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Evaluation of Facilities Management Competencies and Practices in Public primary school buildings, Ondo state, Nigeria

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Abstract

The persistent deterioration of public primary school infrastructure in Nigeria, especially in Ondo State, highlights the critical need for effective facilities management (FM) practices driven by competent personnel. Despite the growing recognition of the role of FM in educational outcomes, limited research exists on how facilities management competencies influence FM practices in public basic education. This study, therefore, assessed the effects of FM competencies on FM practices in public primary school buildings in Ondo State. A quantitative research design was employed, and Ondo State was chosen as the study area due to its socio-economic diversity and educational relevance. Structured questionnaires were distributed to 500 respondents, comprising end-users (teachers and school administrators) and professionals (facilities managers, architects, engineers, builders, and quantity surveyors). A total of 484 valid responses were retrieved, representing a 96.8% response rate. Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) to determine the effect of FM competencies on FM practices. The findings indicated a statistically significant and positive relationship, facility management competencies and practices in the study area. influencing FM practices. The Human Resource Management (bHRM) construct emerged as the most impactful factor influencing the various dimensions of facilities management practices ($\beta = 0.372$; $T = 6.087$; $p < 0.05$). Indicator bHRM 2, which focuses on ensuring adequate staffing for effective facilities management, was found to be the most influential in improving practices such as asset management (eAM), budg*et al*location (eBA), maintenance practices (eMP), and space planning (eSP). The study concludes that strengthening FM competencies, especially in human resource and stakeholder engagement, is essential for improving FM implementation in public primary schools. It recommends the government and relevant education authorities prioritize the recruitment, training, and retention of qualified FM personnel. Establishing comprehensive training programs and clear career pathways for FM staff will ensure that schools have the human capacity needed to implement effective FM practices. The study contributes to knowledge by offering empirical evidence on the role of FM competencies in shaping FM practices in Nigeria's public primary education sector and adapting global FM frameworks to localised, resource-constrained environments.

Keywords: Facilities management, Facilities management competence, Facilities management practices, Buildings, public primary school, and PLS-SEM

INTRODUCTION

Effective education delivery is inextricably linked to the quality of physical infrastructure in learning environments. In contemporary educational discourse, the role of Facilities Management (FM) has emerged as a critical determinant of school building performance, impacting the efficiency, safety, and overall usability of school infrastructure (Gunduz *et al*., 2025). In developing countries, particularly Nigeria, challenges such as poor maintenance culture, inadequate funding, and a shortage of trained personnel have severely compromised the quality and functionality of public schools' infrastructure (Akinyemi *et al*., 2021; Adeoye *et al*., 2024). While FM is gaining attention globally, its operationalization in Nigeria remains fragmented, particularly in public primary schools, which are the foundational level of the education system (Marmoah *et al*., 2019; Rahmawati, 2024). In Ondo State, Nigeria, the situation is no different. Despite governmental investments and policy initiatives aimed at revitalizing basic education, most public primary school buildings exhibit signs of dilapidation and functional decay. The 2020 National Bureau of Statistics data reported a 7% decline in public primary school enrollment in Ondo State, concurrently with a 15% rise in private school enrollment, attributed largely to the deteriorating condition of public schools facilities (NBS, 2021). This infrastructural decline is not only a physical concern but also a reflection of weak facilities management competencies among key personnel, which compromises the development and sustainability of educational environments. Facilities management competencies-defined as the skills, knowledge, and expertise needed to efficiently manage built environments-are crucial for the implementation of sustainable FM practices (Awang *et al*., 2014; Okoro, 2023). Studies like Au-Yong *et al*. (2014) and Meng (2014) have underscored that when FM competencies are weak or underdeveloped, the execution of maintenance strategies, user engagement, and long-term infrastructural planning becomes severely hampered. Furthermore, Elmualim *et al*. (2010) and Mewomo *et al*. (2022) emphasized that institutional sustainability goals cannot be achieved without equipping FM personnel with the necessary competencies to anticipate, plan for, and address infrastructural issues in educational settings.

While numerous studies have proposed competency frameworks tailored to educational institutions (e.g., APPA, 2010; Hasim *et al*., 2020), their contextual applicability to public primary schools in Nigeria, and specifically Ondo State, remains limited. This gap is critical because the unique socio-economic and infrastructural realities in these schools necessitate a customized understanding of how competencies translate into FM practices. A lack of empirical research evaluating the direct relationship between FM competencies and FM practices in public primary schools means that educational authorities are often left without data-driven strategies to improve the learning environment. The problem becomes particularly concerning when considering the practical implications of unskilled FM professionals on building functionality. Poor human resource capabilities lead to neglected maintenance, ineffective stakeholder engagement, and mismanagement of available resources—outcomes that adversely affect not only the structural integrity of school buildings but also the educational experience of pupils and teachers (Oladokun & Ajayi, 2018; Zalejska-Jonsson, 2020).

If this problem persists, it will continue to widen the gap between public and private education, deepen parental distrust in government-run schools, and deteriorate the foundational platform of Nigeria's educational system. The knock-on effects include poor learning outcomes, high dropout rates, and long-term economic disadvantages for communities dependent on public education (Ayeni, 2012). Research by Rahmawati (2024) emphasized the pressing need for a unified and context-sensitive body of knowledge to guide FM practices in educational institutions. However, the author also acknowledged that most frameworks are designed for developed contexts and higher education settings, offering little insight into primary education infrastructures in under-resourced Nigerian communities. Similarly, Onoja (2022) noted the absence of empirical evidence linking FM competencies with effective FM practices in Nigeria's public schools, highlighting a critical literature gap that this study aims to address.

This study is significant for several reasons. First, it investigates a foundational but under-researched

area, the effect of FM competencies on FM practices in public primary schools, within the context of a Nigerian state. It contributes to filling a crucial knowledge gap by providing empirical evidence specific to Ondo State, a region with a high concentration of both urban and rural public schools facing varied infrastructural challenges. Second, by identifying which competencies significantly impact FM practices, this research can guide educational policymakers, facility managers, and governmental agencies (such as SUBEB and the Ministry of Lands and Housing) in designing competency development programs and targeted interventions. Furthermore, this research supports the broader Sustainable Development Goals (SDGs), especially Goal 4-Quality Education and Goal 11- Sustainable Cities and Communities, by enhancing the sustainability and functionality of educational infrastructure through effective management. It also aligns with the Contingency Theory, which emphasizes context-specific managerial approaches, underscoring the need to tailor FM practices to the unique socio-economic realities of public primary schools in Ondo State. Ultimately, the study offers a pathway toward improved educational outcomes by highlighting the foundational role of human resource competencies in translating management strategies into sustainable infrastructural benefits.

Literature Review

Facilities Management (FM) has gained global recognition as a key determinant of infrastructure sustainability and organizational performance, particularly within institutional settings such as education (Elmualim *et al*., 2010; Jensen *et al*., 2023). In schools, effective FM contributes to safe, functional, and engaging learning environments, especially in systems where building degradation directly impairs student outcomes. However, while global FM frameworks have matured in tertiary institutions and corporate environments, their applicability to primary schools in low-income countries remains underexplored.

