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CRITICAL FACTORS AFFECTING QUALITY OF BUILDING PROJECTS: PROFESSIONALS SERVICE PROVIDERS' PERSPECTIVES

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ABSTRACT

Professional service providers play critical roles in achieving building project goals. They manage every complexity during construction activities to enhance competitiveness and sustainability in the construction industry. Notwithstanding, previous studies lacked in-depth explorations of professional service providers' views on critical factors affecting the quality of building projects. Consequently, this paper evaluates critical factors that affect the quality of building projects from the professional service providers' views. A cross-sectional survey was conducted using a structured questionnaire as an instrument of data collection. Various factors that can affect the quality of building projects garnered from extant literature were used to elicit the opinions of Architects, Structural Engineers, Mechanical/Electrical Engineers and Quantity Surveyors who were employed in specific clients' projects. Severity and frequency responses of each factor were used to determine the importance index, and the ranking of factors among the professionals was determined. Percentage Rank Agreement Factor (PRAF) was used to measure the agreement of the importance ranking. One sample t-test and correlation analysis were used to determine the significance of each factor and the degree of relationships among the professionals. The findings from the research analysis revealed 30 significant factors affecting the quality of building projects. The top five most critical factors are 'previous relationship with the client', 'client's involvement in design process', 'client's financial position', 'ability to choose the right design team' and 'new methods for service leverage'. The t-test showed that all the factors are significant towards ensuring quality building projects. A strong correlation exists between Architects and Quantity Surveyors, and between Architects and Structural Engineer. The Architects and M&E Engineers exhibited low correlation. Likewise, the correlation between the Structural Engineers and M&E Engineers was low. This study presents useful insight into the totality of quality from all stakeholders in the industry. It highlights factors that are key to achieving the desired quality of building projects.

Keywords: Building projects, Client, Professional service providers, Quality standard

1. INTRODUCTION

Building projects have the uniqueness of incorporating professional service providers as a team at different stages of building project activities. The selection of the professional team and the quality of their services have a significant impact on the quality and the end-product of the building projects (Olatunde, Ogunsemi and Oke, 2017). In construction, quality occupies a unique position as one of the three most important objectives of project management. It is achieved when the building project conforms to the desired specifications and fulfil the needs and expectations of the clients. To achieve the desired quality goals on a building project, the professional service providers adopt an interdisciplinary collaboration approach to manage every complexity during construction activities (Aluko, Idoro and Mewomo, 2020). Their services range from Architectural, Engineering and Quantity Surveying whose expertize forms the fundamentals of operations of each project (Jewell, Flanagan and Anac, 2010). They provide expert advice on various aspects of building structure from inception to completion of construction projects to ensure quality and attain an acceptable level of performance from construction activities (Aluko, Idoro and Mewomo, 2020).

Lau, Li, Tang and Chau (2016) addressed Total Quality Management (TQM) in Hong Kong, and suggested that organization learning and people management are the two major principles required by engineering consultants for performance and sustainability in the market place. The study of Abdel-Razek (1998) concluded that the goal of service providers should be a quality improvement from time to time. Gholamreza (2012) emphasized the quality of construction from the perspectives of the contractor. In most of the studies, there are few that relates to the quality of projects arising from the perspectives of the professional service providers. Therefore, a need for an extensive study in this regard is vital in Nigeria. Lau et al. (2016) defined this concept of TQM as a philosophy and management practice whose primary aim is to harness its material and human resources effectively in order to achieve the goals of the organization. In building projects, the objective of the professional service providers is to see to the performance of the projects in such a way to meet the needs and expectations of the client.

According to Oyedele et al. (2015), quality issues in developing countries still rely on inherited traditions of Western nations. Abdel-Razek (1998) emphasized that improving quality in developing countries should be seen from each country background. Oyedele, et al., (2015) further stated that construction quality from the viewpoints of professional service providers remains an essential step towards the improvement of quality in Nigeria and other African nations. It has equally been confirmed that the realisation of the level of project performance depends strongly on the quality of service of the professional service providers. Though there is a considerable variation in the delivery of services by these professionals, however, overlap occurs in the process of service delivery, and the quality of the services exerts a lot of influence on the quality of building projects (Jewell et al.,. 2010)

In view of the above, this study is aimed at identifying and evaluating critical factors affecting the quality of building projects from the perspectives of professional service providers. This is to address the problem of poor performance of building projects in order to enhance competitiveness and sustainability in the industry. These service providers in the context of standard building projects' contracts in Nigeria are Architects, Structural Engineers, Mechanical and Electrical Engineers, and Quantity Surveyors. Their services are normally provided as a team for a specified building project.

