AN ASSESSMENT OF QUALITY PERFORMANCE IN CONSTRUCTION USING CLIENTS' PERSPECTIVES OF CONTRACTORS' PROJECT-LEVEL QUALITY PERFORMANCE

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ABSTRACT

A strong quality culture has been recognised to be an important prerequisite to the achievement of sustained competitive advantage through the continuous delivery of high quality products and services as well as clients'/end-users' satisfaction. The last decade however exposed the declining level of clients' satisfaction from the built facilities as a result of poor quality performance in addition to the perennial problems of time and cost overruns in the Nigerian construction industry. This has necessitated a radical change in industry practice in order to improve the quality of construction processes and the level of clients' satisfaction arising therefrom by devising methodology for evaluating the quality performance of the contractors. This paper identified quality attributes relevant to the construction process and proposed a quality performance evaluation model that covers both the corporate and operational levels of a construction project. The paper also implemented the framework in the form of an investigative survey into the quality performance of building contractors in Nigeria as perceived by client organisations. The assessment was based on clients' perception of the contractor quality practices (CQP) based on the identified quality attributes. Seventy two (72) client organisations comprising of government, semi-government and private clients assessed the quality performance of eighteen (18) contractors. The responses were ranked and analysis of variance (ANOVA) was used to measure the degree to which the three categories of clients agree on their assessment of CQP. The results reveal that the three categories of clients generally agree on their assessment, indicating a general consistency in the CQP amongst the contractors. The proposed contractors' quality performance evaluation model can be used in both contractor pre-qualification and/or selection systems.

Keywords: Client; construction; contractor; performance; quality

INTRODUCTION

Although the Nigerian construction industry produces nearly 70% of the nation's fixed capital formation (FOS, 1998), its performance within the economy has been, and continues to be, very poor. For example, the Nigerian construction industry's contribution to employment has remained consistently at 1.0% over the last decade against the World Bank's average observation of about 3.2% in developing countries (FOS, 1998).

In order to enhance the level of competitiveness and facilitate the production of higher quality construction, both Latham (1994) and Egan (1998) have suggested the consideration of quality as a major criterion in construction procurement systems. Yet, quality remains an elusive attribute that has been defined in many different ways. Oglesby *et al.* (1989) consider quality as a subset of performance, in conjunction with productivity; safety and timeliness, while others seem to think of it in terms of "conformity to established requirements" or "fitness for purpose" (Kaydos, 1991; Milakovich, 1995). Tamimi and Sebastianelli (1996) reported a study that requested managers of 86 eastern US firms to define quality and the responses included perfection, consistency, eliminating waste, speed of delivery, compliance with policies and procedures, doing it right the first time, total customer service and satisfaction, etc. ISO 8402 defined quality as the degree of excellence in a competitive sense, such as reliability, serviceability, maintainability or even individual characteristics.

Similarly, the term 'performance' can also take on different meanings depending on the context in which it is being used. Traditionally, it has been used to measure the effectiveness (doing the right thing) and efficiency (doing the right thing right). Various researchers have attributed numerous dimensions to performance, such as quality, productivity, profitability, safety, timeliness, growth, satisfaction, etc. (Szilagyi, 1988; Oglesby *et al.*, 1989; Kaydos, 1991; Milakovich, 1995).

Therefore, in order for construction clients and end-users of completed facilities to realise best value, the concept of quality culture must be stressed in the industry to improve the quality of services (design and construction processes) and products (facilities constructed) offered by various organisations. Accordingly, there is a need for a framework for evaluating quality performance to assist construction clients in selecting quality-oriented organisations that will provide higher quality services and products within budget and on schedule. Therefore, the principal aim of this paper is to provide a methodology that will improve the quality of the design and construction processes and the level of customer satisfaction derived therefrom. The specific objectives include to:

a) review existing quality-based performance measurement frameworks in use in the construction industry;
b) investigate project quality attributes in the design and construction process;
c) develop a holistic quality performance evaluation model that will encompass both the corporate and project levels of a construction; and
d) demonstrate the application of the framework by investigating the client's perspectives of the quality performance of their contractors at operational level.

