procurement of critical infrastructure, such as water and waste treatment, power generation, transport, health, and educational infrastructures. In developing countries, especially in Sub-Saharan Africa, there is a deficit in the quantity and quality of these infrastructures (see South Africa's National Infrastructure Plan (Presidential Infrastructure Coordinating Commission, 2012)). The situation in Nigeria is not dissimilar (African Development Bank (AfDB), 2013).

Besides the deficits in infrastructure in Nigeria, their procurement is further riddled with an array of challenges including deficiencies in the capacity of public procuring entities

(World Bank, 2013). It has been estimated that by 2025 global construction output would increase by 70% to USD$15 trillion (Global Construction Perspectives and Oxford Economics, 2013). Part of this unprecedented growth is expected to be experienced in developing countries as investments are made to address infrastructure deficits. Given that public procurement is one of the important vehicles for realising infrastructure assets that are intended to deliver socio-economic benefits, it is paramount that attention is given to the procurement capacity of public procurement entities. This study aimed to establish the critical gaps in the skills of public personnel involved in the procurement of public infrastructure in Nigeria.
In the sections that follow, a review of Nigeria's infrastructure outlook and public procurement is presented. The review is extended to cover procurement capacity literature, in particular skills, in order to draw out procurement skills and methods of skills development. Subsequent to this, the research strategy applied in this study, the ensuing findings, discussion, implications and concluding remarks are given.

Nigeria's Infrastructure Outlook and Public Procurement

Nigeria's infrastructure deficit remains high despite capital investment of up to US$5.9 billion per year, as well as programmes such as the National Integrated Infrastructure Master Plan (NIIMP), which is estimated to cost US$2.9 trillion over the next 30 years (Veitch, 2014). The state of Nigeria's infrastructure remains poor and has resulted in poor municipal service delivery (Agu and Onodugo, 2009; Foster and Pushak, 2011). For example, as a result of acute shortages in power generation infrastructure, the average per capita consumption of electricity is only about 150kWh per annum compared to the UK average of 5,500kWh (Veitch, 2014). Furthermore, small scale renewable energy generation has not been adequately exploited in Nigeria (AfDB, 2013). Housing deficit in Nigeria is estimated at 17 million units (Veitch, 2014). With regards to transportation, only 18% of Nigeria's estimated 197,000 km of roads is paved; and about 53 percent of the rural population live more than two km away from an all-season road (AfDB, 2013). The state of water, sanitation, education and health infrastructure is also regarded as poor due to years of neglect and ineffective allocation of resources for their procurement (Foster and Pushak, 2011). In order to stimulate the required socio-economic growth there is a need for sustained investment through procurement across all levels of government (i.e. Federal, State and Local Government). Evidence, however, points to procurement capacity deficiency in Nigeria (World Bank, 1995, 2000; Agu and Onodugo, 2009; Adewole, 2014).

The evolution of procurement practices in Nigeria and other developing countries has been on the back of the enactments of legal and regulatory frameworks to improve on previously unregulated and ineffective procurement procedures (Adewole, 2014). Developments that led to the evolution in the public procurement regime in Nigeria include the World Bank's (2000, pp. 26-30) procurement assessment, which identified challenges in public procurement including: "proliferation and ineffectiveness of tender boards; lack of professionalism in the execution of the procurement functions; weaknesses in bank financed projects; excessive deposit for opening of letters of credit; lack of communication strategy; weaknesses in the export, import and tariff procedures; lack of streamlined quality control practices; and lack of knowledge in electronic procurement in the public sector".

To alleviate these challenges, attention has mainly focussed on the formulation of regulatory and legal frameworks to ensure transparency, accountability, anti-

corruption and the achievement of assets that are fit for purpose. Prominent amongst the legal frameworks is the Public Procurement Act 2007 (PPA 2007). The PPA 2007 harmonises existing government practices and policies for public procurement. It has 13 parts and 61 sections, with the broad aim of dealing exhaustively with all issues related to transparency and integrity in public procurement. Despite promotion of the PPA 2007 by the federal government, donor and civil society organisations, it has not been enacted by all the states in Nigeria (Adewole, 2014).

Procurement Capacity

Procurement capacity or capability development has been described by the United Nations (UN) as the process through which individuals, organisations and societies obtain, strengthen, and maintain the capabilities to set and achieve their own development objectives over time (United Nations Development Programme (UNDP), 2010). Procurement capacity can be conceptualised as comprising three interconnected facets: individual; organisational; and environmental/national (see Organisation for Economic Co-operation and Development (OECD) and World Bank 2004; UNDP, 2010). The individual facet, which is pertinent to this study, looks at the skills, knowledge and experience of procurement personnel.

Individual capacity is regarded as a critical aspect of a public agency's procurement function (Lamptey and Elle, 2000). The increasing scope of procurement requires a workforce with the requisite skills, as well as knowledge of trends in the technologies necessary for managing modern procurement (Addo-Duah *et al*., 2014). The World Bank (2003) has drawn a link between the reliance on untrained procurement staff and the misapplication of the procurement procedures and sometimes unethical practices in procurement systems in developing countries. According to Appiah (2011), no matter how robust the regulation or law on public sector procurement, its effective application depends largely on a trained and skilled workforce. Attempts to determine and develop skills to meet changes in public sector procurement practice are not a recent phenomenon (Addo-Duah *et al*., 2014). Yet, there is no global "one-stop-shop" or central reference point of procurement skills for consistency in terms of capability development policy (Giunipero and Pearcy, 2000). Nevertheless, several skills have been proposed to meet the needs of the changing role of procurement. Modern procurement requires skills related to market focus, value derivation, life cycle thinking, sustainability and the application of information technology (Giunipero *et al.,* 2006; Basheka, 2010; Addo-dual *et al.,* 2014). Consequently, skills required for procurement have become increasingly multi-disciplinary and cut across technical, strategic, interpersonal and managerial skills (Tassabehji and Moorhouse, 2008). Table 1 offers a list of skills (drawn from various literature sources) required to meet these modern expectations of procurement.