2. FACTORS AFFECTING QUALITY OF BUILDING PROJECTS

Factors that can influence activities in construction settings are very important and have been highlighted by different researchers (Ejohwomu, Oshodi and Lam, 2017). The knowledge of these factors is necessary in order to be competitive and, most importantly, in meeting the needs and expectations of the client (Zhao et al., 2012; Lau et al., 2016). Several factors affecting the quality of building projects abound in literature, but it is important to distinguish which of them are critical and related to the professional service providers. Critical factors are the elements that are necessary for an organisation or a project to achieve its mission (Ali, Amin and Husin, 2019). The factors that affect the services of professionals have been categorized into seven, namely: staff development, innovation, information and communication technology, construction materials, regulatory framework, client factors and professional fees (Aluko and Idoro, 2018). Ling, Ibbs and Hoo (2006) emphasize that keeping up with these factors remains significant risk faced by architectural and engineering design firms.

Oyedele et al. (2015) emphasize that most cost setbacks in construction can be attributable to poor management, while defects in quality are mostly due to defects in materials, inadequate planning and coordination. According to Zhao et al. (2012), a sound regulatory framework has a lot of implications on professional staff registration and licensing, requirements of procurement Acts for tender, and requirements for collaborations with foreign firms. The regulations for codes and standards equally affect quality depending on the level of quality management considerations. The development of knowledge and expertise in the industry drives the human capital and plays a major role in engineering, procurement and construction projects in the industry. This leads to a better relationship that galvanises a competitive advantage for firms (Nguyen and Hadikusumo, 2017). As a result of the strong dependency on experts, the commitment and loyalty of employees are important and should possess the characteristics of human relations for the image of the professional service organizations (Razavi et al., 2012). To retain qualified staff and avoid unnecessary staff turnover, firms should attract good staff with salary, social welfare, remuneration package and benefits package (Zhao et al. 2012).

The issue of innovation was emphasized by Kamal, Yusof and Iranmanesh (2016). This is in respect of building the capacity of firms for innovation in order to remain competitive in an ever-dynamic environment. Other scholars (Roxas, Battisti and Deakins, 2013; Moohammad, Yusof and Kamal, 2014) observe that larger firms have the capacity to innovate than smaller firms because of access to resources. In contrast, Yusof and Mohd (2011) note that smaller firms have the tendency to innovate because of flexibility.

The unrealistic constraints of time and cost often imposed by clients equally remain an albatross in achieving the desired quality in building projects. The clients often require a quick return on investment. This often results in poor workmanship. The requirements of the procurement regulations that place emphasis on project award to the lowest bidder are equally a challenge of quality (Low and Than, 1996). The decision-making process by clients, particularly the lack of comprehensive briefs, affects the services of consulting firms significantly (Yu et al., 2010). This is because professional services involve a lot of client interactions (Cheng and Proverbs, 2004). Such decision ranges from development scale, revenue targets for the project, procurement routes, and occurrence of design changes as a result of changes in client requirements affecting the services of consulting firms. The ability of the client to assemble a competent design team for project implementation and the involvement of the client in the design process are equally very significant in determining the quality of building projects (Zhao et al., 2012; Lohiya, 2012).

The design team requires information about different types of building materials in order to evaluate and specify building materials during the design process and is crucial for the successful implementation of any design concept (Tas, Yaman and Tanacan, 2008). This is, of course, subject to the availability of these materials in the market. The issue of accessing up-to-date information about the materials, the sources and how they are obtained remain a topical issue in the industry. The demand for construction materials in the industry will continue to create demands in the industry (Ling et al., 2006). Therefore, availability and prices are critical factors in project viability. The specification and usage of materials are equally important to arrive at an affordable cost for the client, which influences the integrity and innovation of designs. Hoxha, Haugen and Bjorberg (2017) emphasise energy efficiency and durability as critical considerations to choose sustainable building materials. Therefore, the use of these materials, availability and integration of these materials with others during design detailing and execution on the construction site is very crucial. It is important, however, that building material information bank, classification systems for these materials, preferably using information technology, will give practitioners easy access to reliable, timely, up-to-date and accurate technical information.

The adoption of Information and Communication Technology (ICT) has become a standard practice in the design process by professional service firms. Russell (2007) observes that the development of Computer-Aided- Design (CAD) programmes have assisted firms in no small measure, it leads to an easier distribution of the service product more efficiently. Technological development has shortened the geographical sphere of operations rapidly, and this has enhanced productivity. Ling, Ibbs and Kumaraswamy (2005) found out this had encouraged field specialisation, technical expertise and the ability to handle complex projects. Firms that give attention to research and development (R&D) get new knowledge that can be applied in practice to achieve better practice (Ling et al., 2006). Scholars, particularly from technology and science-based disciplines, emphasised investment in R&D to be very critical for a successful professional service (Czarnitzki and Thorwarth, 2012; Filippetti and Archibugi, 2011; Zhao and Ordonez de Pablos, 2011).