Review of Contemporary Quality-based Performance Frameworks

Quality Based Selection (QBS) processes for both consultants and contractors are being promoted and used in the UK, US, Japan, Canada, Australia and by non-governmental organisations such as World Bank and Asian Development Bank (CIC, 1998, 2002; CIRIA, 1998; FIDIC, 2003). The procedure generally adopted entails the evaluation of either the consultants or contractors in terms of criteria such as qualifications, experience, ability and integrity. However, while these systems may be able to assess the clients' requirements, they are often incapable of capturing the peculiar needs and desires of the end-users. The following are some of the international quality-based performance frameworks.

EFQM Excellence model

The EFQM Excellence Model was introduced at the beginning of 1992 as the framework for assessing organisations for the European Quality Award. The model is a practical tool that can be used for self-assessment; for benchmarking with other organisations; as a guide to identify areas for improvement; as the basis for a common way of thinking; and as a structure for the organisation's management system. It is a non-prescriptive framework based on nine criteria; five of which are '*enablers*' and four are '*results'*. The '*enabler'* criteria cover what an organisation does (such as leadership, people, policy & strategy, partnerships & resources, and processes) and the '*results'* criteria cover what an organisation achieves (such as performance, people, customer, and society results). While the '*results'* are caused by '*enablers',* the '*enablers'* are improved using feedback from '*results'*.

The RADAR (results, approach, deployment, assessment, and review) logic of the EFQM model is used to deliver continuous improvement. Watson and Seng (2001) argue that EFQM model is well-defined and easier for construction companies to understand and implement. Similarly, Robinson *et al*. (2002) reported that construction firms consider the EFQM model less difficult to implement in terms of determining and monitoring indicators. Nonetheless, Watson and Seng (2001) highlighted implementation problems to include resistance to change, inexperience with the model, documentation difficulties, insufficient time and fund allocation.

Malcolm Baldrige National Quality Award

The Malcolm Baldrige National Quality Award (MBNQA), established in 1987, recognizes US companies that excel in quality management practices and quality results that achieve the highest levels of customer satisfaction. The Malcolm Baldrige criteria are non-prescriptive, comprehensive, directed towards business results, part of a diagnostic system that include interrelated learning cycles, and emphasizes alignment between the stakeholders (Evans and Lindsay, 2005). The seven generic categories that are assessed in the Malcolm Baldrige Award are *leadership, information and analysis, strategic planning, human resource development and management, process management, business results, and customer focus and satisfaction*. These categories derive from the following set of core values that promote delivering increased value to customers and improvement of overall company performance and capabilities: *customer driven quality, leadership, continuous improvement and learning, employee participation and development, fast*

response, design quality and prevention, long range view of the future, management by fact, partnership development, corporate responsibility and citizenship, and results orientation (Evans and Lindsay, 2005). Several outstanding companies have won the Baldrige award, among them Motorola, Armstrong World Industries, Dana Credit Corporation, Federal Express, Texas Instruments, Inc., Ritz-Carlton Hotel Company, Xerox Corporation, and Merrill Lynch Credit Corporation. It is worthy of note that no construction organizations have yet won the award, although many are undoubtedly adopting quality management techniques as first steps toward that coveted goal.

Deming Prize

The Deming Application Prize was instituted in 1951 by the Union of Japanese Scientists and Engineers (JUSE) in recognition and appreciation of W. Edwards Deming's achievements in statistical quality control. It is awarded annually to a company or a division of a company that has achieved distinctive performance improvements through the application of company-wide quality control (CWQC). As defined by JUSE, CWQC is a system of activities to assure that quality products and services required by customers are economically designed, produced, and supplied while respecting the principle of customer orientation and the overall public wellbeing (Evans and Lindsay, 2005). The judging criteria for the Deming Prize consist of a checklist of 10 major categories, with each major category divided into subcategories or 'checking points'. For example, the policy category includes policies pursued for management, quality, and quality control; methods for establishing policies; appropriateness and consistency of policies; utilisation of statistical methods; communication and dissemination of policies; checks of policies and the status of their achievement; and the relationship between policies and long- and short-term plans.