Despite the requirement of Nigeria's Bureau of Public Procurement (BPP) to organise training and human resource development programmes for procurement personnel (see PPA, 2007), it is unclear what skills deficiencies exist, as well as the most appropriate methods for their development. The approaches listed in Table 2 have been suggested within procurement capacity literature for acquiring and updating knowledge and skills for modern procurement.

Table 1: Skills for Procurement

[Insert Table]

Table 2: Methods for Skills or Competency Development

[Insert Table]

Methodology

Aligned to the study's aim, the study sought to gain a generic view of the skills development needs of public personnel involved in the procurement of infrastructure in Nigeria. In such instance, Fellows and Lui (2008) and Creswell (2009) explain that quantitative research, as opposed to qualitative research which is aligned to the provision of meaning of phenomenon, is most appropriate as quantitative research is suitable for obtaining a generalised view of a phenomenon. Consequently, a quantitative research strategy, particularly a survey was adopted. The use of a quantitative strategy for this study implied that the key phenomenon under investigation (i.e. procurement capacity needs) was being viewed as a "single reality" which can be observed and assessed objectively. Qualitative approaches are more concerned with the discovery of subjective reality and feelings (Fellows and Liu, 2008), thus being unsuitable for the study's aim. Furthermore, quantitative survey has been the preferred approach for similar procurement capacity investigations (e.g. Basheka, 2010; Addo-Duah et al., 2014). In this study, the use of a cross-sectional survey thus enabled the capture of the experiences and perceptions of a wide range of public personnel who are involved in the procurement of infrastructure. Details of the survey design are presented below.

Survey design

A questionnaire was designed for the survey. It consisted of three main parts:

Part 1 - Background Information: This part was designed to capture respondents' background information, as well as the public agencies they work for. The individual background information solicited included procurement role, experience in role, experience in procurement of infrastructure, the types of infrastructure respondents are involved in their procurement, type of respondents' organisation (i.e. state or local government agency), and location of the organisation (northern or southern geopolitical zone). Type of organisation was important to consider due to indication in the literature that there are differences in the capacity of different tiers of government agencies in Nigeria (Adewole, 2014). Also, personnel in procurement entities in different geopolitical locations (north and south Nigeria) was worthy of consideration to enable comparative exploration of skills gap, i.e. whether personnel in a location have greater skill deficiencies than those in another location.

Part 2 - Infrastructure Procurement Skills Gaps: This part was two-pronged. The initial section inquired into the procurement personnel's perceptions regarding the importance of a list of procurement skills, and the subsequent section examined their development needs regarding the procurement skills/competencies. Drawing from the literature, 45 skills (shown by Table 1) were operationalised. For the initial section a five-point Likert scale *(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 =*

strongly agree) was used to ascertain the extent to which the personnel agree that the skills are important to the discharge of their procurement role. For the second section, a five-point Likert scale (i.e. *1 = not required at all; 2 = slightly required; 3 = moderately required; 4 = required; and 5 = highly required*) was also used to ascertain the extent to which personnel require further development in each of the 45 skills. This was to establish the critical gaps in the skills of public personnel involved in the procurement of infrastructure.

Part 3 - Approaches for Procurement Skills Development: This part sought to identify the most appropriate methods for the development of infrastructure procurement skills. Drawing from the literature, 15 skills development methods (shown by Table 2) were operationalised. Respondents were asked to indicate on a five-point Likert scale (i.e. *1 = not suitable at all; 2 = slightly suitable; 3 = moderately suitable; 4 = suitable; and 5 = highly suitable*) the extent to which each of the 15 methods are suitable for developing their procurement skills needs. Additionally, respondents were asked to indicate whether they have participated in any procurement related career development activities in the past two years.

Two state locales in Nigeria were used for the study: Kaduna State (in northern Nigeria) and Oyo State (in southern Nigeria). These locales were selected for being homes to major cities in Nigeria (Kaduna city and Zaria in Kaduna State, and Ibadan in Oyo State). Additionally, development plans for the states have highlighted acute infrastructure deficits (Oyo State Government, 2010; Kaduna State Government, 2013). The survey was administered from July – September 2016 by hand delivery to personnel involved in infrastructure procurement within local government authorities' works departments, as well as within state ministries and agencies. It was expected that such personnel would include a range of built environment and procurement personnel e.g. urban/town planners, architects, civil/structural engineers, quantity surveyors, project managers, electrical engineers, and personnel acting in the capacities of project sponsors, senior responsible owners and investment decision makers who are often involved in the initiation, planning, design/specification, execution, and evaluation phases of municipal infrastructure procurement. Overall, 373 questionnaires (comprising 195 in the north, and 178 in the south) were administered and 117 (for the north) and 178 (for the south) were retrieved by hand collection. Following screening of the questionnaire and missing data analysis, 7 of the southern questionnaires were excluded. The effective sample sizes and response rates are: north – 117 and 60.0%; south - 177 and 96.1%; and overall sample - 288 and 97.6%.

Data analysis

The questionnaire data were coded into IBM SPSS Statistic 23 for analysis. SPSS was used to undertake descriptive statistical analyses (e.g. frequencies, mean and standard deviation) and inferential statistical analyses – t-tests. T-test allows the statistical examination of two sample means (Field, 2013), and has been applied in previous studies examining critical competencies of construction professionals (See Ahadzie *et al.,* 2008). In this study, the one-sample t-test was carried out to determine whether the sample population considered a specific skill or method of acquiring the skill to be important or otherwise as well as determine skills requiring further development in the opinion of procurement professionals. The null hypothesis for assessing important procurement skills was that the skill is not important (H_0:$U = U_0$)

and the alternative hypothesis was that the skill was important (H_a:$U > U_0$), where U_0 is the population mean (U_0 was fixed at 3.5, drawing from Ling, 2002 and Ahadzie *et al.,* 2008). Thus, based on the five-point Likert rating scale *(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)*, a skill was deemed to be important if it had a mean score that is significantly greater than 3.5 (which approximates to 4 i.e. "agree" that a skill is important). Similarly, the one-sample t-test (with test value 3.5) was applied to establish the skills in which further development is required. Thus, based on the five-point Likert rating scale *(i.e. 1 = not required at all; 2 = slightly required; 3 = moderately required; 4 = required; and 5 = highly required),* a skill was deemed to require further development if it had a mean score that is significantly greater than 3.5 (which approximates to 4 i.e. "required" on the five-point scale). The same approach was also applied to ascertain the most suitable methods for developing the procurement skills needs. Furthermore, independent samples t-tests were conducted to enable the examination of the statistically significant variations in perceptions of skills development needs across different demographic sub groupings, particularly the different tiers of government and geo-political locations of the procurement personnel. The mean for each variable (i.e. skill and methods of acquisition of skills) including the associated standard deviation and standard error is also reported.

