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EFFECT OF IMPLEMENTING TOTAL QUALITY MANAGEMENT (TQM) ON BUILDING PROJECT DELIVERY IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract

Total Quality Management (TQM) is a management approach to long-term success through customer satisfaction. All members of the organisation are usually involved although the management team are involved in the final decision. Due to the fragmented nature of the construction industry and the involvement of many stakeholders, the concept of TQM is a challenging issue despite the aim of TQM to ensure improvement in the quality of the end product. Thus, this study intends to assess the barriers to the implementation of TQM for building project delivery. A total of fifty-one (51) Questionnaires were administered to participants with years of experience in construction projects in Lagos State, Nigeria. A quantitative research design was adopted. Data obtained based on the stratified random sampling technique were analysed through Statistical Package for Social Sciences (SPSS) version 23 using descriptive statistical tools. The population of the study comprises Quantity Surveyors, Architects, Engineers and Builders. The findings of the study revealed that the construction professionals in Lagos State Nigeria have started demonstrating strong interest in implementing TQM in each of the applicable areas of building project delivery. However, to achieve full implementation of TQM practices, the study revealed that the top management is the major catalyst of the implementation of TQM. As a result, they should be willing to show a strong commitment to the adoption of TQM. This can be achieved by enrolling their employees on TQM training programs. Furthermore, the study showed that implementing TQM will result in better client satisfaction, timely completion of building projects and also reduce cost expenses.

Keywords: Construction Industry, Project delivery, Quality measurers, Total Quality Management

INTRODUCTION

The Construction Industry (CI) plays a major role in the development of any nation (Thomas & Jayakumar, 2017). CI also drives the development of infrastructure and the economy of developing countries (Altayeb & Alhasanat, 2014). It contributes to the Gross Domestic Product (GDP) of any nation (Anny, Anthony, & Kehinde, 2015). However, many factors such as poor workmanship, defects, reworks, cost and time overrun mitigate against the growth of the construction companies (Neyestani & Juanzon, 2016). The industry is a complex, competitive and high-risk business outfit due to the limitations of traditional project delivery systems (Harrington, Sinha, Voehl, & Wiggin, 2012)

Delivering quality projects is a challenge for the CI due to the dearth of information and studies to develop quality improvement initiatives (Reinaldo, Neto, Caiado, & Quelhas, 2020). According to Shoshan & Çelik (2018), the construction industry suffers from shortages of skilled labour, low quality and low productivity as well as accumulating problems, such as manufacturing defects and time and cost overrun. This has led to poor performance, waste and rework along with chronically low levels of customer satisfaction. Therefore, there is a need for change and adoption of Total Quality Management (TQM) to improve the conditions of the CI (Harrington et al., 2012).

The construction industry is based on craftsmanship. Hence quality control and assurance procedures that are applicable in the manufacturing industry cannot be readily applied in construction where there are higher degrees of uniqueness in every project (Frank & Roland, 2001). The study of TQM becomes imperative in an attempt to bridge the gap between the construction and manufacturing industries. Ozaki (2003) opined that construction clients' and customers' demand for enhanced product quality and lower production cost has necessitated the study of TQM on the production processes of construction products.

TQM can be defined as an approach to improving the competitiveness, effectiveness, and flexibility of an organisation. Oakland and Aldridge (1995) opined that TQM is essentially a way of planning, organizing, and understanding each activity that depends on each individual at each level. Pheng and Teo (2004) discussed the implementation of TQM in construction firms and concluded in their study that TQM has been recognised as a successful management philosophy in the manufacturing and service industries, thus, embracing it in the construction industry will improve quality and productivity.

The development of quality management can be defined in four stages viz a viz; quality inspection, quality control, quality assurance and TQM (Dale, 2003). The TQM stage is the highest level involving the application of quality management principles in all aspects of the business (Altayeb & Alhasanat, 2014). The TQM philosophy is useful for all parties in the construction industry (Mahmoud, 2013). It will help to place value on long-term relationships, enhance communication and translate the skills and professionalism in the entire construction sector as well as help to achieve the intended project objectives and benefits (Pheng & Ke-Wei, 1996).

