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CRITICAL SUCCESS FACTORS ASSOCIATED WITH TOTAL QUALITY MANAGEMENT (TQM) IMPLEMENTATION FOR CONSTRUCTION PROJECTS IN NIGERIA

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ABSTRACT

Purpose: The study identified critical success factors associated with TQM implementation for construction projects in south-south Nigeria and explored their underlying factors by categorising the critical success factors using principal component analysis (PCA)
Design/Methodology: Anchored on quantitative questionnaire survey approach, 91 copies of the structured questionnaire were distributed while 50 valid responses were retrieved giving a response rate of 55%. Data were analysed using descriptive statistics, Mann-Whitney U-test, and principal component analysis.
Findings: Findings revealed that customer satisfaction, top management commitment to quality processes, benchmarking, maintaining quality culture and design quality management were ranked top five (5) CSFs associated with TQM implementation for construction projects by respondents in the study while factor analysis conducted produced 7 components. The hypothesis postulated for the study was accepted because the p-value was greater than 0.05 which meant that there was no significant difference in the perception of respondents on the CSFs associated with TQM implementation practices between Akwa Ibom and Rivers States.
Research Implications: It was recommended among others that, construction companies as well as stakeholders should take strategic measures in ensuring that customer satisfaction, top management participation and commitment to quality process and maintaining quality culture were given priority as they were the key CSFs for implementing TQM practices.
Original Value: The study produced a model of critical success factors which was the first in the south-south geopolitical zone of Nigeria.
Keywords: Success factors, quality management, factor analysis, Nigeria.

1. INTRODUCTION

Globalisation of market economies has triggered the need for all corporations in all sectors to concentrate on maintaining a sustainable competitive edge which is directly related to the upkeep of quality both in terms of services and productivity. This is only possible if an organisation engages in operations that are able to effectively compete in the market (Kothari, 2004). Market today is characterised by stiffening competitive

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nature and ever changing customer expectations and demand. An organisation must come up with unique competitive strategies and produce goods and services that continuously meet and exceed these demands and expectations (Salaheldin, 2009). Along with quality, cost, delivery, and flexibility, customer focus is another competitive priority to adapt filling operation strategies proactively in changing environments (Nair and Boulton, 2008).

Successful businesses today ensure that customer satisfaction is of primary focus. This has resulted to the exercise of value creation. Therefore, with the concept of value, customer value has become a source of sustainable competitiveness and companies here adopted different platforms for value creation such as: mass production, streamlined supplier networks, value in design, lean construction/ production, six sigma and Total Quality Management (TQM). TQM is one of the management approaches used to achieve continuous coordination of efforts directed at improving customer satisfaction, increasing employee participation, strengthening supplier partnerships, and facilitating an organisational atmosphere of continuous quality improvement.

According to Arditi and Murat (1997), management commitment to quality and continuous quality improvement is very important concept in construction industry as professionals are well aware of the importance of quality training. Most companies try to satisfy their customer's needs and expectations by improving product quality, increased customer satisfaction and continued improvement towards world class organisations. These challenges have forced companies around the globe to change their old traditional quality systems and implement new quality approaches to deliver high quality goods and services. Although methods to improve and manage quality are numerous, it can be said that TQM has become one of the most successful practices in helping companies enhance competitiveness and prosperity through ensuring sustainability growth (Osayawe and McAndrew,2005).

However, in developing a total quality culture in construction, one important step is to develop a construction team of a main contractor, subcontractors, and suppliers who would commit to the quality process and develop a true quality attitude (Kasongo and Moono, 2010). Therefore, firms have adopted various managerial approaches to cope with any current or future challenges and some organisations have adopted TQM as one of the managerial and organisational methods to achieve long term profitability, sustainability and competitiveness (Bani and Loiy, 2012). TQM implementation in the construction industry gained government attention in different countries such as the United Kingdom and United States. Several reports including Latham Report (1994) and Egan Report (1998) were published to help construction companies to implement TQM and tackle controversial issues facing the industry. These reports have emphasised the attitudes of quality in a company as demonstrated by partnering, team building and employee empowerment. Although, this has been a good start, there are still barriers to the successful implementation of TQM in construction industry. Construction companies are adopting TQM to improve their performance but they still lag behind other industries in the implementation of TQM and one of the main reasons is their inability to determine customer requirements accurately in terms of critical success factors and transform this knowledge into a complete practical reality.

