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The Growth of Quality Assurance for Public Works Procurement in Ghana: Problems and Critical Success Factors

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ABSTRACT

Quality of construction is a problem worldwide. The problem is serious and evident in both developed and developing countries. This study sought to explore the problems and critical success factors that impact on quality assurance for public works procurement. The study adopted a mixed research approach. Data for the study was obtained through a questionnaire survey of 120 procurement officers (made up of works officers, quantity surveyors, architects, quality officers, amongst others). Data obtained from the study was analyzed by mean score rankings, one sample t-test and factor analysis. The findings from the study revealed that 'award of con-tract primarily on price', 'consultants acting on behalf of contractors', 'single contractors buying all tender documents',' poor workmanship', and 'lack of codes and standards' were the five major problems associated with public works procurement. The findings further showed that out of the 15 factors identified by the respondents as the critical quality assurance success factors for public works procurement, factor analysis enabled 10 of them to be placed under four components: 1)Procurement Systems comprising competitive bidding, contract review and application of quality standards; 2) Quality related factors comprising application of quality standards and material quality; 3) Contractor selection and training factors comprising competitive bidding, contractor selection framework and training policy and education; and 4) Project related factors comprising project supervision, motivation and quality recognition and information, specification and documentation. The study recommends that, Public Procurement Authority organizes regular training and education for procurement entities on non-traditional procurement systems and their impact on quality delivery of projects. Government policies and legislations relating to public procurement need to be further reviewed in order to incorporate quality assurance strategies at the initial phases of projects. The study will be of significance to major stakeholders of public procurement, educational institutions, construction professionals, con-tractors, among others who seek to achieve quality in their day to day transactions.

Keywords— Critical success factors, Public procurement, Quality assurance, Works, Ghana

I. INTRODUCTION

Quality assurance is receiving increasing attention worldwide in recent times [1]. It has advanced from a manufacture-centered discipline to one with broad management implications across all industries and professions [2]. Clients and stakeholders in the global marketplace now look forward to organizations that meet or exceed customers' expectations. This demand led to concepts like Quality Function Deployment (QFD) [3], The Theory of Inventive Problem Solving (TRIZ) [4] and Concurrent Engineering (CE) [5] as a means of translating Voice of Customers into product features.

FIDIC [6] confirmed that construction quality is an issue worldwide. The problem is severe and apparent in both developed and developing countries. Lack of construction quality is made manifest in poor or non-sustainable workmanship and unsafe structures. The problems emanating from diverse countries led to the development of Building and Construction Authority (BCA) of Singapore under the BCA Act with functions to promote standardization and enhance construction techniques and materials, and promote the adoption of internationally recognized quality management systems. In addition, Construction Industry Development Board of Malaysia under an Act in 1994 functioned to maintain quality assurance in the built environment industry; promote standardization and enhancement of techniques and materials of construction and to accredit and certify skilled workers and construction site supervisors among other functions [7].

In Ghana, irrespective of one's financial class, contractors are faced with challenges such as poor

workmanship, insufficient engineering capacity, inadequate management and inability to secure adequate working capital [7]. Ghanaian consultants encounter problems as poor quality of work, low productivity, inadequate flow of jobs, low level of fees, etc. As a result, the performance of industry, in respect of cost, time, quality, safety and health of workers, durability of products and the satisfaction of stakeholders, is woefully inadequate (Ibid). For instance, in the UK, the Department of Trade and Industry [8] reported that construction customers were not entirely satisfied with the products of the sector. Olugbenga et al. [9] linked customer satisfaction to procurement system. It was mentioned that no procurement systems could be called 'the best' but one can be better than the other in terms of specific performance. The renowned system of procurement is the traditional system where lowest price has been the core determining factor. Bottommost bidder acceptance is the elementary reason for inherent negative issues in completion of projects since low price quoted by bidders means low quality of structures [10]. Section 59(3) (a) of the Public Procurement Act, 2003 (Act 663) postulate that, winning tenderer will be the bidder with the lowermost evaluated bid price. This does not differ from countries like Nigeria [11], China [10], and Netherland [12].