A study by Pheng and Teo (2004) in the area of TQM implementation shows that the benefits of customer satisfaction, better quality products, and higher market share are often obtained following the adoption of TQM by construction companies. Motwani (2001) opined that implementing TQM is a major organisational change that requires a transformation in the culture, process, strategy, priorities and beliefs of an organisation.

The major problem faced by most construction companies in Nigeria is how to adopt a strategy for high-quality construction that will satisfy the needs of the owner at a reduced, effective price and still ensure that they remain in business without being in debt (Femi, 2015). These problems are multifaceted because the owner wants to spend the least amount possible for the highest quality end product. The challenge now arises on how the company will meet the demand of the clients by providing high-quality buildings at the lowest cost, particularly with extensive competition from various bidders.

TQM implementation problems within the construction industry generally result from the fact that these industries are different from the manufacturing industry (the industry that has most effectively utilized TQM) (Kuprenas, Soriano, & Ramhorst, 1996). The construction industry has a large number of organisational collapses, especially during a downturn in the economy (James Sommerville & Robertson, 2000). Therefore, commitment towards TQM policies that may take several years to provide payoffs may be considered a misdirection of resources. Teams specially formed for a project may cease to work after contractual obligations end (Pheng & Teo, 2004). Many contractors consider high-quality programs as an extra cost, but little do they realize that it is the non-conformance to quality that is expensive. The sources of costs associated with the no achievement of quality include the cost of rework, waste, errors, customer complaints, budget deficiencies, and schedule delays (Elghamrawy & Shibayama, 2008).

Implementing TQM in construction companies implies a comprehensive change to every aspect of the construction process. The process of change is difficult for two main reasons. Firstly, CI had been historically reluctant to implement change. Secondly, a longer time is required than in other sectors. Sommerville & Sulaiman (1997) analysed the implementation of TQM in construction companies and found that most construction managers lack long-term strategy, and systemic views of production management, and have a relatively conservative position towards managerial changes. Hence, the need for this study to identify and examine the barriers to the implementation of TQM on building project delivery.

LITERATURE REVIEW

TQM Concept

TQM is a management approach that has become popular since the early 1980s when it became a powerful method of competitiveness (Bani Ismail, 2012). TQM is defined as a "continuous process of improvement for individuals, groups of people and whole organisations" (Kanji & Asher, 1995). Sashkin and Kaiser (1991) opined that TQM is based upon the constant attainment of customer satisfaction, through incorporating management and employee commitment, training, continuous improvement and great supplier relations. A quality department is based on integrating all organisational functions to focus on fulfilling client needs to achieve organisational objectives, which can be reached by providing employees with the required training towards being self-motivated and controlled to come up with new ideas and methods of doing the job and dealing with clients to provide a high-quality service (Bani Ismail, 2012).

TQM concept is an aspect of continuous improvement which aims at quality as a key parameter of any successful business, hence the quality of a product or service is essential to TQM (Ajayi & Osunsanmi, 2018). According to Pheng & Teo (2004), TQM is a "journey" hence a change in the behaviour and culture of the organisation. TQM entails managing construction activities, the stakeholders, and the construction process from the early stage of the project till the completion stage (Ajayi & Osunsanmi, 2018). The concept focuses on meeting client requirements by providing quality services at a cost that provides value to the client (Hampson & Kraatz, 2011).

The TQM concept and approach are well-understood and widely practised in Europe, North America, Japan and the growing economies of East Asia (Bani Ismail, 2012). However, some firms have experienced difficulties in implementing TQM successfully. These difficulties may not be due to the TQM concept itself; rather, there might have been problems stemming from the cultural factors. However, this often resulted in missing the whole picture of TQM. According to Wong (1999), who indicated that the quality programs implementation in developing countries failed due to the lack of understanding of quality management (QM). Yusof & Aspinwall (2000) stated that failure to understand of top management of TQM programs requirements and the implementation process. Furthermore, it is clear that top management needs to have a good understanding of the purpose of TQM, how its requirements are implemented, ways to measure its business impact and areas in which benefits may lie.