Findings

The findings of the data analyses are given below under three main sections: background information; procurement skills development needs; and suitable methods for developing procurement skills.

Background Information

A majority of the 288 respondents in the survey are engineers (35.1%), followed by quantity surveyors (12.8%), administrators (12.8%), architects (8.3%), builders (8.3%), other roles (6.3%), estate surveyors (5.2%), urban/town planners (4.9%), land surveyors (1.0%), purchasing officer/personnel (1.0%), and procurement officer/personnel (4.2%). The other roles include geologist, engineering technologist, hydrologist, accountant, agriculturist, and environmental health officer. A majority of the respondents (i.e. 82.9%) have been in their roles for over 5 years. The Mean experience in role is 13.48 years (standard deviation (SD) = 7.21). Similar to the experience in role, a majority of the respondents (i.e. 66.2%) have over 5 years of experience in procurement of infrastructure. The Mean experience in procurement of infrastructure is 9.51 years (SD = 6.166). The survey participants are mostly involved in the procurement of housing infrastructure (approximately 38%), followed by power generation and electricity infrastructure (approximately 26%), education infrastructure (approximately 23%), transport infrastructure (approximately 20%), water and sanitation infrastructure (approximately 16%), and health infrastructure (approximately 7%). The distribution of respondents within local government agencies and state government organisations is 52.1% and 47.9% respectively. The distribution of respondents in organisations in the south and north is 59.4% and 40.6% respectively.

Procurement Skills Development Needs

Results on the skills that are perceived by respondents to be important are shown in Table 3. From Table 3, the respondents are generally of the view that nearly all (93.3%) of the 45 procurement skills that were examined are important to their infrastructure procurement function. The topmost important skills include:

Communication (oral/written); Quality management; Project monitoring and auditing/evaluation; Team building; Decision making. The following were, however, not considered to be important to the procurement of infrastructure: *Application of international procurement law and procedures; Responsible sourcing/Green purchasing/Green procurement; and Cross cultural awareness*.

The survey ascertained respondents' deficient procurement skills. This was achieved through an assessment of the extent to which respondents felt they needed further development in each of the 45 skills examined by the survey. The results of a one-sample t-test are shown in Table 4. For 38 out of the 45 skills examined, there is need for further development. Amongst the topmost skills/competencies requiring further development are: *Computing /ICT; Problem solving; Communication (oral/written); Decision making; Health and safety management; Quality management, Relationship management; Team building; Project monitoring and auditing/evaluation; and Time management*. In the opinion of respondents, the skills that require least further development include: *Business case development; Responsible sourcing/Green purchasing/Green procurement; Cross cultural awareness; Application of corporate social responsibility procedures; Application of international procurement law and procedures; Stress management; and E-procurement.*

Independent-samples t-test was used to ascertain if there were statistically significant differences in the levels of development required for procurement skills/competencies between: (1) state level personnel and local government personnel; and (2) the procurement personnel in the north and the personnel in the south. The results are shown by Tables 5 and 6. For the sake of brevity only the significant results (i.e. where the p-value for the t-statistic is ≤ 0.05) are shown. From Table 5 the skills that were identified to be significantly more deficient amongst the state than local government personnel are: *Proposal evaluation*; *Procurement planning*; *Application of national procurement law and procedures; Application of modern integrated procurement procedures*; *Risk management; Responsible sourcing/Green purchasing/Green procurement;* and *Application of ethics guidelines in procurement.* Conversely, *Marketing* was found to be significantly more deficient among local government personnel than state government personnel. From Table 6 the skills that were identified to be significantly more deficient amongst the southern personnel than the northern personnel are: *Creative thinking*; *Business case development*; *Cross cultural awareness; Stress management; Environmental management; and Health and safety management.* Conversely, the only skill that was found to be significantly more deficient amongst the northern personnel than the southern personnel is: *Contract management and enforcement*.

Methods for Developing Procurement Skills

Respondents rated several methods of acquiring and updating procurement skills. A one-sample t-test was conducted to ascertain the methods perceived by respondents as being suitable for developing procurement skills. Methods with Mean scores that are statistically significantly greater than the test value of 3.5 were deemed suitable (see Ahadzie *et al*., 2008). From the test results (shown by Table 7) 11 out of 15 methods were deemed suitable by respondents. *Attendance of conferences and workshops* was the most suitable method followed by *Networking and sharing ideas*

with other professionals, *On-the-job-training*, *Further / Higher academic degree courses*, *and Work team retreats. Distant/Online learning, Apprenticeships, Internships and placements, and Job rotation or secondment* were not regarded as suitable by the respondents. Regarding participation in procurement career development, a limited proportion (i.e. about 25%) of the respondents alluded to having personally participated in any procurement related career development activities in the past 2 years.

