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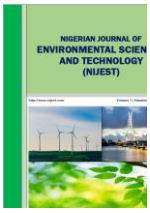

Maintenance Management of Buildings - Panacea for Incessant Collapse Incidences in Nigeria

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ABSTRACT

As the challenges of building maintenance in Nigeria continue to mount, it is imperative that policymakers and regulators take action to address these issues. To mitigate these issues, it is essential to reassess the current regulatory framework and implement more stringent building codes and regulations. Hence, the study examined the maintenance management of buildings with a view to reducing incidences of building collapse and improve the overall quality of the built environment. This was achieved by assessing the types of maintenance practices in use, investigating the challenges and examining strategies for mitigating the challenges. The census method was adopted to investigate the study, focussing on occupants of UNIBEN Junior Staff Quarters, UBTH B-Series as well as the Heads of Units in each institution. 97 respondents participated in the survey but 80 completed responses were retrieved and analysed. Findings revealed evidence of cracks on block walls (MS=4.55) as a major issue pertaining the current state of the buildings while emergency maintenance practices to critical issues ranked highest (MS=4.68). Also, delayed response to maintenance requests (MS=4.20) ranked first among the challenges bedeviling the proper maintenance of the buildings. Training and certification (MS=4.54) of maintenance staff is an essential strategy to mitigating the challenges identified. The study concluded the proposed mitigation strategies is crucial to ensure the long-term sustainability and safety of the built environments in these public institutions. It further recommends comprehensive structural assessments to address the identified defects, prioritizing critical areas that pose immediate safety risks.

Keywords: Building Collapse, Corrective, Maintenance, Management, Preventive, Proactive

1.0. Introduction

Building maintenance stands as a critical pillar in ensuring the sustainability of infrastructure development (Waziri and Vanduhe, 2013). This pivotal function assumes a central role among the array of operational activities associated with buildings, encompassing a comprehensive spectrum of technical and administrative actions directed at preserving or restoring an item to an acceptable condition (BS3811, 1984). The multifaceted nature of adequate maintenance extends beyond cost considerations, addressing core aspects such as safety enhancement and the elongation of asset lifespan (Odediran, et al., 2012). Furthermore, maintenance plays a crucial role in safeguarding the original purpose and intent of a building, covering its functionality, aesthetics, health, and safety, as expounded by Tan, et al., (2014). As a nation's economy experiences growth, there is a corresponding escalation in the demand for maintenance functions (Izobo-Martins, 2014). Public institutions, serving as pivotal providers of diverse services and resources to the general public, often house structures that inherently serve the public interest (Faremi and Adenuga, 2012). However, the absence of appropriate tools for the sustainability maintenance of existing buildings can bear adverse implications for future housing development (Zubairu, 1998). In numerous instances, public residential buildings within these institutions have undergone deterioration due to inadequate maintenance, remaining neglected since their initial construction. Observable signs of this neglect manifest in the condition

of roofs, windows, doors, and various building elements and facilities. This disregard is often attributed to the lack of care exhibited by building occupants who perceive the structures as the institution's property, thereby contributing to the poor state of many public residential buildings.