Government as a key stakeholder in the construction industry has been making various efforts to improve public works performances [13]. However, the efforts have not shown significant impact to the project performance improvement (Ibid). Chung [2] admitted that the construction industry has been sluggish to clinch to the ISO 9000 concepts of quality assurance in its practice. However, there is a drive, especially in the public sector towards en-gaging only quality certified contractors for new projects [2]. Additionally, without appropriate and correct method for selecting the most suitable contractor, the performance of the project will be affected [14], thereby denying the client value for money.

To address this problem, practitioners, researchers and governments have attempted to improve quality by developing models, frameworks and methodologies [15]. However, focus has been on one or two issues of quality only. For instance, partakers' responsibility or communication [16] or on particular types of projects e.g. real estate, etc. or on particular participant e.g. contractor, consultant, etc. [13]. This study aimed at exploring the practices, problems and critical success factors that impact on quality assurance for public works procurement.

II. LITERATURE REVIEW

Participants in Works Procurement: A Review:

Delgado-Hernandez [15] identified five participants to be involved in the construction industry as owner/user, client, contractor, supplier and professional. The Public Procurement Act, 2003 (Act 663) identified participants in the procurement process to include Procurement Entity (PE), Contractor/Supplier and Consultants/Professional.

It is important to note that the PE may be the client, owner and/or user of the finished facility. Act 663 defines PE as any entity conducting public procurement to accomplish the objectives of the Act. Clients are described as the originators or initiators of the construction process [17] and stakeholders who might provide the funds for the project. PE might either be the funding agent or not. Works undertaken by PEs are mostly funded by the Ghana Education Trust Fund (GETFund) or Internally Generated Funds (IGF). Their main interests include: the clear communication of their current and future needs to the professionals and the receipt of the product on time, of good quality and that satisfies their wishes. Their main constraints are: the willingness of the client to listen to their needs, and the skills of designers and the contractor to translate their needs into a product that satisfies their requirements. Users need to avoid complaining at the end of the building procedure because the final product does not satisfy their wishes.

Consultants may include a team of architects, quantity surveyors, civil, mechanical and electrical engineers with the responsibility for the developmental work. Indeed, appropriate and capable project consultants are fundamental to the success of a project [18]. Among their interests are: to design a quality facility on time and within budget and to exceed clients' expectations. They also have two main constraints: the contract with the client and relevant regulations and codes. These "players" want to avoid: the postponement of a project because of high bids or unqualified contractors, the construction of a poor quality product, and errors and omissions in their designs.

The contractor is responsible for building the facility in question. The Ministry of Water Resource, Works and Housing group contractors into eight categories (A, B, C, S, D, K, E and G) according to the type of works they undertake. Their main motivations for taking part in a project are: to make a profit, to finish the job without delays and under budget, and to produce a quality product which will encourage repeat business with the client. The con-tractor wants to prevent under bidding, doing re-work without being compensated and delays, which cause extra operating costs. Suppliers are in charge of providing the materials and components to carry out the construction work.

Suppliers are hired by contractors to provide the needed materials for the construction work. Among their interests are: to supply quality products on time and to repeat business with contractors. Their main constraint is the contract with the contractor. These "players" want to avoid supplying poor quality products that are the causes of problems later in the construction process.

Success Factors that Influence Construction Quality Assurance:

Research on the critical success factors (CSFs) are considered to be a means to improve the effectiveness of projects and to achieve project objectives. Researchers and organizations have decided on the three project performance criteria of cost, time and quality [45, 46, 47].

Building EDC [48] highlighted in particular, motivation, commitment, clear specifications, management structures and responsible personnel as the key factors that contribute to construction quality. Abdel Razek [49], in his study stated that the findings of a study in the UK by BRE [50] for poor construction quality are quite similar to those concluded by Building EDC [48]. Both studies highlighted the following issues: insufficient information, poor communication, poor concern in workmanship and lack of site supervision. Barriers identified by [51] included lack of clarity in responsibilities, rotating personnel, lack of training and a high dependency on national micro economy. Many other barriers have been identified in various other studies: unfair or illegal competition, high interest rates, project bureaucracy, unclear government planning, high foreign competitiveness, remote site, site security, company stability, market change, relationship between parties, lack of motivation, complexity of works, lack of quality culture, cooperation and management behaviour [52, 53, 54]. The attitudes of contractors and consultants to some extent influence the quality of construction work [55]. Hence, the quality of the products is greatly influenced if the parties to the contract do not carry out their duties correctly. Idoro [56] indicate that the quality of a project in the construction environment are influenced by standard of workmanship, assessment by the client on the quality of construction materials, level of defective works and maintenance costs of the project.