ISO 9000

The ISO 9000 series of standards are quality system standards that guide a company's performance of specified requirements in the areas of design/development, production, installation and service. They presume that certain generic characteristics can be standardized, and that a well designed, well implemented and carefully managed quality system provides confidence that the outputs will meet customers' expectations and requirements. They mainly require the supplier to have a verifiable process in place to ensure that it consistently produces what it says it will produce. ISO 9000 requirements are listed in detail by Evans and Lindsay (2005). ISO 9000 promotes conformance to quality system requirements. Evans and Lindsay (2005) observed that one of the major shortcomings of ISO 9000 is that it does not encourage continuous improvement within a company in terms of leadership, strategic planning, or customer relations management. However, it is still a good set of common practices for quality assurance.

It should be noted that the Malcolm Baldrige Award goes beyond the requirements of ISO 9000, emphasizing continuous improvement and customer satisfaction, in addition to ISO 9000's conformance requirements. This is why the core values that underlie this award may be used in defining the company-level quality in the context of the construction industry. These core values are indicators of outstanding quality management practices within a company. Companies that display an established

quality culture achieve quality results along with the highest levels of customer satisfaction. The core values underlying the Malcolm Baldrige criteria could be viewed as building blocks in establishing a generic framework for modelling construction quality and client satisfaction. The core values will provide guidance to firms in the construction industry in interpreting what is expected of them as far as quality practices are concerned. These firms thus need to design and deliver their quality management systems and applications within these core values.

Balanced Scorecard (BSC)

The BSC has been described as one of the most influential business ideas of the 20th century in Harvard Business Review, and had been estimated to be used by 40% of the Fortune 1000 companies at the end of 2001 (Marr, 2001). The scorecard is divided into four perspectives; *financial, internal business, innovation and learning, and customer*. Together, these four perspectives provide a balanced view of the present and future performance of a business. The BSC has an important underlying principle, which is the cause-and-effect between perspectives. Innovation and learning develop new processes and technologies that decrease costs and increase efficiencies in the internal business perspective, which in turn provides more value to the customer, thus improving their satisfaction and finally leading to improved financial results. However, each measure has an impact on the other measures, and advances in one perspective can lead to lower performance in another. Managers thus need to consider the linkages and focus on achieving a level of profitability that can be sustained over the long-term. Schneiderman (1999) and Neely and Bourne (2000) reported that the majority of BSC implementation initiatives fail. Moreover, the four perspectives have been considered insufficient and additional general perspectives have been identified, such as competition (Neely *et al.,* 1995) and employee (Neely, 2002). Olve *et al*. (1999) observed that the development of various scorecards for different levels is a complex and time-consuming process and this has encouraged the proliferation of partial implementation. It also does not provide specific criteria within each of the four perspectives against which businesses can evaluate themselves, and thus creating the tendency for each organisation defining its own measures (Olve *et al*., 1999).

Kagioglou *et al*. (2001) suggested a conceptual framework for application of the BSC by construction firms and added two perspectives important to the construction industry: *project and supplier perspectives*. Additionally, the framework rationalizes the relationships between performance measures and goals derived from strategy to indicate potential area for improvement, through a process-performance measurement relationship matrix. Kagioglou *et al*. (2001) argued that methods used to measure performance in construction projects fall into the three main categories of the BSC: Financial perspective; internal business processes; and customer perspective. Organizational learning is emerging within the fourth BSC perspective of innovation and learning. But Kagioglou *et al*. (2001) asserted that organizational learning can be problematic since participants in construction projects are only temporarily joined. However, Kululanga *et al*. (2001) presented a framework for organizational learning measurement by construction contractors that explained definition difficulty and used dimensions and supporting factors to measure the degree of organizational learning.