Conceptualizing FM Competencies and Practices

FM competencies encompass a wide range of technical, managerial, and interpersonal skills required to plan, operate, and optimize built environments (Kamaruzzaman *et al*., 2018; Okoro, 2023). These competencies span leadership and planning, human resources, financial controls, operations, and sustainability strategies (FMAC, 2014). International standards—such as those developed by APPA (2010) and IFMA—propose comprehensive frameworks, often designed with well-resourced institutions in mind. FM practices, by contrast, refer to the operational expression of these competencies. They include tasks such as maintenance, space utilization, budget tracking, communication, and asset management (Jensen *et al*., 2023; Erbiyik, 2023). Importantly, FM practices do not function in isolation; their quality and consistency depend largely on the strength of the competencies driving them (Meng, 2014; Awang *et al*., 2014).

Global North vs. South: A Contextual Gap

Most competency models and empirical FM studies have been conducted in the Global North, where schools operate with adequate budgets, defined FM career structures, and digital tools such as Building Information Modeling (BIM) (Wang *et al*., 2022). In such settings, FM professionals are typically specialized and guided by institutional mandates. However, this context contrasts sharply with Global South realities, where school infrastructure is often maintained by overstretched generalists or administrative staff with no formal FM training. In Nigeria, and particularly in states like Ondo, schools face structural deterioration, funding limitations, and personnel shortages (Akinyemi *et al*., 2021; Onoja, 2022). Yet most frameworks like APPA and IFMA fail to address the operational constraints encountered in these environments. These limitations include absence of policy enforcement, informal FM roles, and lack of digital support. Consequently, contextual adaptation of global competency models is essential if they are to inform actionable strategies for public primary education.

Empirical Link between FM Competencies and Practices

Although FM competencies have been linked to organizational performance across sectors (Elmualim *et al*., 2010; Meng, 2014), there remains a paucity of quantitative studies examining how specific FM competencies influence specific FM practices particularly in basic education infrastructure in Nigeria. Notable local studies (e.g., Ayeni, 2012; Oladokun & Ajayi, 2018)

document maintenance gaps and personnel inadequacies but stop short of measuring how competency domains (e.g., HR, leadership) directly affect outcomes like asset management or stakeholder engagement. Moreover, while competency domains such as leadership, HR, and sustainability have been validated in university and corporate settings (Awang *et al*., 2014; Hebert & Chaney, 2011), they have not been empirically tested in primary schools, where management dynamics are highly decentralized and budgetary autonomy is often absent. This leaves school leaders and policymakers without data-driven insights to guide FM capacity-building at the grassroots level.

Identified Gap and Study Focus

The literature reveals two critical gaps: (1) limited empirical linkage between FM competencies and FM practices in public primary education, and (2) lack of contextual frameworks suitable for LMIC school systems. Existing global models are too top-heavy, assuming professionalized systems and well-funded infrastructure. Therefore, this study builds on the theoretical assumptions of Contingency Theory by exploring how context-sensitive FM competencies shape operational practices in Nigerian public primary schools. By focusing on domains such as human resource management, work environment, leadership, and organizational processes, this study contributes to a bottom-up understanding of FM performance. In doing so, it provides much-needed empirical evidence to support localized frameworks and policy interventions tailored to the realities of LMIC educational systems.

Hypothesis Development

Building on the theoretical and empirical insights discussed in the literature, this study hypothesizes that facilities management (FM) competencies significantly influence the effectiveness of FM practices in public primary schools. Prior studies (e.g., Awang *et al*., 2014; Meng, 2014; Elmualim *et al*., 2010) have consistently shown that technical and managerial competencies enhance infrastructure sustainability, particularly when aligned with organizational needs and contextual realities. In the Nigerian public education context, where FM roles are often informal and under-resourced (Onoja, 2022; Ayeni, 2012), specific competency domains such as human resource management, leadership, and work environment support may play a decisive role in determining whether FM practices are implemented effectively. This is especially true for primary schools, where building maintenance, resource allocation, and user satisfaction directly depend on the capacity and disposition of those managing the facilities. Guided by Contingency Theory, which posits that organizational effectiveness depends on how well internal capabilities align with external and institutional contexts, this study expects that higher levels of FM competencies will lead to improved FM practices across key operational areas.

Therefore, the study proposes the following directional hypothesis:

H_1: Facilities management competencies have a significant and positive effect on facilities management practices in public primary school buildings in Ondo State.

This hypothesis will be tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) to evaluate both measurement and structural relationships within the proposed model.

METHODOLOGY

The study adopted a quantitative research design to examine the effects of facilities management competencies on facilities management practices in public primary school buildings in Ondo State, Nigeria. The research population comprised end-users (teachers and school administrators) and facilities management professionals (including architects, builders, engineers, quantity surveyors, and facility managers) involved in managing public primary school infrastructure within the state. A total of 500 structured questionnaires were distributed across selected schools and professional organisations, with 484 valid responses retrieved, representing a high response rate of 96.8%. Of these, 322 responses were from end-users and 162 from professionals. The data collection instrument was subjected to content and construct validity checks by academic experts and industry practitioners to ensure relevance and appropriateness, while reliability was confirmed using Cronbach's Alpha, with values exceeding the acceptable threshold of 0.7. Data were analysed

using Partial Least Squares Structural Equation Modelling (PLS-SEM) to test the hypothesised relationships between variables and assess the strength and significance of effects within the proposed model. The structural equation model is represented below:

$$FMP = \alpha 0 + \alpha 1LM + \alpha 2WEM + \alpha 3HRM + \alpha 4OM + e \quad \_\_\_\_ 1$$

Where;

FMP	-	Facilities management practices
α0	-	Constant term
α1-α4	-	Parameter coefficient
e	-	error term
LM	-	Leadership and management
WEM	-	Work environment management
HRM	-	Human resource management
OM	-	Organizational management

The study's analytical framework was modelled using Partial Least Squares Structural Equation Modelling (PLS-SEM), which allowed for the simultaneous assessment of the measurement and structural models. The measurement model consisted of two latent constructs: Facilities Management Competencies (FMC) and Facilities Management Practices (FMP). Each construct was measured reflectively using multiple observed indicators based on validated scales from the literature. The structural model specified a unidirectional path from FMC to FMP, hypothesising a positive and significant effect. The model was estimated using SmartPLS software, and standard model fit indices were used to assess the validity, reliability, and explanatory power of the constructs.

RESULTS AND DISCUSSION

Out of the 500 structured questionnaires distributed to respondents across selected public primary schools and professional organisations in Ondo State, a total of 484 valid responses were received, yielding a commendable response rate of 96.8%. This high return rate enhances the reliability and representativeness of the data. The respondents were categorised into two groups: end-users (teachers and school administrators) and professionals (including facilities managers, architects, engineers, builders, and quantity surveyors). Among the valid responses, 322 (66.5%) were from end-users, while 162 (33.5%) were from professionals. Demographically, the respondents were well distributed across various age groups, professional backgrounds, and years of experience, ensuring a diverse and comprehensive perspective on facilities management practices within the state's public primary school system. The mix of both users and technical professionals offers a balanced understanding of how FM competencies influence practical implementation on the ground. The response rate of the questionnaire as well as the demographic characteristics of respondents are presented in Table 1 and Table 2.