However, problems and errors that arise during the project construction phases, offer opportunities for learning and improvement. One of the main objectives of TQM is to increase customer satisfaction (Chow-Chua, Goh, & Wan, 2003). It requires a commitment to consider the customer's viewpoint in every process. Many concepts have been successfully applied in the manufacturing sector to achieve continual improvement and ultimately product quality. One of these is known as the Juran Trilogy (Juran, 1992). This encompasses three aspects: quality planning, quality control and quality improvement. According to Juran (1992), quality planning is the activity of satisfying customers by developing products and processes that meet their demands. To do so, a series of steps are followed: setting up quality goals, identifying customer needs, developing products that meet customer desires, establishing process controls and evaluating quality performance. However, based on the Juran quality process, the following are the required tools/techniques, which could support a continual improvement process on building project delivery:

1) Planning tools for setting up quality goals.
2) Customer needs for identifying customer requirements.
3) Formal methods for developing products that meet customer needs.
4) Quality control for establishing process controls; and
5) Performance measures for evaluating quality performance.

TQM Adoption in the Construction Industry

Past studies considered the concept of TQM as one of the best solutions to overcome the construction industry problems. Many studies have focused on the importance of implementing the TQM philosophy. Irani, Beskese, and Love, 2004 showed that different construction companies are not willing to implement TQM to reduce quality problems in their projects because they consider TQM to be synonymous with Quality Assurance (QA).

Research conducted by Rao, Youssef, and Stratton (2004) showed that TQM is becoming more than a way of saving a company by increasing profitability in the short term, but companies enjoy cost-efficiency, flexibility and responsiveness. A comprehensive survey was also carried out by Delgado-Hernandez & Aspinwall (2008) aimed at determining whether the use of improvement tools in the construction industry is an important aspect of continued improvement. Results showed that quality, performance measures, and technology tools are common practices in the construction industry.

Agus (2005) identified the relationship between TQM and overall performance. Results showed that there is a strong and positive relationship between TQM, overall performance and customer satisfaction and suggested that an emphasis on quality would result in organisation gains. Also, Rategan (1992) showed that a 90% improvement rate in employee relations, operating procedures, customer satisfaction, and financial performance is achieved due to TQM implementation. From research aiming towards developing a framework for implementing TQM in the construction industry, Al-Sehali (2001) demonstrated that TQM has become one of the best solutions to overcome the construction industry's problems, and specification could be used as a gateway to introducing TQM to the construction industry.

According to Rounds and Chi (1985), one of the most important benefits of implementing TQM in the construction industry is to enhance continuous improvement. Continuous improvement would yield excellence in design, ensure communication in contracts and create a teamwork spirit in construction. Continuous improvement should be an objective as it is a necessary objective of TQM implementation.

In developing a total quality culture in construction, one important step is to develop a construction team made up of the main contractor and subcontractors who would commit to the quality process and develop a true quality attitude. Pheng & Ke-Wei (1996) opined that the main contractor should only select subcontractors who have demonstrated quality attitude and work performance on previous jobs.

Chileshe (1996) showed that most organizations in the construction industry were reluctant to implement Total Quality Management because they felt that the ISO 9000 series was enough and that they did not want to subject their employees to any more "cultural shock". Organizations also felt that there were other pressing issues to consider such as survival. In addition, Irani et al., (2004) noted that organizations in the construction industry have abstained from implementing Total Quality Management practices because they feel that the short-term benefits are relatively minimal due to the complex nature and ever-changing environment of construction projects. Biggar (1990) suggested that the management system must be flexible, sensitive to effective communication and continually improving.