Quality Performance at Corporate-level (QPC)

The foundations of the quality orientation of a company are defined at the corporate level. Quality orientation is recognized by an organizational commitment to developing and maintaining core competence based upon a quality focus (Miles *et al*., 1995). Core competence is what a company does better than anyone else. It should be noted that core competence should be enhanced in line with the business environment, to provide more value to the customer, otherwise it risks becoming obsolete (Russell and Taylor, 1998). Other factors contributing to quality orientation include the business performance and social responsiveness of the organisations. Evans and Lindsay (2005) asserts that quality-conscious companies adopt quality management systems that focus on creating and/or sustaining performance improvement in the areas of *management involvement and leadership, product and process design, product control, customer and supplier communications, quality improvement programmes, employee participation, education and training, and quality information.*

The corporate-level quality of a contractor can be experienced through the corporate quality culture, which comprise of the organizational value system that encourages a quality-conscious work environment. It establishes and promotes quality and continuous improvement through values, traditions and procedures (Goetsch and Davis, 2000). Saraph *et al.* (1989) and Black and Porter (1996) provides reliable and tested critical success factors for Total Quality management. Table 1 shows the quality performance indicators at corporate level of an organisation.

Table 1: Corporate Quality Performance Indicators

Factor 1	People and customer management ♦ Human resource management in line with company performance plans ♦ Employee recognition/ movement to support quality performance plans ♦ Management of customer relations.
Factor 2	Supplier partnership ♦ Assurance of supplier quality ♦ Action to assist and improve the quality and expensiveness of suppliers
Factor 3	Communication of improvement information ♦ Determination of quality costs ♦ Assessment of needs for quality trailing and subsequent delivery and review ♦ Benchmarking of processes in non-competing organizations ♦ Promotion of quality improvement with outside groups.
Factor 4	Customer satisfaction orientation ♦ Commitments to customers through strengthening of warranties/policies, etc. ♦ Comparisons of customers' satisfaction with competitors and internal indicators. ♦ Determination of improvements in customer satisfaction. ♦ Benchmarking of direct competitors' products and policies
Factor 5	External Interface Management ♦ Recognition of responsibilities for public health and safety, and the environment. ♦ Determination of customers' requirements. ♦ Integration of the design process with customer and operational requirements.

Factor 6	Strategic Quality Management ♦ Process control and improvement of core process in accordance with design ♦ Active leadership by managers in quality issues. ♦ Inclusion of employee well-being considerations in improvement activities. ♦ Senior executive commitment to quality through involvement and communications. ♦ Development/implementation of short-term plans/strategies focused on quality. ♦ Analysis of performance and cost data to support improvement priorities.
Factor 7	Team work structures form improvement ♦ Use of specific organizational structures to support quality improvement. ♦ Use of techniques to identity key process, customers and suppliers.
Factor 8	Operational Quality Planning ♦ Development/implementation of short-term plans/strategies focused on quality. ♦ Consideration of performance requirements in developing short terms goals.
Factor 9	Quality improvement measurement system. ♦ Assessment and improvement of processes, practices and products/services. ♦ Management of data/information to support quality improvement efforts. ♦ Procedures to ensure reliability and improvement of data gathering.
Factor 10	Corporate quality culture. ♦ Consideration of performance requirements in developing long-terms goals. ♦ Encouragement of a company wide culture committed to quality improvement.

Adopted from Black and Porter (1996)

Quality Performance at Project-level (QPP)

The quality performance of a construction project at the site-level includes the quality of the constructed facility as well as the quality of services. A mix of product and service quality dimensions would therefore be very instrumental to the achievement of site-level quality performance. Table 2 contains some of the product and service quality dimensions (attributes) from literature, and their interpretations.