Table 1: Response Rate of Questionnaires Distributed and Retrieved

Questionnaires	**Total**
Number distributed	500
Number retrieved (End-user + Professional)	484
Number well filled and usable (End-user)	322
Number well filled and usable (Professional)	162
Percentage (Well filled and usable / Distributed)	96.8%

Source: Researcher's Field Report (2025)

Table 2: Demographic Information

A. Characteristics of Users and Facilities

Age	**Less than 20 years**	**20-25 years**	**26-30 years**	**Over 30 years**	**Total**		
Frequency	1	6	85	230	322		
Percentage	0.3	1.9	26.4	71.4	100		
Sex	**Female**	**Male**	**Total**				
Frequency	183	139	322				
Percentage	56.8	43.2	100				
Experience	**Below 5 years**	**5-10 years**	**11-15 years**	**16-20 years**	**Over 20years**	**Total**	
Frequency	75	62	98	60	27	322	
Percentage	23.3	19.3	30.4	18.6	8.4	100	
Education	**WAEC/NECO**	**NCE**	**OND**	**HND**	**B.Sc./B.Tech./B.Edu.**	**M.Sc./M.Tech./M.Eng.**	**Total**
Frequency	2	175	1	3	140	1	322
Percentage	0.6	54.3	0.3	0.9	43.5	0.3	100
Number of Pupils	**Less than 500 pupils**	**500-800 pupils**	**801-1100 pupils**	**1101-1400 pupils**	**Over 1400 pupils**	**Total**	
Frequency	120	160	10	8	24	322	
Percentage	37.3	49.7	3.1	2.5	7.5	100	
Number of Teachers	**Less than 10 teachers**	**10-15 teachers**	**16-20 teachers**	**21-25 teachers**	**Over 25 teachers**	**Total**	
Frequency	168	85	49	1	19	322	
Percentage	52.2	26.4	15.2	0.3	5.9	100	
Subject Teacher	**Yes**	**No**	**Total**				
Frequency	315	7	322				
Percent	97.8	2.2	100				
Years of Teaching	**Less than 1year**	**1-2years**	**3-4years**	**Over 4years**	**Total**		
Frequency	2	75	237	8	322		
Percentage	0.6	23.3	73.6	2.5	100		

B. Characteristics of the Professionals

Age	20-25 years	26-30 years	Over 30 years	Total			
Frequency	14	55	93	162			
Percentage	8.6	34.0	57.4	100			
Sex	Female	Male	Total				
Frequency	49	113	162				
Percentage	30.2	69.8	100.0				
Work Experience	Below 5 years	5-10 years	11-20 years	Over 20 years	Total		
Frequency	37	57	44	24	162		
Percentage	22.8	35.2	27.2	14.8	100		
Profession	Faciities manager	Architect	Builder	Quantity Surveyor	Engineer	Total	
Frequency	30	21	26	39	46	162	
Percentage	18.5	13.0	16.0	24.1	28.4	100	
Education	OND	HND	PGD	B.Sc./B.Tech.	M.Sc./M.Tech./M.Eng.	Ph.D.	Total
Frequency	1	27	20	82	29	3	162
Percentage	0.6	16.7	12.3	50.6	17.9	1.9	100

Source: Researcher's Field Report (2025)

Measurement Model for Facilities Management Competencies and Facilities Management Practices

To assess the measurement quality of the constructs measuring the facilities management competencies and facilities management practices in public primary school buildings in Ondo State, Nigeria, the study employed Partial Least Squares Structural Equation Modelling (PLS-SEM). A total of 9 constructs were evaluated, each represented by a reflective measurement model, as recommended by Hair *et al*. (2017). These constructs include: bHRM (Human Resource Management), bLM (Leadership & Management), bOM (Organizational Management), bWEM (Work Environment Management), eAM (Asset Management), eBA (Budgetary Allocation), eCSE (Communication & Stakeholder Engagement), eMP (Maintenance Practices), eSP (Space Utilization). The PLS-SEM analysis provided insights into the reliability and validity of these constructs, as well as their relationships with one another. Notably, no indicators were deleted from the model, although a few constructs exhibited slightly lower reliability indices. Despite this, all constructs remained within acceptable limits for exploratory research, as indicated by their Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) values. The results are shown in Tables 3 to 6 and Figure 1.

Table 3: Construct Reliability and Validity of Facilities Management Competencies and Facilities Management Practices

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Bhrm	0.733	0.746	0.848	0.652
Blm	0.787	0.813	0.875	0.701
bOM	0.621	0.680	0.790	0.558
bWEM	0.879	0.905	0.916	0.731
Eam	0.715	0.733	0.839	0.637
eBA	0.836	0.839	0.891	0.673
eCSE	0.744	0.749	0.854	0.662
eMP	0.886	0.890	0.921	0.745
eSP	0.738	0.772	0.850	0.656

Source: Researcher's Field Report (2025)

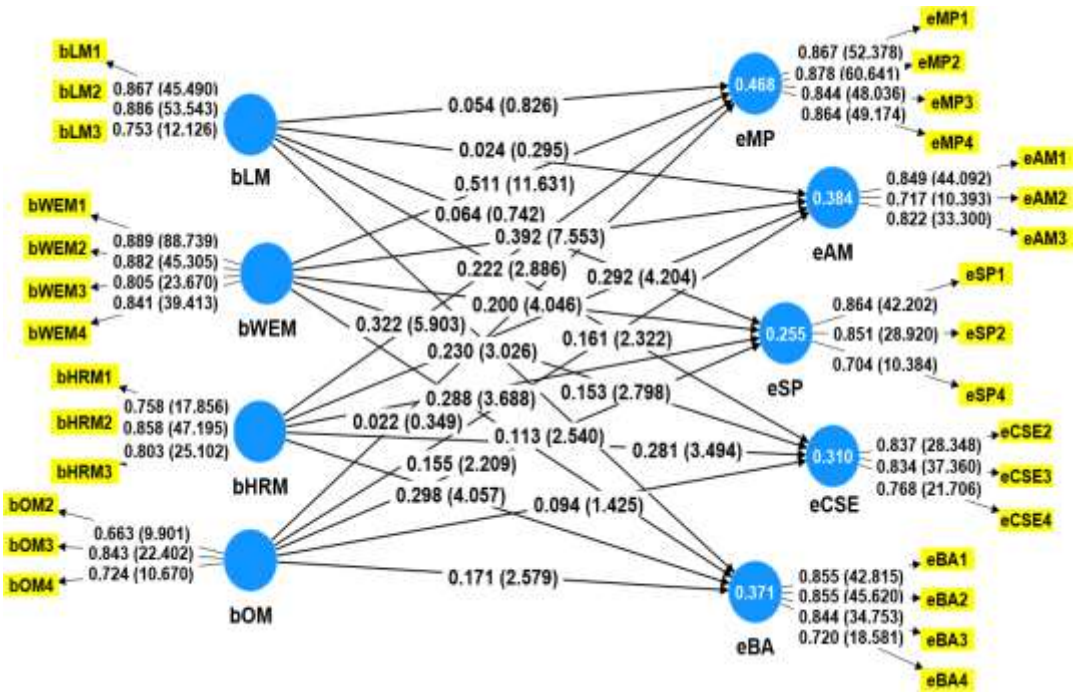

Figure 1: Measurement Model for Facilities Management Competencies and Facilities Management Practices (Disaggregated)