The introduction of Building Information Technology (BIM) facilitated smooth communication and reduction in design inconsistencies that can lead to rework and assists firms to remain competitive (Sverlinger, 2000). Knowledge management is also used in the research literature as a component of ICT. Fong and Choi (2009) reiterate that there is a general lack of specially assigned staff for knowledge acquisition and management in the Professional Service Firms (PSFs). This was confirmed by Massaro et al. (2016). The findings of the study revealed that knowledge management research in small and medium enterprises like professional service firms is fragmented and uncoordinated. The impact of ICT in day-to-day activities is immense, PSFs that will remain competitive will invest in it continuously. Effective communication enhances the time, cost and quality performance of building projects. Meaningful resolution of problems in construction settings requires effective communication among the stakeholders.

The performance of individual groups within the team of construction settings is very crucial. This often determines the overall project performance. Oyedele and Tham (2007) noted that the commitment of management to continuous quality improvement is critical to achieving quality in building projects. Other factors of quality include levels of commitment of participants, a conducive atmosphere of operations, levels of co-operations among participants and the client's involvement in the process. Lau et al. (2015) revealed specifically that areas of improvement in the service of professionals that are related to the quality of building projects include improvement of buildability, timeliness in respect of design and construction, management of input of different disciplines within the team.

Others are a better understanding of client and user's requirements, better communication within the team during design and construction, and effective communication with clients, including timely reports and design issues. Frodell, Josephson and Lindahl (2008) equally emphasized that three main factors of project success as the client's ability to make decisions committed construction management workforce and competency within the workforce. Equally seen as important is the dissemination of project goals among the team. The overall objective of the professional service providers is to manage both human and material resources in order to satisfy the client both with the tangible design product and the service delivery processes. Stakeholders' commitment is vital in achieving this laudable goal in a project environment.

3. RESEARCH METHOD

This study adopted survey approach using questionnaire to collect the needed data on the factors identified in the literature affecting quality of building projects. A pilot set of the questionnaire was sent to ten selected professionals to test the relevance of the survey. This was followed by an interview discussion with the selected professionals to determine the effectiveness and level of understanding of the questions. Based on their comments, the questionnaire was refined before it was finally adopted. The population of the study consists of Architects, Structural Engineers, Mechanical and Electrical (M&E) Engineers, and Quantity Surveyors who are involved in 120 building projects selected using purposive sampling. From the sampling, a population of four hundred and eighty was established. In order to arrive at an acceptable sample distribution, the minimum sample size was calculated using the following formula as posited by Udofia (2011):

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

Where n = minimum sample size, 1 = Unity; e = Level of significance = 0.05; N = Universe or Population = 480

$$n = \frac{480}{1 + 480(0.05^2)} = 218$$

With an addition of 50% (109) to the minimum sample size (218) calculated, a sample size of three hundred and twenty-seven (327) is used for the study. Therefore, the number of the questionnaire distributed was 327, of which 270 were received and used for the analysis (Table 1). The first section of the questionnaire consists of the personal characteristics of the respondents. Such characteristics include respondents' gender, academic qualification, professional affiliation, cadre and years of experience. The second section consists of the variables of the study as contained in the questionnaire, and was in two parts. They were measured using a 5-point Likert scale. In the first part, respondents were expected to rate the frequency of the factors using 1=Not frequent, 2=Frequent, 3=Average, 4=Very frequent and 5= Extremely frequent. In the second part, the severity of the factors were also expected to be rated using 1=Not severe, 2=Severe, 3=Average, 4=Very severe and 5= Extremely severe.

The importance of each factor was computed by multiplying the severity and frequency of each factor. This is expressed as follows:

Importance (I) = Severity (S) x Frequency (F) ………….. (i)

The comparison of ranking among professionals was done using severity, frequency and importance indexes as follows:

Severity Index (SI) = $\left(\frac{\Sigma(s)}{NS}\right)$ X 100% …………………… (ii)

Frequency Index (FI) = $\left(\frac{\Sigma(f)}{NS}\right)$ X 100% …………………. (iii)

Importance Index (II) = $\left(\frac{\Sigma(sf)}{NSF}\right)$ X 100% ...…………………. (iv)

In the above equations, s and f are severity and frequency ratings and ranges between 1 and 5.

S and F are the highest severity and frequency ratings of 5, and N is the total number of responses for that particular factor. To determine the general agreement in the ranking of all factors, the rank agreement factor (RAF) and percentage rank agreement factors (PRAF) was used to measure the agreement in the importance ranking among the professionals. This is expressed as follows:

$$PRAF = \frac{RAFmax - RAFi}{RAFmax} \times 100\% \quad \ldots\ldots\ldots\ldots\ldots \quad (v)$$

$$RAF = \frac{\Sigma ASMQ}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (vi)$$

In the above, RAFmax = maximum RAF, RAFi = RAF for each factor, N= number of variable factors ranked, and ΣASMQ =sum of the order of rankings by Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. All of the above are from formulae derived by Tam et al. (2000). Statistical Package for Social Sciences (SPSS) 23 was used to conduct one sample t-test to discover a significant difference between the mean difference of each factor and the hypothesised average value. Spearman Rank Correlation analysis was used to measure the degree of correlation among the professional service providers in the ranking of the factors that contribute to the quality of building projects.

