# Application of Total Quality Management Practices and Building Maintenance Operations in Construction Firms in Enugu Metropolis

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#### Abstract

This paper examined the application of total quality management practices and building maintenance operations in construction firms in Enugu metropolis. Four research questions guided the study. This study adopted a descriptive survey research design. The population for the study comprised 250 registered construction professionals in Enugu Metropolis. The entire population size of 250 respondents was used as the sample size. A validated structured questionnaire titled "Total Quality Management Practices and Building Maintenance Operations Questionnaire" (TQMPBMOQ) was developed by the researcher. The questionnaire underwent Cronbach Alpha method internal consistency tests for four clusters, resulting in reliability values of 0.76, 0.72, 0.82, and 0.77 respectively. Descriptive statistics of mean score was used to analyze the data to answer the research questions. It was found that construction professionals in Enugu Metropolis have a high commitment to Total Quality Management (TQM) practices in building maintenance operations. They have identified challenges contractors face when applying TQM, and have agreed on measures to ensure effective quality assurance practices in the building industry. The professionals have agreed on the importance of TQM in the construction industry. Based on the findings, it was recommended amongst others that ongoing professional development and training programs be established. These programs should focus on building the capacity of contractors, site supervisors, and other stakeholders in effectively applying TQM principles.

*Keywords:* Application, Management Practices, Total Quality Management, Maintenance Operations, Construction Firms

#### Introduction

The construction sector is globally recognized as a fundamental industry on which the development and economic progress of a country depend. The quality of a nation's infrastructure and construction projects significantly impacts its growth and development status (Adam, Kunya & Sanusi, 2020). In this context, building maintenance plays a vital role in sustaining the functionality, safety, and aesthetic value of infrastructure, thus ensuring long-term benefits. Total Quality Management (TQM) has become a critical framework for maintaining high standards in building operations and maintenance, aiming to meet or exceed customer satisfaction while ensuring the durability and reliability of structures (Low, Abdul-Rahman & Zakaria, 2020).

In the building industry, contractors adopt specialized project management techniques to oversee the planning, design, and maintenance of construction projects. The primary goal of management is to optimize time, cost, and quality, commonly referred to as the "triple constraint" of project delivery (Dilawo & Salimi, 2019). These techniques are applied across various delivery systems, including design-bid-build and public-private partnerships, to achieve superior project outcomes.

The integration of TQM practices into building maintenance operations has become essential in the construction industry. TQM focuses on continuous improvement, quality assurance, and customer satisfaction. It ensures that all stages of building maintenance are well-planned and organized, providing a systematic approach to quality control and improvement (Jimoh, Oyewobi, Isa & Waziri, 2019). Contractors implementing TQM in building maintenance employ various practices such as quality planning, quality assurance, and quality control to ensure adherence to set standards and improve overall performance. These practices help measure the quality of construction outputs in terms of performance, reliability, and durability, contributing to long-term competitiveness in the market (Kado, Bala & Dandajeh, 2016).

However, the level of commitment to TQM practices among contractors varies, and it is crucial to assess how dedicated contractors are to implementing these practices in building maintenance operations. Successful application of TQM requires the active involvement of both management and employees in a continuous effort to ensure long-term customer loyalty and satisfaction (Ogunseiju, Olayiwola, Akanmu & Olatunji, 2022). Many contractors face challenges in maintaining this commitment due to the complexity of coordinating various stakeholders in the construction process, such as subcontractors, suppliers, and clients, who may have differing expectations and standards.

Challenges encountered during the implementation of TQM in building maintenance include resistance to change, lack of training, insufficient resources, and the complexity of integrating new technologies into traditional construction methods. Additionally, the involvement of multiple parties, each with their own quality expectations, often complicates the implementation of a cohesive TQM framework (Aluko, Idoro & Mewomo, 2021). Contractors also face difficulties in maintaining consistent quality across projects, especially when balancing time, cost, and quality constraints. These challenges highlight the need for ongoing commitment to quality improvement, employee engagement, and teamwork across all levels of the organization.

To address these challenges, various measures can be implemented to ensure effective quality assurance in building maintenance through TQM. These include fostering a culture of continuous improvement, investing in employee training, adopting advanced technologies for monitoring and assessing quality, and ensuring clear communication among all stakeholders. Furthermore, setting up robust feedback mechanisms can help contractors identify areas for improvement and make necessary adjustments in real-time (Low et al., 2020). By adopting these measures, contractors can enhance their ability to deliver high-quality, reliable maintenance services, which are critical for the long-term sustainability of construction projects.

