

## Built Environment Professionals' Perception of the Importance of Facility Management Professionals at the Design Stage

Adedamola Olufunke Oluwunmi

*Department of Estate Management, Faculty of Environmental Sciences, University of Lagos, Akoka, Lagos State, Nigeria*

Author's email: ooluwunmi@unilag.edu.ng

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### Abstract

There is a misconception that facility management (FM) professionals are needed only after a building has been completed, in order to manage maintenance and operating expenses. Hence, they are hardly considered an essential part of the design team. To query this notion, this study investigated the perception of built environment professionals on the importance of FM professionals at the design stage. Quantitative research using a questionnaire survey was adopted. Three hundred and forty questionnaires were administered to four categories of built environment professionals (engineers - civil, electrical and mechanical; architects; quantity surveyors, and builders) in Lagos, Nigeria and 266 (78%) of the questionnaires were found useful for analysis. The data was analysed using percentages, mean, relative importance index (RII) and Kruskal-Wallis test. The outcome of the analysis showed that respondents agree that FM professionals are important at the design stage in order to review design from a maintenance, operation, and serviceability perspective. The study also revealed that architects and quantity surveyors are fully convinced that FM professionals are crucial at the design stage, while builders and engineers are not. It was suggested that the governing body of FM professionals, the International Facility Management Association (IFMA), should organize forums where other built environment professionals can be educated on the importance of involving FM professionals at the design stage. Moreover, IFMA should leverage its membership base to secure meetings with owners of facilities with high running costs and demonstrate to them the savings accruable had they engaged FM professionals at the design stage. This is with a view to encouraging such owners to engage IFMA members from the onset of their subsequent projects. Doing so will ensure the delivery of cost-efficient facilities.

*Keywords:* Built environment, design stage, FM, importance, professionals

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### 01.0 INTRODUCTION

The client usually starts a building project with a clear goal in mind and entrusts the design team with a framework to work with. The team of designers then creates the schematic design and collaborates with the construction team. Facility management (FM) professionals are only brought on board after the building has been completed to manage the maintenance and operating expenses that will determine the structure's performance throughout its lifespan. This could be due to the fact that the facility manager's job is often seen as reactive (Ahmed, 2012). Several studies have shown that the FM professional is not generally regarded as an essential member of the design team, and thus their involvement is given low priority (Abeydeera et al., 2017; Ahmed, 2012; Sarkar, 2021). This, according to GreenKey FM (2021) and Sarkar (2021), may be due to facility owners' inability to grasp and recognise the true extent of their usefulness.

Ahmed (2012) and Kalantari et al. (2017) asserted that early involvement of FM professionals leads to lower operational and maintenance expenses as well as more efficient building utilization over time. When issues like carbon footprint, maintainability, sustainability, and flexibility in use are taken into account, the benefits of early facility management input can be priceless. In the words of Smith (2021), the involvement of FM professionals throughout the process of design and construction can assure a significantly higher level of efficiency in the building's operation, resulting in improved long-term value for money. According to Smith (2021), providing an efficient and cost-effective facility, in a manner that will aid subsequent day-to-day facility upkeep duties, will be the FM professional's top responsibility during the design phase. Ahmed (2012) stressed that FM professionals must be a part of the design process from the start in order to create facilities that are both economically and operationally viable. However, this fact is often overlooked when FM elements are not factored into the property's plan from the start (Smith, 2021). It is worthy of note that FM is to design what software is to hardware, hence it is essential for facility managers to interact with architects, builders, engineers and so on in order to produce a suitable link between the "hardware" and "software" of a building (Ahmed, 2012). That is, in the same manner that software enables hardware to perform optimally, FM's involvement in facility design enables maximal performance of a building.

In view of this, several studies have concentrated on the merits of engaging the services of FM professionals during the design stage (Alhammedi, 2019; Ashworth, 2020; Attobrah et al., 2021; Bako, 2020; Engstrom, 2021; Kalantari et al., 2017; Olunwa, 2018; Smith, 2021). Nevertheless, they are still faced with resistance from their colleagues in the built environment sphere (Abeydeera et al., 2017; Ahmed, 2012; Tucker et al., 2017), clients (Bako, 2020; Smith, 2021), and others.