Past studies concluded that it is necessary to transpose and translate the principles, practices and techniques used for Total Quality Management in manufacturing to construction (Formoso & Revelo, 1999; Lahndt, 1999; McCabe, 1996; Soares & Anderson, 1997). Lahndt, (1999) concluded that Total Quality Management (TQM) techniques have been used extensively and beneficially in the areas of manufacturing and industrial engineering to control processes and prevent defects before they happen, ultimately saving millions of dollars. The construction industry needs the same types of tools and for the same reasons, but due to the dissimilarity industries, cannot apply them as they are. Formoso & Revelo (1999) conducted a study aimed at developing a method for improving the materials supply system in small-sized building firms using Total Quality Management (TQM) principles. The results showed that it is not easy to apply such techniques and principles in small-sized buildings.

METHODOLOGY

A quantitative research design was used for this study. The population of the study comprises Quantity Surveyors, Architects, Building Services Engineers (Mechanical and Electrical) and Builders. The list of these construction professionals which serves as the sampling frame for this study was obtained from their respective professional bodies. The total population is 4862. The sample size was calculated using the formula method

$$n = \frac{Z^2 pqN}{e^2\,(N-1) + Z^2 pq}$$

n = sample size, N= population size; p is the population reliability or frequency estimated for sample size n), p is 0.5 and p+q = 1, e = margin of error considered as 10% and Z = normal reduced variable at 0.05 level of significance = 1.96.

Sample size calculated (n) $= \frac{1.96^2 \times 0.5 \times 0.5 \times 4862}{0.10^2\,(4862- \quad) + 1.96^2 \times 0.5 \times 0.5} = 94$

RESULTS

A total of 94 questionnaires were distributed but 51 questionnaires were retrieved and used for the analysis. This gives a response rate of 54.26%. Table 1 shows that the majority of the respondents (42%) work in a contracting organization, while 33% and 16% work in a private organization and public sector respectively. The remaining 10% works in a consultancy organization. For the profession, Quantity surveyors are the major contributor to this study with a percentage of 45%, followed by Architects with 14%. This is then followed by the Civil/Structural Engineer and Project Manager both represented by 14% of the respondents. The Builders were represented by 10% of the total respondents, while the Document Controller, Engineering Draftsman, Project Planning Engineer and QA/QC Engineer were the least contributors with 2%. Forty-nine Percent (49%) of the respondents are Bachelor's degree holders while 37% are Master's degree holders next is Higher National Diploma holders with 10%. Master of Business Administration and Doctorate holders were both 2%. Additionally, 31% of the respondents have between 1-5 years of working experience, 20% have between 6-10 years of working experience, and 31% have between 11- 15 years of working experience. 6% of the respondents have 16-20 years of experience, and 12% of the respondents have 20 and above years of experience. This shows that the respondents are experienced and can provide useful information for this study. For the number of projects handled by the respondents' organizations, over 41 projects representing 53% have been completed by the companies. This indicates that the majority of the respondents' companies have handled a large number of projects. Quantity Surveyors. The remaining 2% are fellow members of the NIA

Table 1: Demographic Information

Variables		Frequency	Percentage (%)
Type of Organization	Consultancy	5	10
	Contracting	21	41
	Private	17	33
	Public Sector	8	16
	Total	51	100
Professional Designation	Architect	7	14
	Builder	5	10
	Civil/Structural Engineer	6	12
	Document Controller	1	2
	Engineering Draftsman	1	2
	Project Manager	6	12
	Project Planning Engineer	1	2
	QA/QC Engineer	1	2
	Quantity Surveyor	23	45
	Total	51	100
Highest Academic Qualification	HND	5	10
	B. TECH/B.SC	25	49
	M.SC	19	37
	MBA	1	2
	PhD	1	2
	Total	51	100
Years of Experience	1-5	16	31
	6-10	10	20
	11-15	16	31
	16-20	3	6
	20 and above	6	12
	Total	51	100
Number of projects handled by the organization	11-20	4	8
	21-30	9	18
	31-40	7	14
	41 and above	27	53
	5-10	4	8
	Total	51	100

Source: Ajayi, Olanipekun and Adedokun (2020)