The adoption of Total Quality Management practices in building maintenance operations is critical for the construction industry in Enugu Metropolis and beyond. Understanding the level of

commitment among contractors, addressing the challenges they face, and implementing effective quality assurance measures will contribute to the overall performance, customer satisfaction, and competitiveness of the industry. There is, therefore, a need to thoroughly evaluate the application of TQM practices among contractors to ensure sustained quality improvements in building maintenance

# **Statement of the Problem**

In Enugu Metropolis, like many parts of Nigeria, the issue of poor building maintenance is increasingly apparent, particularly with regard to public buildings and large private structures. A cursory observation of the environment reveals a widespread lack of proper maintenance culture among building owners and occupiers. This issue is especially evident in public buildings such as government offices, schools, hospitals, and other infrastructure, many of which are left in a state of neglect soon after their construction. The focus of most construction efforts in Enugu, as seen in projects like the Enugu Metropolis Secretariat and other government buildings, tends to prioritize the erection of grand edifices while ignoring the critical aspect of ongoing maintenance. This oversight often leads to rapid deterioration and increased long-term costs, a scenario that has become common in the state.

Building maintenance in Nigeria is often perceived as an onerous task, fraught with numerous challenges that make it seem like a herculean responsibility. These challenges are compounded by the absence of a structured approach to maintenance operations. Similarly, Ebekozien, Ayo-Odifiri, Nwaole, Ibeabuchi and Uwadia (2022) identified key issues plaguing building maintenance in Nigeria, such as inappropriate maintenance policies, non-compliance with statutory requirements, lack of employee involvement in decision-making, insufficient training for maintenance personnel, and the absence of performance monitoring systems. In Enugu Metropolis, many construction firms struggle with these same issues, contributing to the erratic and unsustainable maintenance patterns observed across both public and private buildings.

The challenges outlined above can be mitigated through the adoption of Total Quality Management (TQM) principles in building maintenance operations. TQM, with its emphasis on continuous improvement, quality control, and stakeholder involvement, provides a structured approach that can address the gaps in current maintenance practices. It offers a framework for setting clear maintenance policies, ensuring compliance with statutory requirements, involving employees in decision-making processes, and instituting a robust performance monitoring system. By adopting TQM, construction firms in Enugu Metropolis can enhance the quality and efficiency of their maintenance operations, leading to longer-lasting buildings and reduced costs over time.

Despite the recognized importance of TQM in improving building maintenance, there is a significant gap in its application within the construction firms in Enugu Metropolis. Most contractors and building managers either lack awareness of TQM principles or fail to apply them consistently. This study aims to bridge this gap by investigating how TQM practices can be effectively integrated into building maintenance operations in construction firms across Enugu Metropolis. By exploring the level of commitment to TQM, the challenges contractors face, and the potential solutions that TQM can offer, this study seeks to provide a comprehensive approach

to improving building maintenance in the region. In doing so, it intends to fill the gap between current maintenance practices and the potential for a structured, quality-driven approach to building upkeep. The following specific objectives therefore determined:

- 1. The Total Quality Management practices used by contractors in building maintenance operation in Enugu Metropolis.
- 2. The level of commitment of contractors to Total Quality Management Practices in building maintenance operation in Enugu Metropolis
- 3. The challenges encountered by contractors while implementing Total Quality Management during the execution of maintenance operation.
- 4. The measures for effective quality assurance practice through the use of TQM in the building industry

# **Research Questions**

The following research questions guided the study:

- 1. What are the Total Quality Management (TQM) practices used by contractors in building maintenance operations in Enugu Metropolis?
- 2. What is the level of commitment of contractors to Total Quality Management practices in building maintenance operations in Enugu Metropolis?
- 3. What challenges do contractors encounter while implementing Total Quality Management during the execution of building maintenance operations?
- 4. What measures can be adopted to ensure effective quality assurance practices through the use of Total Quality Management in the building industry?

# **Literature Review**

# **Quality Management in Construction Industry**

The concept of quality has existed for many years, but its meaning has changed and evolved over time. Before the early twentieth century, quality management meant inspecting products to ensure that they met specifications (Rotimi, 2022). This is evident in the Egyptian wall painting circa of 1450BC which showed evidence of measurement. Stones used in the pyramids 16 which were cut so well that a knife could not go between them. According to Nair and Choudhary (2016) around 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. In the 1960s, with the help of so-called " quality gurus," the concept took on a broader meaning.