This resistance also affects FM professionals in Nigeria. According to a report prepared by Nwannekanma and Onyedika-Ugoeze (2019), many Nigerians do not consult FM professionals – who are recommended to be part of the design team – due to a low level of awareness of the benefits of doing so. The Managing Director of James Cubitt Facility Managers, Mrs. Gbadunade Ogunleye, emphasised that it is crucial for FM professionals to be part of a design team (see Oghifo, 2020). She said that FM professionals will have more work to do if they engaged only after construction, because some decisions may have been made and implemented which may constitute impediments to cost-effective running and maintenance of the facility. In the opinion of Dr. Richard Somiari, the Centre Director/Managing Consultant of Lagos State DNA and Forensic Centre, many people mistakenly believe that FM professionals are needed only when the building needs to be cleaned, but there is much more to their work (see Nwannekanma & Onyedika-Ugoeze, 2019). It has been established by several research efforts that involving FM professionals during the design phase can reduce initial costs, avoid unanticipated contingencies during the operational phase, improve design performance, and increase design efficiency (Enoma, 2005; Ashworth, 2020; Smith, 2021). It also reduces lifecycle costs, ensures less “rework”, and ensures a better facility that is easy to maintain (Attobrah et al., 2021; Olunwa, 2018). There is therefore a need for advocacy and greater awareness on the importance of FM professionals among stakeholders in the built environment, particularly professionals in the built environment. Hence, Mr. David Lola Majekodunmi, an architect cum the Chairman of Nigerian Institute of Architects (NIA) for Lagos chapter, urged other built environment professionals to work effectively with FM professionals and involve them from the preliminary design stage of construction (c.f. Gbadeyanka, 2021). This is because evidence has shown that FM professionals face resistance from their colleagues in the built environment (Abeydeera et al., 2017; Tucker et al., 2017).

This resistance to FM professionals at the design stage might exist because some built environment professionals are not well-informed of their (FM professionals) relevance (Nwannekanma & Onyedika-Ugoeze, 2019). It could also be due to the fact that the majority of studies looked at all professionals as a whole, without examining the opinion of each category of professionals, to know their thoughts on the inclusion of FM professionals at the design stage. Hence, it might be necessary to seek the opinion of each category of professional since they are expected to work closely with facility managers. The need to seek the opinion of each category of professional separately is buttressed by Enoma (2005), who stated that from one project to another, facility managers may be viewed differently by the project team based on the latter’s education and training, as well as their experience and discipline. The author emphasized the importance of relaying detailed comments about how they all perceive FM professionals on an individual basis. Hence the need for this study, which investigates the perception of built environment professionals of the importance of FM professionals at the design stage in Lagos, Nigeria. This study is crucial to built environment professionals and other stakeholders because they will be well-informed about the expertise and experience that FM professionals have in improving design performance, increasing design efficiency, managing space, and their capacity to spot design flaws before it is either too late or too costly to make changes. Moreover, through this research, an information gap is filled and a contribution is made to the literature.

## **02.0 LITERATURE REVIEW**

The review of literature is divided into two parts. The first part explains the importance of FM professionals at the design stage, while the second part identifies the benefits of involving FM professionals at the design stage.

### **2.1 Importance of FM Professionals at the Design Stage**

Staff Writer (2020) stated that an FM professional's responsibilities should begin earlier than when a project is handed over. Some buildings, according to the author, are difficult to maintain. They would, however, be less difficult to maintain if FM professionals were brought in early on in the design and construction process. A report by the Building Research Association of New Zealand (BRANZ) confirmed that FM professionals’ engagement in the design phase positively improves building usefulness, performance, and longevity. As a result, the group argued for involving FM professionals early in the planning process of a project (INCLEAN Magazine, 2019). In supporting this view, Tucker et al. (2012) asserted that incorporating FM into the complete development of a building has a significant impact on the building's durability and sustainability. According to the quote by Paul Goldberger – an architecture critic (as cited in Staff Writer, 2020), incorporating FM professionals from the start is critical in order to ensure that a building's functionality and longevity are maximised. The author emphasised that their involvement at the onset would avoid creating difficult-to-access areas that would be impossible to clean or maintain, thereby retaining the building's functionality for the longest period possible.

Early involvement of FM professionals in the design process, according to the Chief Executive Officer of Facilities Management Association of New Zealand (FMANZ) – Gillian Wess (as cited in INCLEAN Magazine, 2019), creates an avenue to favourably influence the usefulness, longevity, and performance of buildings while also saving money. The paper also declared that a lot of work has been put into promoting this approach under the term “soft landings”, in which FM professionals are involved from design to occupancy, assuring a smooth transition when the building is occupied. The concept of this strategy is to lower facility operational expenses by focusing on whole-of-life costs. Fatayer et al. (2019) also affirmed that an FM professional’s early involvement improves facility operation and maintenance, as evidenced by a decrease in electrical, architectural, plumbing, structural, heating, air conditioning, and ventilating defects.