The maintenance framework, as defined by BS3811, offers a comprehensive subdivision into planned and unplanned maintenance, elucidated by Streifel (2002). Planned maintenance, distinguished by its methodical organization and execution with forethought, control, and the utilization of records within a scheduled program, contrasts with unplanned maintenance, which is undertaken when an element is already damaged and broken down ((Faremi and Adenuga, 2012)). Despite the challenges posed by these distinctions, it remains imperative for public institutions to prioritize building maintenance. Well-maintained buildings confer a multitude of benefits to the public, including heightened safety, enhanced performance, and increased sustainability. Therefore, a concerted effort to address the challenges and prioritize maintenance is essential for ensuring the long-term well-being of public infrastructure. The preservation of building infrastructure not only safeguards against potential security threats but also optimizes the operational efficiency of facilities. However, the upkeep of buildings poses a significant financial and environmental challenge (Ghavifekr & Hussin, 2011). Faremi and Adenuga (2012) highlights that escalating maintenance costs, coupled with ineffective governmental policies, can contribute to the degradation of public buildings. Bakri & Mydin (2014) attributed the decline in infrastructure quality to substandard materials and construction practices. Numerous public buildings suffer from neglect, evident in fundamental components such as flooring, ceilings, doors, and windows. Several government offices and housing complexes have endured prolonged periods without substantial maintenance, resulting in a current state of disrepair, and in some instances, abandonment. Ghavifekr and Hussin (2011) and Faremi and Adenuga (2012) mutually asserts that public buildings in Nigeria exhibit severe structural and aesthetic deterioration due to negligence from both occupants and government officials. Insufficient maintenance and inadequate funding, as emphasized by Adejimi (2005), significantly contributes to the prevalence of abandoned and intermittently functional buildings in Nigeria. These findings resonate with Fanie *et al.* (2004) observation that buildings in higher education institutions deteriorate over time due to a lack of maintenance by both administrators and students. This underscores the imperative need to delve into the subject of building maintenance, with the ultimate goal of deriving meaningful recommendations to addressing the challenges. The study therefore assesses residential building maintenance practices in selected public institutions in Benin City, Nigeria, with a view to providing sustainable measures for mitigating building collapse cases in Nigeria. This was achieved by examining the types of maintenance practices in use and investigating the challenges of residential building maintenance practices in the study area. The focus was exclusively on bungalow residential buildings within the Junior Staff Quarters (JSQ) at the University of Benin and the UBTH Staff Quarters B-Series in Benin City, Edo State, Nigeria. This was as a result of some observable neglect regarding the state of these structures. The study emphasizes on the need for a paradigm shift into maintenance management in order to ensure the sustainability, safety and well-being of public residential buildings. By prioritizing maintenance management, there is savings of money, improved safety from likelihood of collapses, and surety of buildings to continue to serve their intended purposes for years to come.

1.1 Building Maintenance Management

Building Maintenance Management is intricately linked to the condition of buildings and services, ensuring they meet the required standards for optimal performance (Zulkarnain et al., 2011; Ganisen, et al, 2015). Maintenance management encompasses various functions aimed at efficiently utilizing resources to enable techniques and facilities to operate in alignment with consumer expectations. The overarching objective of maintenance management is to identify the optimal combination of building maintenance methods, selecting the most suitable technique for each element within the building (Ofori, et al., 2015). Regular reviews of the maintenance management methods are essential to ensure the delivery of high-quality services (Zulkarnain et al., 2011). Public criticism according to Abdul Lateef *et al.* (2011) has brought to light concerns about the suboptimal performance of university buildings in Malaysia. Consequently, the success of maintenance management in universities relies heavily on the methods employed and the supervisory efforts of the university sector to yield improved outcomes. Maintenance, fundamentally, aims to preserve buildings in their initial functional, structural, and aesthetic states, ensuring that they maintain their investment value over an extended period (Mahmud, et al., 2024). Adequate maintenance not only extends the economic life of the building but also contributes to its overall well-being. However, a cursory examination of public buildings

reveals a myriad of abandoned and inadequately functioning facilities. The malfunctioning of facilities in public buildings often stems from insufficient maintenance and/or poor facility management. Raghavaiah and HariPrasad (2019) emphasizes on the importance of addressing maintenance issues from a preventive standpoint during the project's inception and planning stages, encompassing project conception, design, construction, and completion. This approach aims to prevent facility failures expected or avoidable in nature. Despite the essential role of maintenance, there is a lack of consensus among authors regarding the categorization of maintenance types. While Lateef (2010) classified maintenance into preventive and corrective types, Faremi and Adenuga (2012) introduced responsive maintenance. Nevertheless, the core objective of maintenance remains consistent.