Quality began to be viewed as something that encompassed the entire organization, not only the production process. All functions were responsible for product quality and shared the costs of poor quality. However, in the 1970s and 1980s many U.S. industries had to make changes to their quality policies when they lost market share to foreign competition particularly in the auto

industry. Many hired consultants and instituted quality training programs for their employees (Rotimi, 2022). Fisher (2019) established in his study that many of the management practices used to support construction organizations are being challenged. The industry's clients are moving forward. Clients demand improved service quality, faster buildings and innovations in technology. In Nkrumah, Stephen, Takyi and Anaba (2017), Quality Management Concept is said to be structured in general according to the "International Organization for Standardization" ISO 9000-series and the "Plan, Do, Check, Act" PDCAcycle. It further illustrated the two main structures stated above as follows;

**ISO 9000-series:** According to EN ISO 9000 quality management is defined as "coordinated activities to direct and control an organization with regard to quality". Direction and control with regard to quality generally includes establishment of the quality policy and quality objectives, quality planning, quality control, quality assurance and quality improvement:

**Quality planning** is focused on setting quality objectives and specifying necessary operational processes and related resources to fulfill the quality objectives.

Quality control is focused on fulfilling quality requirements.

Quality assurance is focused on providing confidence that quality requirements will be fulfilled.

Quality improvement is focused on increasing the ability to fulfil the quality requirements

**PDCA-cycle** An important mindset of quality management is the PDCA-cycle. This cycle including the four components as Plan, Do, Check and Act (PDCA), was originally conceived by Walter Shewhart in the 1930's, and later adopted by W. Edward Deming. The model provides in general a framework for the improvement of a process or system and is an iterative four-step quality strategy cf (Nkrumah *et al.*, 2017).

Plan: Establish objectives and processes necessary to deliver results in accordance to specification.

**Do:** implementation of processes Check: Monitor and evaluate processes and results against objectives and specifications.

Act: Take actions to the outcome for necessary improvement (e.g. improve, standardize).

# Methodology

This study adopted a descriptive survey research design. The population for the study comprised 250 registered construction professionals in Enugu Metropolis. These professionals included 55 Architects, 70 builders, 65 Engineers, and 60 quantity surveyors. The entire population size of 250 respondents was used as the sample size. This means that the researcher can manage the population size therefore no sampling technique. A validated structured questionnaire titled "Total Quality Management Practices and Building Maintenance Operations Questionnaire" (TQMPBMOQ) was developed by the researcher. The questionnaire has two sections; A and B. Section A elicited profiles of the respondents while section B was divided into four clusters; I - IV in line with the

specific objectives of the study. The response options for the instrument was structured on a 4point scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree SD) with values 4, 3, 2, and 1 respectively. The questionnaire was also subjected to test of internal consistency using Cronbach Alpha method for the four clusters. After computation, reliability values of 0.76, 0.72, 0.82 and 0.77 were obtained for the four clusters. 250 copies of questionnaire were administered to the respondents using the direct delivery approach and 211 copies were retrieved and used for data analysis. Descriptive statistics of mean score was used to analyze the data to answer the research questions. The benchmark of 2.50 mean score was set for the decision rule for the mean scores. Any mean score below 2.50 is adjudged disagreed while any mean score above 2.50 is rated agreed.

#### Results

S/N	Item statement	SA	А	D	SD	Total	Х	Remarks
1	Human resources	45	100	42	24	211	2.79	Agree
		180	300	84	45	588		
2	Contract planning unit	56	89	46	10	211	2.81	Agree
		224	267	92	10	593		
3	Estimating department	40	102	30	39	211	2.68	Agree
		160	306	60	39	565		
4	Quality assurance unit	33	123	32	23	211	2.79	Agree
		132	369	64	23	588		
5	Marketing department	40	111	20	40	211	2.72	Agree
		160	333	40	40	573		
6	Health and safety department	46	108	40	17	211	2.87	Agree
		184	324	80	17	605		
7	Maintenance unit	46	93	38	34	211	2.72	Agree
		184	279	76	34	573		

 Table 1: Mean responses on respondents' Total Quality Management (TQM) practices used

 by contractors in building maintenance operations in Enugu Metropolis

The result revealed in Table 1 shows that items 1 - 7 with their respective mean scores of 2.79, 2.81, 2.68, 2.79, 2.72, 2.87 and 2.72 were rated agreed. This means that construction professionals agreed on TQM practices used in building maintenance operations in Enugu Metropolis.