The issue of quality has become of great importance especially with the ever growing concerns and demands from various players in the market (Kothari, 2004). These demands arise due to the increased number of reported quality issues like the frequent collapse of structures leading to injuries and death. In Nigeria, for instance, a number of buildings have been reported to have collapsed due to quality issues, like poor

supervision, poor quality materials, poor construction procedures and poor inspection (Adenuga, 2013). To respond to these failures, most organisations and even the government have resorted to adopt and implement operations management strategies that have been seen to work elsewhere in as much as quality management is concerned. Due to the importance of construction industry in the Nigerian economy and the highly competitive environment in the construction sector, firms are required to adopt TQM approach in order to compete locally and globally by improving their quality system to facilitate and increase their market share and client relation. Thus, the construction sector has to be developed in different areas starting with adoption of a formal quality approach, having a clear understanding of TQM approaches and key business processes, employee training and observation and performance measurements (Dahlgaard, Kristensen, Kanji and Gopal, 1992).

While most studies on TQM have focused on the manufacturing industry, a vital construction sector that contributes more than 16% to the nation's GDP and which is adjudged to be the largest employer of labour in Nigeria has been largely ignored. In Nigeria, most studies are on implementation of quality culture (Bello, Soyingbe and Akinwanide, 2012), factors affecting Quality (Adenuga, 2013) and the impact of TQM application in construction industry (Iruobe, Ojambati, and Akinpade, 2012). The study in this paper seeks to fill the gap by examining the critical success factors for TQM implementation as part of a two part research aimed at examining TQM practices for construction projects in south-south Nigeria.

1.1. Objectives of the Study

Given the background above, the specific objectives are to:

i. Identify critical success factors associated with TQM implementation for construction projects in the study area.

ii. Categorise the critical success factors (CSFs) associated with TQM implementation for construction projects using principal component analysis (PCA).

The outcome of the study is expected to create awareness on the critical success factors associated with TQM implementation, thereby enabling the stakeholders and construction companies to pay close attention to these factors so as to enhance elimination of rework and promote defect-free projects.

2. LITERATURE REVIEW

2.1. Concept of Total Quality Management

TQM is an integrated process involving both management and employees with the ultimate goal of managing the design, development, production, transfer and use of the various types of products and services in both the environment and market place (Johnson, 1987). It is also a continuous improvement approach to doing business through a new management model. The TQM philosophy evolved from the continuous improvement philosophy with a focus on quality as the main dimension of business. Emphasizing the quality of product or service is predominating under TQM. It expands beyond statistical process control to embrace a wider scope of management activities of how we manage people and organisations by focusing on the entire process. According to Oakland and Marosszeky, (2006), TQM is a comprehensive management system which;

- Focuses on meeting owners'/customers' need by providing quality services at a cost that provides value to the owners/customers.
- Is driven by the quest for continuous improvement in all operations
- Recognizes that everyone in the organisation has owners/customers who are either internal or external.
- Views an organisation as an internal system with a common aim rather than as individual departments acting to maximize their own performance.
- Focuses on the way tasks are accomplished rather than simply what tasks are accomplished.
- Emphasizes teamwork and a high level of participation by all employees.

In the construction industry, TQM is one of the approaches that contribute towards ensuring that projects are being delivered to the stakeholder requirements. According to Faroogui, Masood and Aziz (2008), construction sector globally is considered to be a basic industry on which the development of a country depends. To a great extent, the growth of a country and its development status is generally determined by the quality of its infrastructure development and construction projects. Quality is contained in the tripod of construction management and it does not only impact appearance and durability but also the performance of a project (Jackson 2004).

According to Peter (2001) TQM of a project is the accomplishment of project through the application and integration of the TQM process of initiation, planning, execution, monitoring, controlling and closing. It integrates these functions progressively through the project life cycle with the aim of achieving the desired project performance and to satisfy the stakeholders.

2.2. Critical Success Factors Associated with Implementation of TQM

Saraph et al. (1989) defines critical success factors for TQM as critical area of managerial planning and action that must be practiced to adhere to effective quality management in business enterprise. The construction industry has lagged behind other industries in implementing reform through total quality management. It has not followed manufacturing industry in the implementation of TQM. The success of TQM philosophy in manufacturing and other industries is forcing construction organisations to adopt TQM. Below are the 10 critical success factors of TQM for construction industry.

