ESTABLISHING STATUS OF NIGERIAN BUILDING DESIGN FIRMS BASED ON EUROPEAN CONSTRUCTION INSTITUTE TOTAL QUALITY MANAGEMENT MATRIX

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Total Quality Management (TQM) is based on the philosophy of continuously improving goods and services. This research was aimed at establishing status of Nigerian Building Design Firms by studying the degree to which they were operating under the concept of TQM using European Construction Institute's (ECI) matrix. Firms were grouped under types of design activities and questionnaire survey was used to generate data of the study. The study revealed that the overall average ECI Score of the groups of Nigerian Building Design Firms is 27.4. Thus, according to the ECI the Nigerian Building Design Firms belong to the class 'The start of improvement'. Among the ECI quality factors, 'Training, awareness, education and skill' was recognised to be receiving the least attention from among the firms. It is recommended that the firms should particularly pay attention to this area in order to achieve the requirements and benefits of TQM.

Keywords: total quality management, design firm, quality factor, employee, education.

INTRODUCTION

Total Quality Management (TQM) previously known as Total Quality Control (TQC) is defined as "a management approach that tries to achieve and sustain long-term organisational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs and obeying governmental statutes and regulations" (Yamaoka 1994, Harris and McCaffer 2005). According to Ahmed et al (1990), Kumaraswamy and Dissannayaka (2000), Harris and McCaffer (2005) and (Chen, 2008), TQM evolved from quality control and inspection and quality assurance as a result of the change in the concept of quality management system due to the fact that the previous approaches to quality had not provided the necessary change of culture, but instead had diverted energies from customer needs, satisfaction and process improvement to checks and documentation. TQM approach now provides the needed change of culture.

According to Mack and Joshnsten (2004), the concept of TQM comes from the work and leadership of late Dr. Edwards Deming whose formula for company's business success is based on the relationship between improved quality and improved productivity. TQM is based on the philosophy of continuously improving goods and services as reflected in one of the requirements of the International Standard

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Organisation (ISO 9000, 2008). Hitherto, a quality organisation shall continually improve effectiveness of quality of its management system through the use of quality policy, quality objectives and audits results, analysis of data, corrective actions and management review." ISO 9000 (2005) echoed that the aim of continual improvement of quality management system is to increase the probability of enhancing the satisfaction of customers and other interested parties.

TQM intends to improve both process and its product. Kume (1988) figured out that the bases upon which such improvement can be achieved include, knowing or understanding points to be improved, technical possibilities of improvement, establishing cooperative or organisational structures for improvement and implementing education and training needed for the improvement. Moreover, Mack and Joshnsten (2004) opined that the process for continues improvement of quality is generally defined by six broad steps. These are; making suggestions for areas of improvement; breaking down into parts and providing measurement tools; creating solutions to suggestions; implementing and observing the solutions at work; acknowledging the individuals and rewarding their ingenuity and incorporating the solutions on a broad scale.

Yiwei and Eng (2008) observed that the concept and application of TQM have been successfully applied in the manufacturing and service industries, worldwide. However, there has not been widespread application in the construction industry. The authors reported some of the following reasons and observations.

- A survey conducted by Anon (1993) among 300 architectural, engineering and contracting firms indicated that most of the top managers of these firms did not understand or accept TQM. Similarly, most of their employees and sub-contractors neither considered quality nor were they empowered to make improvements.
- Quality achieved by construction firms studied by Shammas-Toma (1996) generally fell below the required standards, despite the fact that all contractors involved had some quality control procedures in operation.
- There existed a barrier caused by traditional or conventional practice which prevents wider implementation and acceptance of TQM the construction industry.

Regarding the last observation or reason, Cheng and Liu (2007) noted that "organisations have different working environments, work attitudes and leadership styles, which influence the implementation of the TQM approach." For that reason, it is essential that organisational culture must be integrated in TQM approach.