Table 3: Important Skills for Infrastructure Procurement

[Insert Table]

Table 4: Skills Development Needs for Infrastructure Procurement

[Insert Table]

Table 5: Differences in Perceived Infrastructure Procurement Skills Development Needs - By Type of Organisation

[Insert Table]

Table 6: Differences in Perceived Infrastructure Procurement Skills Development Needs - By Location

[Insert Table]

Table 7: Suitable Methods for Development of Infrastructure Procurement Skills

[Insert Table]

Discussion

From Table 3, strategic skills (e.g. decision making and leadership) and interpersonal skills (e.g. communication and team building) are ranked amongst the most important skills in the opinion of public procurement personnel in state and local government agencies (SLGAs) in Nigeria. There appears to be a realisation of the changing role of procurement from technical and operational procedures towards more tactical and strategic functions. This is contrary to previous studies that have highlighted seemingly lack of appreciation of the changing role of procurement in developing countries (see Basheka, 2010; Addo-Duah *et al*., 2014). The study has revealed a relatively adept group of procurement professionals in the Nigerian context. However, despite their high recognition of the importance of the procurement skills investigated in this study, there is an apparent disregard for some procurement competencies that are generally viewed as critical to modern procurement, notably responsible sourcing/green procurement/green purchasing (see OGC, 2007; Glass, 2011; Mensah and Ameyaw, 2012; Upstill-Goddard et al., 2015).

In the opinion of the respondents, seven skill areas require the least further development (Table 4). From Table 3 these are also amongst those viewed as being the least important. This could thus explain why respondents do not consider the need for further development in the seven skills, rather than an interpretation that they feel competent in those skills. From the findings, the skill deficiencies cut across SLGAs and across personnel in the north and south. The types of deficient skills also cut across operational and strategic skills. Some key interpersonal skills also emerged as areas where public procurement staff require further development. These include *Communication*, *Team building*, and *Relationship management*. This suggests efforts to develop a cadre of highly skilled procurement professionals with the requisite technical and interpersonal skills since the commencement of procurement reforms

through the PPA 2007 may not have yet had the necessary impact on individuals at the state and local government levels. The findings, however, indicate that capacity challenges are still rife in state and local government infrastructure procurement entities even with regards to several technical skills e.g. *Quality management*, *Contract management and enforcement, Project monitoring and auditing/evaluation*, *Computing /ICT, Application of national procurement laws and procedures, and Tendering*. This is surprising given that individual capacity building efforts by governmental initiatives often focussed on technical aspects (see World Bank, 2013).

Existence of technical skill gaps amongst the public procurement personnel gives credence to the inadequate positive impact of procurement reform at the lower tiers of government, as well as on individual personnel capacity building (Agu and Onodugo, 2009). This is further evidenced by the finding that a majority of procurement personnel have not participated in any procurement related career development activities in the past 2 years, despite the acknowledgement of the need for individual capacity development in national procurement regulatory and management frameworks (see PPA, 2007; World Bank, 2013; BPP, 2016). More so, deficiencies exist in arguably basic technical procurement skills, such as *Proposal evaluation,* and surprisingly this is even more evident among the state organisation personnel than the local government personnel. Furthermore, other skill deficiencies (e.g. *Procurement planning)* were also found to be more pronounced among the state government personnel despite reports in literature, which suggests that local government agencies would be relatively more deficient in capacity than state government agencies (Adewole, 2014).

Concerning methods for personnel capacity building, distance/online learning, an ICT mode of capacity building, is not regarded as being suitable for developing infrastructure procurement skills. This is, however, understandable given that the respondents admitted to needing further development in Computing/ICT skills. *Conferences and workshop attendance*, and *Networking and sharing ideas with other professionals* were found to be amongst the most suitable methods for procurement skills development. There was also acknowledgement of the suitability of work-based professional development methods, particularly *on-the-job training*. However, skills development methods such as apprenticeships, internships and placements were not deemed suitable. This could be because these methods are usually used for introducing and training new personnel into roles, while a majority of the respondents are established in their roles as shown by their years of experience in role and also years of experience in procurement.

Implications of Findings

Overall, the above research outcomes provide capacity-building insights within the Nigerian context that could be leveraged by public procurement entities in Nigeria's state and local governance structure. Aligned to this are the following implications:

- Policy makers at state and local government levels would have to formulate procurement capacity development plan(s) covering appropriate short and long-term capacity development goals and clear performance measures to guide implementation of capacity building reforms. Such plans would have to recognise the key areas of personnel procurement skills gaps.

- To facilitate actual implementation of the plans, the plans would have to be cascaded down into well-resourced and structured operational components with appropriate schemes and programmes that will address the set performance measures and goals. For instance, periodic skills audits by state and local government public procurement entities would be beneficial in providing up-to-date and clear indications of the capacity of their staff.

- There is a need for recognition that individual procurement capacity transcends technical skills. Efforts towards promotion of individual capacity building need to recognise the strategic functions of procurement. Additionally, interpersonal or soft skills need to be part of procurement skills development programmes, curricula and initiatives in Nigeria.

- Procurement skills development initiatives would benefit from being designed to take into account the suitable methods of skills development.

Whilst the findings of the study are based on data from Nigeria, they could provide some insights for other developing countries, especially those in Sub-Saharan Africa that are implementing or undergoing public procurement reforms. For instance, the list of procurement skill areas and methods of skills acquisition employed in this capacity assessment study could serve as a useful blueprint for studying capacity deficiencies amongst public procurement personnel in other developing countries.

Conclusions

The successful procurement of public infrastructure is inextricably linked to the skills of procurement personnel. In this vein, an understanding of the skills development needs of procurement personnel is crucial. However, within the extant literature there is limited empirical indication as to the procurement skills gaps for public procurement personnel in Nigeria. Through a survey of public personnel involved in infrastructure procurement within Nigerian state and local government agencies, this inquiry has revealed circa 40 technical and interpersonal skills that are perceived by procurement personnel to be important for the procurement of public infrastructure in Nigeria. Amongst the topmost important skills are: communication; quality management; project monitoring and auditing/evaluation; team building; decision making; leadership; value engineering; health and safety management; computing/ICT; and problem solving.

The study has also shown that there is an acute need for procurement skills development amongst public infrastructure procurement personnel. Out of 45 procurement skills that were examined, there is need for further development in 38 of them. Whilst the areas of development cover both technical and interpersonal skills, interpersonal skills feature prominently amongst the topmost skill development areas. The type of organisation (i.e. local and state government) and location of organisation where personnel is based (i.e. north or southern Nigeria) seem to have limited bearing on the skills development needs of personnel.