Top Management Commitment: Research suggests that most quality tools associated with TQM do not generally produce an advantage, but a certain behavioural feature such as executive commitment can produce an advantage. Many a time TQM initiatives have failed to fulfil their potentials due to lack of senior management commitment to the quality process. Thus, for TQM, commitment by the management is essential. Without it, there is no need to proceed further (Jaafreh et al., 2013).

Quality Culture: The factor like use of information for improvement, authority equal to responsibility. Job security, climate of fairness, compensation based on equality, teamwork, collaboration, learning and involvement, ownership, and development from an organisational culture, which then tends to increase in productivity, quality and customer and employee satisfaction. Failure of the TQM is attributed to a lack of developing and sustaining a quality oriented culture and mismatch of organisational culture. In a sense, TQM fundamentally requires a new culture. In the construction industry, company culture and project culture both co-exist and need integration (Saraph et al., 1989).

Strategic quality management: Strategic quality management concepts must be put into practice by the inclusion of quality objectives in the strategic planning process and through strategic planning frameworks, like Quality Function Deployment (QFD), which provide specific instructions for approaching, executing and evaluating the development of strategic concepts. Internal issues develop a long-term road-map with the incorporation of core competencies concepts and emphasize the adoption of new technologies. External issues are the response of the organisation to the economic swings in the industry, the impact of new market opportunities or existing business practices and protection against competitors (Prayugo and Sohal, 2006).

Design Quality Management: Superior designs result in distinct competitive capabilities such as fast delivery and flexibility. In construction projects, new designs are thoroughly reviewed before construction and experimental design is used extensively in structure design. Clarity of specifications and avoidance of frequent redesign is emphasized. Detailed design, schedule and cost estimate, design evaluations, constructability in design, control of design activity are part of design quality management. Thus, good design quality management results in an excellent quality of core service that positively influences customer's perceptions of quality and an important aspect of TQM (Gadenne and Sharma, 2009).

Process Management: This focuses on managing the construction process so that it operates as expected, without breakdowns, shortage/missing materials and tools (Black and Porter, 1996). It is needed to reduce rework and waste due to mis-specification of processing parameters. This provides clarity of ownership and less reliance on inspection. In the context of construction, specific activities like planning the sequence of field tasks, analysis of layout, access, temporary facilities, innovative use of construction equipment and tools and the use of pre-assembly or pre-fabrication items are carried out. Also, constructability is included in the contract document. Pre-work, demobilization and execution are part of process management (Juran, 1998).

Supplier Quality Management: Supplier quality management includes fewer dependable contractors, enhance on suppliers' process control, storing inter dependence of supplier and customer, purchasing policy, emphasizing quality rather than price, supplier quality control and supplier assistance in quality development. Materials are often a major source of quality problems and affect buyer satisfaction. Instead of relying on tools such as acceptance sampling to establish the quality of incoming materials and component parts, it is preferable for constructors to purchase from a move limited number of qualified or certified suppliers (Powel, 1995).

Education and Training: Education and training forces employees to not only possess the adequate knowledge and skills to perform the jobs, but also to possess specific values, knowledge, and skills associated with TQM issues of appropriate training and inadequate knowledge. Thus, employees will be motivated to engage in quality-oriented behaviour when their roles and the relevance of their training to overall quality goals are clarified (Saraph, 1989).

Empowerment and Involvement: Empowerment and involvement enhances the individual self-esteem and improves his/her ability to solve problems and to make low-risk decisions. Workers motivation, responsibility, and accountability are generic concepts that can benefit any business organisation. The causes of ongoing quality problems like lack of team work, conflict and lack of worker involvement are overcome by personally participating in quality improvement activities, which leads to the success of TQM (Garvin, 1998).

Information and Analysis: Information and analysis consist of evaluation for various policies and strategies, quality audit, analysis of quality costs, department/function performance evaluation, and employee and supplier performance evaluation. If there is inferior dissemination of the generated information, quality techniques like benchmarking tool will be rendered ineffective. To maintain a true customer focus, an organisation must ensure prompt feedback of customer survey results to appropriate functional areas for effective actions (Saraph, 1989).