TQM approach is generally employable to any type of organisation and any organisation stands to benefit by its adoption. Aggarwal and Rezaee (1996) revealed that many of the most successful organisations that have become global, more cost effective and efficient, and, more focused on customer satisfaction have implemented the TQM concept.

A study conducted by Cheng and Liu (2007) based on TQM principle on the relationship of organisational culture and the implementation of TQM among Hong Kong construction firms established that the ideal culture profile is one which supports a friendly working environment. In such culture, leaders act as advisors to allow smooth operation of the organisation under a long term concern for growth and acquisition of new resources. European Construction Institute (ECI) Matrix was employed for the study.

Regarding design organisations in Nigerian Bamisile (2004) observed their design processes were prevalently complex compounded with other problems such as uncontrollable delays; having to do work on different stages or on different projects at the same time; consulting only few relevant written information or not at all; poor recording of design, making backtracking difficult; and lack of checking drawings and other documents prepared by junior staff before being issued for construction. Based on this Bamisile (2004) asserted that "one could say that the design teams have not yet adopted any quality culture in their contribution to production of buildings in Nigeria".

The above assertion could be justifiable considering incessant collapse of building structures around Nigeria and the concern for quality of construction projects across the country (Abiodun and Afangadem, 2007). Between 1974 and 2006, 61 cases of buildings collapse were reported across the country (LSPDA 2010). Out of this figure, 13% was directly attributed to faulty designs. Moreover, the report revealed that out of 233 associated cases of lost lives - 53% was traced to incidences due to faulty designs.

However, Kado et al (2010) conducted a study on application of TQM principles by the Design consultancy firms in North-western part of Nigeria. European Construction Institute Matrix was similarly employed for the study. The study indicated that whether by design or coincidence, design consultancy were actually using the aspects of TQM in their operations. A particular firm attained the highest status of 'Recognised TQ Company.' Conversely, the result of the study revealed that, on the overall, the firms recorded a status of 'Realisation of improvement needed.'

Based on the above, this research was aimed at establishing the status of building design firms across Nigeria under the concept of TQM using European Construction Institute's matrix. Development of quality management in a company should be based on a recognised quality culture and its development process (Harris and McCaffer, 2005). ECI approach was adopted as it provides such avenue. The study of this nature becomes imperative because according to Kume (1988), "attempts to achieve better quality without improving design and process will result in increased cost" – not only monetary but also compromise to safety issues and possible fatalities.

LITERATURE REVIEW

Quality Management System Frameworks

Quality management system is the collection of all processes, tools, techniques and subsystems that run simultaneously with production system (service or manufacturing), and the control of the production system's effectiveness, efficiency and productivity (Yasamis et al 2002), Quality management system is responsible for; ensuring that production or service delivery conform to customer requirements, minimizing cost of quality and production of a product or delivery of service to standards. Furthermore, it consists of framework for guiding quality related actions and all employees and a means of assessing how well these actions are carried out.

Cheng and Liu (2007) pointed out that it is relevant to understand the definition of quality in understanding TQM and hitherto defined it as "the standard of a product or service which meets the customers' (reasonable) expectations." Customer satisfaction is the bottom line of businesses as well as TQM.

'Total Quality Management' was broken down and explained by Aggarwal and Razaee (1996) as; 'Total' stands for organisational wide commitment. It indicates that quality is the business of all stakeholders (users, systems personnel and top management).

Everyone should work together to achieve and possibly exceed user's expectations. 'Quality' stands for a characteristic of high grade of excellence; and 'Management' represents the philosophy, leadership, infrastructure and resources which create continuous improvement in the process of system development and enhancements.

According to Cheng and Liu (2007), International Standard Organisation (ISO) officially defined TQM "as a way of managing an organisation which aims at continues participation of and co-operation of all its members in the improvement of quality in order to achieve customers' satisfaction, long-term profitability of the organisation and benefits of its members, in accordance with the requirements of society." An important aspect of TQM is that everyone in an organisation should be involved and committed from top to bottom, because the pursuit of total quality is seen as never-ending journey of continuous improvement. Particularly, commitment, knowledge and involvement were recognised as the fundamental characteristics of TQM (Cheng and Liu, 2007).