4. RESULTS AND DISCUSSION

4.1 Respondents' characteristics

The features of the respondents of this study were investigated for an understanding of persons who supplied the data used for the study. For the investigation, five features, namely, respondents' gender, academic qualification, professional affiliation, cadre and experience, were selected. In addition, the type of client, namely public or private, was investigated for the building projects. The results are presented as follows.

Table 1: Descriptive results of the bio-data of the Respondents

Variable	Frequency	Percentage
Gender		
Male	198	73.3
Female	72	26.7
Total	270	100.0
Highest Academic Qualification		
HND	60	22.2
B.Sc	44	16.3
PGD	85	31.5
MSc	75	27.8
PhD	6	2.2
Total	270	100.0
Professional Affiliation		
MNIA	70	25.9
MNSE (Structural)	68	25.2
MNSE (M &E)	67	24.8
MNIQS	65	24.1
Total	270	100
Professional Cadre		
Graduate	142	52.6
Corporate	88	32.6
Fellow	40	14.8
Total	270	100

Variable	Frequency	Percentage
Professional Experience		
1-10 years	130	48.1
11-20 years	73	27
Above 20 years	67	24.9
Total	270	100.0

Table 1 revealed that the majority of the respondents (73.3%) are male, while 26.7% of the respondents are female. This implies the predominance of male practitioners in the industry than their female counterparts. The result also shows that 16.3% of the respondents in Consultancy firms had B. Sc, 27.8% had a Master's degree, and 22.2% had Higher National Diploma as their highest academic qualifications. Also, 31.5% had PGD as their highest qualification while 2.2% had a PhD. The results indicated that the respondents in the client organization had an adequate academic qualification with HND as a minimum qualification.

The results further revealed that (25.9%) of the respondents in client organizations are members of the Nigerian Institute Architects, 25.2% are members of NSE (Structural Engineering division), 24.8% are members of NSE (M & E division), while 24.1% are members of NIQS. The results indicated that the four professionals who are involved in providing consultancy services in building projects are evenly represented in the respondents. The analysis of the cadre of membership of professional bodies shows 52.6% are in the graduate cadre, 32.6% in corporate cadre and 14.8% are in fellowship cadre in their professions. The results also revealed that 48.1% had 1-10 years of experience on the job, 27.0% had 11-20 years' experience, while 24.8% had more than 20 years of experience on the job. The results imply that a greater percentage of respondents are of moderate experience.

4.2 Comparison of indexes and rankings of the factors among professionals

The indexes for the factors in respect of importance (I), severity (S) and frequency (F) were calculated and ranked appropriately for Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. The results in Table 2 shows the indexes and rankings for Architects, Table 3 for Structural Engineers, Table 4 for M&E Engineers and Table 5 for Quantity Surveyors.

Table 2: Indexes and Rankings of Architect's Response

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	74.43	6	81.14	1	59.54	6
Commitment of members staff	80.64	2	78.29	2	64.51	2
Ability to choose the right design team	71.40	8	74.86	6	57.14	8
Client's financial position	76.90	4	76.86	4	61.54	4
Staff education and training	79.50	3	77.43	3	63.60	3
Previous relationship with the client	89.90	1	70.86	11	71.94	1
Authority for design team effective performance	72.00	7	73.43	8	57.60	7
Availability of materials for design	67.71	13	75.71	5	54.17	13
Supply and price of construction materials	68.86	10	74.86	6	55.09	10
Adoption of building information modelling	57.50	29	71.43	10	46.00	28
Effects of sub-standard materials	64.78	17	70.86	11	51.83	16
Client's involvement in design process	76.29	5	68.57	18	61.03	5
Internet communication link among employees	61.79	21	64.00	26	49.43	20
Level of commitment by participants	63.00	20	54.86	29	50.40	19
New methods for service leverage	67.43	14	69.14	15	55.03	11
New activities for knowledge of employees	69.36	9	67.14	21	55.49	9
Salary and social welfare structure	67.43	14	72.29	9	53.94	14

Improvement of buildability	56.43	29	69.14	15	45.14	29
New internal administration and operation	63.86	19	66.00	23	51.09	18
Capacity of the local materials industry	59.93	26	69.42	14	47.94	26
ICT link to all relevant external information	61.29	22	68.85	17	49.03	21
Levels of cooperation among participants	60.43	24	68.57	18	48.34	24
Communication within the team during and construction	68.00	12	69.43	13	54.40	12
Management of input of different team members	61.14	23	66.57	22	48.91	22
Availability of created new line of services	64.00	18	67.71	20	51.20	17
Allocation of resources to R&D in ICT	57.86	28	64.86	24	46.29	27
Available government regulatory framework	66.79	16	64.00	26	53.43	15
Policy framework for tech staff registration	51.57	30	63.43	25	41.26	30
Procurement Acts for professionals	59.00	27	60.57	28	48.91	23
Frequency of changes in regulation	60.43	24	54.00	30	48.34	25

Table 2 above shows that in severity scale 'the use of modern hardware and software', was ranked first, 'commitment of members of staff' was ranked second while 'staff education and training' was ranked third by Architects, while 'frequency of changes in regulation' was ranked least. In the frequency of the factors, 'previous relationship with client' was ranked first, commitment of members of staff was ranked second while staff education and training was ranked third. This shows some level of consistency with respect to the perceptions of Architect with respect to achieving expected quality of building projects by the clients.

