

Assessing the knowledge and compliance of Quality Management practice among Ghanaian Construction Organisations

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ABSTRACT: Construction organisations are using Quality Management Systems (QMS) increasingly as a strategy to address issues with quality in their sector to satisfy end-user requirements. Unfortunately, construction projects in Ghana constantly face lack of quality management practices. This study aimed to evaluate perceived benefits, knowledge about QMS practice and compliance among professionals in the Ghanaian Construction Industry. A cross-sectional quantitative approach was adopted involving the administering of an online questionnaire, which yielded 142 responses from respondents who occupy mid-level and senior level positions in the construction industry. It was found out that the respondents had a satisfactory knowledge of QMS practice and its importance. They demonstrated their knowledge by admitting that certain quality drivers such as teamwork and quality education as well as quality measures such as delivering projects within a specified time frame indicate a successful QMS implementation. Finally, organisations' compliance to QMS standards based on participants responses were assessed. It was established that about 65 percent of participants were reported to be compliant. Even though this proportion is appreciable, client satisfaction may be compromised in project delivery.

Keywords: Quality, Quality Management System, Construction Project, Construction Organisation, Standards and Compliance

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1. INTRODUCTION

Quality has remained at the forefront amongst the factors used to determine the degree of success or failure of a project. Quality is a key success criterion that supports a project delivery process which any organisation renders to its clients [1]. Harris et al. [2] described quality as always interconnected with customer satisfaction and improvements in services or products which makes its implementation process a major influence in satisfying the required needs of the customer. Hence, the idea of quality management is to influence the need to plan and ensure that all projects are of the right standards as required [3].

Quality management systems (QMS) consist of guidelines required to monitor quality control, process improvement, and quality assurance to ensure the effectiveness of its implementation process on projects [4]. Talking about projects, QMS is literally indispensable in the operations of the construction industry.

Construction projects require satisfactory quality management to facilitate quality assurance within the industry [5]. Under project construction, the

most vital factors that the client takes into consideration are time, quality, and cost [6].

Pheng and Teo [5] stated that the adoption of quality management by construction organisations can provide several benefits such as increased market shares through the provision of high-quality services to its clients. Despite the high importance of quality management systems, there has been, however, a high incidence of inadequate practices of quality management system at construction sites which often results in severe project delays, reworks, and other undesirable risks [7].

Buildings and other civil infrastructures are in high demand in Ghana. It is thus critical for its construction industry to effectively implement quality management practices to help reduce the recurrent deficits of poor performance, poor job quality, and a lack of creativity or professionalism which often leads to building collapses, injuries, and high construction costs [8].

According to Adusa-Poku and Anokye [9], one of the main issues faced by most Ghanaian construction companies is how to effectively implement quality management systems to satisfy

client needs without incurring extra debts at the end of the project lifecycle.

Osei-Asibey et al. [10] confirmed that quality management is still a major challenge in the Ghanaian construction industry, where majority of the construction companies promise to ensure that quality works are implemented however, they fail to attain the necessary standards that meets the clients' expectations.

As part of efforts to address this challenge, this current study seeks to evaluate perceived benefits, knowledge about QMS practices and compliance among professionals in the Ghanaian construction industry.

2. METHODS

This study employed cross-sectional quantitative research methods wherein primary data was collected from key relevant stakeholders of the Ghanaian construction industry via questionnaire survey. The participants of the survey were sampled from Architectural, Construction, Consulting, and Project Management firms operating in the Ghanaian Construction Industry.

2.1. Sampling of Study Respondents

A purposive sampling technique was adopted to select the respondents from the afore-listed construction organisations. The respondents who participated were mid-level to senior staffs who have appreciable knowledge and experience to give accurate responses.

Sample Size Calculation

Since the population of employees in the Ghanaian construction industry is unknown, Cochran equation was adopted to yield a representative sample for this study.

$$n_o = \frac{z^2 pq}{e^2} \quad (1)$$

n_o is the sample size, e is the desired level of precision ($e=0.05$), p is the estimated proportion of mid to top level employees (0.1) that is present in the population and q is $1-p$ (0.9). The value of the standardised score ($z=1.96$) is found in statistical tables, which is represented by area under the normal distribution curve.

$$n_o = \frac{1.96^2 \times 0.10 \times 0.90}{0.05^2} = 138.29 \approx 138$$

To accommodate for possible data errors in entry of missing entry, an additional 4 responses were collected, resulting in a final sample size of 142.