Some of the recognised standards containing framework for quality management system include the ISO series, Malcolm Baldridge (MB) standard and BS 5750 of the British Standard Institute (BSI) (Yasamis et al, 2002, Duncan et al, 1990 and Stebbing, 1990). The requirements of the Quality Management Systems covered by the ISO embrace issues relating to Quality Control, Quality Assurance and TQM.

Design Quality and Design Organisations

Tunstall (2000) described design as the selection of facts, requirements or perceptions about the properties or behaviour of individual elements which can be combined into a larger whole. It was further noted that in principle, the elements of building design are the same as elements of any product, and like any other product, materials process, form and appearance are selected and arranged to meet demands and needs of manufacture and use. This suggests that TQM principles can adequately be employed by design organisations. In fact, Harris and McCaffer (2005) stated that the ISO 9000 family standards operate on the assumption that certain factors have influence on the quality of a product or service provided by an organisation. Top on their list among these factors is design.

Design stage is a very vital component of TQM in construction. Abdel-Razek (1998) conducted a survey of 159 construction professionals and academics in Egypt on the relative importance of factors needed to improve construction. The survey revealed that improving design and pre-construction planning was ranked first. Thus, design organisations play a major role in the construction industry. Bubshait et al (1999) buttressed that "they are the media that transfer the requirements of the client to the contractor and ensure that they are met." Furthermore, "they need to provide a high quality of service to ensure that their client's project achieves the best possible standards of cost, time and quality".

Design quality involves the degree to which the features of the facility conform to the client's need. Moreover, Bamisile (2002) mentioned that design quality "is the quality determined by the 'Client's Consultants' on behalf of the client. It is the quality standards required by the contract and described in the appropriate production information issued by the designers to the 'Production Team."

Kolawole (1998) identified three categories of factors militating against the achievement of quality in construction; these are 'cheapest cost first' attitude, design and construction. With respect to design Griffith (1990), mentioned that the problems

attributed to design are detailing, legislation, co-ordination, communication, supervision and buildability." However, this is in no way exhaustive because the ISO 9000 and the Malcolm Baldridge Standards contain 13 and 14 major quality sections respectively relevant to design (Bubshait et al, 1999).

Individuals or parties to construction projects include among others, design consultants, popularly referred to as Architectural/engineering (A/E). In traditional contracting, their responsibilities according to Yasamis et al (2002) include all the tasks performed to determine the functional specifications of the facility, quality assurance and improvement.

In general, Kolawole (1998), stated that "total quality (in construction) can be achieved only if every individual including the client and every organisation is working towards the achievement of consistent project oriented objectives," and that it "requires appropriate systems".

European Construction Institution (ECI) and (ECI) Matrix

European Construction Institution (ECI) was founded in 1990 to build and champion a culture motivated to raising the performance standards of the construction industry across Europe, (http://www.loughboroughengineering.com... 2010). ECI is focused on delivering construction excellence with an aim to improving competiveness of its members through sharing of knowledge and application of best practice to enable them meet challenges of world-class project delivery in Construction and Engineering Construction (http://www.eci-online.org/what-is-eci, 2013).

ECI produced a matrix in 1993 to measure the degree to which a company was operating under total quality management (Harris and McCaffer 2005 and Cheng and Liu, 2007). The matrix contains 12 quality outlined below:

- Commitment and leadership by top management at location.
- Organised process and structure for total quality.
- Necessary business performance.
- Supplier relationship (internal and external).
- Training, awareness, education and skills.
- Relationship with internal and external customer.
- Understanding and satisfaction of employees.
- Communications.
- Teamwork for improvement.
- Independent certification of quality management system.
- Objective measurement and feedback.
- Natural use of total quality tools and techniques.

Research Methods

Data Collection

Questionnaire survey was used to obtain primary data for the study. The questionnaire composed of two parts. Part one was used to gather data on firms' profiles. Part two contained copy of the adopted ECI matrix as the main instrument used in collecting the major data of the study.