Regarding methods for procurement skills development, *conferences and workshop attendance*, *networking and sharing ideas with other professionals, and on-the-job*

training are perceived by public procurement personnel to be amongst the most suitable methods. *Distant/online learning*, *apprenticeships*, *internships and placements,* and *job rotation or secondment are perceived to be unsuitable.* Overall, these findings provide insights that could be leveraged by public sector infrastructure procurement agencies in Nigeria to enable them to continuously augment the capacity of their procurement personnel.

Whilst the context of the study (i.e. Nigeria) does not permit generalisability of the findings to other developing countries, the execution of the study, particularly the procurement skill areas and the methods of skills development examined, could provide a useful blueprint for the empirical assessment of the capacity constraints of public personnel involved in the procurement of infrastructure in other developing countries.

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Table 1: Skills for Procurement

	Literature Sources													
	Kolchin and Giunipero (1993)	Giunipero and Pearcy (2000)	Carr and Smeltzer (2000)	Dainty *et al.* (2004)	Giunipero *et al.* (2006)	Tassabehji and Moorhouse (2008)	Office of Government Commerce (OGC) (2008)	Ahadzie *et al.* (2009)	Basheka (2010)	UK Ministry of Justoce (MOJ) (2012)	Addo-Duah *et al.* (2014)	New Zealand Government Procurement (NZGP) (2014)	Kwofie *et al.* (2016)
Communication (oral/written)	√	√	√	√	√	√		√	√		√	√	√
Computing/ICT	√	√	√		√	√			√	√	√	√	
Conflict resolution and management	√	√	√	√		√		√		√	√		√
Whole life costing and financial analysis				√			√		√				
Cost management and accounting compliance	√		√		√	√	√	√	√	√	√	√	
Leadership	√	√		√	√	√	√			√	√	√	
Negotiation	√	√	√	√	√	√	√		√		√	√	√
Proposal evaluation		√			√	√	√				√	√	
Quality management	√		√	√		√	√	√			√	√	
Relationship management	√	√	√		√	√	√	√	√	√	√	√	
Risk management	√	√			√	√	√	√	√		√		√
Responsible sourcing/Green purchasing/Green procurement	√						√		√	√			√
Strategic planning	√	√	√	√	√	√	√		√	√	√	√	
Variation/Change management	√	√				√					√		
Time management			√			√		√	√			√	
Application of ethics guidelines in procurement							√		√			√	

Procurement planning						√	√		√	√		√	√	
Decision making				√	√	√			√			√		
Entrepreneurship		√				√			√					
Creative thinking			√	√		√			√			√		
Problem solving		√	√			√		√	√			√	√	
Stakeholder management						√	√		√			√		
Application of national procurement law and procedures	√	√					√		√	√	√	√	√	
Application of international procurement law and procedures									√			√		
Application of modern integrated procurement procedures							√				√			
Contract management and enforcement	√	√				√	√		√	√	√	√	√	
Marketing									√	√				
Research and development		√			√				√			√	√	
E-procurement						√	√							
Sustainable design							√						√	
Data (quantitative and qualitative) analysis		√	√			√								
Team building			√		√	√	√					√		
Market analysis and forecasting	√	√	√		√	√				√	√	√		
Business case development			√		√	√	√		√			√		
Project scope definition					√	√	√			√	√			
Project strategy development/organisational governance					√	√	√			√	√			
Tendering									√	√		√		

Project monitoring and auditing/evaluation			√			√			√	√	√	√
Application of diversity and equal opportunities procedures											√	
Application of corporate social responsibility procedures						√					√	
Cross cultural awareness	√	√			√						√	
Stress management			√		√						√	
Environmental management						√	√					
Health and safety management						√	√					
Value engineering					√	√						

Table 2: Methods for Skills or Competency Development

Methods
Further / Higher academic degree courses
Apprenticeships
Self-learning through manuals, academic or professional journals
Exchange visits and study tours
On-the-job-training
Short continuous professional development (CPD) courses
Coaching, mentoring and shadowing
Networking and sharing ideas with other professionals
Work team retreats
Conferences and workshop attendance
More job responsibility
Job rotation or secondment
Internships and placements
Distant / Online Learning
In-house training courses

Sources: Giunipero *et al.* (2006), Stephen and Triraganon (2009), Basheka (2010) and UNDP (2006; 2007; 2010)

Table 3: Important Skills for Infrastructure Procurement

Skills	N	Mean	Rank by Mean	Std. Dev.	Std. Error Mean	One-Sample T-test (Test Value = 3.5)						
						t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Diff.	95% Confidence Interval of the Difference	
											Lower	Upper
Communication (oral/written)	288	4.319	1	0.889	0.052	15.650	287	0.000	0.000	0.819	0.716	0.923
Quality management	288	4.125	2	0.821	0.048	12.917	287	0.000	0.000	0.625	0.530	0.720
Project monitoring and auditing/evaluation	288	4.118	3	0.883	0.052	11.873	287	0.000	0.000	0.618	0.516	0.721
Team building	287	4.084	4	0.753	0.044	13.137	286	0.000	0.000	0.584	0.496	0.671
Decision making	286	4.070	5	0.880	0.052	10.955	285	0.000	0.000	0.570	0.468	0.672
Leadership	287	4.059	6	0.857	0.051	11.056	286	0.000	0.000	0.559	0.460	0.659
Value engineering	288	4.052	7	0.956	0.056	9.802	287	0.000	0.000	0.552	0.441	0.663
Health and safety management	287	4.045	8	0.886	0.052	10.429	286	0.000	0.000	0.545	0.442	0.648
Computing/ICT	287	4.031	9	0.947	0.056	9.501	286	0.000	0.000	0.531	0.421	0.641
Problem solving	287	4.031	9	0.866	0.051	10.389	286	0.000	0.000	0.531	0.431	0.632
Time management	288	4.024	11	0.841	0.050	10.584	287	0.000	0.000	0.524	0.427	0.622
Procurement planning	287	4.014	12	0.924	0.055	9.427	286	0.000	0.000	0.514	0.407	0.621
Data (quantitative and qualitative) analysis	288	3.993	13	0.835	0.049	10.024	287	0.000	0.000	0.493	0.396	0.590
Tendering	287	3.986	14	0.823	0.049	9.999	286	0.000	0.000	0.486	0.390	0.582
Proposal evaluation	286	3.983	15	0.880	0.052	9.268	285	0.000	0.000	0.483	0.380	0.585
Relationship management	287	3.955	16	0.850	0.050	9.067	286	0.000	0.000	0.455	0.356	0.553
Strategic planning	288	3.955	16	0.900	0.053	8.578	287	0.000	0.000	0.455	0.350	0.559
Creative thinking	287	3.937	18	0.977	0.058	7.584	286	0.000	0.000	0.437	0.324	0.551
Sustainable design	288	3.903	19	0.878	0.052	7.785	287	0.000	0.000	0.403	0.301	0.505
Cost management and accounting compliance	288	3.896	20	0.924	0.054	7.272	287	0.000	0.000	0.396	0.289	0.503
Contract management and enforcement	287	3.889	21	0.890	0.053	7.397	286	0.000	0.000	0.389	0.285	0.492
Application of national procurement law and procedures	288	3.878	22	0.946	0.056	6.791	287	0.000	0.000	0.378	0.269	0.488