Table 2: Product and Service Quality dimensions at Project-Level

Dimension	**Definitions**
Product Quality	
Performance[a]	Basic function of the facility meets the end-user's needs and intents
Features[a]	Characteristics that supplement basic functions of the facility
Reliability[a, c]	The level of confidence with which the end-user may use the facility, to the end of its design life, without failure.
Conformance[a]	The degree to which construction operations meet the design standards and specifications
Durability[a]	The amount of use end-users get from the facility before replacement is preferred to continued repair
Serviceability[a]	Speed, courtesy, competence with which maintenance on facility can be carried out
Aesthetics[a]	The level of satisfaction the end-user experiences with the facility's look, feel, sound, taste, or smell.
Perceived quality[a]	The level of satisfaction the end-user experiences with the facility's image and publicity
Service Quality	
Time[b]	The duration of the contract, including the wait for mobilisation on site
Timeliness[b]	Completion of the contract on the scheduled date
Completeness[b]	The amount of items on the punchlist upon completion of the

	project
Courtesy[b, c]	The degree of respect, politeness, friendliness and kindness of the site and other personnel
Consistency[b]	The ability to repetitively provide the same level of service to all clients
Accessibility & convenience[b, c]	The ease with which the contracting service is obtained
Accuracy[b]	The ability to provide the right service the first time with minimum amount of rework
Responsiveness[b, c, d]	The ability to react to the unexpected problems encountered during the contract. Willingness and readiness to provide prompt service
Reliability[c, d]	Ability to perform the promised service dependably and accurately
Communication[c]	Keeping customers informed in a language they can understand and listening to the customer when necessary
Credibility[c]	Honesty; trustworthiness
Security[c]	Physical, financial and confidentiality
Competence[c]	Possession of required skills and knowledge of all employees
Tangibles[c, d]	The physical facilities and equipment, and appearance of employees
Understanding[c]	The ability to comprehend the client's needs and requirements
Assurance[d]	Knowledge and courtesy of employees and their ability to inspire trust and confidence
Empathy[d]	The degree of caring, individualised attention the firm provides its customers
Recovery[e]	The ability to regain momentum and improve after each project completion

[a]Garvin (1988); [b]Evans and Lindsay (2005); [c]Parasuraman *et al.* (1985); [d]Parasuraman *et al.* (1988); [e]Gronroos (1988)

Proposed Framework for the Evaluation of Construction Quality Performance

Quality performance in the context of this paper is defined in terms level of satisfaction derived by owners and end-users of completed facilities as a result of the performance of the consulting and contracting organisations. The proposed methodology for evaluating quality performance, shown in Figure 1, diagnoses construction from both corporate level (where corporate strategies concerning how to perform the construction operations are formulated) and project level (where the design and construction systems produce a physical facility and provide contracting and consulting services). Although prescriptive in nature, this dissection would facilitate the development of strategies to define, operationalise, measure and improve construction quality at both corporate- and site- levels. The following definitions constitute the key quality dimensions of the proposed methodology:

a) Design Quality Practices – consist of a framework for guiding quality-related actions by all employees of the consulting organisations and a means of assessing how well these actions are carried out. These are reflected in the quality practices of the consulting organisations.
b) Total Quality Systems - consist of a framework for guiding quality-related actions by all employees and a means of assessing how well these actions are carried out. These are reflected in the quality management systems of the organisations.
c) Product design performance – the degree to which the features of the facility conform to the client's needs as expressed in the client's brief.
d) Product quality performance - the degree of conformance of built facility to the drawings and specifications.

e) Design service performance - the competence, integrity and promptness with which the design and construction planning activities are carried out by consultants.
f) Construction service performance - the technical/managerial competence, integrity and promptness demonstrated by contractors during the construction process.

The evaluation of project quality performance are based on the availability and implementation of certain quality improvement tools and techniques that will help in the assessment of the quality attributes identified at both corporate and project levels.