The significance of FM professionals at the design stage, according to Pilanawithana and Sandanayake (2017), includes providing cost-effective buildings, ensuring value for money, and preparing operations and maintenance strategies. Supporting this viewpoint,

Abeydeera et al. (2017) found that incorporating FM professionals into the development process ensures long-term development and lowers operational and maintenance expenses. FM professionals, according to Alhammedi (2019), guarantee that the design is easy-to-maintain and that the end users are satisfied. Smith (2021) and Engstrom (2021) declared that reviewing designs, helping to select finishes and equipment, conducting inspections and quality checks, ensuring that buildings are cost-efficient and easy-to-maintain as well as verifying installations are part of the responsibilities of FM professionals at the design stage. The early involvement of FMs (facility managers), according to Olunwa (2018), reduces lifecycle costs, adds value to the facility by ensuring less "rework," emphasizes value for money, ensures higher reliability, and ensures a better facility that is easy to run, maintain, and manage by using whole-life costing and risk management techniques. In the opinion of Neuman (2015), FM professionals will contribute to proper design and equipment selection in terms of maintainability, cost of operations, and safety, among others. Attobrah et al. (2021) stated that the involvement of FM professionals at the various stages of the design process improves the performance of buildings throughout their life cycle. Integration of FM professionals into the development process, according to Tucker et al. (2017) and Tucker and Masuri (2018), promotes facility buildability, operability, and sustainability.

Given the foregoing, previous studies have undoubtedly examined the usefulness of facility managers during the design phase. However, to the author's knowledge, none of the studies was undertaken in Nigeria. Moreover, the opinion of each category of built environment professionals was not sought. Therefore, this research on the importance of FM professionals at the design stage is justified.

## 2.2 Benefits of FM Professionals' Involvement in the Design Process

Several authors have attempted to identify some of the benefits of involving FM professionals in the design stage of a building. Based on existing literature, Table 1 summarises some of these benefits.

**Table 1** Benefits of involving FM professionals at the design stage

S/N	Author(s)	Benefit
1	Enoma (2005); Ahmed (2012); Ashworth (2020); Sarkar (2021); Smith (2021)	Minimise maintenance costs - FM professionals should be involved at the design stage because they have the technical know-how to put measures in place that facilitate smooth running of buildings and other utilities, thereby reducing maintenance costs
2	Enoma (2005); Ahmed (2012); Olunwa (2018); Sarkar (2021); Smith (2021)	Ease of accessibility during maintenance - Maintenance accessibility is frequently neglected during the design process. FM professionals are to assure design for maintainability at the outset of new projects because it can have a significant impact on length of downtime caused by maintenance tasks. If maintainability is built into a building's design, it will increase the efficacy and efficiency of maintenance by guaranteeing that tasks involving maintenance are simple, promptly done, precise, safe, and economical
3	Enoma (2005); Kalantari et al. (2017); Bako (2020); Sarkar (2021); Smith (2021); Mewomo et al. (2022)	Minimise the need for major repairs and design changes - By reviewing operational design options and the structural engineer's choice of building structure, FM professionals can assist in minimising design defects at the design phase. By doing this, the need for significant repairs and design modifications will be reduced
4	Meng (2013); Sarkar (2021); Smith (2021)	Supervision of the procurement of quality materials - FM professionals provide assistance in selecting quality materials that best meet the needs of the building. They will advise team members against using materials that will need to be replaced or upgraded frequently
5	Ahmed (2012); Bako (2020); Smith (2021)	Space management - When engaged at the design stage, FM professionals will contribute expertise to space management. They see to it that the available space is used as efficiently as possible
6	Smith (2021)	Compliance with standards - FM professionals can ensure that the design complies with building standards e.g. Health, Safety and Environment (HSE) regulations. This will ensure that the safety of lives and property is considered during design
7	Enoma (2005); Bako (2020)	Provision of a facility that is more suitable to the demands of end users - The presence of FM professionals in the design team ensures that the needs of users are taken into account, leading to a "soft landing" for them (users) during the occupancy phase. This improves the building's performance
8	Olunwa (2018); Smith (2021)	Manage the supply chain efficiently - FM professionals manage the supply chain for the project by balancing supply and demand for various building materials to ensure efficiency
9	Smith (2021)	Promote discourse among project team members by emphasizing the advantages of collaboration i.e. FM professionals enhance communication by stressing the advantages of cooperation among project team members while fostering teamwork and collaboration throughout the design process
10	Enoma (2005); Olunwa (2018); Bako (2020); Smith (2021)	Greater value for money - The functioning of the building may be made much more efficient with the help of an FM professional during the design and construction phases, which will ultimately result in better value for money. At the design stage, the FM professional will be concerned with providing a facility that is economical to run and will be easy to maintain

From Table 1, it can be concluded that several efforts have pointed out that the involvement of FM professionals at the design stage is a gain rather than a loss. It is thus alarming that they are still confronted with resistance from other built environment professionals (Abeydeera et al., 2017; Tucker et al., 2017). This might be due to ignorance of the important contributions of FM professionals at the design stage. Hence, the grounds for the current study are tapped.