Market analysis and forecasting	287	3.875	23	0.884	0.052	7.178	286	0.000	0.000	0.375	0.272	0.477
Project scope definition	287	3.871	24	0.878	0.052	7.164	286	0.000	0.000	0.371	0.269	0.473
Negotiation	287	3.861	25	0.917	0.054	6.663	286	0.000	0.000	0.361	0.254	0.467
Project strategy development/organisational governance	287	3.854	26	0.889	0.052	6.742	286	0.000	0.000	0.354	0.250	0.457
Application of ethics guidelines in procurement	287	3.840	27	1.046	0.062	5.505	286	0.000	0.000	0.340	0.218	0.461
Environmental management	288	3.837	28	0.902	0.053	6.339	287	0.000	0.000	0.337	0.232	0.441
Research and development	287	3.801	29	0.960	0.057	5.318	286	0.000	0.000	0.301	0.190	0.413
Variation/Change management	287	3.780	30	0.830	0.049	5.723	286	0.000	0.000	0.280	0.184	0.377
Application of modern integrated procurement procedures	288	3.771	31	0.905	0.053	5.081	287	0.000	0.000	0.271	0.166	0.376
Whole life costing and financial analysis	287	3.749	32	0.912	0.054	4.627	286	0.000	0.000	0.249	0.143	0.355
Conflict resolution and management	287	3.746	33	0.983	0.058	4.233	286	0.000	0.000	0.246	0.131	0.360
Stakeholder management	288	3.708	34	0.973	0.057	3.635	287	0.000	0.000	0.208	0.096	0.321
Application of diversity and equal opportunities procedures	287	3.707	35	0.988	0.058	3.553	286	0.000	0.000	0.207	0.092	0.322
Marketing	287	3.659	36	0.909	0.054	2.953	286	0.003	0.002	0.159	0.053	0.264
E-procurement	288	3.646	37	1.012	0.060	2.446	287	0.015	0.008	0.146	0.028	0.263
Entrepreneurship	287	3.645	38	1.003	0.059	2.442	286	0.015	0.008	0.145	0.028	0.261
Business case development	286	3.643	39	0.954	0.056	2.540	285	0.012	0.006	0.143	0.032	0.254
Risk management	287	3.638	40	0.990	0.058	2.355	286	0.019	0.010	0.138	0.023	0.253
Stress management	287	3.606	41	0.987	0.058	1.824	286	0.069	0.035	0.106	-0.008	0.221
Application of corporate social responsibility procedures	287	3.599	42	0.980	0.058	1.716	286	0.087	0.044	0.099	-0.015	0.213
Application of international procurement law and procedures	288	3.590	43	0.976	0.058	1.569	287	0.118	0.059	0.090	-0.023	0.204
Responsible sourcing/Green purchasing/Green procurement	287	3.502	44	0.971	0.057	0.030	286	0.976	0.488	0.002	-0.111	0.115
Cross cultural awareness	287	3.477	45	1.013	0.060	-0.379	286	0.705	0.353	-0.023	-0.140	0.095

Notes: Scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree
For skills below the dash line, Mean is not significantly greater than 3.5

Table 4: Skills Development Needs for Infrastructure Procurement

Skills	N	Mean	Rank by Mean	Std. Dev.	Std. Error Mean	One-Sample T-tes (Test Value = 3.5)						
						t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Diff.	95% Confidence Interval of the Difference	
											Upper	Lower
Computing/ICT	287	4.139	1	0.917	0.054	11.814	286	0.000	0.000	0.639	0.746	0.533
Problem solving	286	4.080	2	3.181	0.188	3.086	285	0.002	0.001	0.580	0.951	0.210
Communication (oral/written)	287	4.066	3	1.041	0.061	9.217	286	0.000	0.000	0.566	0.687	0.445
Decision making	286	4.021	4	0.933	0.055	9.447	285	0.000	0.000	0.521	0.630	0.412
Health and safety management	287	3.976	5	0.980	0.058	8.219	286	0.000	0.000	0.476	0.590	0.362
Quality management	287	3.972	6	0.885	0.052	9.042	286	0.000	0.000	0.472	0.575	0.369
Relationship management	286	3.923	7	3.119	0.184	2.294	285	0.023	0.011	0.423	0.786	0.060
Team building	287	3.909	8	0.945	0.056	7.336	286	0.000	0.000	0.409	0.519	0.300
Project monitoring and auditing/evaluation	286	3.906	9	0.981	0.058	6.990	285	0.000	0.000	0.406	0.520	0.291
Time management	287	3.902	10	0.952	0.056	7.161	286	0.000	0.000	0.402	0.513	0.292
Procurement planning	287	3.892	11	0.938	0.055	7.079	286	0.000	0.000	0.392	0.501	0.283
Strategic planning	286	3.892	11	0.973	0.058	6.809	285	0.000	0.000	0.392	0.505	0.278
Leadership	287	3.885	13	0.952	0.056	6.851	286	0.000	0.000	0.385	0.496	0.274
Creative thinking	286	3.864	14	0.958	0.057	6.418	285	0.000	0.000	0.364	0.475	0.252
Value engineering	287	3.850	15	1.052	0.062	5.639	286	0.000	0.000	0.350	0.472	0.228
Data (quantitative and qualitative) analysis	287	3.847	16	0.922	0.054	6.368	286	0.000	0.000	0.347	0.454	0.240
Proposal evaluation	287	3.833	17	0.908	0.054	6.206	286	0.000	0.000	0.333	0.438	0.227
Contract management and enforcement	287	3.819	18	1.039	0.061	5.200	286	0.000	0.000	0.319	0.439	0.198
Environmental management	287	3.819	18	0.987	0.058	5.473	286	0.000	0.000	0.319	0.433	0.204
Conflict resolution and management	286	3.818	20	1.023	0.061	5.257	285	0.000	0.000	0.318	0.437	0.199
Research and development	286	3.794	21	1.003	0.059	4.951	285	0.000	0.000	0.294	0.410	0.177
Tendering	286	3.762	22	1.029	0.061	4.309	285	0.000	0.000	0.262	0.382	0.142
Market analysis and forecasting	286	3.752	23	0.924	0.055	4.607	285	0.000	0.000	0.252	0.359	0.144
Application of national procurement law and procedures	287	3.739	24	1.076	0.064	3.756	286	0.000	0.000	0.239	0.364	0.114