2.2. Methods of Data Analysis

The data collected was first edited, coded, transcribed, and then cleaned. It was then grouped based on measures such as ordinal, nominal, and scalar. The data was then coded by attaching numerical value to every quantitative data.

Before any statistical analysis was done, reliability test was conducted to validate the consistency in participants' response of items in ordinal scale ('strongly disagree' to 'strongly agree'). Cronbach's alpha was computed for this test. Cronbach's Alpha ≥ 0.50 indicates high reliability/ consistency.

Statistical Package for Social Science (SPSS) was used to analyse data using both inferential and descriptive statistics. To examine the relationship between each item of participant's demographics, compliance and knowledge level, Chi Square Test of Independence was used. P-values <0.05 was considered to indicate statistical significance.

2.3. Data Interpretation

In this survey, compliance to QMS standards were assessed using four questions encompassing statements about QMS that are required to operate in the construction industry. Respondents who chose "Yes" were given a score of 3, and "Maybe" or "No" response were given a score of 0. Therefore, maximum possible score is 12. Thus, the total score ranged from 0 to 12 points. Compliance was categorised using the median score. Respondents who had a median score or above were classified as compliant, whilst those below the median scores were classified as non-compliant.

The central tendency measures, mean and standard deviation were adopted to draw a conclusion or take sides on various questions in sections that were subjected to a 5-point Likert scale with levels of agreement ranging from 'strongly agree' to 'strongly disagree'. With this scale, a calculated mean of '0.5-1.49' corresponds to 'strongly disagreement' responses to the questions. A mean of '1.5-2.49' corresponds to 'disagreement' and a mean of '2.5-3.49' corresponds to neither 'agreement' nor 'disagreement' (i.e., neutral). For the positive side of the scale, a mean of '3.5-4.49' corresponds to 'agreement' responses whilst a mean

of '4.5-5' corresponds to 'strongly agreement' responses.

3. RESULTS

Demographic variables of participants and perceptions of QMS practice included in the study were examined using descriptive statistic measure.

3.1. Reliability Test

For sections such as importance, perception, and measures for success of QMS practice which had items subjected to an ordinal scale ('strongly disagree' to 'strongly agree'), the computed Cronbach's Alpha was greater than 0.5 which is an indication of some degree of consistency in participant's responses.