### 03.0 METHODOLOGY

The research was carried out in Lagos, Nigeria. This state was chosen because it is the hub of commercial activity in Nigeria, with a relatively high level of construction activities and a huge concentration of construction professionals (Nduka & Ogunsanmi, 2015). Moreover, the study location was chosen because it houses a substantial number of Architecture, Engineering, and Construction (AEC) firms. This, according to Babatunde et al. (2021), makes the study area suitable for conducting this type of survey and collecting the necessary data. A cross-sectional survey of built environment professionals in Lagos, Nigeria – comprising engineers (civil, electrical and mechanical), architects, quantity surveyors (QS), and builders – was employed in this study.

The data for the study was collected using a standardized questionnaire created by the researcher. The first part of the questionnaire is the introductory part, which informed respondents of the voluntary, anonymous and confidential nature of their participation. The participants gave their verbal consent on the grounds that the researcher is also a professional in the built environment. The questionnaire posed questions taken from findings from earlier research (Abeydeera et al., 2017; Alhammadi, 2019; Engstrom, 2021; Mewomo et al., 2022; Neuman, 2015; Olunwa, 2018; Smith, 2021; Tucker & Masuri, 2018). Apart from the introductory part, there are two other sections in the questionnaire. Section A features questions about the research participant's profile, whereas the B section has questions about the importance of involving FM professionals in the design process. Section B's questions are drawn from ten parameters derived from the literature review done earlier. A five-point Likert scale was used to standardise responses to the questions in the B part of the questionnaire. A Likert scale was chosen because it is a rating scale, commonly used in survey research to examine respondents' opinions, attitudes, behaviours, or perceptions (Bhandari & Nikolopoulou, 2020; Taherdoost, 2019). Due to the inability to obtain an extensive list of registered built environment professionals in Lagos State, the researcher purposefully sampled 340 built environment professionals (i.e. 85 engineers, 85 architects, 85 builders, and 85 QS). This sample size is in line with the opinion of Babatunde et al. (2021), who adjudged a minimum of 50 for each category of professionals as being sufficient for a study.

The researcher and three specially-trained field assistants administered hard copies of the questionnaires. The survey took three months to complete (from February to April of 2022). The questionnaires were administered by the researcher and her assistants at engineering, architectural, quantity surveying, and construction firms in the study area. This was also coupled with visits to construction sites in the Lekki-Epe axis. This is because, with the on-going real estate development boom in that axis, it has emerged as the most rapidly developing part of the state and the country (Desmond, 2022; Ihua-Maduenyi, 2019; Salau, 2022). Consequently, a large number of built environment professionals work in that area. These two locations (firms and sites) were picked because they are the most likely places where the majority of the target professionals can be found. Out of the 340 questionnaires that were administered, 280 were retrieved. Of the number retrieved, 266 (representing 78%) were filled by professionals who had participated in construction projects in the study area, and were also affiliated with the Nigerian Society of Engineers (NSE); or the Nigerian Institute of Architects (NIA); or the Nigerian Institute of Quantity Surveyors (NIQS) or the Nigerian Institute of Building (NIOB) respectively. They have also at one time or the other worked with FM professionals. The figure retrieved was judged to be useful for analysis. Table 2 shows the number of questionnaires distributed, number retrieved and the number that was analysed. The data obtained from the questionnaires was collated using a statistical tool known as the Statistical Package for Social Sciences (SPSS) and analyzed using descriptive and inferential statistical tools. The outcomes of the analysis are interpreted using the decision rule of Ogbolo (1996) as cited in Ahmed (2013) which ascribes "Positive Feelings" to 4-5 scores, "Neutral Feelings" to 3 scores, and "Negative Feelings" to 1-2 scores. The mean, Relative Importance Index (RII) and Kruskal-Wallis test were used to analyse questions on the importance of FM professionals at the design stage. The results of the analyses are displayed in tables and charts.