Sustainable design	286	3.727	25	1.013	0.060	3.792	285	0.000	0.000	0.227	0.345	0.109
Cost management and accounting compliance	287	3.721	26	0.996	0.059	3.763	286	0.000	0.000	0.221	0.337	0.106
Project strategy development/organisational governance	286	3.710	27	0.986	0.058	3.599	285	0.000	0.000	0.210	0.325	0.095
Application of ethics guidelines in procurement	285	3.698	28	1.024	0.061	3.267	284	0.001	0.001	0.198	0.318	0.079
Stakeholder management	285	3.691	29	1.036	0.061	3.116	284	0.002	0.001	0.191	0.312	0.070
Project scope definition	285	3.691	29	1.026	0.061	3.147	284	0.002	0.001	0.191	0.311	0.072
Application of modern integrated procurement procedures	285	3.681	31	1.055	0.062	2.892	284	0.004	0.002	0.181	0.304	0.058
Entrepreneurship	287	3.659	32	1.072	0.063	2.506	286	0.013	0.006	0.159	0.283	0.034
Risk management	287	3.655	33	1.022	0.060	2.570	286	0.011	0.005	0.155	0.274	0.036
Whole life costing and financial analysis	287	3.631	34	0.991	0.058	2.234	286	0.026	0.013	0.131	0.246	0.016
Negotiation	287	3.631	34	1.029	0.061	2.151	286	0.032	0.016	0.131	0.250	0.011
Application of diversity and equal opportunities procedures	287	3.606	36	1.065	0.063	1.690	286	0.092	0.046	0.106	0.230	-0.017
Marketing	286	3.605	37	1.023	0.061	1.734	285	0.084	0.042	0.105	0.224	-0.014
Variation/Change management	286	3.594	38	0.935	0.055	1.708	285	0.089	0.044	0.094	0.203	-0.014
E-procurement	286	3.563	39	1.140	0.067	0.934	285	0.351	0.176	0.063	0.196	-0.070
Stress management	287	3.561	40	1.151	0.068	0.898	286	0.370	0.185	0.061	0.195	-0.073
Application of international procurement law and procedures	287	3.544	41	1.136	0.067	0.649	286	0.517	0.258	0.044	0.176	-0.088
Application of corporate social responsibility procedures	286	3.503	42	1.069	0.063	0.055	285	0.956	0.478	0.003	0.128	-0.121
Cross cultural awareness	287	3.425	43	1.094	0.065	-1.160	286	0.247	0.123	-0.075	0.052	-0.202
Responsible sourcing/Green purchasing/Green procurement	284	3.419	44	1.045	0.062	-1.306	283	0.193	0.096	-0.081	0.041	-0.203
Business case development	286	3.409	45	1.065	0.063	-1.444	285	0.150	0.075	-0.091	0.033	-0.215

Notes: Scale: 1 = not required at all; 2 = slightly required; 3 = moderately required; 4 = required; 5 = highly required.
For skills below the dash line, Mean is not significantly greater than 3.5.

Table 5: Differences in Perceived Infrastructure Procurement Skills Development Needs - By Type of Organisation

Skills	Organisation	N	Mean	Std. Dev.	Std. Error Mean	Independent Samples t-test							
						Levene's Test for Equality of Variances			t-test for Equality of Means				
						Equality of Variances	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Proposal evaluation	Local government	150	3.627	0.909	0.074	Equal variances assumed	7.145	0.008	-4.133	285.000	0.000	-0.432	0.104
	State government	137	4.058	0.855	0.073	Equal variances not assumed			-4.145	284.737	0.000	-0.432	0.104
Risk management	Local government	150	3.487	1.041	0.085	Equal variances assumed	3.668	0.056	-2.959	285.000	0.003	-0.353	0.119
	State government	137	3.839	0.972	0.083	Equal variances not assumed			-2.969	284.859	0.003	-0.353	0.119
Responsible sourcing/Green purchasing/Green procurement	Local government	149	3.235	1.042	0.085	Equal variances assumed	0.018	0.893	-3.168	282.000	0.002	-0.387	0.122
	State government	135	3.622	1.014	0.087	Equal variances not assumed			-3.173	280.570	0.002	-0.387	0.122
Application of ethics guidelines in procurement	Local government	150	3.493	1.035	0.084	Equal variances assumed	3.394	0.066	-3.635	283.000	0.000	-0.433	0.119
	State government	135	3.926	0.967	0.083	Equal variances not assumed			-3.648	282.592	0.000	-0.433	0.119
Procurement planning	Local government	150	3.760	0.974	0.080	Equal variances assumed	4.205	0.041	-2.517	285.000	0.012	-0.276	0.110
	State government	137	4.036	0.878	0.075	Equal variances not assumed			-2.529	284.953	0.012	-0.276	0.109
Application of national procurement law and procedures	Local government	150	3.560	1.096	0.089	Equal variances assumed	6.603	0.011	-2.983	285.000	0.003	-0.374	0.125
	State government	137	3.934	1.023	0.087	Equal variances not assumed			-2.992	284.857	0.003	-0.374	0.125
Application of modern integrated	Local government	150	3.520	1.060	0.087	Equal variances assumed	3.900	0.049	-2.742	283.000	0.006	-0.339	0.124