Internal Consistency-Construct Reliability and Validity

To assess the internal consistency of the constructs, Cronbach's Alpha (CA) and Composite Reliability (CR) were employed. Cronbach's Alpha (CA) serves as a measure of the internal consistency of the constructs, with values exceeding 0.700 indicating acceptable reliability. Additionally, Composite Reliability (CR) was assessed, and values above 0.7 suggest a high level of consistency among the indicators of each construct. Convergent validity was evaluated using Average Variance Extracted (AVE), which measures the proportion of variance captured by the construct in relation to the total variance in its indicators. According to Hair *et al*. (2017), an AVE value of 0.5 or higher is considered acceptable, indicating that the construct explains at least half of the variance in its indicators. As shown in Table 3, and Figure 1, the Cronbach's Alpha values for the constructs ranged from 0.621 (for bOM: Organizational Management) to 0.886 (for eMP: Maintenance Practices), with most constructs exceeding the recommended 0.7 threshold, indicating strong internal consistency. Specifically, bHRM (Human Resource Management) had a Cronbach's Alpha of 0.733, bLM (Leadership & Management) had 0.787, and eAM (Asset Management) had 0.715. These values demonstrate good internal consistency for each of these constructs, which is essential for establishing the reliability of the measurement model. Although the construct Organizational Management (bOM) had a Cronbach's Alpha of 0.621, which is below the conventional threshold of 0.700 (Hair *et al*., 2017), it was retained because its AVE (0.558) exceeded the acceptable limits in exploratory studies (Hair *et al*., 2017). Composite Reliability (CR) values also confirmed the reliability of the constructs, ranging from 0.790 (for bOM) to 0.921 (for eMP). All constructs met the recommended threshold of 0.7, further reinforcing the reliability of the measurement model. Regarding convergent validity, the Average Variance Extracted (AVE) values ranged from 0.558 (for bOM) to 0.745 (for eMP), with all constructs exceeding the 0.5 threshold. This indicates that each construct successfully captures more than half of the variance in its indicators, validating the convergent validity of the measurement model.

Discriminant Validity

To assess discriminant validity, we examined the cross-loadings, the Fornell-Larcker Criterion, and the Heterotrait-Monotrait Ratio (HTMT). The cross-loadings (Table 4) show that each indicator has a higher loading on its own construct than on any other construct, which confirms that each construct is distinct and not redundant with others in the model. For example, bHRM1 has a loading of 0.758 on bHRM, which is higher than its loadings on any other construct, such as bLM (0.448), bWEM (0.284), and others. The Fornell-Larcker Criterion (Table 5) indicates that the AVE of each construct is greater than the squared correlation between that construct and other constructs, further supporting the discriminant validity of the model. For example, the AVE for bHRM is 0.652, which is higher than the squared correlations between bHRM and other constructs like bLM (0.524) and eAM (0.429). Finally, the HTMT matrix (Table 6) shows that the HTMT values for all constructs are below the threshold of 0.90, suggesting that there is no issue with discriminant validity. For instance, the highest HTMT value is 0.839 (between bHRM and eAM), which is well below the 0.90 threshold, confirming that the constructs are sufficiently distinct from each other.

These findings suggest that the measurement model is robust and suitable for further analysis in the study. The strong reliability and validity of the constructs provide a solid foundation for evaluating the relationships between facilities management competencies and facilities management practices, and for testing the hypotheses associated with the first specific objective of the study. The next step will involve examining the structural model to assess how these competencies and practices influence the functionalities of public primary school buildings in Ondo State.

Table 4: Cross Loadings of Facilities Management Competencies and Facilities Management Practices

	bHRM	**bLM**	**bOM**	**bWEM**	**Eam**	**eBA**	**eCSE**	**eMP**	**eSP**
bHRM1	**0.758**	0.448	0.408	0.184	0.284	0.410	0.313	0.299	0.328
bHRM2	**0.858**	0.460	0.300	0.036	0.341	0.452	0.494	0.359	0.401
bHRM3	**0.803**	0.360	0.246	0.182	0.417	0.351	0.280	0.407	0.262
bLM1	0.447	**0.867**	0.438	0.249	0.345	0.457	0.383	0.380	0.287
bLM2	0.532	**0.886**	0.470	0.307	0.371	0.478	0.443	0.374	0.323
bLM3	0.310	**0.753**	0.367	0.241	0.230	0.325	0.338	0.221	0.290
bOM2	0.272	0.295	**0.663**	0.136	0.256	0.248	0.176	0.190	0.152
bOM3	0.319	0.429	**0.843**	0.255	0.355	0.411	0.354	0.308	0.337
bOM4	0.285	0.416	**0.724**	0.064	0.200	0.266	0.215	0.105	0.246
bWEM1	0.076	0.196	0.083	**0.889**	0.453	0.221	0.205	0.530	0.230
bWEM2	0.226	0.394	0.231	**0.882**	0.464	0.332	0.380	0.565	0.340
bWEM3	0.130	0.236	0.326	**0.805**	0.346	0.127	0.092	0.406	0.186
bWEM4	0.085	0.232	0.158	**0.841**	0.360	0.202	0.250	0.466	0.240
eAM1	0.321	0.321	0.237	0.494	**0.849**	0.351	0.442	0.572	0.408
eAM2	0.326	0.207	0.325	0.239	**0.717**	0.226	0.365	0.396	0.348
eAM3	0.380	0.371	0.345	0.393	**0.822**	0.617	0.565	0.557	0.459
eBA1	0.446	0.419	0.413	0.238	0.419	**0.855**	0.448	0.503	0.438
eBA2	0.407	0.386	0.368	0.094	0.390	**0.855**	0.437	0.383	0.386
eBA3	0.423	0.454	0.367	0.170	0.371	**0.844**	0.474	0.470	0.282
eBA4	0.367	0.408	0.253	0.386	0.523	**0.720**	0.625	0.545	0.428
eCSE2	0.360	0.386	0.315	0.253	0.462	0.549	**0.837**	0.458	0.463
eCSE3	0.349	0.399	0.252	0.379	0.539	0.521	**0.834**	0.489	0.393
eCSE4	0.416	0.351	0.295	0.052	0.412	0.395	**0.768**	0.308	0.441
eMP1	0.364	0.320	0.106	0.562	0.528	0.423	0.343	**0.867**	0.295
eMP2	0.413	0.349	0.357	0.537	0.602	0.515	0.446	**0.878**	0.334
eMP3	0.432	0.376	0.319	0.400	0.542	0.589	0.516	**0.844**	0.393
eMP4	0.299	0.324	0.200	0.517	0.552	0.478	0.488	**0.864**	0.397
eSP1	0.409	0.322	0.292	0.245	0.377	0.384	0.450	0.367	**0.864**
eSP2	0.381	0.361	0.269	0.231	0.472	0.448	0.439	0.358	**0.851**
eSP4	0.168	0.147	0.286	0.270	0.405	0.286	0.403	0.254	**0.704**