Corrective maintenance, which is the most straightforward type, is employed when a building element is used until it breaks down. Addressing deterioration in materials and components, this type can be costlier due to consequential damage and inconvenient timing for users and operators, as noted by Kenley, et al. (2011). Corrective maintenance is appropriate for non-significant works, elements with unmonitored conditions, and instances where preventive maintenance costs exceed corrective measures. Preventive/Planned maintenance aims to reduce the likelihood of failure by executing predetermined tasks at regular intervals (Raghavaiah & HariPrasad, 2019). Advantages include planned tasks, reduced maintenance costs, minimized downtime, and improved health and safety. However, potential drawbacks include performing maintenance irrespective of an item's condition and higher costs if not adequately controlled. Condition based maintenance responds to significant deterioration indicated by a change in monitored parameters. Similar to planned maintenance, regular inspections occur, with work or replacement undertaken only when a substantial change in condition or performance is detected. This type is suitable for health, safety, and significant items with monitorable conditions, utilizing cost-effective online monitoring techniques. The selection of a maintenance strategy depends on a comprehensive investigation and appraisal. Factors influencing the choice include the building's age, character, prospective life, physical condition, environmental factors, tenant requirements, government policy, and financial considerations. Regardless of the chosen strategy, maintenance should meet statutory obligations, maximize the building's life, ensure user well-being, protect and enhance investment value, achieve value for money, encourage tenant participation, and minimize inconveniences. An optimal maintenance strategy, as recommended by Khalil and Nawawi (2008), not only enhances quality and user satisfaction but is also executed promptly, cost-efficiently, and with minimal disruption to occupants. This comprehensive approach underscores the importance of proactive and preventive measures in building maintenance management.

The fundamental objective of building management is to preserve the value of the structure, overseeing maintenance functions aligned with its intended purpose (Marquez *et al.*, 2008; Chiang, et al., 2016). Building maintenance is a proactive effort aimed at preventing damage to components caused by the obsolescence of buildings before their expected lifespan. It involves scheduled tasks performed periodically, encompassing activities such as inspection, repair, replacement, cleaning, lubrication, adjustment, and equalization (Moghaddam and Usher, 2010; Izobo-Martins, 2014). Periodic preventive maintenance is typically carried out on critical components or elements to sustain their performance according to design specifications (Basri, et al., 2017). Embracing preventive maintenance proves to be an effective strategy in enhancing the reliability and quality of a building's system and components. By signalling the appropriate timing for maintenance activities, preventive maintenance helps avert failures (Yang, 2004). Preventive maintenance is specifically conducted to prevent damage and failure of elements (Onawoga & Akinyemi, 2010). It is a proactive approach that aims to address potential issues before they escalate. In contrast, unplanned maintenance occurs when elements are already damaged and broken down, necessitating reactive measures (Onawoga and Akinyemi, 2010). This distinction underscores the importance of a preventive maintenance strategy in mitigating risks and ensuring the continuous functionality of building components.

1.2 Forms of Maintenance Practices

Building maintenance practices encompass a diverse array of activities crucial for the preservation and enhancement of structures. These practices are essential not only for ensuring the sustained functionality of buildings but also for safeguarding their structural integrity and aesthetic appeal. Below are various forms of maintenance practices, each playing a pivotal role in the comprehensive care and management of the built environments. *Servicing* stands as a regular, day-to-day maintenance operation involving periodic clearing activities. This encompasses routine tasks like daily sweeping, monthly window cleaning, and the cyclical

application of paint for both aesthetic enhancement and protective purposes. The intricacy of service schedules may escalate with the integration of sophisticated equipment, driven by constant facility usage and exposure to weather conditions (Cobbinah, 2010). *Rectification* work typically addresses issues early in a building's life or sporadically throughout its lifespan. It arises from design shortcomings, inherent faults, or the unsuitability of components. This phase presents an opportune moment to minimize maintenance costs through meticulous design, ensuring component suitability, and proper installation (Bolaji & Adejuyigbe, 2012). *Replacement* the inevitability of replacement looms over buildings due to the varying rates of material decay influenced by service conditions and exposure to weather. The need for replacement can stem from both the physical breakdown of materials and the deterioration of appearance.