**Table 2** Number of questionnaires distributed, retrieved and analysed

No. Distributed	No. Retrieved	No. Analysed	Percentage Analysed
340	280	266	78%

### 04.0 FINDINGS AND DISCUSSION OF RESULTS

#### 4.1 Participants Background Information

This section shows preliminary information on the participants. The analyses presented here are on the profession of participants, and their years of experience. The results are detailed in Figures 1 and 2.

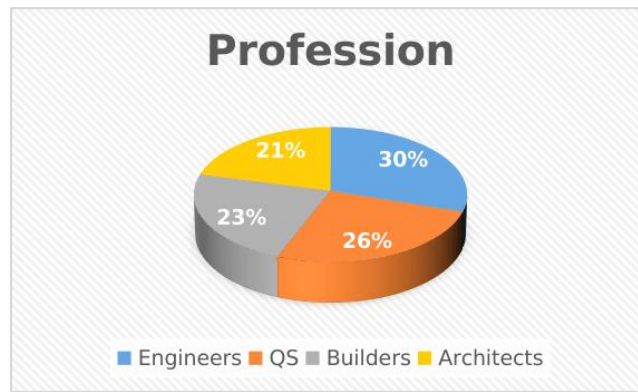


Figure 1 Profession of participants

Figure 1 shows that out of the 266 professionals that participated in the survey, 30%, 26%, 23%, and 21% were engineers, QS, builders, and architects, respectively. In addition, 22% of respondents said they had 5 years or less of working experience, 70% said they had 6-20 years of work experience, and 8% said they had more than 20 years of work experience (see Figure 2). This implies that the respondents have sufficient experience in the built environment to provide critical information and express their views on the value of FM professionals throughout the design stage.

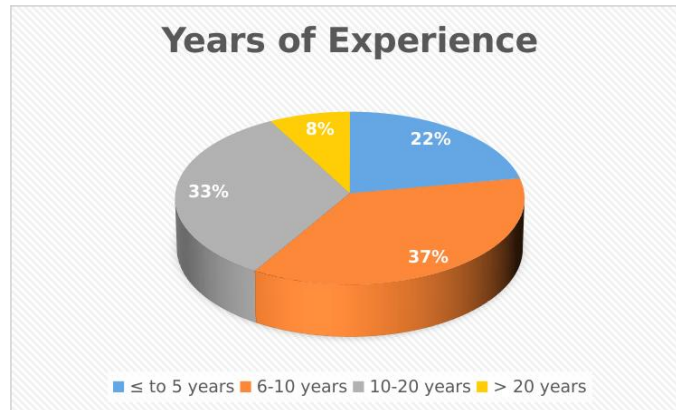


Figure 2 Years of experience

#### 4.2 Importance of FM Professionals at the Design Stage

The researcher used a 5-point Likert scale to assign 5, 4, 3, 2 and 1 to "Strongly agree", "Agree", "Uncertain", "Disagree" and "Strongly Disagree" respectively for each participant, to arrive at the mean score and RII. The analyses of the professionals per group and their general consensus are as shown in Tables 3 and 4 respectively.

Table 3 Importance of FM professionals at the design stage (analysis per professional group)

Importance	Engineers (E)		Architects (A)		Builders (B)		QS	
	M	R	M	R	M	R	M	R
They contribute to a building's functionality	2.50	9 <sup>th</sup>	4.10	5 <sup>th</sup>	2.85	10 <sup>th</sup>	3.10	9 <sup>th</sup>
They contribute to a building's sustainability	3.65	4 <sup>th</sup>	4.17	3 <sup>rd</sup>	3.99	2 <sup>nd</sup>	4.05	2 <sup>nd</sup>
They contribute to a building's durability	3.00	6 <sup>th</sup>	4.15	4 <sup>th</sup>	3.10	8 <sup>th</sup>	3.88	4 <sup>th</sup>
They can manage budgets at the design stage	2.16	10 <sup>th</sup>	3.25	10 <sup>th</sup>	3.18	6 <sup>th</sup>	3.16	8 <sup>th</sup>
They can review design from a maintenance, operation and serviceability perspective	4.02	1 <sup>st</sup>	4.34	1 <sup>st</sup>	4.20	1 <sup>st</sup>	4.22	1 <sup>st</sup>
They can check the quality of materials, equipment and their installation	3.96	2 <sup>nd</sup>	4.00	6 <sup>th</sup>	3.99	2 <sup>nd</sup>	3.94	3 <sup>rd</sup>
They are essential in the selection of appropriate materials, equipment and finishes	3.00	6 <sup>th</sup>	3.82	8 <sup>th</sup>	3.15	7 <sup>th</sup>	3.69	6 <sup>th</sup>