Table 3: Indexes and Rankings of Structural Engineer's Response

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	68.00	24	77.85	1	54.40	24
Commitment of members staff	74.62	13	77.54	2	59.69	13
Ability to choose the right design team	75.62	11	76.00	5	60.49	9
Client's financial position	75.38	10	75.08	6	60.31	11
Staff education and training	66.92	26	76.62	4	53.54	26
Previous relationship with the client	75.46	9	77.23	3	60.37	10
Authority for design team effective perform	69.77	21	75.08	6	55.82	21
Availability of materials for design	74.46	14	71.08	13	59.56	22
Supply and price of construction materials	65.69	27	68.00	21	52.55	27
Adoption of building information modelling	67.85	25	73.85	9	54.27	25
Effects of sub-standard materials	70.54	18	69.23	19	56.43	18
Client's involvement in design process	75.69	8	72.62	11	60.55	8
Internet communication link among employees	63.62	29	72.92	10	50.89	29
Levels of commitment by participants	71.30	16	57.54	30	57.04	16
New methods for service leverage	70.77	17	70.77	14	56.62	17
New activities for knowledge of employees	89.23	1	74.46	8	71.38	1
Salary and social welfare structure	77.23	6	70.46	16	61.78	6
Improvement of buildability	71.61	15	70.15	17	57.29	15
New internal administration and operation	86.07	2	71.38	12	68.86	2
Capacity of the local materials industry	77.46	5	64.00	27	61.97	5
ICT link to all relevant external information	80.38	4	67.08	22	64.30	4
Levels of cooperation among participants	69.92	20	69.54	18	55.94	20
Communication within the team during design and construction	64.92	28	70.77	14	51.94	28
Management of input of different team members	54.77	30	68.62	20	43.82	30

Availability of created new line of services	69.54	22	66.77	23	55.63	14
Allocation of resources to R&D in ICT	69.38	23	66.77	23	55.50	23
Available government regulatory framework	82.77	3	63.69	28	66.22	3
Policy framework for tech staff registration	70.15	19	64.31	26	56.12	19
Procurement Acts for professionals	76.92	7	66.46	25	61.54	7
Frequency of changes in regulation	75.00	12	60.31	29	60.00	12

Table 3 above shows the evaluation of severity and frequency of factors affecting quality of building projects as provided by the Structural Engineers. From the Table, 'the use of modern hardware and software', was ranked first, 'commitment of members of staff' was ranked second while 'previous relationship with client' was ranked third, while 'levels of commitment by participants. In respect of frequency of factors, 'new activities for knowledge of employees' were ranked first, 'new internal administration and operation' was ranked second 'available government regulatory framework' was ranked third. Unlike Architects' perception, this shows a significant difference in the perceptions of the Structural Engineers.

Table 4: Indices and Rankings of Mechanical and Electrical Engineer's Responses

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	47.07	30	93.43	2	37.66	30
Commitment of members staff	61.43	14	72.29	4	49.14	14
Ability to choose the right design team	58.00	23	74.00	1	46.40	3
Client's financial position	73.93	2	71.71	5	59.14	2
Staff education and training	60.14	17	72.86	3	48.11	17
Previous relationship with the client	67.50	8	70.00	7	54.0	7
Authority for design team effective perform	67.79	6	70.57	6	54.23	6
Availability of materials for design	59.21	20	70.00	7	47.37	21
Supply and price of construction materials	61.21	16	69.43	9	48.97	15
Adoption of building information modelling	55.50	27	67.43	10	44.40	27
Effects of sub-standard materials	67.36	10	67.43	10	53.89	9
Client's involvement in design process	73.78	3	66.00	15	59.03	3
Internet communication link among employees	59.43	18	65.14	19	47.54	18
Levels of commitment by participants	56.00	25	58.57	30	44.8	25
New methods for service leverage	77.50	1	66.00	15	62.00	1
New activities for knowledge of employees	60.57	7	66.29	14	48.46	16
Salary and social welfare structure	71.86	4	62.86	26	57.49	4
Improvement of buildability	57.64	24	67.14	12	46.11	24
New internal administration and operation	67.50	8	64.86	21	54.00	8
Capacity of the local materials industry	59.00	21	66.86	13	47.2	20
ICT link to all relevant external information	58.86	22	65.14	19	47.09	18
Levels of cooperation among participants	54.43	28	65.71	17	43.54	28
Communication within the team during design and construction	55.57	26	64.29	23	44.46	26
Management of input of different team members	63.71	12	64.57	23	44.46	26
Availability of created new line of services	66.00	11	63.14	25	52.80	10
Allocation of resources to R&D in ICT	70.43	5	64.29	23	56.34	5
Available government regulatory framework	62.00	13	65.43	18	49.60	12
Policy framework for tech staff registration	53.36	29	62.00	27	42.69	29