Quality culture, as stated by Leonard [24], is a pertinent factor in successful implementation of quality, and if employees of a construction project recognize the value of their performance in an appropriate manner and with the appropriate amount of care, then motivation will be a necessary driver of their quality culture [57]. According to Said et al. [58], factors that affect construction quality may include; lack of management commitment, inconclusive interpretation of standard requirements and training policies. Quality factors in Malaysian construction environment is related by those actually doing the work, offsite and on site activities, project management, construction process, training and education, teamwork, supplier partnership, policies and recognitions [59, 22]. The main factors involved with quality issues are the application of quality standards, management commitment, communication, activities during design and planning, and relationship between construction players [60]. Lack of efficient training skills and insufficient status acknowledgement of construction technology were also pointed out as factors hindering the Malaysian construction industry [61]. Janipha and Ismail [62] identified supervision, information, specification and documentation, communication, competitive bidding, management commitment, material quality by supplier and quality culture and attitude as factors militating against quality in construction procurement.

III. RESEARCH METHODOLOGY

A structured questionnaire survey which involved both open and closed-ended questions was conducted to explore the problems and critical success factors that impact on quality assurance for public works procurement in Ghana. The survey targeted 120 procurement and works officers (consultants and contractors) who were selected from colleges of education and consulting firms based on their experiences in public works procurement. The officers from the Colleges of Education were selected by stratified, purposive and census sampling from different parts of Ghana. The regions from which these officers were selected included Ashanti and Brong Ahafo (ASHBA) Regions, Eastern and Greater Accra (EGA) Regions and Central and Western (CENWEST) Regions. The consult-ants (Architects and Quantity Surveyors) and contractors (Engineers) with whom these colleges had been engaged for the past five years (i.e. 2010 to date) were also selected for the study. Table 1 summarizes the sampling frame from which the respondents were selected.

TABLEI
SAMPLING FRAME OF RESPONDENTS

By Profession	EGA	CENWEST	ASHBA	TOTAL
Procurement Officers	8	6	10	24
Works Officers	8	6	10	24
Quantity Surveyors	8	6	10	24
Engineers	8	6	10	24
Architects	8	6	10	24
Total	**40**	**30**	**50**	**120**

The Colleges were contacted with an introductory letter and the respondents were briefed about the exercise, after which they expressed their interest to participate in the survey. Procurement Officers provided names, contacts and locations of contractors and consultants they had engaged for a period of five years. Contacts received, especially for contractors, were to Directors of companies who did not have much technical information on pro-jects. Through the Directors, contacts of officers' in-charge of projects were received. These officers were later contacted to seek their permission to participate in the survey. Upon acceptance, questionnaires were administered face-to-face to the respondents.

The questionnaire was divided into three sections: Section A sought information on the background of the respondents; Section B required the respondents to score on the Likert scale of 1 to 5 (where 1= Least Significant

and 5= Very Significant) the significant problems associated with public works procurement and; Section C also required the respondents to score on the Likert scale of 1 to 5 (where 1=Highly uncritical and 5=highly critical) the critical quality assurance success factors for public works procurement. Table 2 provides summary of the literature sources for the critical success factors and problems of quality assurance in public works procurement that were used to prepare the questionnaire for the respondents. In all, 13 problems associated with quality in public works and 15 critical quality assurance success factors for public works procurement were identified from literature. For ease of analysis of data, the fifteen critical quality assurance success factors were coded from V1 to V15. Despite literature arguments on the appropriateness of scale length, the selection of 5-point scale was mainly based on respondents' ability to express neutrality [63].