Customer Satisfaction: A construction organisation may outperform the competition by being able to anticipate and respond quickly to customers' demands with new ideas and technologies and to produce constructed facilities that satisfy or exceed customers' expectations. Despite the use of the latest process improvement techniques and capable management, a firm's neglect of its customers may lead to disaster. It is argued that without customer focus, the TQM programme will lack the foundations on which to build further (Barkley and Saylor, 1994).

Other critical success factors identified from the literature include benchmarking, business result, impact on society and environment, resources, and statistical process control Saraph (1989) and Oakland (1993).

3. RESEARCH METHODOLOGY

3.1. Research Design

This study adopted quantitative survey design and exploratory approach. It focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon. It will involve the use of structured questionnaire to illicit response from target respondents.

3.2. Area of the Study

The areas of study are Akwa Ibom and Rivers states. Uyo became the capital of the Akwa Ibom state on September 23, 1987 following the creation of Akwa Ibom State from erstwhile Cross River State. Akwa Ibom State has a population of 3,920,208according to the 2006 census and is largely a civil service state. Akwa Ibom is one the states that make up the Niger Delta region in Nigeria. Port Harcourt is the capital of Rivers State and has an estimated population of 5,185,400 inhabitants according to 2006 census. It is the largest city in the Niger Delta and oil capital of Nigeria as major international oil services and exploration companies are located in that city. The two states share large portion of massive construction activities carried out by state government, federal government, Niger delta development commission (NDDC) and some private sectors in the south-south geopolitical zone of Nigeria on account of increased allocation coming into the two states.

3.3. Population and sample

Population is the collection of all items which may include people or objects or of events that are to be considered in a given problem situation (Udofia, 2011). The population for this study included all the construction companies both indigenous and multinational in the two states, Akwa Ibom and Rivers state. Target respondents who are representatives of the contractors included project managers, site supervisors, and quality control managers. Efforts were made to ensure that only those who have specific knowledge of how their companies handled issues of quality management especially with regards to TQM practices for their projects were used for the study.

The formula provided by Yamane (1967) was used to generate the sample size as follows:

$$n = \frac{N}{1 + N(e)^2} \qquad Equation\ (1)$$

Where n = sample size, N = Population size, e = level of precision = 0.05 at 95% confidence level.

The formula was adopted because it takes care of the confidence level as well as the level of precision required to accommodate the probable sample error. For instance, it enables the researcher measure the compliance level of TQM practices in order to be 95% confident that the probable error of using a sample rather than the entire population will not exceed 5%. Tables 1 shows how the formula was applied to generate the sample size for the study.

Table 1: Sample frame of construction companies used for the study

State	Sample frame	Sample	Valid response
Akwa Ibom	46	41	27
Rivers	57	50	23
Total	103	91	50

Sampling technique has two major types; the random or probability sampling technique and the non-probability sampling technique. Probability sampling refers to all forms of sampling in which the items sampled are selected according to some known laws of chance such that every item in the population has a known chance (equal or unequal) of being selected (Saunders et al., 2009). This study adopted stratified random sampling, simple random sampling and purposive sampling techniques. Stratified random sampling divides the population into series of relevant strata in such a way that each of the strata is represented proportionally within the sample. The stratified random sampling was used to divide the construction companies into Akwa Ibom and Rivers states while simple random sampling was used to select sample of construction companies from each state.

3.4. Data Collection and analysis

Data for the study were collected mainly through a structured questionnaire. The questionnaire was divided into two parts. Section A captured the respondents' demographic data (company category, educational qualification, job description, working experience and company location). Section B contained structured questions on critical success factors associated with TQM implementation while respondents were asked to rate their levels of agreement with the 15 factors using a scale of 1=strongly disagree, 2=disagree, 3=moderate, 4=agree and 5=strongly agree. Responses of the respondents from the questionnaires were gathered, coded and processed using the SPSS (Statistical Package for Social Sciences) software. Data collected were analysed using descriptive statistics and principal component analysis.

4. PRESENTATTION AND DISCUSSION OF RESULTS

4.1. Personal Information

The frequency tables for personal data are displayed in the Tables 2, 3, 4, 5 and 6. For category of company, 26 of the respondents were from contracting companies, 21 were consultants and 3 were clients. In terms of Academic qualification, it can be seen

that none of the respondents was below HND/BSC and this shows how reliable this information is. Majority of the respondents are Engineers (19), followed by Builders (13), then Quantity surveyors (8), Architects (6), Estate managers (2) and Quality managers (2). Under working experience, only 9 of the respondents were within '0-5yrs' category, the rest have been in the business for 6 years and above. 27 of the respondents were in Akwa Ibom state while 23 of them were in River state.