procurement procedures	State government	135	3.859	1.023	0.088	Equal variances not assumed			-2.747	281.600	0.006	-0.339	0.123
Marketing	Local government	150	3.727	0.948	0.077	Equal variances assumed	2.713	0.101	2.127	284.000	0.034	0.256	0.120
	State government	136	3.471	1.088	0.093	Equal variances not assumed			2.112	269.159	0.036	0.256	0.121

Notes:
Scale: 1 = not required at all; 2 = slightly; required; 3 = moderately required; 4 = required; 5 = highly required

Table 6: Differences in Perceived Infrastructure Procurement Skills Development Needs - By Location

Skills	Location	N	Mean	Std. Dev.	Std. Error Mean	Independent Samples t-test							
						Levene's Test for Equality of Variances			t-test for Equality of Means				
						Equality of Variances	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Creative thinking	South	169	4.006	0.896	0.069	Equal variances assumed	10.312	0.001	3.062	284.000	0.002	0.348	0.114
	North	117	3.658	1.010	0.093	Equal variances not assumed			2.996	229.827	0.003	0.348	0.116
Contract management and enforcement	South	170	3.724	1.141	0.088	Equal variances assumed	19.515	0.000	-1.882	285.000	0.061	-0.234	0.124
	North	117	3.957	0.855	0.079	Equal variances not assumed			-1.982	282.907	0.048	-0.234	0.118
Business case development	South	169	3.544	1.035	0.080	Equal variances assumed	0.020	0.889	2.609	284.000	0.010	0.331	0.127
	North	117	3.214	1.081	0.100	Equal variances not assumed			2.588	242.428	0.010	0.331	0.128
Cross cultural awareness	South	170	3.553	1.082	0.083	Equal variances assumed	0.333	0.564	2.407	285.000	0.017	0.314	0.130
	North	117	3.239	1.088	0.101	Equal variances not assumed			2.405	248.680	0.017	0.314	0.130
Stress management	South	170	3.729	1.108	0.085	Equal variances assumed	1.171	0.280	3.032	285.000	0.003	0.413	0.136
	North	117	3.316	1.172	0.108	Equal variances not assumed			3.001	240.264	0.003	0.413	0.138
Environmental management	South	170	3.929	0.983	0.075	Equal variances assumed	0.529	0.468	2.306	285.000	0.022	0.271	0.118
	North	117	3.658	0.975	0.090	Equal variances not assumed			2.309	250.705	0.022	0.271	0.118
Health and safety management	South	170	4.094	0.981	0.075	Equal variances assumed	0.235	0.628	2.491	285.000	0.013	0.291	0.117
	North	117	3.803	0.958	0.089	Equal variances not assumed			2.502	253.211	0.013	0.291	0.116

Notes: Scale: 1 = not required at all; 2 = slightly; required; 3 = moderately required; 4 = required; 5 = highly required

Table 7: Suitable Methods for Development of Infrastructure Procurement Skills

Skills Development Methods	N	Mean	Rank by Mean	Std. Dev.	Std. Error Mean	One-Sample t-test (Test Value = 3.5)						
						t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Diff.	95% Confidence Interval of the Difference	
											Lower	Upper
Conferences and workshop attendance	287	4.108	1	0.953	0.056	10.810	286	0.000	0.000	0.608	0.497	0.719
Networking and sharing ideas with other professionals	287	4.042	2	0.872	0.051	10.526	286	0.000	0.000	0.542	0.440	0.643
On-the-job-training	287	4.017	3	0.906	0.053	9.672	286	0.000	0.000	0.517	0.412	0.623
Further / Higher academic degree courses	287	4.000	4	1.087	0.064	7.792	286	0.000	0.000	0.500	0.374	0.626
Work team retreats	287	3.986	5	0.861	0.051	9.565	286	0.000	0.000	0.486	0.386	0.586
Short continuous professional development (CPD) courses	287	3.920	6	0.945	0.056	7.531	286	0.000	0.000	0.420	0.310	0.530
More job responsibility	286	3.874	7	0.961	0.057	6.580	285	0.000	0.000	0.374	0.262	0.486
Exchange visits and study tours	287	3.843	8	0.979	0.058	5.941	286	0.000	0.000	0.343	0.229	0.457
Coaching, mentoring and shadowing	287	3.746	9	0.954	0.056	4.361	286	0.000	0.000	0.246	0.135	0.357
Self-learning through manuals, academic or professional journals	286	3.678	10	1.016	0.060	2.967	285	0.003	0.002	0.178	0.060	0.297
In-house training courses	288	3.649	11	1.150	0.068	2.203	287	0.028	0.014	0.149	0.016	0.283
Job rotation or secondment	288	3.486	12	1.062	0.063	-.222	287	0.825	0.412	-0.014	-0.137	0.109
Internships and placements	288	3.444	13	1.051	0.062	-.897	287	0.371	0.185	-0.056	-0.177	0.066
Apprenticeships	287	3.418	14	1.167	0.069	-1.188	286	0.236	0.118	-0.082	-0.218	0.054
Distant / Online Learning	288	3.358	15	1.079	0.064	-2.239	287	0.026	0.013	-0.142	-0.268	-0.017

Notes: Scale: 1 = not suitable at all; 2 = slightly suitable; 3 = moderately suitable; 4 = suitable; 5 = highly suitable
For methods below the dash line, Mean is not significantly greater than 3.5.