Effect of Total Quality Management Implementation on Construction Project Performance in Gombe State

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Abstract
This research work is aimed at assessing the effect f total quality management implementation on construction project performance in Gombe state with a view to come up with a better quality implementation management.. A quantitative survey research design was employed to randomly collect data from construction firms duly registered to carry out construction projects in Gombe state using a structural questionnaire. The collected data was analysed using descriptive statistical tools of frequencies, percentage, mean and multiple regression through the use of statistic package for social science (SPSS). The research reveals that: a) management commitment & leadership, training for total quality management, statistical methods, cost- quality and customer service were said to be in a good state of implementation, while, construction industry specific factors, supplier involvement and teamwork were found to be in a very good state of implementation. b) quality level and time plan were strongly agreed to measured the project meanwhile, satisfaction and cost were found to be agreed as element measuring the performance level. c) Finally, total quality management implementation significantly affects project performance in Gombe state. Construction industry specific factors, supplier involvement, cost quality, statistical methods, and teamwork were the TQM implementation which significantly affects project performance. Management commitment & leadership, (MCL) and construction industry specific factors (CISF) have negative effect on construction project performance as indicated by standardized beta coefficient of -.048 and -.368 respectively. It's recommended that there is need for Government and all the agencies concerned in construction work to ensure the enforcement of total quality management implementation in all construction projects i.e. quality not profit priority.

I.   Introduction
The main aspect of quality management is to ensure efforts to achieve the required level of quality for the product which are well planned and organized. From the perspective of a construction company, quality management in construction projects should mean maintaining the quality of construction works at the required standard so as to obtain customers' satisfaction that would bring long term competitiveness and business survival for the companies (Chin-Keng & Hamza, 2011). Therefore, Total Quality Management (TQM) has being viewed as a gainful tool in guaranteeing the success of set standard for projects in the built environment. As a result of its ability to provide quality through effective management processes, TQM has garner significant attention in most academic discussion over the years (Aghimien, Aigbavboa, Thwala and Mothiba, 2019).

The main philosophy behind TQM is satisfaction of customer needs. Zehir, Ertosun, Zehir and Muceldilli (2012) define TQM as a holistic quality improvement approach to firms for the purpose of improving performance in terms of higher quality products, more satisfied customers, reduced costs, improved financial, quality and innovation performance and improved employee satisfaction. The primary focus of TQM is the involvement of everyone and it has the ability to adapt to new ideas, tools and methods. The most important determinant of success for an organization in implementing TQM is the ability of the organization to translate, integrate and institutionalize TQM practices on the job. TQM is a way of thinking about goals, organizations, processes and people to ensure things are done right the first time (Pheng & Teo, 2004).

Project performance (PP) is the extent to which projects are delivered based on the requirements of the clients. These requirements include completing the project within budgeted cost, stipulated time, and agreed quality (Hassan, Yusuf, Usman and Ibrahim, 2022). Project success is mostly and fundamentally determined using time and cost performance criteria (Rahman, Memon, Nagapan, Latif, and Azis, 2012). However, Ogunde, Olaolu, Afolabi, Owolabi & Ojelabi (2017) reported that there is poor performance of construction projects across the world. Incidentally, developing countries (including Nigeria) have a higher rate of poor performance of projects than developed countries. It is reported that over 70% and 50% of the construction projects started

are likely to exceed the time and cost budgeted with a magnitude of over 50% and 20% respectively (Okweto, 2012).

However, despite the benefits of quality management, the threat of substandard quality in construction is on the increase especially in developing nations (Orji et al., 2016). Gombe state, being part of Nigeria, may not be immune from the problem. With the increased inflow of construction organization into the state, and the massive unprecedented infrastructure development witnessed in the state in the last decade, managing quality of the construction work and process is of paramount importance and if the consequences of non-implementing quality work are to be avoided. Therefore this research seeks to assess the effect of total quality management implementation on construction project performance in Gombe state with a view to revealing the extent of the effect.