Figure 1 shows that out of the 35% of the respondents are graduate members of their professional body, the Quantity Surveyors are the highest with a percentage of 20%. This is followed by the Architects and the Engineers who are both 6%. For the NIOB, 2% of the respondents are graduate members, while the remaining percentage is for others. Also, the figure shows that 56% of the respondents are corporate members of their professional body, the Quantity Surveyors are the highest with a percentage of 24%. This is followed by the Engineers and the Builders who are both 16% and 8%. For the Architects, 6% of the respondents are corporate members, while the remaining percentage is for others. Similarly, out of the 6% of the respondents are fellow members of their professional body, 4% are Quantity Surveyors.

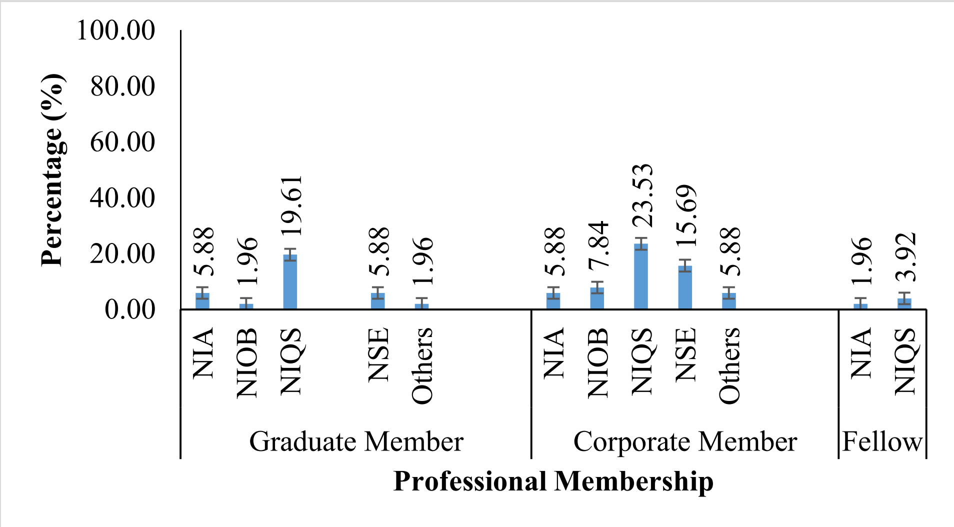

Figure 1: Histogram of the Professional Qualification of Respondents
Source: Ajayi, Olanipekun and Adedokun (2020)

Barriers to the Implementation of TQM on Building Project Delivery

Table 2 shows the ranking of the barriers to the implementation of TQM on building project delivery. Lack of top management support and leadership procedures (SI = 86.67; SD = 0.71) ranked first, followed by Lack of workforce qualified in quality management implementation (SI = 83.14; SD = 0.92) and difficulties in including quality measures, continuously monitored & construction process (SI = 83.14; SD = 0.81) both ranked second, next was Difficulties in employing statistical quality control techniques in the construction process (SI = 82.75; SD = 0.75) ranked fourth, Need for conducting continuous training programs for employees (SI = 81.96; SD = 0.78) and Need for employing skills workforce (SI = 81.18; SD = 0.83) were ranked fifth and sixth respectively. Difficulties in mapping processes and developing standards (SI = 80.78; SD = 0.85) and the High cost of developing and utilizing a quality management system (SI = 80.78; SD = 0.82) were both ranked seventh.

Also, Lack of effective team/team building skills (SI = 80.00; SD = 0.92) and Difficulties in developing quality information systems in the construction process (SI = 80.00; SD = 0.94) were both ranked ninth. Incompatibility of standardised quality management system with the construction industry (SI = 78.82; SD = 0.95), Difficulties in taking corrective and preventive actions (SI = 77.65; SD = 0.91), Difficulties in quantifying cost of quality (SI = 76.86; SD = 0.92) and Low education level of field forces (SI = 75.69; SD = 1.03) were ranked eleventh, twelfth, thirteenth and fourteenth respectively.