TABLEII
SUMMARY OF CSFS AND PROBLEMS OF QUALITY ASSURANCE FOR PUBLIC WORKS PROCUREMENT

Source	CSFs	Source	Problems of Quality
Janipha and Ismail (2013)	Supervision, information, specification and documentation, communication, competitive bidding, management commitment, material quality by supplier and quality culture and attitude	Darwish (2005)	Inadequate design brief, repetitive design review by the owner, lack of understanding of client's requirements, unstable client's requirements, last minute changes by client and insufficient overall design time
Sodangi et al. (2010); Wan Mahmood et al. (2006)	Training and education, teamwork, supplier partnership, policies and recognition	Oyedele et al. (2012)	Poor client briefing, poor specification, lack of design
Kandeil et al. (2010)	Application of quality standard, management commitment, communication	Oyedele et al. (2012)	Poor client briefing, poor specification, lack of design code and standards and inadequate technical knowledge
Building EDC (1987)	Motivation, commitment, clear specifications, management structure, responsible personnel	Serpell et al. (2002)	Limited knowledge of quality and poor definition of needs
BRE (1982); Building EDC (1987)	Insufficient information, poor communications, poor workmanship and lack of site supervision	Pheng and Peh (1996)	Poor workmanship, unclear drawings and specifications, cost and schedule constraints, lack of coordination, lack of contractor's involvement in design and planning activities, unrealistic completion periods and lack of buildability
Serpell et al. (2002)	Lack of clear responsibilities, rotating personnel, lack of training and high dependency on national micro economy	Crown Agents (1998) and Westring (1997)	Single contractor buying and pricing all bidding documents
Low and Goh (1992); Sommerville (1994), Pheng and Tan (1996); Zantanidis and Tsiotras (1998); Leonard (2008); Pheng and Wee, (2001); Chung (1999)	Lack of quality culture, cooperation and management behaviour, lack of motivation, project bureaucracy, unclear government planning and policies	Malkin (2013), Boley (2009), Purohit (2013), Pheng and Wei (1996)	Poor quality construction material
Said et al. (2009)	Lack of management commitment, inconclusive interpretation of standard requirement, training policies	Pheng and Kiong (2005), Pheng and Wei (1996) and Jha and Iyer (2006)	Poor quality workmanship
Abdul Razak et al. (2010)	Lack of efficient training skills, insufficient status acknowledgement	Alman (1989), Smallwood and Rwelamila (1998) and Smallwood (2000)	Award of contract primarily on price, competitive tendering, lack of pre-qualification, skills shortage, insufficient workforce training
Low and Peh (1996)	Attitude of contractors and consultants		
Idoro (2010)	Standard of workmanship, assessment by the client on the quality of construction materials and level of defective work		

IV. RESULTS AND DISCUSSION

Profile of Respondents

Bansa [64] stated that one may be able to target the best institution for a research, but as to whether the right individuals in that institution are contacted is more

important since the people that matter most are the once that are able to provide all the needed responses. Rodriguez [65] indicated that the position held by any person form a great part in every response that comes from that person. A number of the respondents representing 40 percent were Quantity Surveyors, followed by 24 percent who were Architects. Twenty-one percent (21%) and 15% were also Procurement Officers and Works Officers respectively whiles none of the respondents were Quality Officers. It is always best when researchers target a certain sector of an institution in preparation to get information. As explained, the persons that were targeted are people that have in-depth knowledge on public works procurement.

It is often argued that the number of years one stays in a particular work add up to their experience. Drawing from this, there was a need to know how long the respondents had been on professional work to determine their level of experience over the years. Fifteen (15) percent of the respondents involved in the survey had been in the Profession for up to 5 years while 8 percent of the respondents had been in the profession from 6 to 10 years. Thirty-four (34) percent had been in the profession from 11 to 15 years, with 31 percent of the respondents who had been in the profession for 16 to 20 years. Furthermore, 12% of the respondent had stayed in their respective profession for a period of more than 20 years. The conclusions drawn on these findings are that, the results give indications that the respondents have reasonable experience in professional practice. This is evidenced by 85% of respondents having worked over 5years (between 6 and above 20years).

It can be noted that one's level of training shows their level of knowledge of a profession. Training is gained by the level of education acquired from a particular field of study. It is also a general knowledge that the training of a learned person contributes greatly to problem solving. Essentially, out of a total of 88 respondents, 40 percent had Bachelor's Degree, whiles 34 percent of the total number had Professional Diploma in various professions such as Architecture, Quantity Surveying, etc. Fifteen (15) percent had obtained Higher National Diploma (HND) with 11 percent qualified with Master's Degree. Nobody had a Doctorate degree. This emphasized the perceived influence that the respondent would have on the survey. This is because when the right people are contacted they provide responses that are very meaningful.