Importance	Engineers (E)		Architects (A)		Builders (B)		QS	
	M	R	M	R	M	R	M	R
They contribute to proper design in terms of health and safety environment	3.79	3 <sup>rd</sup>	4.34	1 <sup>st</sup>	3.84	4 <sup>th</sup>	3.75	5 <sup>th</sup>
They ensure that buildings meet target occupants' needs	3.01	5 <sup>th</sup>	3.79	9 <sup>th</sup>	3.77	5 <sup>th</sup>	3.69	6 <sup>th</sup>
They ensure that buildings are cost-efficient	2.88	8 <sup>th</sup>	3.95	7 <sup>th</sup>	3.04	9 <sup>th</sup>	2.85	10 <sup>th</sup>

Note: M = Mean Score; R = Ranking

From the analysis in Table 3, it is obvious that architects have the strongest belief that FM professionals are useful at the design stage and should therefore be included from the onset. This is evident in their mean ranking (ranging from 3.25 to 4.34). They are of the opinion that FM professionals are important because they can review design from a maintenance, operation, and serviceability perspective (with a mean of 4.34), contribute to proper design in terms of health and safety environment (with a mean of 4.34), contribute to a building's sustainability (with a mean of 4.17), durability (with a mean of 4.15), and functionality (with a mean of 4.10). Moreover, they agree that FM professionals are important at the onset because they can check the quality of materials, equipment, and their installation (with a mean of 4.00) and ensure that buildings are cost-efficient (with a mean of 3.95). It is evident from Table 3 that the architects are convinced that FM professionals are important at the design stage in 9 out of the 10 parameters presented to them to rate. This result is not surprising given that the FM profession has its roots in architecture and FM principles are strongly tied to the architectural design principle of functionality (Musa, 2021; Nor et al., 2014).

Next to the architects are the QS and builders, with a mean ranging from 2.85 to 4.22 and 2.85 to 4.20, respectively. The QS and builders also affirmed that FM professionals can review design using a maintenance, operation, and serviceability perspective (mean=4.22 and 4.20 respectively), contribute to a building's sustainability (mean=4.05 and 3.99 respectively), and that they can check the quality of materials, equipment, and their installation at the design stage (mean=3.94 and 3.99 respectively). From the analysis, it is clear that quantity surveyors agree that FM professionals are relevant in 7 out of the 10 parameters used to measure their importance, while the builders concurred only with 5 of the parameters. The findings of the perception of QS are consistent with those of Salleh et al. (2014). The authors reported that QS value the presence of FM professionals in the built environment to the point where the former intend to bridge skill gaps between them (i.e., QS and FM professionals) so that they can become effective and successful facility managers. This is because, for QS, FM practice is a promising new opportunity.

The engineers ranked the importance of FM professionals at the design stage the lowest compared to other professionals. The engineers, like their counterparts, agree that FM professionals review design from a maintenance, operation, and serviceability perspective (mean=4.02), check the quality of materials, equipment, and their installation (mean=3.96), contribute to proper design in terms of health and safety environment (mean=3.79) and contribute to a building's sustainability (mean=3.65). This outcome opposes the findings of Abeydeera et al. (2017) which postulated that mechanical, civil, and electrical engineers are among the non-FM professionals who affirmed that FM professionals are not required to achieve a building's long-term sustainability. This might be because these professionals were not sampled as a group, but together with other non-FM professionals, which is what this study is advocating for. The analysis also shows that the engineers considered the FM professionals relevant only in 4 out of the 10 parameters posed to them.

The above outcome on the importance of FM professionals from the perspective of these four categories of professionals supports previous findings of multiple studies (Abeydeera et al., 2017; Alhammedi, 2019; Attobrah et al., 2021; Engstrom, 2021; Fatayer et al., 2019; Smith, 2021). These authors affirmed that the involvement of FM professionals at the various stages of the design process enhances the performance of buildings during their life cycle, since they ensure that designs are reviewed, select quality finishes and equipment, conduct inspections and quality checks, verify installations, and promote sustainability and easy-to-maintain buildings.