Furthermore, Difficulties in quantifying the cost of poor quality (SI = 75.29; SD = 0.93), Difficulties in finding workers who can claim to be experts in both construction and quality (SI = 74.90; SD = 1.09), Primary customer focus (SI = 74.12; SD = 1.12) and Too tight schedules (SI = 69.80; SD = 1.10) were ranked fifteen, sixteenth, seventeenth and eighteenth respectively. An increase in paperwork (SI = 1.06; SD = 1.06) was ranked last.

Table 2: Ranking of the Barriers to TQM

S/N	Barrier	Code	SI	SD	Rank
1	Lack of top management support and leadership procedures	B1	86.67	0.71	1
2	Lack of workforce qualified in quality management implementation	B5	83.14	0.92	2
3	Difficulties in including quality measures, continuously monitored & construction process	B7	83.14	0.81	2
4	Difficulties in employing statistical quality control techniques in the construction process	B4	82.75	0.75	4
5	Need for conducting continuous training programs for employee	B13	81.96	0.78	5
6	Need for employing skills workforce	B8	81.18	0.83	6
7	Difficulties in mapping processes and developing standard	B2	80.78	0.85	7
8	High cost of developing and utilizing a quality management system	B14	80.78	0.82	7
9	Lack of effective team/team building skills	B6	80.00	0.92	9
10	Difficulties in developing quality information systems in the construction process	B9	80.00	0.94	9
11	Incompatibility of standardised quality management system with the construction industry	B16	78.82	0.95	11
12	Difficulties in taking corrective and preventive actions	B3	77.65	0.91	12
13	Difficulties in quantifying the cost of quality	B15	76.86	0.92	13
14	Low education level of field forces	B19	75.69	1.03	14
15	Difficulties in quantifying the cost of poor quality	B10	75.29	0.93	15
16	Difficulties in finding workers who can claim to be experts in both construction and quality	B12	74.90	1.09	16
17	Primary customer focus	B17	74.12	1.12	17
18	Too tight schedules	B18	69.80	1.01	18
19	Increase in paperwork	B11	69.02	1.06	19

Note: SI = Severity index; SD = Standard deviation

Source: Ajayi, Olanipekun and Adedokun (2020)

Factor Analysis of the Barriers to TQM

Table 3 shows the total variance explained for the barriers to the implementation of TQM. The table shows the percentage of variance for initial eigenvalues, Extraction sums of squared loadings and Rotation sums of squared loadings. For initial eigenvalues, the percentages of variance from components 1 to 19 are 43.741, 10.299, 8.073, 5.827, 5.55, 4.512, 3.828, 3.701, 3.205, 2.518, 2.165, 1.625, 1.245, 1.092, 0.889, 0.672, 0.427, 0.348 and 0.281 respectively. For Extraction sums of squared loadings, the percentages of variance are 43.741, 10.299, 8.073, 5.827 and 5.55, while for Rotation sums of squared loadings, the percentages of variance are 18.618, 17. 483, 16.018, 12.279 and 9.091.

Table 3: Total Variance Explained for Barriers of TQM

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.311	43.741	43.741	8.311	43.741	43.741	3.537	18.618	18.618
2	1.957	10.299	54.04	1.957	10.299	54.04	3.322	17.483	36.101
3	1.534	8.073	62.113	1.534	8.073	62.113	3.043	16.018	52.119
4	1.107	5.827	67.94	1.107	5.827	67.94	2.333	12.279	64.398
5	1.055	5.55	73.49	1.055	5.55	73.49	1.727	9.091	73.49
6	0.857	4.512	78.002						
7	0.727	3.828	81.831						
8	0.703	3.701	85.532						
9	0.609	3.205	88.736						
10	0.478	2.518	91.254						
11	0.411	2.165	93.419						
12	0.309	1.625	95.045						
13	0.237	1.245	96.29						
14	0.208	1.092	97.382						
15	0.169	0.889	98.271						
16	0.128	0.672	98.944						
17	0.081	0.427	99.371						
18	0.066	0.348	99.719						
19	0.053	0.281	100						

Extraction Method: Principal Component Analysis.