To find out which professional bodies respondents belonged to, the study revealed that 24 respondents representing 27 percent belonged to Ghana Institution of Surveyors (GhIS), 18 respondents representing 21 percent be-longed to Ghana Institution of Architects (GIA), and 46 respondents representing 34 percent had no professional affiliation. When workers belong to professional bodies, they create enabling platform that allows them to share information related to their area of work and improve on their capacities.

Quality Assurance Problems in Public Works Procurement

Respondents were asked to indicate their views on the problems which they felt were associated with public works procurement. One-sample t-test was run for the variables obtained and a test value of 3.5 was used. A significance level was set at 95% in accordance with predictable risk levels [66]. Field [67] explained standard error as the standard deviation of sample means and a measure of how representative a sample is likely to be of the population. The larger the standard error the more variations from the means of different samples and the smaller the standard error the less variation depicting a precise image of the populace.

Table 3 is the results which shows the mean scores, standard deviations and the standard errors obtained for each variable. Table 3 further shows that out of the 13 variables, 10 had mean values above the test mean of 3.5. This means that according to the respondents, 10 out of the 13 variables were considered as problems associated with quality in public works in Ghana. The results further show that, 'award of contract primarily on price', 'consultants acting on behalf of contractors', 'single contractors buying all tender documents',' poor workmanship', and 'lack of codes and standards' were considered as the first five major problems in public works procurement. Others include ''poor supervision', 'poor construction materials', 'lack of buildability in design', 'poor design coordination', and 'unstable client requirement'.

The findings obtained corroborates literature. Research has shown that the perspective of the construction industry in terms of quality is poor as compared to the manufacturing sector [19, 20, 21]. Unstable clients' requirements [29], poor client briefing [30, 32], design changes [30], lack of constructability [30, 32], lack of design code and standards on quality [30, 32], limited knowledge of quality [31], poor workmanship [36, 32], poor quality construction material [39, 40], etc. are all factors which have been extensively considered in literature as problems associated with public works procurement.

TABLE III
PROBLEMS ASSOCIATED WITH QUALITY IN PUBLIC WORKS

Problems	N	Mean	Std. Deviation	Std. Error	Rank
Unstable client requirement	88	3.53	1.381	.147	10th
Poor definition of needs	88	2.45	1.493	.159	13th
Lack of buildability in design	88	3.67	1.201	.128	8th
Inadequate design details	88	3.45	1.364	.145	11th
Poor design coordination	88	3.60	1.427	.152	9th
Lack of codes and standards	88	4.00	1.028	.110	5th
Consultant acting on behalf of contractor	88	4.17	1.085	.116	2nd
Bid rotation	88	3.23	.854	.091	12th
Award of contract primarily on price	88	4.17	1.053	.112	1st
Single contractor buys all tender documents	88	4.05	1.113	.119	3rd
Poor supervision	88	3.86	1.315	.140	6th
Poor construction materials	88	3.74	1.434	.153	7th
Poor workmanship	88	4.03	1.179	.126	4th

Critical Quality Assurance Success Factors for Public Works Procurement

Respondents were again asked to indicate the critical quality assurance success factors for public works procurement. Table 4 further summarizes the mean scores and standard deviations of the 15 factors evaluated by the respondents. The results in Table show that 5 out of the 15 factors were considered as very critical quality assurance success factors for public works procurement. The results further show that, 'Procurement system (V13)', 'Quality culture and attitude of contractor (V9)', 'Quality culture and attitude of contractors (V8)', 'Training policy and education (V5)', and 'Communication (V4) were considered as the most critical quality assurance success factors for public works procurement.