Also, a further look at the analysis of professionals on a per-category basis shows that the engineers and QS disagree that FM professionals can ensure that buildings are cost-efficient. Engineers and builders also disagree that they can contribute to a building's functionality, while engineers disagree that they can manage budgets at the design stage. The analysis of the four categories of professionals indicates that the architects and QS strongly accept that FM professionals should be involved at the onset of a building project. The builders neither disagree nor agree, but the engineers disagree outrightly with the concept that they are actually important at the design stage. The implication of these outcomes is that not all built environment professionals are convinced that FM professionals should be part of the project team at the design stage. Hence, there is a need for FM professionals to embark on aggressive advocacy which will demonstrate their usefulness as part of the project team from the onset of a building project.

**Table 4** Importance of FM professionals at the design stage (professionals' general consensus)

Importance	Engineers		Architects		Builders		QS		AM	ARII	OR	R
	M	RII	M	RII	M	RII	M	RII				
They can review design from a maintenance, operation and serviceability perspective	4.02	0.804	4.34	0.868	4.20	0.840	4.22	0.844	4.20	0.840	1 <sup>st</sup>	PF
They contribute to a building's sustainability	3.65	0.730	4.17	0.834	3.99	0.798	4.05	0.810	3.97	0.794	2 <sup>nd</sup>	PF
They can check the quality of materials, equipment and their installation	3.96	0.792	4.00	0.800	3.99	0.798	3.94	0.788	3.97	0.794	2 <sup>nd</sup>	PF
They contribute to proper design in terms of health and safety environment	3.79	0.758	4.34	0.868	3.84	0.768	3.75	0.750	3.93	0.786	4 <sup>th</sup>	PF
They ensure that buildings meet target occupants' needs	3.01	0.602	3.79	0.758	3.77	0.754	3.69	0.738	3.57	0.714	5 <sup>th</sup>	PF
They contribute to a building's durability	3.00	0.600	4.15	0.830	3.10	0.620	3.88	0.776	3.53	0.706	6 <sup>th</sup>	PF
They are essential in the selection of appropriate materials, equipment and finishes	3.00	0.600	3.82	0.764	3.15	0.630	3.69	0.738	3.42	0.684	7 <sup>th</sup>	NeuF
They ensure that buildings are cost-efficient	2.88	0.576	3.95	0.790	3.04	0.608	2.85	0.570	3.18	0.636	8 <sup>th</sup>	NeuF
They contribute to a building's functionality	2.50	0.500	4.10	0.820	2.85	0.570	3.10	0.620	3.14	0.628	9 <sup>th</sup>	NeuF
They can manage budgets at the design stage	2.16	0.432	3.25	0.650	3.18	0.636	3.16	0.632	2.94	0.588	10 <sup>th</sup>	NeuF

Note: M = Mean Score; RII = Relative Importance Index; AM = Average Mean; ARII = Average Relative Importance Index; OR = Overall Ranking; R = Remark; PF = Positive Feelings; NeuF = Neutral Feelings; NegF = Negative Feelings

Table 4 reveals the general consensus of the professionals. They generally believe that FM professionals can be useful when reviewing design from the perspective of maintenance, operation, and serviceability (mean=4.20; RII=0.840), contribute to a building's sustainability (mean=3.97; RII=0.794), and check the quality of materials, equipment, and their installation (mean=3.97; RII=0.794). Also, they affirmed that FM professionals can contribute to proper design in terms of health and safety environment (mean=3.93; RII=0.786) as well as ensure that buildings meet target occupants' needs (mean=3.57; RII=0.714). Collectively, they are not convinced that FM professionals are essential in the selection of appropriate materials, equipment, and finishes (mean=3.42; RII=0.684); that they ensure buildings' cost-efficiency (mean=3.18; RII=0.636); contribute to a building's functionality (mean=3.14; RII=0.628), and manage budgets at the design stage (mean=2.94; RII=0.588).

Judging from the above analyses in Tables 3 and 4 (i.e. the built environment professionals on a per-category basis and collectively), it is obvious that the collective analysis is not a true picture of what each category of professionals believes, with respect to the involvement of FM professionals. It can be concluded that it is better to seek the opinion of professionals on a per-category basis to truly ascertain their opinion rather than sample them collectively as done by Abeydeera et al. (2017). This conclusion therefore contradicts the outcome of the works of Tucker et al. (2017) and Abeydeera et al. (2017) that posited that FM professionals face resistance from other built environment professionals as a bloc. The implication of the findings based on the perception of professionals collectively might be misleading since 2 out of the 4 professionals considered FMs' involvement at the design stage advantageous.

### 4.3 Comparison of the Perception of Built Environment Professionals (Kruskal-Wallis Test)

The Kruskal-Wallis test was additionally utilized by the researcher to compare the means of the professionals. This was done with a view to determining if there was any significant difference in the opinions of the importance of FM professionals at the design stage. Table 5 provides the analysis.