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.837	0.840	30

3.2. Demographic Characteristics

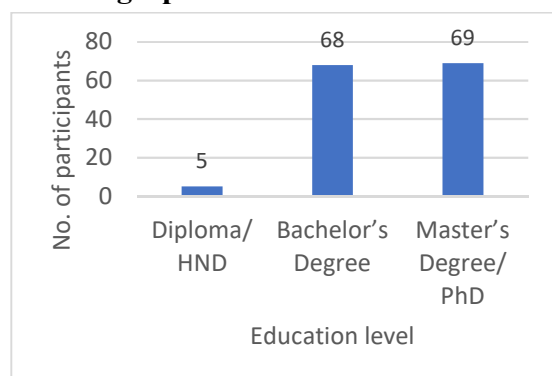


Figure 1: Educational Level of participants

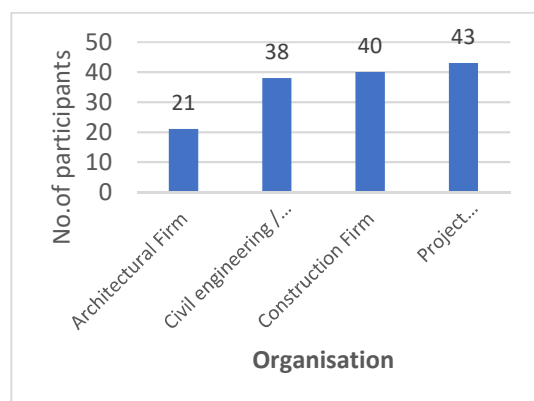


Figure 2: Participating firms

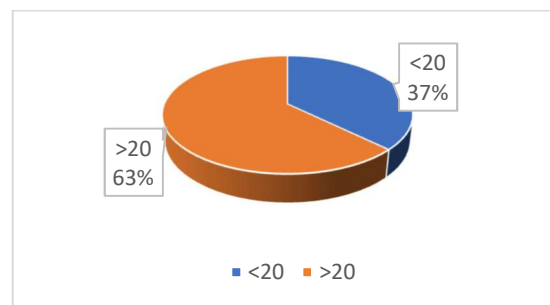


Figure 3: Organisation size of participants

This section presents the participants' demographic analysis. The results from the descriptive statistics showed a total of 142 participants. For the educational level, 69(48.6%) have Master's/PhD, 68(47.9%) have Bachelor's degree and 5(3.5%) have Diploma/HND. The number of participants who undertook this survey include construction firms (40), architectural firms (21), consulting/civil engineering firms (38) and project management firms (43). For the organisational size, majority of participants work in firms with more than 20 memberships (N=89, 62.7%) whilst the rest (N=53, 37.3%) responded that their firm membership size was less than 20.

3.3. Evaluation of knowledge of QMS practice

Participants were asked to rate using a 5-point Likert scale ('strongly disagree' to 'strongly agree') on issues such as perceptions, drivers, and measures for QMS success in an organisation. The following tables present the results of the responses obtained from the participants.

A. Perception about QMS

Table 2: Descriptive statistic of perception on QMS

Indicators	Mean	Std. Deviation
QMS can improve client satisfaction	4.44	0.525
QMS provides the right guidelines which always ensures quality	4.44	0.539
QMS reduces re-works on projects	4.55	0.540
QMS focuses on continuous improvement	4.41	0.535
Practicing QMS provides high profits for organisations	4.54	0.554
OVERALL	4.48	0.539

B. Drivers of QMS implementation

Table 3: Descriptive statistic of drivers of QMS practice

Indicators	Mean	Std. Deviation
Quality Education	4.46	0.514
Teamwork	4.54	0.514
Employees' Involvement	4.33	0.530
Communication between top managers and employees	4.57	0.511
Organisational culture	4.45	0.527
OVERALL	4.47	0.519

C. Measures for QMS implementation Success

Table 4: Descriptive statistic of measures for QMS implementation success

Indicators	Mean	Std. Deviation
Products must meet the acceptable standards	4.73	0.448
Delivering projects within a specified timeframe, cost effective and high-quality standard	4.79	0.410
Achieving projects of high project sustainability	4.75	0.434
Head of Works visits site to check that materials being used are of approved quality and standards	4.66	0.504
OVERALL	4.73	0.449

With reference to Table 2, Table 3, and Table 4, the respective computed overall mean (Mean > 4.0) suggests that the participants agree with the various statements which is a good indication of an appreciable knowledge about drivers of QMS practice and measures for successful implementation and its importance to project success.

3.4. Assessment of QMS effectiveness

Participants' responses to the effectiveness of QMS practice in their respective organisations are presented in the table below. Responses suggest that averagely, QMS practice is effective because of certain measures put in place such as quality reporting structure.

Table 5: Descriptive statistic of QMS practice Effectiveness

Indicators	Mean	Std. Deviation
Your organisation has an effective quality reporting structure	4.57	0.525
The adopted QMS method is implemented effectively	4.59	0.548
Organisation has a process for effectively managing quality documents	4.67	0.487
Your organisation keeps records of previous work	4.73	0.479
OVERALL	4.64	0.510

3.5. QMS standards Compliance

Table 6: Response on QMS standards Compliance

Response	Frequency (N=142)	Percentage (100%)
Does your organisation have an adopted QMS in practice?		
No	7	4.9
Yes	130	91.5
Maybe	5	3.5
Does your organisation have an approved quality strategy/plan designed by the top management?		
Yes	140	98.6
Maybe	2	1.4
Is your organisation's QMS certified in accordance with ISO 9001 international standard or any other standard?		
No	23	16.2
Yes	93	65.5
Maybe	26	18.3
Is your organisation's QMS certificate still valid?		
No	31	21.8
Yes	69	48.6
Maybe	42	29.6

Overall Compliance score		
Non-Compliant	50	35.2
Compliant	92	64.8

Table 6 presents an assessment of organisations' compliance to key requirements/ standards for QMS implementation. More than half of participants responded in affirmative "Yes" to 3 out of 4 questions posed. With regards to the question on "Is your organisation's QMS certificate still valid?", majority of participants posited "No" or "Not sure".

3.6. Chi square Test of Independence

This test was conducted to evaluate the relationship between participants' educational level, organisation, and organisation size and QMS compliance measure.