TABLE IV
CRITICAL QUALITY ASSURANCE SUCCESS FACTORS FOR PUBLIC WORKS PROCUREMENT

Code	Variables	Mean	Std. Dev.	Rank
V_1	Project supervision	**1.49**	0.61	9th
V_2	Competitive bidding	**1.39**	0.68	10th
V_3	Management commitment	**1.13**	0.61	12th
V_4	Communication	**3.65**	1.27	5th
V_5	Training policy and education	**3.73**	1.34	4th
V_6	Material quality	**1.12**	0.39	14th
V_7	Motivation and quality recognition	2.35	0.93	7th
V_8	Quality culture and attitude of contractor	**4.89**	1.66	3rd
V_9	Quality culture and attitude of contractor	**4.94**	1.98	2nd
V_{10}	Relationship between construction players	1.91	0.89	8th
V_{11}	Information, specification and documentation	1.22	0.64	11th
V_{12}	Contract review	**1.11**	0.69	15th
V_{13}	Procurement system	**4.95**	0.34	1st
V_{14}	Application of quality standards	3.31	1.41	6th
V_{15}	Government policies and regulations	**1.13**	0.66	13th

The Kaiser-Meyer-Olkin (KMO) indicator was further used to assess sample size adequacy [68]. With the KMO value of 0.7, as indicated in Table 5, there is indication that the text is meritoriously adequate for factoring. This suggests that factor analysis is appropriate and correlation matrix is appropriate for factoring. The Bartlett's test of Sphericity is also significant (a p - value of 0.00 at a large chi-square value of 274.45, this though relative, is large enough to warrant factor analysis.

The correlation analysis, the KMO and the Bartlett's tests suggest that, there are correlations among the indicator variables and hence, can subject the original 15 indicators to a factor analysis procedure. The value of KMO statistic mingle between 0 and 1, the sum of partial correlations is large relative to the sum of correlations only if the value is 0, indicating diffusion of pattern of the correlations and hence factor analysis is likely to be inappropriate but if it is not zero then it means factor analysis is appropriate [68].

TABLE V
KMO TEST

Measure	value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.71
Bartlett's Test Critical Value	274.45
Bartlett's test degree of freedom	104
Bartlett's significant value	0.00

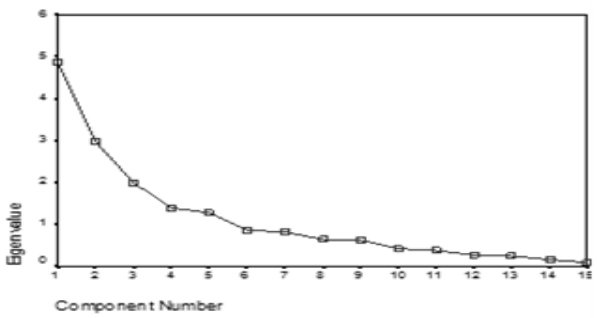

FIGURE I: SCREE PLOT

The Scree plot graphs the eigen value against the component number. From Figure 1, it can be seen that the 'el-bow' of the diagram occurs at the fourth component. This shows that the number of factors that must be considered for extraction is four (4) but must not exceed five.

TABLE VI
ROTATED FACTOR MATRIX [VARIABLES]

	Component			
	1	2	3	4
V_1	0.02	0.39	0.37	**-0.80**
V_2	**0.92**	0.02	**0.52**	0.03
V_3	0.06	-0.04	-0.14	0.16
V_4	0.24	0.21	-0.20	0.03
V_5	0.36	0.09	**1.07**	0.24
V_6	0.13	**1.22**	0.18	-0.07
V_7	-0.18	0.48	0.08	**1.03**
V_8	-0.09	0.17	0.13	-0.09
V_9	-0.25	0.28	**0.60**	0.04
V_{10}	0.04	0.04	-0.42	0.05
V_{11}	0.27	0.27	0.42	**1.13**
V_{12}	**0.91**	0.02	-0.18	-0.10
V_{13}	0.14	0.13	0.33	0.05
V_{14}	**1.04**	**-0.67**	-0.11	0.25
V_{15}	-0.03	0.03	0.00	0.09

According to [69], the rotation of the factors offers an opportunity to have a simpler factor structure that can be meaningfully interpreted. Table 6 presents the results of the rotated component matrix. Table 6 shows that, factor one loads highly on V2 (Competitive bidding), V12 (Contract review) and V14 (Application of quality standards). Thus the factor was termed procurement system factors. The factor two loaded highly on V14 (Application of quality standards) and V6 (Material quality). This factor was named quality related factors.

The third factor loaded highly on V2 (Competitive bidding), V9 (Contractor selection framework) and V5 (Training policy and education), and so was named contractor selection factors.