Each of the quality factors in the matrix was accompanied by six statuses describing level of organisations' attainment. The description was self explanatory such that a respondent can easily select a position that best fits his firm's status or attainment

regarding any of the 12 quality factors. The statuses were allocated 0 to 5 points. Only one status had to be selected under each factor. Multiple selections were disqualified.

Architectural, Structural, Mechanical and Electrical and Multi-disciplinary design firms were identified as the groups of firms responsible for building designs in Nigeria. Respondents from these groups of firms were asked to rate their firms' status corresponding to the 12 total quality factors in the matrix as described earlier. Responses obtained were used to calculate total scores for individual firms, average scores for groups of firms and overall average score for all the firms studied. In each case, individual, group and overall statuses of the Nigerian design firms regarding their efforts towards TQM were established.

Sampling frame and Questionnaire Administration
To establish sample size for the research, list of registered consultancy firms was obtained from Corporate Affairs Commission (CAC, 2010). The list indicated that there were 6,990 registered consultancy firms across the country. A sample size of 237 design consultancy firms was calculated using 95% confidence level based on approaches and recommendations outlined by Krejcie and Morgan (1970), Cochran (1977), Salkind (1997), Bartlett et al (2001), United Nation Development Programme (2004) and Olanruwaju (2010).

Principles of cluster and stratified random sampling plans were adopted according to Fellows and Liu (2003) and Keller and Warrack (2003). This was due to the diverse nature of the country geographically as well as the grouping of the design firms based on their respective professional undertakings.

Questionnaires were administered to the executive or senior management staff of the design firms. This was necessary due to the nature of data required by the research.

Data Analysis
Data analyses simply involved calculating the scores of the ECI total quality factors for each responding firm by adding the scores for each firm's status corresponding to each quality factors. This established statutes of individual firms. To arrive at the statues of each group, simple average was calculated for the firms under each group. Overall average score of the groups was computed to arrive at the overall industry status.

Table 1: Score and category of status of ECI companies

Score	Status Category
55-60	A recognised TQ Company
45-54	A world class operation
33-44	Realisation of improvement needed
25-32	The start of improvement
12-24	Need commitment to overcome resistance
0-11	No appreciation of quality.

If an organisation scored a maximum of 5 points on all the 12 factors it would achieve a maximum of 60 points, thus achieving the highest possible status. Interpretation of score obtained by an organisation was based on ECI categorisation presented in table (Harry and McCaffer (2005).

Research Findings and Discussion

Analysis of Administered questionnaires

106 questionnaires were returned which indicate a return rate of 44.8%. Out of these, 96 (90.6%) were observed to be usable and adequate for analysis based on the assertion of Moser and Kalton (1971) that the result of a survey could be considered as unbiased and significant if the return rate is not lower than 30-40%.

Architectural firms constituted 28.1% of the firms studied, Structural (16.7%, Mechanical and Electrical (10.4%) and Multi-disciplinary design firms (44.8%). Thus, about an average number of the firms were engaged in more than one design activity.

ECI Status of Groups of Design Firms

Table 2 presents the average scores calculated for the four groups of building design firms studied across Nigeria. However, it should be noted that quality factor number 10 (Independent Certification of QMS) was generally scored '0' for all the design firms. This was necessary because Standard Organisation of Nigeria (SON) disclosed that, even though it had officially adopted ISO 9000 series for quality management in Nigeria, certification of design organisations in relation to quality management was yet to commence.

Table 2: Average ECI scores of the groups of Nigerian building design firms

Group of firms	Average Score	Status
Architectural	26.4	The start of improvement
Structural	31.3	The start of improvement
Mechanical & Electrical	24.3	Need commitment to overcome resistance
Multi-disciplinary	27.6	The start of improvement
Overall Average	27.4	The start of improvement

From table 2, it can be depicted that the Architectural, Structural and the Multi-disciplinary groups of design firms have recorded average scores within the ECI status with scores between 25-32 points. This placed the groups under the fourth ECI status of 'The Start of improvement'. More effort is needed from them towards attaining the requirements of TQM.