Source: Researcher's Field Report (2025)

Table 5: Fornell-Larcker Criterion of Facilities Management Competencies and Facilities Management Practices

	bHRM	**bLM**	**bOM**	**bWEM**	**eAM**	**eBA**	**eCSE**	**eMP**	**eSP**
bHRM	**0.807**								
bLM	0.524	**0.837**							
bOM	0.390	0.511	**0.747**						
bWEM	0.157	0.319	0.225	**0.855**					
eAM	0.429	0.384	0.375	0.482	**0.798**				
eBA	0.503	0.510	0.430	0.272	0.518	**0.820**			
eCSE	0.458	0.467	0.352	0.289	0.582	0.604	**0.813**		
eMP	0.439	0.397	0.290	0.584	0.646	0.582	0.519	**0.863**	
eSP	0.413	0.357	0.344	0.300	0.512	0.468	0.530	0.410	**0.810**

Source: Researcher's Field Report (2025)

Table 6: HTMT of Facilities Management Competencies and Facilities Management Practices

	bHRM	bLM	bOM	bWEM	eAM	eBA	eCSE	eMP	eSP
bHRM									
bLM	0.674								
bOM	0.581	0.718							
bWEM	0.215	0.369	0.306						
eAM	0.594	0.491	0.545	0.584					
eBA	0.639	0.618	0.564	0.300	0.647				
eCSE	0.612	0.605	0.485	0.354	0.783	0.764			
eMP	0.542	0.464	0.362	0.650	0.798	0.673	0.633		
eSP	0.531	0.450	0.487	0.370	0.706	0.587	0.720	0.500	

Source: Researcher's Field Report (2025)

Structural Model for Facilities Management Competencies and Practices in Public Primary Schools in Ondo State, Nigeria

The study examined the relationship between the exogenous variables, which are the different facets of facilities management competencies, and the disaggregated endogenous sub-constructs related to facilities management practices (FMPs) in public primary schools in Ondo State, Nigeria. This assessment follows the procedure prescribed by Hair *et al*. (2017; 2019), adhering to the guidelines for evaluating structural models. Specifically, the structural path analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM), with significance determined by T-values exceeding 1.96 and *p*-values ≤ 0.05 at a 95% confidence level. Additionally, moderate significance was considered for T-values above 1.65 and *p*-values ≤ 0.1.

Collinearity and Path Coefficients (β)

The Variance Inflation Factor (VIF) values were checked to assess collinearity, and all VIF values were found to be below 3.0, confirming that collinearity is not a concern. In Table 7, the VIF values range from 1.120 to 1.721, indicating that all predictor variables are suitably uncorrelated and that the structural model is robust and free from multicollinearity issues. The path coefficients represent the strength and direction of relationships between exogenous variables (facilities management competencies) and endogenous variables (facilities management practices). From Table 7, several important findings were noted. For Human Resource Management (bHRM), the path from bHRM to eAM (Asset Management) is significant with a path coefficient of 0.292 (T-stat = 4.204, *p* = 0.000), indicating a strong positive effect. This suggests that human resource management practices contribute significantly to asset management in public schools. The same construct also shows significant positive relationships with other sub-constructs, including budg*et al*location (bHRM -> eBA = 0.298, T-stat = 4.057, *p* = 0.000) and space utilization (bHRM -> eSP = 0.288, T-stat = 3.688, *p* = 0.000). Whereas Leadership & Management (bLM), the path from bLM to eAM is not significant (β = 0.024, T-stat = 0.295, *p* = 0.768), suggesting that leadership management, while important, may not have a strong direct impact on asset management practices in this context. However, the path from bLM to eBA (Budg*et al*location) is significant (β = 0.230, T-stat = 3.026, *p* = 0.002), indicating that leadership management plays an essential role in budg*et al*location for facilities management. For Organizational Management (bOM), the path from bOM to eAM (Asset Management) is significant (β = 0.161, T-stat = 2.322, *p* = 0.020), suggesting that the organizational management practices in place have a moderate but significant impact on asset management. However, the path to other constructs such as eCSE (Communication and Stakeholder Engagement) and eMP (Maintenance Practices) is not statistically significant. Among all the constructs, Work Environment Management (bWEM) has the highest path coefficients, showing strong and consistent relationships across all facilities management practices. The path from bWEM to eAM is significant and large (β = 0.392, T-stat = 7.553, p = 0.000), indicating a substantial positive impact. The path to maintenance practices (eMP) is particularly noteworthy with a large effect (β = 0.511, T-stat = 11.631, *p* = 0.000). This suggests that the work environment for facilities

management staff plays a critical role in determining the success of maintenance practices.

Coefficient of Determination (R^2)

The R^2 values presented in Table 7 measure the proportion of variance explained by the model for each endogenous variable. According to Cohen's (1992) standard, as cited in Tehseen *et al*. (2019) and Adepoju *et al*. (2023), R^2 values of 0.26, 0.13, and 0.02 represent substantial, moderate, and weak explanatory power, respectively. Upon reviewing the R^2 values for the constructs in this study, it is evident that all of them fall within the substantial range.

Table 7: Path Analysis of Facilities Management Competencies and Facilities Management Practices (Sub-Constructs Level/Disaggregated)

Path	Beta	STD	T stat	P values	f-square	VIF
bHRM -> eAM	0.292	0.069	4.204	0.000	0.097	1.420
bHRM -> eBA	0.298	0.073	4.057	0.000	0.099	1.420
bHRM -> eCSE	0.281	0.080	3.494	0.000	0.080	1.420
bHRM -> eMP	0.322	0.055	5.903	0.000	0.137	1.420
bHRM -> eSP	0.288	0.078	3.688	0.000	0.078	1.420
bLM -> eAM	0.024	0.081	0.295	0.768	0.001	1.721
bLM -> eBA	0.230	0.076	3.026	0.002	0.049	1.721
bLM -> eCSE	0.222	0.077	2.886	0.004	0.042	1.721
bLM -> eMP	0.054	0.065	0.826	0.409	0.003	1.721
bLM -> eSP	0.064	0.086	0.742	0.458	0.003	1.721
bOM -> eAM	0.161	0.069	2.322	0.020	0.030	1.401
bOM -> eBA	0.171	0.066	2.579	0.010	0.033	1.401
bOM -> eCSE	0.094	0.066	1.425	0.154	0.009	1.401
bOM -> eMP	0.022	0.062	0.349	0.727	0.001	1.401
bOM -> eSP	0.155	0.070	2.209	0.027	0.023	1.401
bWEM -> eAM	0.392	0.052	7.553	0.000	0.222	1.120
bWEM -> eBA	0.113	0.045	2.540	0.011	0.018	1.120
bWEM -> eCSE	0.153	0.055	2.798	0.005	0.030	1.120
bWEM -> eMP	0.511	0.044	11.631	0.000	0.438	1.120
bWEM -> eSP	0.200	0.049	4.046	0.000	0.048	1.120
eAM R-Square	**0.384**					
eBA R-Square	**0.371**					
eCSE R-Square	**0.310**					
eMP R-Square	**0.468**					
eSP R-Square	**0.255**					