Factor four loads highly on V1 (Project Supervision) V7 (Motivation and quality recognition) and V11 (Information, specification and documentation), hence was named project related factors.

Principal Component 1: Procurement System Factors

The three factors that loaded on Principal Component 1 were Competitive bidding (0.92), Contract review (0.91) and Application of quality standards (1.04). These factors loaded on this component related more to procurement, thus, the theme procurement system factors. Contract review and competitive bidding had high correlation of 0.55. The mean values of 1.39 (Competitive bidding) and 1.11 (Contract review) showed how least they were ranked as factors for assuring quality. The core objective of any procurement system is to achieve fair com-petition. Literature revealed that a bane to achieving excellence in quality was linked to the system of procurement adopted [62]. The survey revealed that all procurement entities in the colleges adopted the traditional system of procurement. Semi structured interview brought to bear the necessity to explore other nontraditional systems of procurement to identify its potential benefits in terms of quality.

Principal Component 2: Quality Related Factors

The two factors that loaded on Principal Component 2 were application of quality standards (0.67) and material quality (1.22). This principal component was named quality related factors. The various factors loaded on this principal component were affirmations from literature like application of quality standards [60] and material quality [56, 62]. Standard of quality for a project is set out at the onset. The onus lied on the supervisor (consultant) to guide parties, especially the contractor to work in line with the laid down standards. Quality standard looks at material and workmanship. From literature, poor quality of materials and workmanship have been a cause of collapse of several buildings [40, 38, 39, 41, 23]. It can be deduced from the above that misapplication of quality standards is likely to lead to quality failure. This implies that to assure quality, quality related factors will be paramount.

Principal Component 3: Contractor Selection and Training

On this principal component, three factors were loaded namely Competitive bidding (0.52), Contractor selection framework (0.60) and Training policy and education (1.07). The problems to achieving quality in public works procurement ranked award of contract primarily on price as one of the principal factors. Literature and semi structured interview confirmed that lowest price meant least quality [10, 11]. To overcome this problem, the framework for contractor selection needs to change from only price to include non-price factors. Sodangi et al. [59] Wan Mahmood et al. [22] and Said et al. [58] identified the impact training policy and education will have on quality. The global marketplace keeps changing which implies that policies and personnel need to continually change through amendments and education to keep abreast with current demands. An informant said "hardly do Ghanaian contractors invest in their personnel, … ABCECG activities does not have any bearing to winning a con-tract … why do I waste my resources".

Principal Component 4: Project Related Factors

Principal component 4 loaded on these factors; project supervision (0.80), motivation and quality recognition (1.03) and information, specification and documentation (1.13). Literature confirmed the effects of these factors on quality assurance in public works procurement [48, 50, 59, 22, 62]. Project supervision was keen as an inform-ant mentioned "the contractor is as good as the consultant who supervises him". Lack of supervision will lead to contractor misapplying contract conditions and

specification to his advantage. Quality recognition and motivation through award ceremonies organized by ABCECG in collaboration with other stakeholders to honor contractors of high quality performance will augur well for the industry.

V. CONCLUSION

This study sought to explore the problems and critical success factors that impact on quality assurance for public works procurement. The study adopted a mixed research approach. Data for the study was obtained through questionnaire. The findings from the study revealed that 'award of contract primarily on price', 'consultants acting on behalf of contractors', 'single contractors buying all tender documents',' poor workmanship', and 'lack of codes and standards' were the five major problems associated with public works procurement. The findings further showed that out of the 15 factors identified by the respondents as the critical quality assurance success factors for public works procurement, factor analysis enabled 10 of them to be placed under four components: 1)Procurement Systems comprising competitive bidding, contract review and application of quality standards; 2) Quality related factors comprising application of quality standards and material quality; 3) Contractor selection and training factors comprising competitive bidding, contractor selection framework and training policy and education; and 4) Project related factors comprising project supervision, motivation and quality recognition and information, specification and documentation. The findings from the study contribute to literature on public procurement and quality assurance to enhance improvement in works procurement practices. It is highly recommended that, Public Procurement Authority should organize regular training and education for procurement entities on non-traditional procurement systems and their impact on quality delivery of projects. Government policies and legislations relating to public procurement need to be further reviewed in order to incorporate quality assurance strategies at the initial phases of projects.

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