Table 4 shows that there is an overall statistical difference between the variables. Also, since Sig<0.005, the data is suited for factor analysis.

Table 4: KMO and Bartlett's Test for Barriers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.751
Bartlett's Test of Sphericity	Approx. Chi-Square	674.906
	df	171.000
	Sig.	0.000

Source: Ajayi, Olanipekun and Adedokun (2020)

Table 5 shows the summary of the Rotated Factor Matrix for the barriers to the implementation of TQM. The factor analysis was performed following the Principal Component Solution with a Varimax Rotation (Kaiser,1958). The data fed into Factor analysis consisted of the data obtained from respondents (51). The component factors were rotated by a varimax solution. The discussion of the result has been based on the varimax rotated factor matrix. To discuss the result of the factor matrix the factor loading of 0.50 or above is considered to be significant.

Factor loadings are simply the correlation coefficient between an original variable and an extracted factor. However, the factor loading (except those less than 0.5) of the barriers to the implementation of TQM on building project delivery. Component 1 consists of six significant factors with factor loadings ranging from .505 to .0.874, Component 2 consists of five significant factors with factor loadings ranging from 0.525 to 0.776, Component 3 consists of five significant factors with factor loadings ranging from 0.547 to 0.677, Component 4 consists of two significant factors with factor loadings 0.737 and 0.868, while Component 5 consists of one significant factor with loading factor of 0.597.

Table 5: Rotated Component Matrix for TQM Barriers

Barriers	Component					
		1	2	3	4	5
Lack of top management support and leadership procedures	B1			0.669		
Difficulties in mapping processes and developing standard	B2			0.677		
Difficulties in taking corrective and preventive actions	B3			0.628		
Difficulties in employing statistical quality control techniques in the construction process	B4			0.646		
Lack of workforce qualified in quality management implementation	B5		0.525			
Lack of effective team/team building skills	B6	0.563				
Difficulties in including quality measures, continuously monitored & construction process	B7		0.713			
Need for employing skills workforce	B8		0.756			
Difficulties in developing quality information systems in the construction process	B9		0.65			
Difficulties in quantifying the cost of poor quality	B10					0.597
Increase in paperwork	B11	0.77				

Difficulties in finding workers who can claim to be experts in both construction and quality	B12				0.737
Need for conducting continuous training programs for employee	B13		0.776		
High cost of developing and utilizing a quality management system	B14	0.65		0.547	
Difficulties in quantifying the cost of quality	B15				
Incompatibility of standardised quality management system with the construction industry	B16	0.874			
Primary customer focus	B17	0.769			
Too tight schedules	B18	0.505			
Low education level of field forces	B19				0.868

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 8 iterations.

Source: Ajayi, Olanipekun and Adedokun (2020)

Figure 2 shows the scree plot for the barriers to the implementation of TQM on building project delivery. Based on the scree plot, it can be seen that it might lead to a slightly different conclusion because as the number of variables increases, the more unreliable the scree plot becomes. Component 1 was along the vertical position of the elbow while components 2 – 19 were parallel to the horizontal axis indicating zero eigenvalue.