II. Methodology

The study adopt quantitative research methodology in which a questionnaire was developed and administered to construction building professionals of registered firms in Gombe state. A total of two hundred and thirty (230) questionnaires were administered, 196 of the returned questionnaire were valid and used for the analysis. The sample size was determined using Kretcie and Morgan (1970). The sampling technique adopted was purposive simple random in which gives each respondent equal chance for selection. After a considerable data collection, the study employed multiple regressions as a method of data analysis with the aid of SPSS software.

III. Result and Discussion

Table1 below present the result of total quality management implementation among the construction firms in Gombe state. On aggregate, the level of management commitment and leadership, training, statistical methods, cost quality and customer service were all found to be in a good state of implementation with a mean of 4.066, 4.061, 4.079, 3.907 and 3.967 respectively. While teamwork, supplier involvement and construction industry specific factor having a mean value of 4.20, 4.21 and 4.37 accordingly were said to be in a very good state of implementation. This concluded that the total quality management implementation were said to be in a good level.

Table1: Total Quality Management implementation

Statement	Mean	Std. Dev	Remark
Management Commitment & Leadership Implementation (MCLI)	**4.066**	**.71740**	**Good**
Problem identification (construction)	3.806	.85525	Good
Management culture practice	4.066	.97175	Good
Commitment and understanding	4.327	.64491	Very Good
Training Implementation	**4.061**	**.40361**	**Good**
Training for quality among workers	4.112	.68512	Good
Awareness among workers	4.321	.57624	Very Good
Instruction in the basic of TQM	3.878	1.02046	Good
Causes and effect analysis	3.939	.66125	Good
Team problem solving	4.200	.67473	Very Good
Interpersonal communication and interaction	4.051	.73551	Good
Rudimentary statistic methods	3.622	.86547	Good
Cost quality management	4.403	.64513	Very Good
Teamwork Implementation	**4.200**	**.54789**	**Very Good**
Establishment joint goals	4.437	.66512	Very Good
Establishment of plans	4.026	.65191	Good
Establishment of controls	4.005	.98448	Good
Statistical Methods Implementation	**4.079**	**.43378**	**Good**
identify the causes of quality problem	4.286	.85335	Very Good
Communication in precise language	4.333	.65415	Very Good
To verify repeat and produce measurement base on data	4.082	.71860	Good
Determination of past and present	3.729	.62703	Good
Features status of work progress	3.811	.66416	Good
Decision making on facts data	4.239	.67834	Very Good
Cost Quality Implementation	**3.907**	**.51496**	**Good**
Costs review	4.495	.73378	Very Good
Inspection	4.270	.56690	Very Good
Testing	3.699	.99031	Good
Scrap cost	3.679	.87340	Good
Rework	3.392	.98384	Good
Supplier involvement Implementation	**4.213**	**.43732**	**Very Good**
Quality of plans	4.229	.53908	Very Good
Specification prepared by this designer	4.291	.51850	Very Good
Quality of equipment and materials	4.229	.50974	Very Good
Quality of work performance by sub contractor	4.102	.67162	Good
Customer Service Implementation	**3.967**	**.81346**	**Good**

Designer satisfaction	4.000	1.04268	Good
Constructor satisfaction	3.934	.69481	Good
Construction Industry Specific Factors	**4.372**	**.58970**	**Very Good**
Cost	4.372	.58970	Very Good
Time	4.372	.58970	Very Good
Quality overrun	4.372	.58970	Very Good

Table2 below shows the evaluation of project performance measure by the construction firms in Gombe State. The project performance measure was evaluated at the different elements which are satisfaction, cost, quality and time. The result indicated that quality level and time plan were strongly agreed to be the elements that measure the project performance in the study areas as indicated by mean values of 4.71 and 4.22 respectively while, satisfaction and cost were agreed as element measuring the performance level with a mean score of 4.14 and 3.96. It can be concluded that the project performance measure in construction projects in Gombe state was agreed to be time, cost, quality and satisfaction.