Table	2: Mean	responses	on the	level o	of com	nitment	of	contractor	s to	Total	Quality
Manag	gement pr	actices in b	uilding	mainter	nance o	peration	ns in	i Enugu Me	trop	olis	

S/N	Item statement	SA	А	D	SD	Total	Х	Remarks	
8	Competent project team	43	99	39	30	211	2.73	Agree	
		172	297	78	30	577			
9	Project understanding	32	108	51	30	211	2.76	Agree	
IIAR	Page <b>119</b>								

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		128	324	102	30			
10	Meeting quality standard	21	139	35	11	211	2.75	Agree
		84	417	70	11	582		
11	Client involvement	50	56	81	24	211	2.63	Agree
		200	168	162	24	554		
12	Adequate resources	40	30	102	39	211	2.34	Disagree
		160	90	204	39	493		
13	Organization guidelines	56	89	46	10	211	2.81	Agree
		224	267	92	10	593		
14	Maintenance management	31	46	78	56	211	1.83	Disagree
		124	138	96	29	387		

The result in Table 2 revealed that items 12 and 14 with their respective mean scores of 2.34 and 1.83 were rated disagreed while items 8, 9, 10, 11 and 13 with their respective mean scores of 2.73, 2.76, 2.75, 2.63 and 2.81 were rated agreed. This means that construction professionals have high level of commitment to total quality management practices in building maintenance operations in Enugu Metropolis.

 Table 3: Mean responses of the challenges do contractors encounter while applying Total

 Quality Management during the execution of building maintenance operations

S/N	Item statement	SA	А	D	SD	Total	Х	Remarks
15	Lack of effective supervision	51	120	21	19	211	2.96	Agree
		204	360	42	19	625		
16	Lack of effective communication	42	113	35	21	211	2.83	Agree
		168	339	70	21	598		
17	Lack of management's commitment to	56	78	46	31	211	2.75	Agree
	quality assurance	224	234	92	31	581		
18	Lack of a quality assurance team to lead	31	139	25	11	211	2.85	Agree
	the process	124	417	50	11	602		
19	Personnel unable to thoroughly read and	50	56	81	24	211	2.63	Agree
	understand contract documents	200	168	162	24	554		
20	Field employees regarding quality	44	99	51	17	211	2.81	Agree
	assurance as irrelevant	176	297	102	17	592		
21	High labour turnover the company	43	99	39	30	211	2.73	Agree
		172	297	78	30	577		
22	Lack of skilled workers available	56	89	46	10	211	2.81	Agree
		224	267	92	10	593		-

The result in Table 3 revealed that items 15 - 22 with their respective mean scores 2.96, 2.83, 2.75, 2.85, 2.63, 2.81, 2.73 and 2.81 were rated agreed by the respondents. This means that construction professionals agreed on the challenges contractors encounter while applying Total Quality Management during the execution of building maintenance operations.

Table 4:	Mean	responses	on the	measures	can be	adopted	to ensu	ire effective	quality
assurance	e practi	ces througl	h the us	e of Total (	Quality N	<b>Janagem</b>	ent in th	e building in	dustry

S/N	Item statement	SA	Α	D	SD	Total	X	Remarks
23	Management commitment							
24	Communication between managers and	43	99	39	30	211	2.73	Agree
	employees	172	297	78	30	577		
25	Detailed and logical work report	37	108	51	30	211	276	A graa
23	Detailed and logical work report	120	224	102	20	211	2.70	Agiee
26	Deputer increation and audit of quality	120	524 112	102	30 21	011	2 02	A
26	Regular inspection and audit of quality	42	113	35	21	211	2.83	Agree
	report	168	339	/0	21	598		
27	Training and education of team	56	78	46	31	211	2.75	Agree
	members	224	234	92	31	581		
28	Review/analysis used to improve	31	139	25	11	211	2 85	Δ gree
20	performance	124	137 A17	50	11	602	2.05	ngice
20	Well defined roles and responsibilities	12 <del>4</del> 56	+17 70	16	21	211	2 75	1 0000
29	wen-defined roles and responsibilities	30	/0	40	31 01	211	2.75	Agree
	of project participants	224	234	92	31	581		
20	Clearly defined goals and chiestives	21	120	25	11	211	2 05	Agroo
50	Clearly defined goals and objectives	31 104	139	23 50	11	211 (02	2.83	Agree
		124	41/	50	11	602		

Data in Table 4 revealed that items 23 - 30 with their respective mean scores of 2.73, 2.76, 2.83, 2.75, 2.85, 2.75, and 2.86 were rated agreed by the respondents. This means that construction professionals agreed on measures adopted to ensure effective quality assurance practices through the use of Total Quality Management in the building industry.