Table 2: Category of company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contractor	26	52.0	52.0	52.0
	Consultant	21	42.0	42.0	94.0
	Client	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Table 3: Academic Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NCE/ND	0	0.0	0.0	0.0
	HND/BSC	31	62.0	62.0	62.0
	MSC	18	36.0	36.0	98.0
	PhD	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

Table 4: Job description

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architect	6	12.0	12.0	12.0
	Builder	19	38.0	38.0	50.0
	Estate Manager	3	6.0	6.0	56.0
	Quantity Surveyor	8	16.0	16.0	72.0
	Engineer	11	22.0	22.0	94.0
	Others	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Table 5: Working experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5yrs	16	32.0	32.0	32.0
	6-10yrs	18	380	38.0	70.0
	11-15yrs	10	20.0	20.0	90.0
	16-20yrs	5	10.0	10.0	100.0
	Total	50	100.0	100.0	

Table 6: Location of company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Akwa Ibom State	27	54.0	54.0	54.0
	Rivers State	23	460	46.0	70.0
	Total	50	100.0	100.0	

4.2. Critical Success Factors Associated with TQM Implementation

The objective two of this study was achieved by rating the 15 CSFs derived in the literature review by the respondents who are construction experts. They were specifically asked to rate the level to which the CSFs are associated with TQM implementation using scale of 1 = strongly disagree, 2 = disagree, 3 = moderate, 4 = agree, 5 = strongly agree. Result of the analysis is shown in Table 7.

Table 7: *Mean scores and ranking of Critical Success Factors for TQM*

S/N	CRITICALSUCCESS FACTORS	AKWAIBOM		RIVERS		COMBINED	
		Mean	Rank	Mean	Rank	Mean	Rank
1	Customer satisfaction.	4.00	2	4.17	1	4.08	1
2	Top management commitment to the quality process.	4.07	1	3.96	3	3.96	2
3	Benchmarking	4.00	2	3.74	10	3.88	3
4	Maintaining quality culture.	3.96	4	3.78	8	3.88	3
5	Design quality management.	3.78	7	3.96	3	3.86	5
6	Information and analysis.	3.74	9	4.00	2	3.86	5
7	Resources	3.70	12	3.96	3	3.82	7
8	Statistical process control	3.85	6	3.74	10	3.80	8
9	Business result	3.93	5	3.61	15	3.78	9
10	Empowerment and involvement.	3.70	12	3.83	6	3.76	10
11	Impact on society and environment	3.70	12	3.83	6	3.76	10
12	Education and training.	3.74	9	3.74	10	3.74	12
13	Strategic quality management.	3.78	7	3.70	14	3.74	12
14	Supplier quality management.	3.59	14	3.78	8	3.68	14
15	Process management.	3.56	15	3.74	10	3.64	15

The result in Table 7 shows that the five top CSFs associated with TQM implementation were "customer satisfaction" (mean =4.08), "top management commitment to quality process" (3.96), "benchmarking" (mean = 3.88),"maintaining quality culture" (mean = 3.88) and "design quality management" (mean = 3.86). However, the three least rated CSFs by respondents were "process management" at 15th(mean = 3.64), "supplier quality management" at 14th (mean = 3.68), and "strategic quality management" at 13th(mean = 3.74).

Testing of Hypothesis

In order to the level of similarity of opinion of respondents across the two states used for the survey, a hypothesis was postulated to guide the study. It states that there is no significant difference in the perception of respondents on the CSFs associated with TQM implementation practices in the study area. Mann Whitney U test was used to test the hypothesis. It is a non-parametric tool used to compare means for two independent groups and to find out if the distribution of an independent variable is the same for the two groups and therefore from the same population. The decision rule is that the null hypothesis is accepted for all p-values greater than 0.05 (5% level of significant difference), otherwise the hypothesis is rejected and the alternative hypothesis accepted**.** The results of analysis are presented in Tables 8 and 9.