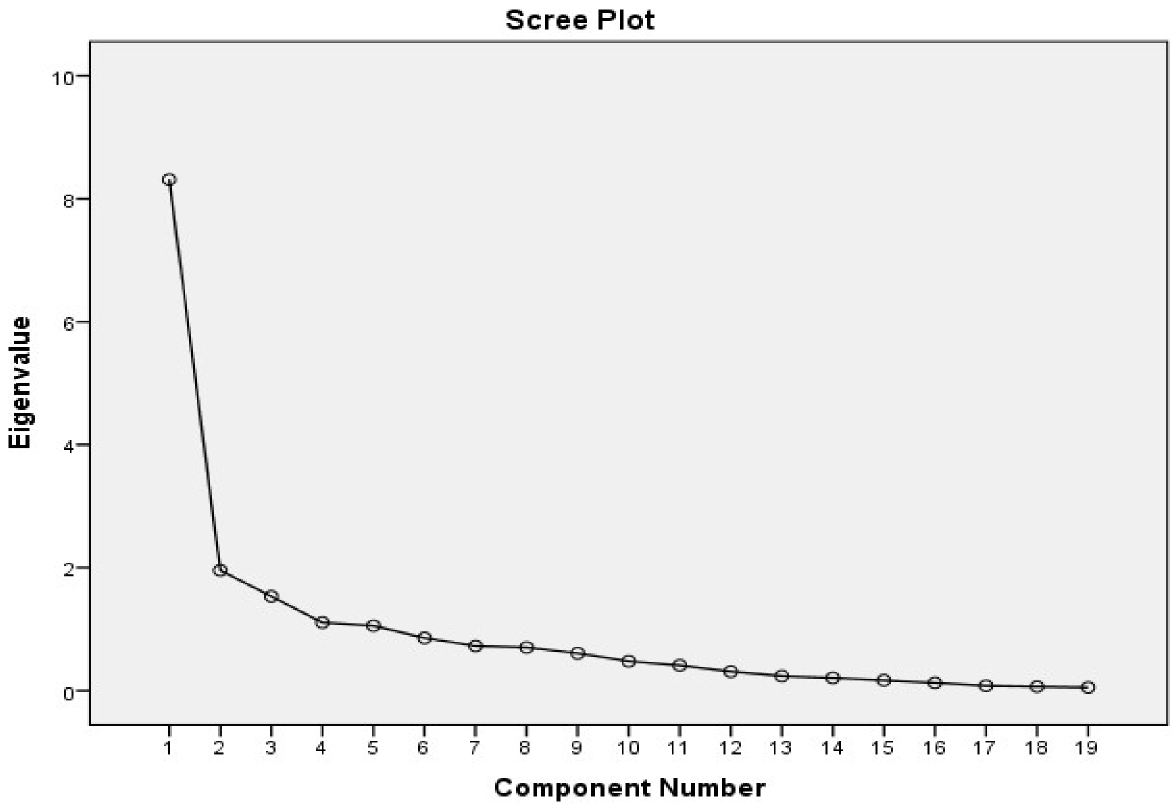

Figure 2: Scree Plot for Barriers to the Implementation of TQM on Building Project Delivery

Source: Ajayi, Olanipekun and Adedokun (2020)

DISCUSSION OF FINDINGS

The barriers to the implementation of TQM in Building project delivery are a lack of workforce qualified in quality management implementation and difficulties in including quality measures during the construction process. This is in support of the study of Ajayi and Osunsanmi (2018) which identified the factors affecting the implementation of TQM as management commitment factors, the role of quality department, training and Education. Thus, TQM involves management skills in its implementation.

Previous studies also identify training, teamwork, leadership, management process and strategic quality planning amongst others as barriers to the implementation of TQM (Suwandej,2015; Abdullah et al, 2009). According to Dahiya and Bhatia (2013) cited in Ajayi and Osunsanmi (2018), identified quality culture, autocratic style of leadership, communication problem and commitment of the employee to implement change as a barrier in the implementation of TQM.

CONCLUSION AND RECOMMENDATION

The top management team must consistently demonstrate the highest level of commitment to ensure full implementation of TQM practices. There should be extensive awareness and training programs initiatives to improve the employees' and clients' understanding and approach toward quality and hence increase their achievement of quality culture, which would also improve coordination, productivity, and construction industry performance. Construction professionals need to understand that change is a slow and often painful process and sometimes takes time. Hence, they should all work in collaboration and provide adequate support for the successful implementation of TQM practices. The Nigerian construction industry should be able to develop and implement strategies for the effective implementation of TQM to enable it to compete with other developing and developed countries.

Finally, an effective control mechanism should be designed for monitoring the entire process. A team can be formed to monitor the TQM framework and produce a process that addresses the continuous improvement cycle.

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