**Table 5** Comparison of the perceptions of built environment professionals

Engineers	Architects	Builders	QS
R = 126.5	R = 301.5	R = 189	R = 203
n = 10	n = 10	n = 10	n = 10
N = 40; k = 4			

**Key**

R = Sum of ranks for each of the professionals

N = Total observation in all groups

(i.e. total number of responses)

k = The number of groups compared

df = Degrees of freedom ( $df = k - 1$ )

H = Kruskal-Wallis H test

**Note**\* The difference is significant if  $P < 0.05$ \* The difference is insignificant if  $P > 0.05$ **Calculation Summary**The significance level is  $\alpha = 0.05$ , and the number of degrees of freedom is  $df = 4 - 1 = 3$ .

The H statistic is computed as follows:

$$H = \frac{12}{N(N+1)} \left( \frac{R_1^2}{n_1} + \frac{R_2^2}{n_2} + \dots + \frac{R_k^2}{n_k} \right) - 3(N+1)$$

$$H = \frac{12}{40(40+1)} \left( \frac{126.5^2}{10} + \frac{301.5^2}{10} + \frac{189^2}{10} + \frac{203^2}{10} \right) - 3(40+1)$$

$$H = 11.513$$

The  $p$ -value is  $p = 0.00925$ , and since  $p = 0.00925 < 0.05$ , thus,  $H(3) = 11.513$ ,  $p = 0.00925$ . This means that the result is significant at  $p < 0.05$ . Based on the outcome of the Kruskal-Wallis test, it can be concluded that there is a significant difference in the mean of the perception of selected built environment professionals. The implication of this outcome is that the difference in opinions of the categories of professionals regarding the importance of FM professionals at the design stage is substantial. Hence, it is essential to always seek their opinions on a per category basis to truly ascertain their views.

**05.0 CONCLUSION AND RECOMMENDATIONS**

This study investigated built environment professionals' perceptions of the importance of FM professionals at the design stage. From the study, there are four distinct outcomes: first, all four categories of professionals agree that FM professionals are important at the design stage. Second, architects and quantity surveyors are more convinced of their importance than builders and engineers. Third, none of the professionals is convinced that FM professionals are essential when selecting appropriate materials, equipment, and finishes; ensuring buildings' cost-efficiency; contributing to a building's functionality; and managing budgets. Finally, there is a significant difference in the mean of the perceptions of selected built environment professionals. This is a pointer to the fact that the opinions of professionals should be sought per category, not collectively. Based on the findings of the study, the researcher makes the following suggestions:

1. The first outcome of the study points to a consensus among the sampled built environment professionals that FM professionals are important at the design stage, to review design from a maintenance, operation, and serviceability perspective. The governing body of FM professionals (IFMA) should leverage on this consensus by organizing forums where other built environment professionals can be educated on other areas where facility managers can be useful at the design stage. This will help them to position themselves in the built environment sphere in a way that will showcase other areas they can be of service.
2. Based on the second outcome of the study, IFMA should solicit for the opportunity to discuss with architects and QS at the annual conferences of NIA and NIQS respectively. This is with a view to persuading these professionals to convince their clients to include FM professionals in the design team from the onset of a building project.
3. Also, considering that engineers and builders are not particularly convinced of the significance of FM professionals at the design stage, it is vital for them (FM professionals) to provide the governing councils of NSE and NIOB, respectively, with a clear understanding of their scope of work at the design stage. This is crucial if they plan to thrive in today's increasingly competitive marketplace.
4. Finally, IFMA should leverage its membership base to secure meetings with owners of facilities with high running costs and demonstrate to them the savings that would have accrued had they engaged FM professionals at the design stage. This is with a view to encouraging such owners to engage IFMA members as part of the design team from the onset of their subsequent projects. Doing so will ensure, from the onset, that the design is operationally viable, easy-to-maintain and suitable for users' needs.



## 06.0 LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDIES

In this study, only 10 parameters were utilized to judge the importance of FM professionals during the design stage. It is possible that if more parameters are incorporated and investigated in a subsequent study, the results may vary. In addition, this study was conducted using questionnaires, which may be subject to some specific constraints associated with questionnaire surveys. Thus, it is proposed that further research may be undertaken using a combination of data collection methods, such as interviews and questionnaire surveys. Furthermore, because this study only included four categories of built environment professionals, further research with more categories of professionals should be explored in the future. Finally, this study only looked at built environment professionals in Lagos, Nigeria – a follow-up study might look at professionals in other locations.

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