Table2: Performance measure

Constructs	Mean	Std. Dev	Remark
(Time) The project should be Completed within planned time	4.2143	.45854	**Strongly agreed**
(Cost) The project should be executed within the planned budget	3.9643	.78691	**Agreed**
(Quality) The project should meet the required quality level	4.7092	.48792	**Strongly agreed**
Client Satisfaction	4.1403	.37933	**Agreed**

Table3 shows the model summary and the ANOVA result. The model produced overall R value of 0.614 and R square value of 0.377 with F-statistics of 14.163 which are significant as indicated by p value of .000 far below the recommended maximum of 0.05 (Pallant, 2011). This shows that the model predicts about 38 percent of the variation in project performance measure. In other words, about 38 percent in the changes on project performance can be explained by changes in the total quality management implementation. The model as a whole is good for the analysis as it produced a good R square value.

Table3: Model Summary and ANOVA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.614[a]	.377	.351	.22723	14.163	.000[b]

Table 4 below reveals the individual effect of the independent variables on the dependent variable. The result shows that the magnitude of the effect of total quality management implementation predictors. The total quality management implementation with significantly affect are construction industry specific factors, supplier involvement, cost quality, statistical methods , and teamwork as indicated by t-statistics values of -4.876, 6.115, 3.358, 2.727 and 2.081 accordingly all with p-values of .000, .000, .001, .007 and .039 respectively. Management commitment & leadership, (MCL) and construction industry specific factors (CISF) have negative effect on construction project performance as indicated by standardized beta coefficient of -.048 and -.368 respectively. The total quality management with least significant effect on project performance were found to be customer services and management commitment & leadership

Table4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.714	.263		10.320	.000
	AMCL	-.019	.049	-.048	-.387	.699
	AT	-.130	.066	-.186	-1.976	.050
	ATW	.102	.049	.197	2.081	.039
	ASM	.153	.056	.236	2.727	.007
	ACQ	.153	.046	.279	3.358	.001
	ASI	.248	.040	.384	6.116	.000
	ACS	.058	.034	.168	1.719	.087
	ACISF	-.176	.036	-.368	-4.876	.000

IV. Conclusion

Total quality management (TQM) is a holistic quality improvement approach to firms for the purpose of improving performance in terms of higher quality products, more satisfied customers, reduced costs, improved financial, quality and innovation performance and improved employee satisfaction. Project performance (PP) is the extent to which projects are delivered based on the requirements of the clients. These requirements include completing the project within budgeted cost, stipulated time, and agreed quality. This study is aimed at assessing the effect of total quality management implementation by construction project performance in Gombe state with a view to come up with a better quality implementation management.

The research found that management commitment and leadership, training for total quality management, statistical methods, cost quality and customer service implementation were all found to be in a good state of implementation in Gombe state while, construction industry specific factors, supplier involvement and teamwork implementation were found to be in a very good state implementation. Furthermore, the study conclude that quality level and time plan were strongly agreed to measured the project meanwhile, satisfaction and cost were found to be agreed as element measuring the performance level. However, the result concluded that total quality management implementation significantly affect project performance in Gombe state. Construction industry specific factors, supplier involvement, cost quality, statistical methods and teamwork were the TQM implementation which significantly affect project performance all with p-values of .000, .000, .001, .007 and .039 respectively, finally management commitment & leadership, (MCL) and construction industry specific factors (CISF) have negative effect on construction project performance as indicated by standardized beta coefficient of -.048 and -.368 respectively.

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Dear sir/Madam,

The objective of this study is to collect information from constructions Firms on **Effect of Total Quality Management Implementation by Construction Project Performance in Gombe State**. The information collected will be treated with utmost confidentiality. Thank you for your assistance.