Procurement Acts for professionals	61.43	14	59.14	29	49.14	13
Frequency of changes in regulation	59.29	19	61.71	28	47.43	19

The severity for M&E Engineers in Table 4 above shows that 'ability to choose the right design team' was ranked first, 'the use of modern hardware and software' was ranked second while 'staff education and training' was ranked third. However, 'levels of commitment by participants' was ranked last. On the frequency rating, 'new methods for service leverage' was ranked first, 'client's financial position' was ranked second while client's involvement in design process was ranked third. The evaluation is a reflection of the area of specialization of the respondent. However, some level of agreement can be seen in the evaluation of the severity of the factors.

Table 5: Indices and Rankings of Quantity Surveyor's Responses

Factors	FI	FR	SR	SR	II	IR
The use of modern hardware and software	61.08	26	80.00	1	48.86	26
Commitment of members staff	67.62	16	77.54	3	54.09	16
Ability to choose the right design team	78.12	2	78.46	2	62.89	2
Client's financial position	75.23	5	75.08	7	60.18	4
Staff education and training	70.77	9	73.23	9	56.62	9
Previous relationship with the client	79.08	1	73.85	8	63.26	1
Authority for design team effective perform	70.38	10	76.00	4	56.30	10
Availability of materials for design	68.76	13	75.69	5	55.02	13
Supply and price of construction materials	70.31	11	75.69	5	56.24	11
Adoption of building information modelling	54.77	29	69.84	15	43.87	29
Effects of sub-standard materials	68.46	15	71.38	10	54.77	15
Client's involvement in design process	77.38	3	68.62	19	61.91	3
Internet communication link among employees	67.46	17	69.54	16	53.97	17
Levels of commitment by participants	62.38	25	55.69	30	49.91	25
New methods for service leverage	71.08	8	69.85	13	56.86	8
New activities for knowledge of employees	63.23	24	69.85	13	50.58	24
Salary and social welfare structure	66.77	19	71.08	11	53.42	19
Improvement of buildability	67.15	18	62.15	26	53.72	18
New internal administration and operation	65.00	23	69.54	16	52.00	23
Capacity of the local materials industry	65.54	22	70.76	12	52.43	22
ICT link to all relevant external information	75.24	4	69.23	18	60.18	4
Levels of cooperation among participants	68.62	14	66.46	23	54.89	14
Communication within the team during design and construction	65.77	21	60.92	28	52.62	21
Management of input of different team members	74.46	6	62.15	26	59.57	6
Availability of created new line of services	52.38	30	67.08	21	41.91	30
Allocation of resources to R&D in ICT	72.08	7	66.46	23	57.66	7
Available government regulatory framework	59.23	27	66.77	22	47.38	27
Policy framework for tech staff registration	65.92	20	65.23	25	52.73	20
Procurement Acts for professionals	68.85	12	67.69	20	55.08	12
Frequency of changes in regulation	56.61	28	56.31	29	45.29	28

Table 5 above shows the evaluation of severity and frequency of factors affecting quality of building projects as provided by the Quantity Surveyors. From the Table, 'the use of modern hardware and software', was ranked first, 'ability to choose the right design team' was ranked second and 'commitment of members of staff' was ranked third. On the frequency of factors, 'previous relationship with the client' was ranked first, 'ability to choose the right design team' was ranked second and 'client's involvement in design process' was ranked third. Critical observation of the evaluation by the professionals shows there are no specific quality assurance guidelines, as each service providers evaluate these factors from the perspective of loyalty to area of specialization. The fragmented nature of the industry plays out continuously, with less integration of diverse information.

4.3 Percentage rank agreement factor

The evaluation of the importance of the factors was carried out using the rank agreement factor (RAF) and percentage rank agreement factor (PRAF). The quantitative measure was among Architects, Structural Engineers, M&E Engineers and Quantity Surveyors. The RAF can either be < 1 or > 1. A higher factor indicates a higher level of disagreement (Elinwa and Joshua, 2001). A RAF value of 0.00 implies a perfect agreement. Table 6 below shows the highest RAF value to be 3.63 and the least value of 0.63. The one sample t-test results for the thirty factors are also shown in Table 6 using a significant p-value of < 0.05 as a basis at 95% confidence value. The result shows that all the thirty factors have a p-value of < 0.05. This means that all the factors are statistically significant in affecting the quality of building projects.