Source: Researcher's Field Report (2025)

For instance, the R^2 value for Asset Management (eAM) is 0.384, which indicates that the model explains 38.4% of the variance in asset management practices, and this is considered substantial. Similarly, the Budg*et al*location (eBA) construct has an R^2 value of 0.371, meaning that 37.1% of the variance in budg*et al*location practices is explained, again falling within the substantial range. The Communication and Stakeholder Engagement (eCSE) construct has an R^2 value of 0.310, suggesting that the model accounts for 31% of the variance in this area, which is also substantial. Moving on to Maintenance Practices (eMP), the R^2 value is 0.468, which is the highest among the constructs, explaining 46.8% of the variance in maintenance practices. This indicates that the model has a relatively high explanatory power for this construct, further reinforcing its substantial impact. Lastly, Space Utilization (eSP) has an R^2 value of 0.255, meaning that 25.5% of the variance in space utilization is explained by the model. While this is on the lower end of the substantial range, it still qualifies as a substantial value according to Cohen's criteria. In summary,

all the R^2 values in this study fall within the substantial range, suggesting that the model demonstrates a moderate to substantial level of explanatory power. Maintenance Practices (eMP) shows the highest explanatory power, while Space Utilization (eSP), despite having the lowest R^2 value, still remains substantial. Thus, the model provides a strong explanation of the facilities management practices and functionalities of public primary school buildings in Ondo State.

Aggregated Path Analysis

In Table 8, the path coefficients for the aggregated model show the cumulative effect of the constructs on the overall facilities management practices (eFMPs). Notably, bHRM (Human Resource Management) has the strongest path coefficient (β = 0.372, T-stat = 6.087, p = 0.000), reaffirming its importance in determining the overall effectiveness of facilities management practices. Similarly, bWEM (Work Environment Management) also shows a large effect (β = 0.361, T-stat = 8.081, p = 0.000), indicating that improving the work environment for facilities management staff leads to a significant improvement in overall facilities management practices.

Table 8: Path Analysis of Facilities Management Competencies and Facilities Management Practices (Aggregated)

	Beta	STD	T stat	P values	f-square	VIF
bHRM -> eFMPs	0.372	0.061	6.087	0.000	0.210	1.418
bLM -> eFMPs	0.146	0.071	2.045	0.041	0.027	1.720
bOM -> eFMPs	0.147	0.060	2.449	0.014	0.033	1.399
bWEM -> eFMPs	0.361	0.045	8.081	0.000	0.250	1.121
eFMPs R-Square	**0.534**					

Source: Researcher's Field Report (2025)

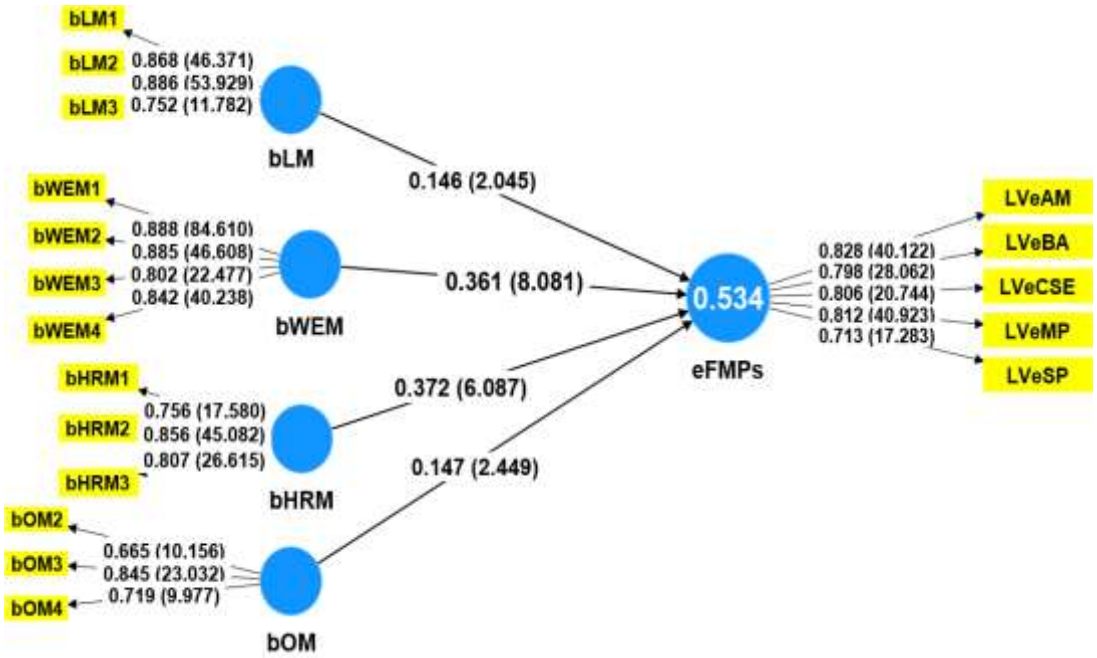

Figure 2: Structural Model for Facilities Management Competencies and Facilities Management Practices

Discussion of Findings

This study examined the relationship between key facilities management (FM) competencies and the implementation of FM practices in public primary schools in Ondo State, Nigeria, using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings provide both empirical and theoretical contributions by revealing which competencies most strongly influence operational effectiveness in resource-constrained school environments. Across both disaggregated and aggregated models, Human Resource Management

(bHRM) and Work Environment Management (bWEM) emerged as the most influential competency domains. These constructs significantly predicted a range of FM practices, including asset management, budget allocation, maintenance procedures, stakeholder engagement, and space utilization. In contrast, Leadership & Management (bLM) and Organizational Management (bOM) demonstrated more limited or context-dependent effects.

The strong effect of bHRM especially the indicator relating to adequate staffing (bHRM2) confirms prior studies (Awang *et al*., 2014; Ayeni, 2012) that emphasize the pivotal role of competent personnel in ensuring functional school infrastructure. In this study, human resource competencies accounted for a large proportion of the variance in maintenance (β = 0.322) and asset management practices (β = 0.292), suggesting that without trained and sufficient personnel, technical strategies or administrative processes alone cannot ensure sustainability in facility operations. Likewise, bWEM was significantly associated with improved performance in maintenance (β = 0.511) and asset management (β = 0.392), supporting findings from Wang *et al*. (2022), which stress that working conditions directly influence the productivity of FM staff. In Nigerian public schools where funding, tools, and staff morale are often suboptimal these results underscore the importance of a supportive physical and organizational work environment as a catalyst for effective FM delivery.