FIELD SURVEY

Abdulrasheed Abubakar
Team leader

Please, Answer the question by ticking [√] from the options provided which appropriately suits your opinion

SECTION A: DEMOGRAPHIC DATA OF THE RESPONDENT

S/N	Attributes	Options	Tick
1	Professional Background	Architect	1
		Civil Engineering	2
		Quantity Surveyor	3
		Builder	4
		Project Manager/consultant	5
2	Year of Experience	1-5 years	1
		6-10 years	2
		11-15 years	3
		15 years and above	4
3	Number of Projects handled yearly	1-5 projects	1
		6-10 Projects	2
		11 project and above	3
4	Highest level of education	HND	1
		Degree	2
		Msc	3
		Ph.D and Above	4
5	What is your occupation	Private Organisation	1
		Public sector	2

SECTION B: TATAL QUALITY MANAGEMENT IMPLEMENTATION

Please rate each of the following total quality management implementation

s/n	Total Quality Management Implementation	Please rate the scale which appropriately suite your opinion				
(a)	**Management Commitment & Leadership**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
1	Problem identification (construction)	1	2	3	4	5
2	Management culture practice	1	2	3	4	5
3	Commitment and understanding	1	2	3	4	5
(b)	**Training**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
4	Training for quality among workers	1	2	3	4	5
5	Awareness among workers	1	2	3	4	5
6	Instruction in the basic of TQM	1	2	3	4	5
7	Causes and effect analysis	1	2	3	4	5
8	Team problem solving	1	2	3	4	5
9	Interpersonal communication and interaction	1	2	3	4	5
10	Rudimentary statistic methods	1	2	3	4	5
11	Cost quality management					
(c)	**Teamwork**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
12	Establishment joint goals	1	2	3	4	5
13	Establishment of plans	1	2	3	4	5
14	Establishment of controls	1	2	3	4	5
(d)	**Statistical methods**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
15	To identify the causes of quality problem	1	2	3	4	5
16	Communication in precise language	1	2	3	4	5
17	To verify repeat and produce measurement based on data	1	2	3	4	5
18	Determination of past and present	1	2	3	4	5
19	Features status of work progress	1	2	3	4	5

		Very Bad	Bad	Fair	Good	Very Good
20	Decision making on facts data	1	2	3	4	5
(e)	**Cost Quality**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
21	Costs review	1	2	3	4	5
22	Inspection	1	2	3	4	5
23	Testing	1	2	3	4	5
24	Scrap cost	1	2	3	4	5
25	Rework	1	2	3	4	5
(f)	**Supplier involvement**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
26	Quality of plans	1	2	3	4	5
27	Specification prepared by this designer	1	2	3	4	5
28	Quality of equipment and materials	1	2	3	4	5
29	Quality of work performance by sub-contractor					
(j)	**Customer service**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
30	Designer satisfaction	1	2	3	4	5
31	Constructor satisfaction	1	2	3	4	5
(h)	**Construction Industry Specific Factors**	**Very Bad**	**Bad**	**Fair**	**Good**	**Very Good**
40	Cost	1	2	3	4	5
	Time	1	2	3	4	5
	Quality overrun	1	2	4	4	5

SECTION C: CONSTRUCTION PROJECT PERFORMANCE
Please rate each of the following construction project performance measured

	Project Performance Measure	Strongly Disagreed	Disagreed	Moderate	Agreed	Strongly Agreed
(a)	**Time**	1	2	3	4	5
1	The project should be Completed within planned time	1	2	3	4	5
(b)	**Cost**	1	2	3	4	5
2	The project should be executed within the planned budget	1	2	3	4	5
(c)	**Quality**					
3	The project should meet the required quality level	1	2	3	4	5
(d)	**Satisfaction**					
4	There should be satisfaction with team members meeting	1	2	3	4	5
5	There should be budget Satisfaction	1	2	3	4	5
6	Schedule satisfaction	1	2	3	4	5
7	Quality of workmanship	1	2	3	4	5
8	Client and project manager's satisfaction,	1	2	3	4	5
9	Friendliness of environment, health and safety		2	3	4	5