Table 6: Percentage Rank Agreement Factor and Level of Significance

Factors	ARC	SE	M&E	QS	Sum of Ranking **ΣASMQ**	RAF	PRAF	Ranking order	t-test (p-value)
Previous relationship with the client	1	10	7	1	19	0.63	82.64	1	0.001**
Client's involvement in design process	5	8	3	3	19	0.63	82.64	1	0.001**
Client's financial position	4	1	2	4	21	0.70	80.72	3	0.001**
Ability to choose the right design team	8	9	3	2	22	0.73	78.89	4	0.001**
New methods for service leverage	11	17	1	8	37	1.23	66.12	5	0.001**
Salary and social welfare structure	14	6	4	19	43	1.43	60.61	6	0.001**
Authority for design team effective performance	7	21	6	10	44	1.47	59.50	7	0.001**
Commitment of members staff	2	13	14	16	45	1.50	58.68	8	0.001**
ICT link to all relevant external information	21	4	18	4	47	1.57	56.75	9	0.001**
New activities for knowledge of employees	9	1	16	24	50	1.67	53.99	10	0.001**
New internal administration and operation	18	2	8	23	51	1.70	53.17	11	0.001**
Staff education and training	3	26	17	9	55	1.83	49.59	12	0.001**
Procurement Acts for professionals	23	7	13	12	55	1.83	49.59	12	0.001**
Government regulatory framework	15	3	12	27	57	1.90	47.66	14	0.001**
Supply and price of construction materials	10	27	15	11	58	1.93	46.83	14	0.001**
Effects of sub-standard materials	16	18	9	15	58	1.93	46.83	16	0.001**
Allocation of resources to R&D in ICT	27	23	5	7	62	2.07	42.98	17	0.001**
Management of input of different team members	22	30	11	6	69	2.30	36.44	18	0.001**
Availability of materials for design	13	22	21	13	69	2.30	36.44	18	0.001**
Availability of created new line of services	17	14	10	30	71	2.37	34.71	20	0.001**
Capacity of the local	26	5	20	22	73	2.43	33.06	21	0.001**

materials industry									
Internet for communication link among employees	20	29	18	17	84	2.80	22.87	22	0.001* *
Frequency of changes in regulation	25	12	19	28	84	2.80	22.87	22	0.001* *
Levels of commitment by participants	19	16	25	25	85	2.83	22.04	24	0.001* *
The use of modern hardware and software	6	24	30	26	86	2.86	21.21	25	0.001* *
Improvement of buildability	29	15	24	18	86	2.87	20.94	26	0.001* *
Levels of cooperation among participants	24	20	28	14	86	2.87	20.94	26	0.001* *
Communication among team during design and construction	12	28	26	21	87	2.90	20.11	28	0.001* *
Policy framework for technical staff registration	30	19	29	20	98	3.27	9.92	29	0.001* *
Adoption of building information modelling	28	25	27	29	109	3.63	0.00	30	0.001* *

* *Significant factors @0.01 (95%) confidence interval

Table 6 shows that the most important are 'previous relationship with the client', 'client's involvement in the design process' and 'client's financial position'. Others are 'ability to choose the right design team' and 'new methods for service leverage'. The least are 'building information modelling', 'policy framework for technical staff registration' and 'communication within the team during and construction'.

The issue of clients as exemplified here brings to the fore the fundamental position and responsibility in achieving quality building projects. These findings are consistent with the position of earlier researchers in the field of construction management. Frodell et al. (2008) established that the client's ability to make decisions remains a major factor having a substantial effect on construction projects in Sweden. This position is equally in tandem with the ability to choose the right design team. The choice of the right team influences enhances quality thinking and the competence of the workforce. Kama and Junnonen (2017) noted that design team work in order to provide solutions to clearly specified requirements. As such, the client has a duty to make an informed decision which is expected to influence the quality of the building project.

Previous relationship with the client is equally an important feature in the context of the performance of professional service providers. This is consistent with the findings of Grierson and Brennan (2017). The study emphasized that previous relationships with clients can influence client referral behaviour which is important for business success. Kumar, Petersen and Leone (2010) equally stated earlier that referral is an outcome of a transaction occurring within a newly established service provider-client relationship. According to Olatunde, Ogunsemi and Oke (2017), the composition of the team members has a significant effect on both the quality and the completion time of construction projects. Therefore, effort should be made in establishing roles of team members when they are appointed in order to work as a team for a common goal of achieving the expectation of the client.

The issue of communication within the team during and construction' in this study is however in contrast with Kama and Junnonen (2017). In the findings of Kama and Junnonen (2017), improvement in the quality of service and project is found in internal communication and collaboration within the design teams. This emphasized further that the success rate of project is always party specific. Stakeholders are therefore expected to focus more on client-oriented strategies to achieve the project goal and objectives. It is equally important for the design team to appreciate that communications channels help the stakeholders in a project to understand work processes, improve buildability and find solutions to problems during design and construction as they arise.