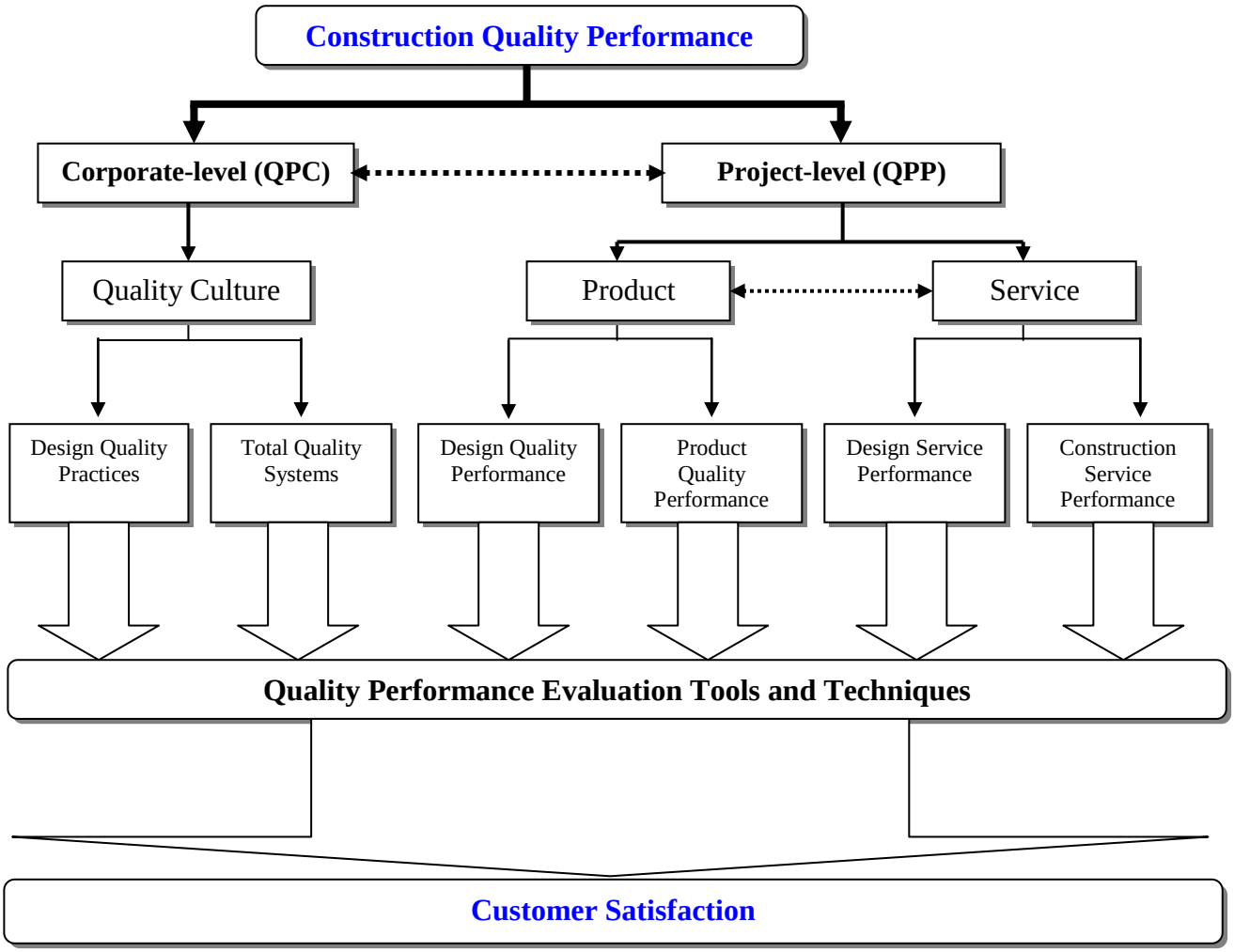

Figure 1: Framework for Evaluating Construction Quality Performance

Case Study: Clients' perspectives of Project-level Quality Performance of Contractors

The proposed framework was partially implemented in the context of clients' perceptions of the quality performance of contractors at the project level. The evaluation was restricted to the project level because construction is a project-oriented industry and many construction researchers have emphasized closer focus on the project level more than the organisational level (Kagioglou *et al.*, 2001; Love and Holt, 2000).

Eighteen (18) out of thirty (30) randomly selected medium sized contractors responded to the request to identify one each from the following client groups that they worked with recently; Government, Semi-government and Private clients. Each of the client organisations were requested to assess the quality performance of the specific contractor that identified them. The assessment was along the product and service dimensions identified in Table 2 using a scale of 1 to 5 where 1 is poor performance and 5 is best performance. The average means of the scores for each contractor and their rankings are given in Table 3. The contractors were labelled A to R to maintain the confidentiality of their identities assured during the survey.