The average score recorded by the Mechanical and Electrical group of building design firms of 24.3 belongs to the fifth ECI category of 12-24 - 'Need commitment to overcome resistance'. This indicated a lack of commitment towards TQM and hence more concerted effort is needed from the grou.

The overall average of the groups stood at 27.4. Therefore, the overall efforts of the Nigerian design firms generally belong to the fourth ECI status of 'The start of improvement.'

ECI status of an organisation depends on the contribution of each quality factor. Table 3 provides the average scores calculated for each group of firms in relation to the quality factors. Note that 'ECIF' codes were used to represent quality factors, 'AF' for Architectural firms, 'SF' for Structural, 'MEF' for Mechanical and Electrical and 'MDF' for Multi-disciplinary firms. Overall average scores were represented by 'OAS'.

Table 3: Average ECI Quality Factors Scores for Groups of Design Firms

Factor Code	AF	SF	MEF	MDF	OAS
ECI F1	4.3	4.6	2.0	4.1	3.8
ECI F2	3.4	3.8	3.1	3.6	3.5
ECI F3	3.7	3.8	3.1	3.8	3.6
ECI F4	3.9	4.1	3.5	3.9	3.9
ECI F5	3.4	2.8	3.6	3.5	3.3
ECI F6	3.6	3.4	3.1	4.0	3.5
ECI F7	4.1	4.0	3.5	3.7	3.8
ECI F8	3.7	4.0	3.7	4.1	3.9
ECI F9	3.7	3.9	3.7	3.8	3.8
ECI F10	-	-	-	-	-
ECI F11	3.2	3.3	3.5	3.4	3.4
ECI F12	3.1	3.8	3.2	3.6	3.4

From the table, the highest average score of 4.6 was recorded by the Structural group of firms on the first quality factor (ECIF1 - Commitment and leadership by top management at location). This suggested a high level of commitment by the group regarding the quality factor. Conversely, least average score of 2.0 was recorded by the Mechanical and Electrical group, thereby indicating that the group was providing only spasmodic support and encouragement to quality initiative regarding the same quality factor.

Generally, the overall average scores in the last column of the table showed that the highest average scores was 3.9 recorded in both ECIF4 - Supplier relationship and ECIF8 - Communications. Regarding ECIF4's, the score suggested a visible improvement of business performance among the firms, while in case of ECIF8, it suggested that there was an established and widely used communication system among the firms.

Least overall average scores were recorded in ECIF5 - Training, awareness, education and skills (3.3), ECIF11 - Objective measurement and feedback (3.4) and ECIF12 - Natural use of total quality tools and techniques (3.4). The average scores indicated that requirements relating to staff training, awareness, education and skill development were partially implemented by the firms, that there was co-ordinated measurement of objective and analysis of results in place among the firms and that total quality tools and techniques were only used by the firms only when reminded.

CONCLUSIONS

The study revealed that generally, the Nigerian building design firms obtained overall average ECI score of 27.4. This placed the firms in the fourth ECI status of ‘The start of improvement.’ The highest performance demonstrated by the firms was in the aspects of 'Supplier relationship' and 'Communications.' Their major weaknesses were in the areas of staff training, awareness, education and skills; objective measurement and feedback and natural use of total quality tools and techniques. Generally, findings suggested that a lot of effort is required from among the firms towards achieving the requirements and benefits of Total Quality Management. In particular, it is

recommended that paramount attention must be given to employees' education and training the Nigerian building design firms among other considerations. It is also recommended that SON should earnestly consider commencement of certification of Quality Management Systems of the Nigerian construction organisations as this will improve their status. Furthermore, it should be noted that the success of the Nigerian building design firms in this respect, is strongly associated with commitment of top management as reflected in first ECI quality factor. Cheng and Liu (2007) noted that 'TQM is found to be more successful in companies with long term and internal focus in management aspect."

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