Table 8: Mean Ranks result from Mann Whitney test analysis

	Study Areas	N	Mean Rank	Sum of Ranks
Perception of respondents on CSFs associated with TQM practices	Akwa Ibom State	15	15.77	236.50
	Rivers State	15	15.23	228.50
	Total	**30**		

Table 9: Mann Whitney U test statistics result

	Perception of respondents on CSFs associated with TQM practices
Mann-Whitney U	108.500
Wilcoxon W	228.500
Z	-.168
Asymp. Sig. (2-tailed)	.866
Exact Sig. [2*(1-tailed Sig.)]	.870

The result indicates that Mann-Whitney U is 108.5 while p-value is 0.866 (p>0.05). The hypothesis is therefore accepted because the p-value is greater than 0.05. This means that there is no significant difference in the perception of respondents on the CSFs associated with TQM implementation practices between Akwa Ibom and Rivers States.

4.3. Categorisation of CSFs Associated with TQM Practices

Factor analysis by PCA was used to explore the hidden relationships among the critical success factors using Varimax rotation. Factor extraction determines the factors through principal component analysis; while at the second stage, factor rotation eliminates medium loadings by maximizing the number of high and low loadings to make factor interpretation more accurate (Udofia, 2011).

Kaiser-Meyer-Olkin (KMO) measures sampling adequacy and Bartlett's test of sphericity is used to test for the appropriateness of the sample from the population and

the suitability of factor analysis. The result in Table 10 shows a chi-square of 119.474 and a significant level of 0.008, which is an indication that the sample is adequate. KMO is also an index for comparing magnitudes of the observed correlation coefficients of all pairs of variables. It is small when compared to the sum of square correlation coefficient. A KMO value of 1 represents a perfectly adequate sample. A KMO value of 0 represents a perfectly inadequate sample. The KMO value in Table 4.12 is 0.609, which shows that the sample is reasonably adequate.

Table 10: KMO and Bartlett's Test Result

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.609
Bartlett's Test of Sphericity	Approx. Chi-Square	119.474
	df	105
	Sig.	.008

Table 11 shows the initial Eigen value, the extracted sum of squared loading and rotation sum of squared loading presented as total variance explained. It indicates that 7 components accounted for 73.017% of total variance explained while remaining 26.983% of the variance of the variables is accounted for by extraneous factors which are unique to the variables.

Table 11: Result of variance explained by the 15 factors

	Initial Eigen values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.634	17.557	17.557	2.634	17.557	17.557
2	2.047	13.645	31.202	2.047	13.645	31.202
3	1.569	10.462	41.663	1.569	10.462	41.663
4	1.393	9.288	50.952	1.393	9.288	50.952
5	1.256	8.376	59.328	1.256	8.376	59.328
6	1.047	6.982	66.309	1.047	6.982	66.309
7	1.006	6.708	73.017	1.006	6.708	73.017
8	.788	5.251	78.268			
9	.712	4.749	83.017			
10	.698	4.656	87.673			
11	.600	4.000	91.673			
12	.421	2.808	94.481			
13	.372	2.480	96.961			
14	.232	1.546	98.507			
15	.224	1.493	100.000			

Tables 12 and 13 shows the rotated component matrix and factor categorisation with factor loading distribution.

Table 12: Rotated Component Matrix Varimax

	Component						
Variables used in Factor Analysis	1	2	3	4	5	6	7
TMCQP	.814						
MQC	.716						
SQM	.514						
DQM					.658		
PM			.759				
SQM			.690		.502		
E&T					.801		
E&I				.663			
I&A				.855			
CS	.614						
BM			.562				
BR		.763					
IS&E						.748	
RS							.898
SPC		.794					

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 10 iterations

Table 13: Factors categorization with loaded items and values

Factors	Items loaded	Loading values
Top management	Top management commitment to quality process	0.814
	Maintaining quality culture	0.716
	Strategic quality management	0.514
	Customer satisfaction	0.614
Process control	Statistics process control	0.794
	Business results	0.763
Process management	Process management	0.759
	Benchmarking	0.562
	Supplier quality management	0.690
Information and Employee involvement	Information and analysis	0.855
	Empowerment and involvement	0.663
Training and quality management	Education and training	0.801
	Design quality management	0.658
	Supplier quality management	0.502
Impact on environment	Impact on society and environment	0.748
Resources	Resources	0.898

Factor 1: Top management

Top management commitment to quality process 0.814
Maintaining quality culture 0.716