Table 3: Evaluation Results of Assessment of Contractors by Client organisations

Contractors	Client Organisations			Average Score	Rank
	Government	Semi – government	Private		
A	4.18	4.33	4.55	4.35	2
B	4.18	4.42	4.35	4.31	4
C	4.14	4.42	4.30	4.29	5
D	4.14	4.08	4.30	4.17	10
E	3.78	3.83	4.05	3.89	12
F	4.36	4.17	4.45	4.33	3
G	3.82	4.08	3.75	3.88	14
H	4.18	4.17	4.35	4.23	7
I	3.96	4.25	4.45	4.22	8
J	3.96	4.25	4.35	4.19	9
K	3.75	4.17	3.75	3.89	12
L	4.32	4.50	4.30	4.37	1
M	4.00	4.50	4.30	4.27	6
N	4.32	4.67	4.30	4.10	11
O	2.00	2.33	2.00	2.11	17
P	0.00	0.33	0.00	0.11	18
Q	3.00	3.00	3.00	3.00	15
R	3.00	3.00	3.00	3.00	15

ANALYSIS OF VARIANCE (ANOVA)

An analysis of variances (ANOVA) test was carried out at 95% confidence level to determine whether the three groups of clients have different perceptions on the quality performance of the contractors. The null hypothesis, $H_{0,}$ was that the three groups of clients have the same perception about the quality performance of the contractors.

The decision was to accept H_1 if the critical value of F is less than F-table, otherwise H_0 will be accepted. In other words, to accept H_1 is to say that the three groups have different perceptions of the quality performance of the contractors.

Since the F-ratio calculated from the ANOVA table has a value of 0.52, which is less than the critical value of F at 5% significant level of 3.19, it can be concluded that H_0 is accepted and implying that the mean quality performance of the three categories of clients is the same. Thus, by way of inference, a contractor can be selected based on the assessment of any of the three groups of client organisations as far as quality performance of construction product and service is concerned at the project level.

Conclusion

Construction owners and end-users expect the highest quality from the products and services that they receive from their designers and contractors. For quality improvements to be effective and long lasting, they need to be supported by all parties involved in the processes. Latham (1994) and Egan (1998) suggested that quality should also be considered as a major criterion in construction procurement systems. This calls for a radical paradigm shift from the traditional reactive techniques that focus on technical and financial capabilities against predetermined targets to more proactive and dynamic evaluations in the selection processes of design and/or contracting organisations. This will ensure more focus on motivating and guiding organisations to enhance the quality of their operations. Thus, it is critical for owners to make sure that their expectations, and those of the end-users, are well represented in the evaluation and selection systems.

A quality performance evaluation model that covers both the company and site levels of a construction project was proposed in this paper. The paper also identified quality attributes relevant to the construction process and implemented the framework in the form of an investigative survey into the quality performance of building contractors in Nigeria as perceived by client organisations. The measurement was based on clients' perception of the quality performance of contractors based on identified quality practices at both organisational and operational levels. Seventy two (72) client organisations comprising of government, semi-government and private clients assessed the quality performance of eighteen (18) contractors. The responses were ranked and analysis of variance (ANOVA) was used to measure the degree to which the three categories of clients agree on their assessment of contractors' quality performances. The results revealed that the three categories of clients generally agree on their assessment, indicating a general consistency in the quality performances amongst the contractors.

The paper, while acknowledging the dynamics and continuous change in the construction sector especially the shortcomings of the lowest cost competitive bidding, further stressed that quality should be considered as a major criterion in contractor evaluation and selection systems. It is also recommended that Government, being the major client of the building industry, should establish specialist Construction Quality Council that will serve as regulatory body to ensure conformance to quality standards required in various areas (materials, labour skills, equipment, methods, etc) of the construction industry.

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