# **Discussion of Findings**

The finding in research question one revealed that construction professionals agreed on TQM practices used in building maintenance operations in Enugu Metropolis. This means that all professionals involved are dedicated to maintaining and improving the quality of building maintenance services. This includes focusing on customer satisfaction, meeting or exceeding maintenance standards, and continuously improving practices. The findings among others revealed the Human resource, Contract planning unit, Estimating department, Quality assurance unit, Marketing department, Health & safety department, Maintenance unit, Contract planning unit, Estimating department, Faster project delivery, Safety performance, Quality during/after. The findings of the study supported that of Ye, Jin, Xia and Skitmore (2015) quality management is

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Page 121

essential in any construction activities been carried out. The finding of Ngatiman, Supriyoko and Mulyo (2022) agreed that engineers, architects, and facility managers regularly incorporate TQM into their building maintenance operations. Professionals may agree on key TQM practices such as continuous improvement, customer focus, and quality inspections.

The finding in research question two revealed that construction professionals have high level of commitment to total quality management practices in building maintenance operations in Enugu Metropolis. Professionals continuously seek to enhance the quality of their maintenance work. They regularly evaluate and refine their procedures, identifying areas where improvements can be made, and implementing better methods for inspection, repairs, and maintenance of buildings. The findings of the study is in line with Shamsuddin, Ani, Ismail and Ibrahim (2015) that contractors level of commitment to quality management is high because every contractor want to deliver a good job and make name. The finding also agreed with that of Aziz, Sumantoro and Maria (2019) that majority of firms incorporate key TQM strategies such as preventive maintenance, routine inspections, and continuous improvement efforts. These practices aim to reduce long-term maintenance costs and ensure higher building performance over time.

The finding in research question three revealed that construction professionals agreed on the challenges contractors encounter while applying Total Quality Management during the execution of building maintenance operations. This means that there is a consensus among these professionals regarding the common difficulties faced by contractors in implementing TQM principles. This finding supported that of Nwankwo and Ugwu (2020) that a large proportion of building maintenance contractors in Enugu Metropolis reported difficulties in securing adequate funding to maintain TQM practices consistently. The authors note that smaller firms, in particular, struggle to afford the quality management systems necessary for effective implementation, forcing them to prioritize cost savings over quality. Conversely, this finding opposed that of Obinna and Mba (2020) that many construction professionals in Enugu Metropolis were aware of the benefits of TQM and actively sought solutions to mitigate the associated challenges

The finding in research question four revealed that construction professionals agreed on measures adopted to ensure effective quality assurance practices through the use of Total Quality Management in the building industry. This findings was in tandem with that of Onoh and Emeka (2022) that firms that implemented training programs, invested in new technologies, and fostered better collaboration with clients to ensure successful TQM practices. These efforts were seen as an indication that despite the challenges, a growing number of contractors are embracing TQM as a necessary component of their operations. Aneke and Nnamani (2021) found that firms with proactive leadership were able to overcome challenges related to resource constraints and communication breakdowns. This support allowed for better allocation of resources and more effective quality management, contributing to smoother operations and greater consistency in TQM application.

# Conclusion

Construction professionals in Enugu Metropolis largely agree on the adoption and significance of Total Quality Management (TQM) practices in building maintenance operations. Their high level

of commitment to TQM reflects a growing recognition of its benefits in improving operational efficiency, enhancing client satisfaction, and ensuring long-term building quality. Despite this commitment, professionals acknowledge various challenges that contractors encounter when implementing TQM, including resource constraints, lack of training, resistance to change, and communication breakdowns. These challenges hinder the consistent and effective application of TQM practices. However, the professionals also agree on measures that can address these challenges, such as increasing investment in training programs, fostering better communication among stakeholders, and securing management support for quality assurance practices.

#### Recommendations

Based on the findings of the study, the following recommendations were made:

- 1. Given the high level of commitment among construction professionals to TQM practices, it is recommended that ongoing professional development and training programs be established. These programs should focus on building the capacity of contractors, site supervisors, and other stakeholders in effectively applying TQM principles.
- 2. To address the challenges related to communication breakdowns, it is recommended that collaborative platforms be established for stakeholders involved in building maintenance operations. These platforms should facilitate regular discussions, feedback sessions, and the exchange of best practices related to TQM, improving overall coordination and project quality.
- 3. Financial constraints and resource limitations have been identified as significant challenges in applying TQM during building maintenance. It is recommended that construction firms and industry regulators allocate more resources to the implementation of TQM. This could include access to modern tools, technologies, and financial incentives that support quality management.

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Page **123** 

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Page 124

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