Table 7: Pearson Chi Square Test

Demographics		Value
Educational Level	Chi-square	3.480
	df	2
	P- value	0.176
Participating Firms	Chi-square	2.570
	df	3
	P- value	0.463
Organisation Size	Chi-square	0.236
	df	1
	P- value	0.627

The null hypothesis (Ho) was formulated that there is no relationship between a paired categorical variable, while the alternate hypothesis (Ha) states that there is a relationship between the paired categorical variables. P-values computed less than or equal to the alpha level of 0.05 implies rejecting the null hypothesis hence the conclusion that there is a significant relationship between the paired parameters of interest. P-values greater than the alpha level of 0.05 implies accepting the null hypothesis hence the conclusion that there is an insignificant relationship between the paired parameters of interest. In Table 7, it is evident that none of the demographic features has a significant relationship with compliance to QMS standards, thus, whether an organisation is compliant or not, is independent of these features.

4. DISCUSSIONS

One of the main goals of this study was to investigate the perceptions and knowledge of participants towards QMS practice. This issue is critical for research to identify the necessary interventions, as projects may not yield the intended success if employees do not have sufficient knowledge.

Wang et al. [11] posits that a consumer weighs the benefits against the cost of adoption, and if the perceived benefit outweighs the perceived cost, consumers are more likely to adopt the product or service. In this study, participants were assessed on the perceived benefits of QMS practice.

Taken together the responses on perceived benefits of QMS practice, "QMS reduces re-works on projects" had the highest average score (mean = 4.55; SD =0.55) while the least item score came from "QMS focuses on continuous improvement" with a mean of 4.41 and SD of 0.54. All the indicators on perceived benefits had an average score higher than 4.40 which was above the median of 3. This signifies that averagely respondents agree that QMS practice is of importance to project success.

Considering the responses on drivers of QMS practice, "Communication between top managers and employees" had the highest average score (mean = 4.57; SD =0.51) while the least item score came from "Employees' Involvement" with a mean of 4.33 and SD of 0.53. All the indicators on drivers of QMS practice had an average score higher than 4.40 which was above the median of 3. This signifies that averagely respondents agree that all factors proposed are drivers. This finding correlates with study conducted by Kaziliūnas [12] titled: "Implementation Of Quality Management Systems In Service Organisations". He concluded that top management acts as a driver of the implementation of quality management systems. Another study by Pheng and Teo [5] also revealed that employee involvement and empowerment as well as top management commitment are essential in implementing QMS practice.

Considering the responses on measures that indicate QMS successful implementation, "Delivering projects within a specified timeframe, cost effective and high-quality standard" had the highest average score (mean = 4.70; SD =0.11) while the least item score came from "Head of Works visits sites to check that materials being used

are of approved quality and standards” with a mean of 4.66 and SD of 0.50. All the indicators on measures of QMS success had an average score higher than 4.50 which was above the median of 3. This signifies that averagely respondents strongly agree that all factors proposed are indicators of successful implementation of QMS. Findings from Joubert [13] posit that measures for successful QMS implementation in the construction industry, including the fact that contractors are expected to deliver products of certain standards (embodied in specifications) within extremely tight time constraints.

Lastly, compliance to QMS standards in organisations was evaluated based on responses by participants. The median score of the QMS standards compliance among participants was 9 (3–12). Overall, about 65% of respondents showed compliance whilst 35% showed non-compliance towards QMS standards/ requirements which establishes that majority of the respondents acknowledge and implement QMS practices. Al-Ani and Adhmawi [14] in their study entitled: “Implementation of Quality Management Concepts in Managing Engineering Project Site” reported that requirements for compliance should cover three main points: Quality Assurance Program, Suitable Organisation, and Necessary Quality Assurance Documents.

5. CONCLUSIONS

Construction companies should understand that achieving successful project completion takes time and it requires an organisation to adapt, grow, and learn. There is the need for organisations to adopt and meet all requirements of quality management to ensure successful project completion. Employees must be well equipped with the necessary knowledge and skills through training and provided with a conducive working environment to be compliant with QMS standards. The responses analysed indicated that there are still some respondents whose organisations do not fully adhere to QMS standards. Construction companies should create a flexible and conducive organisational culture to encourage the development and implementation of quality management practices in the construction industry.

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