Conversely, the limited impact of bLM on operational areas like space planning and maintenance echoes findings by Meng (2014) and Hebert & Chaney (2011), who note that while leadership is critical in decision-making and strategic alignment, it requires complementary operational capacities to translate vision into action. Similarly, bOM showed moderate significance in areas such as budget allocation (β = 0.171) but lacked consistent influence across other domains, highlighting its indirect role in practice-oriented outcomes. An important insight is the interplay between strategic competencies (bLM, bOM) and executional competencies (bHRM, bWEM). The former are necessary for resource planning and stakeholder alignment but are insufficient in isolation. Effective FM in low-resource settings, as seen in this study, is primarily driven by operational readiness: adequate staffing, conducive environments, and actionable procedures.

Overall, the findings advance our understanding of FM implementation by emphasizing that in LMIC public school systems, it is not just what is planned but who delivers it and under what conditions that determines effectiveness. This has significant implications for FM competency frameworks, many of which are designed for well-resourced institutional settings. The results suggest that localized FM models in Nigeria and similar contexts must prioritize human resource and environmental support over abstract strategic planning.

Implications of Findings

The findings from this study have several critical implications for education policymakers, school administrators, and facilities management practitioners, particularly in the context of resource-constrained public primary schools in Nigeria. First, the consistent and strong effect of Human Resource Management (bHRM) across all FM practice domains reinforces the necessity of prioritizing staffing quality and quantity in school infrastructure governance. The evidence indicates that facilities are only as effective as the people managing them. This underscores the urgent need for the Ondo State Universal Basic Education Board (SUBEB) and other relevant agencies to invest in structured recruitment pipelines, role-specific FM training, and continuous professional development. Without competent personnel, strategic plans, however well-designed, are unlikely to be implemented effectively.

Moreso, the pronounced influence of Work Environment Management (bWEM), especially in relation to maintenance and asset management, suggests that working conditions are not peripheral but central to FM outcomes. Creating a physically safe, well-equipped, and psychologically supportive work environment for FM staff can dramatically improve operational performance. These findings validate global recommendations (e.g., Wang *et al*., 2022) but also localize them: in underfunded Nigerian schools, providing basic tools, clear procedures, and recognition for FM staff can lead to measurable gains in infrastructure upkeep.

Moreover, while Leadership & Management (bLM) and Organizational Management (bOM) showed more selective effects (e.g., on budgeting and stakeholder engagement), their contributions remain important. These competencies serve as enablers shaping strategic directions, aligning FM with educational priorities, and facilitating external support. Their relatively lower impact on operational tasks suggests a gap between strategy formulation and execution, which could be bridged by improved coordination between administrators and frontline FM personnel.

Furthermore, the study's results challenge the adequacy of imported FM competency frameworks when applied to primary education settings in LMICs. Models like APPA or IFMA, while useful, may overemphasize capital planning and high-level strategy at the expense of executional realities on the ground. This study instead points to a practical recalibration: in low-income school environments, impact is maximized when basic HR structures and work support systems are in place.

Finally, from a governance perspective, the findings highlight an opportunity for cross-ministerial collaboration between education authorities and ministries responsible for housing, public works, and labour to address FM challenges holistically. Integrating facilities management into mainstream educational planning, rather than treating it as a back-end support function, could lead to more resilient and child-friendly learning environments. Table 4.9 shows the summary of the key relationships and practical implications for policymakers.

Figure 3: IPMA for Constructs of Facilities Management Competencies and Facilities Management Practices

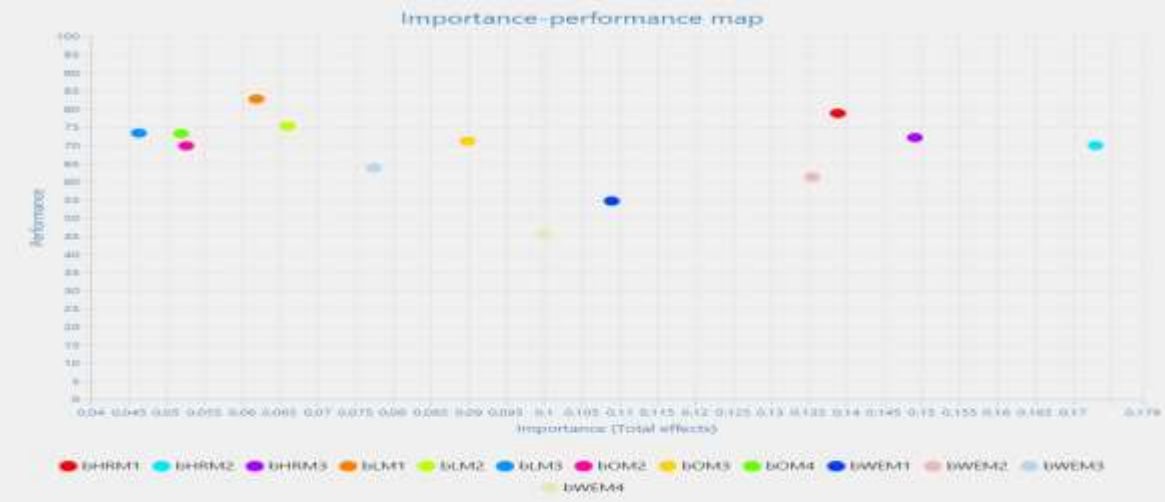

Figure 4: IPMA for Indicators of Facilities Management Competencies and Facilities Management Practices

Table 9: Summary of Key FM Competencies and Practical Implications

FM Competency Domain	Key Impact Areas	Policy/Practice Implications
Human Resource Management (bHRM)	Maintenance, Asset Management, Communication	Recruit, train, and support skilled FM staff; integrate FM into HR planning
Work Environment Management (bWEM)	Maintenance, Asset Management	Improve physical tools, safety, and morale of FM staff
Leadership & Management (bLM)	Budgeting, Stakeholder Engagement	Provide leadership training and strategic FM vision
Organizational Management (bOM)	Budget Allocation, Communication	Strengthen administrative systems and reporting mechanisms

Source: Researcher's Field Report (2025)

CONCLUSION

This study investigated the relationship between facilities management (FM) competencies and FM practices in public primary schools in Ondo State, Nigeria. Using Partial Least Squares Structural Equation Modelling (PLS-SEM), the findings revealed a statistically significant and positive influence of FM competencies especially human resource management (bHRM) and work environment management (bWEM) on the quality of FM practices such as maintenance, asset management, budgeting, stakeholder engagement, and space utilization.

These results highlight a pressing need for the educational system in Nigeria to rethink FM capacity beyond infrastructure investments. Competent personnel and enabling environments are the foundation upon which effective FM practices are built. Without them, policies and physical upgrades may yield only temporary improvements.