Strategic quality management 0.514
Customer satisfaction 0.614
Factor 2: Process control
Statistics process control 0.794
Business result 0.763
Factor 3: Process management
Process management 0.759
Benchmarking 0.562
Supplier quality management 0.690
Factor 4: Information and employee involvement
Information and analysis 0.855
Empowerment and involvement 0.663
Factor 5: Training and quality management
Education and training 0.801
Design quality management 0.658
Supplier quality management 0.502
Factor 6: Impact on environment
Impact on society and environment 0.748
Factor 7: Resources
Resources 0.898

Result in Table 13 indicates that 'Resources' loaded the most with 0.898 although categorized under factor 7 which has the lowest percentage variance compared to the first 6 factors. Judging from the rotation sums of squared loading, the relative importance of the 7 factors is equalized, the management of construction companies in south-south zone of Nigeria should ensure that top management are committed to quality process, quality culture are maintained by making sure the that the right resources are used for production processes, the right information is accessed at the right time and proper education and training of employees to achieve quality production void of defects at first attempt.

4.4. Discussion of Findings

Findings reveal that customer satisfaction, top management commitment to quality process, maintaining quality culture and benchmarking has the most ranked CSFs for the two states. For individual state, top management commitment to quality process, customer satisfaction and benchmarking ranked top three CSFs for Akwa Ibom state while customer satisfaction, information and analysis, and top management commitment to quality were ranked top three CSFs for Rivers state. This is consistent with the finding of Saraph (1989) that CSFs of TQM practices are critical areas of managerial planning and action that must be practiced to adhere to effective quality management in business unit. This also shows that managements in construction companies in south-south Nigeria is committed to implementing TQM practices and as such, they encourage the employees on the steps to effectively practice TQM.

The findings revealed that 7 components accounted for 73.017% of the total variance explained while the remaining 26.983% was accounted for by extraneous factor. Varimax rotation was employed which converged in 10 iterations. A total of seven (7) factors were extracted which were grouped and summarized. Factor 1 (Top management) has four items loaded in it. The loadings are; top management commitment to quality process, maintaining quality culture, strategic quality management customer satisfaction with loading values of 0.814, 0.716, 0.514, and 0.614 respectively. Factor 2 (Process

control) has two items loaded on it which are; statistical process control with loading values of 0.794 and business results with loading value of 0.763. Three items were loaded on factor 3(Process management) which includes process management (0.759), benchmarking (0.562) and supplier quality management (0.690). Factor 4 (Information and Employee involvement) has two items loaded namely; information and analysis (0.855) and empowerment and involvement (0.663). Three items loaded on factor 5 (Training and Quality management) were education and training (0.801), design quality management (0.658) and supplier quality management (0.502). Only one item was loaded on factor 6 and factor 7 (Impact on environment and Resources) which are impact on society and environment (0.748) and resources (0.898) respectively. Findings also show that resources, information and analysis, top management commitment to quality process, and education and training were highest loaded items individually irrespective of the factors grouping, with loading values of 0.898, 0.855, 0.814 and 0.801 respectively.

5. CONCLUSION AND RECOMMENDATIONS

The study investigated CSFs associated with TQM implementation; explore the underlying relationships within the factors using factor analysis. Findings reveal that customer satisfaction, top management commitment to quality process, benchmarking, maintaining quality culture and design quality management were ranked top five CSFs associated with TQM implementation for construction projects by respondents. It was therefore concluded that construction companies in south-south, Nigeria, need a lot of improvement in their practices towards TQM in order to enhance their quality standards to meet and align with ISO 9000 series of TQM practices.

From the study, it was evident that customer satisfaction, top management commitment to quality process, and maintaining quality culture were the top critical success factors in implementation of TQM practices for construction companies as responded by the respondents. This study therefore recommends that construction companies as well as stakeholders should take strategic measures in ensuring that customer satisfaction, top management participation and commitment to quality process and maintaining quality culture are given priority as they are the key CSFs for implementing TQM practices. This study further recommends that top managements should commit themselves in providing leadership and key resources needed in quality management. Organisations should train their employees on TQM practices regularly and at all levels in the organisations so as to enhance knowledge of TQM Practices. Quality managers and project managers should develop appropriate, effective and flexible communication systems that allow free flow of quality information at all levels in the organisation.

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