The importance of Building Information Modelling (BIM) in this study surprisingly is in contrast with the position of contemporary researches. This is because BIM had been seen as a ready tool to address the fragmentation and low performance in Architecture, Engineering and Construction (AEC) industry. Collaboration and communication have been enhanced through BIM with a major benefit of better cost estimation and control, efficient construction planning and management, and improvement in design and project quality (Chan, Olawumi, and Ho, 2019). Even at the design stage, BIM shas been adopted as an effective tool to facilitate efforts at improving safety performance (Teo, Ofori, Tjandra and Kim, 2016). BIM reduces fragmentation in the industry, allows accurate updating of changes, improves communication within the project team. It enhances project efficiency and productivity, facilitates the selection of sustainable materials and ensuring the real-time sustainable design and multi-design alternatives (Olawumi and Chan, 2019).

4.4 Correlation Analysis

Spearman rank correlation from SPSS 23 was used for the correlation. This was to measure the degree of correlation among Architects, Structural Engineer, M&E Engineers and Quantity Surveyors in ranking the factors that affect the quality of building projects. Table 7 below shows the result of the correlation analysis. The result shows a strong correlation (0.73) between Architects and Quantity Surveyors and between Architects and Structural Engineer (0.41). The Architects and M&E Engineers exhibited low correlation (0.39), that of Structural Engineers and M&E Engineers was equally low (0.18). The low correlation might be a result of the nature of the line of teamwork among the professionals. However, a negative correlation (-0.19) was recorded between Quantity Surveyors and Structural Engineers. The explanation is because of the importance of communication within the team during design and construction. These drawbacks should be addressed by the professionals in the team. This is because the performance of one group in a team is also dependent on the performance of others in the team.

Table 7: Spearman rank correlation coefficients of professionals' importance of factor

Professionals	ARC importance	SE importance	M&E Engineer's importance	QS importance
Architect's importance	1			
Structural Engineer's importance	0.41**	1		
Mechanical & Electrical Engineer's importance	0.39**	0.18**	1	
Quantity Surveyor's importance	0.73**	-0.19**	0.41**	1

**Correlation significant at 0.01 (95%) confidence interval (2-tailed)

5. IMPLICATIONS AND CONCLUSION

This study examined thirty factors that affect the quality of building projects within the services of professional service providers. The service providers who provided information for the study are Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. The importance of the factors was quantitatively computed through severity and frequency indexes. Rank agreement factor (RAF) used for comparison among the service providers, while percentage rank agreement factor (PRAF) was used to measure the agreement in the importance rankings. T-test was used to test the significance of each factor to the quality of the building project. Spearman correlation analysis was also used to measure the degree of correlation among the professionals.

The most important as established in the study are 'previous relationship with the client', 'client's involvement in the design process' and 'client's financial position', 'ability to choose the right design team' and 'new methods for service leverage'. The least are 'building information modelling', 'policy framework for technical staff registration' and 'communication within the team during and construction'. The study contributed to the field of project success in that there is a need to measure the importance that various participants assign to various success factors of projects.

The factors that are rated the most important affecting quality of building projects in this study are client-related issues. The implication of this is that practitioners need to focus a higher emphasis on human relationships and attitudinal challenges. This suggests the need to inculcate this in the quality standard and quality assurance processes. Professional service providers should consider this as a metric in the performance measurement. Researchers have established the vantage position of clients in the industry. Meeting the needs and expectations of clients remain vital for both financial performance and sustainability in the industry. Professionals should place emphasis on client-oriented practices in order to serve the clients better. The clients, on the other hand, need to open communication with service providers, making their requirements known in a clear term.

The industry requires innovation both at the design and construction stage, which will enhance the quality of processes. Most importantly is the present lopsided and poor integration of BIM in both at design and construction stages of building projects. BIM as a tool creates, manage and adopts virtual representation of a facility from the design to the operational life cycle of a project. Stakeholders should advocate for legislation in integrating BIM into every stage of the construction stage. This is because BIM has been seen in several countries as a viable tool to address the fragmentation in the industry. It enhances communication, effective site planning, avoidance of design errors, coordination of drawings and services and collaboration for overall performance in the industry. It enhances the quality of process and product of infrastructures. It integrates all the participants together with a focus on delivering the project as represented by the BIM.

The findings have established that the right content of design documents, timely delivery of designs, effective communication within the team, management of inputs from the different stakeholders in the team and up-to-date investment in ICT affect the quality of the construction process. The technical and functional quality of the building is related to how the completed facility meets the specification in the design documents. It is the sum total of the performance of all the participants in the project. The overall quality of the project determines how the needs and aspirations of the client have been met. It is also a determinant of future engagement of the service providers, which is equally an opportunity for continuous development.

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