RECOMMENDATIONS AND PRACTICAL IMPLICATIONS

i. Prioritize Human Resource Development: Recruit, train, and retain qualified FM personnel. Offer targeted capacity-building programs in maintenance planning, budgeting, and user engagement.
ii. Improve Work Environment Conditions: Ensure FM staff are equipped with adequate tools, materials, and safety provisions to perform their roles effectively.
iii. Strengthen Leadership and Organizational Structures: Provide clearer operational frameworks and guidelines to standardize FM delivery across schools.
iv. Institutionalize Local FM Frameworks: Develop context-specific FM competency models tailored to public basic education in Nigeria.
v. Integrate FM into Educational Policy Planning: Mainstream FM into education funding, school evaluation, and teacher support systems.

Theoretical Contributions and Future Research Directions

This study extends Contingency Theory by demonstrating how FM effectiveness is highly dependent on contextual alignment between competencies and institutional realities. In under-resourced settings, FM success hinges more on operational readiness—staffing, tools, and work environment than on strategic plans alone.

Future research should:

i. Conduct qualitative case studies to explore the lived experiences of FM personnel.
ii. Test the model in other Nigerian states or LMICs to assess generalizability.
iii. Develop and validate a localized FM competency framework for basic education.
iv. Evaluate longitudinal impacts of FM training on infrastructure and learning outcomes.

By embedding FM within a localized theoretical and policy structure, this study charts a practical and academic pathway toward safer, more

sustainable school environments across Nigeria and other developing contexts.

REFERENCES

Adeoye, M. A., Shogbesan, Y. O., Jolaoye, J. D., & Jimoh, A. H. (2024). Building a Better Future: Strategical Approaches in Tackling Poor Maintenance in Nigerian Public Secondary Schools. Mimbar Ilmu, 29(1), 9-16.

Adepoju, A., Ekundayo, K., & Oladiipo, A. (2023). Household energy conservation behaviour: A socio-economic perspective. Journal of Digital Food, Energy & Water Systems, 4(1).

Akinyemi, I. A., Lawal, R. O., & Owosoro, P. (2021). Provision and Utilisation of Facilities and Public Senior Secondary School Students' Academic Achievement in Lagos State Education District V. African Journal of Educational Management, Teaching and Entrepreneurship Studies, 3(1), 54-65.

APPA. (2010). Leadership in educational facilities. Retrieved from https://www.appa.org on March 15, 2025.

Au-Yong, C. P., Ali, A. S., & Ahmad, F. (2014). Preventive maintenance characteristics towards optimal maintenance performance: A case study of office buildings. World Journal of Engineering and Technology, 2(3B), 1–6.

Awang, M., Noordin, N. A., & Shah, M. (2014). Facilities management competencies for sustainable development: Malaysian polytechnics' perspectives. International Journal of Facility Management, 5(2), 22–31.

Ayeni, A. J. (2012). Achieving quality in Nigerian education system through effective facilities management. International Journal of Education and Research, 4(2), 87–96.

Cohen, J. (1992). Statistical power analysis. Current directions in psychological science, 1(3), 98-101.

Elmualim, A., Shockley, D., Valle, R., Ludlow, G., & Shah, S. (2010). Barriers and commitment of facilities management profession to the sustainability agenda. Building and Environment, 45(1), 58–64.

Erbiyik, H. (2023). Definition of Maintenance and Maintenance Types with Due Care on Preventive Maintenance. IntechOpen. doi: 10.5772/intechopen.106346

Gunduz, M., Naji, K. K., & Maki, O. (2024). Evaluating the performance of campus facility management through structural equation modeling based on Key Performance Indicators. Journal of Management in Engineering, 40(1), 04023056.

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. Industrial management & data systems, 117(3), 442-458.

Hasim, M. S., Jalil, M. K. A., Safiee, L. S., Khalid, E. I., & Jie, K. Q. (2020). Factors influencing the adoption of sustainability into university facilities management practices: A case study of universities in South Australia. International Journal of Environment and Sustainable Development, 19(3), 308-319.

Hebert, R., & Chaney, J. (2011). Inter-generational knowledge transfer in facilities management: A pilot study. Journal of Facilities Management, 9(3), 191–203.

Islam, R., Nazifa, T. H., & Mohamed, S. F. (2019). Factors influencing facilities management cost performance in building projects. Journal of performance of constructed facilities, 33(3), 04019036.

Jensen, P. A., Lindkvist, C., & Salaj, A. T. (2023). Enablers and barriers for facilities management value creation in education: A conceptual model. Facilities, 41(3/4), 210–226.

Jensen, P. A., Nielsen, S. B., & Rasmussen, H. L. (2023). Collaboration between researchers and practitioners on developing facilities management standards and guidelines. Facilities, 41(5/6), 357-371.

Kamaruzzaman, S. N., Myeda, N. E., Zawawi, E. M. A., & Ramli, R. M. (2018). Developing facilities management (FM) competencies for Malaysia: Reference from international practice. Journal of Facilities Management, 16(2), 157–174.

Marmoah, S., Adela, D., & Fauziah, M. (2019). Implementation of facilities and infrastructure management in public elementary schools. Al-Tanzim: Jurnal Manajemen Pendidikan Islam, 3(1), 102-134.

Meng, X. (2014). The role of facilities managers in sustainable practice in the UK and Ireland. Smart and Sustainable Built Environment, 3(1), 23–34.

Mewomo, M. C., Ndlovu, P. M., & Iyiola, C. O. (2022). Factors affecting effective facilities management practices in South Africa: a case study of Kwazulu Natal Province. Facilities, 40(15/16), 107-124.

National Bureau of Statistics. (2021). Nigeria Education Data Report 2020: Trends in primary school enrollment. Retrieved July 15, 2025, from https://www.nigerianstat.gov.ng

Okoro, C. S. (2023). Sustainable facilities management in the built environment: A mixed-method review. Sustainability, 15(4), 3174.

Oladokun, S. O., & Ajayi, C. A. (2018). Assessing users' perception of facilities management services in a public university: A case study approach. Journal of Facilities Management Education and Research, 2(2), 62–73.

Olaifa, A. S., Ali, M. A. A., Olaifa, E. O., Oladimeji, R. M., & Akpala, K. C. (2024). Principals' Facilities Maintenance Measures and Administrative Effectiveness in Private Secondary Schools in Kwara State, Nigeria. Chalim Journal of Teaching and Learning, 4(2), 101-118.

Onoja, A. (2022). Evaluation of facility management effectiveness in public basic schools in Nigeria. African Journal of Educational Research, 26(3), 45–59.

Rahmawati, S. N. (2024). Analysis of Facilities and Infrastructure Management in Elementary Schools: A Case Study in the Agricultural Settlement of Duduksampeyan District. Jurnal Inovasi Pendidikan Dasar, 9(2), 16-25.

Tehseen, S., Qureshi, Z. H., Johara, F., & Ramayah, T. (2019). Assessing perceived business success as a reflective-formative (Type II) second-order construct using PLS-SEM approach. Journal of Sustainability Science and Management, 14(5), 84-114.

Wang, T., Ali, A. S., & Au-Yong, C. P. (2022). Exploring a body of knowledge for promoting the building information model for facilities management. Ain Shams Engineering Journal, 13(4), 101717.

Zalejska-Jonsson, A. (2020). Does facilities management affect perception of building quality? A study of cooperative residential buildings in Sweden. Facilities, 38(7/8), 559-576.