While distinguishing between maintenance and improvement poses a challenge, it is generally accepted that maintenance may encompass elements of reasonable improvement (Oladimeji, et al., 2025). *Renovations* involve significant overhauls aimed at restoring a structure to its original design and specification or enhancing its initial design. Common tasks within this category include repainting components, repairing roofs, and addressing damaged electrical and mechanical elements (Cobbinah, 2010). Renovations stand as a considerable and impactful facet of maintenance in today's construction industry (Olanrewaju, 2010). *Conversion* refers to the transformation of a building's use, such as turning a residential structure into a religious space or repurposing a lecture theatre into an office complex. Prior to embarking on conversion projects, a thorough examination of the building's stability is imperative (Cobbinah, 2010). *Extension* arises in response to sudden or necessary developmental needs. For instance, a lecture theatre may undergo expansion to accommodate a growing population, involving the addition of structural elements to increase housing dimensions (Cobbinah, 2010). *Alteration* involves adjusting a building's initial design to elevate it to a particular standard or accommodate evolving aesthetic preferences. This may be driven by changing occupant tastes, environmental factors, or geographical considerations. First-generation universities often engage in alteration works to modernize their architectural structures (Cobbinah, 2010). Understanding and implementing these various forms of maintenance practices are paramount for ensuring the holistic care, resilience, and enduring allure of built structures. It necessitates a strategic blend of proactive measures and responsive actions, acknowledging the multifaceted nature of a building's lifecycle management.

1.3 Categorization of Maintenance Practices

There are several maintenance methods in existence for practice in many fields around the globe. Seeley (1987) as cited in Cobbinah (2010) grouped maintenance methods generally used by many maintenance organizations into two main types which are planned maintenance and unplanned maintenance. Planned maintenance on buildings and facilities can be scheduled in advance. It involves systematic planning and execution, utilizing control and records within a structured plan (Cobbinah, 2010). In contrast, unplanned maintenance lacks a structured or arranged plan, often responding reactively to unforeseen issues. It is conducted when the element is already damaged and broken down (Cobbinah, 2010; Onawoga and Akinyemi, 2010). This maintenance work is conducted based on user request and not to be scheduled in advance (Rahman and Chattopadhyay, 2007). Maintenance methods encompass various approaches to ensure the optimal performance and longevity of building components. Preventive maintenance operates at scheduled intervals or specific standards to minimize the likelihood of failure or performance deterioration. Corrective maintenance steps in after a failure, focusing on repairing the item to restore its original function. Emergency maintenance is an immediate response to prevent severe consequences (Muchiri, et al., 2011). Condition-based maintenance relies on continuous monitoring and knowledge of an item's condition for proactive preventive measures. Lastly, scheduled maintenance adheres to a programmed or scheduled interval, providing a systematic approach to upkeep over time and operations. These varied maintenance methods contribute to the comprehensive care and management of the built environments (Rahman and Chattopadhyay, 2007; Onawoga & Akinyemi, 2010).

1.4 Challenges of Maintenance Practices

Examining the challenges associated with residential building maintenance practices in the study area is essential for addressing deficiencies and enhancing overall maintenance effectiveness. Ajiero, et al. (2022) emphasizes the historical undervaluation of building maintenance, resulting in neglect and the accumulation of backlogs, underscoring the growing need for preventive maintenance. This historical context provides a

valuable perspective for analysing challenges specific to the study area. In many cases, these buildings have suffered neglect, with minimal maintenance efforts since their initial construction. Visible signs of this neglect manifest in the deteriorating condition of roofs, windows, doors, and various building elements and facilities. The lack of significant upkeep is often attributed to the apathetic attitudes of building occupants who perceive the structures as belonging to the institution. These attitudes contribute significantly to the poor state of numerous public residential buildings. This study suggests that a lack of understanding by upper management may result in inadequate allocation of maintenance resources (Ofide, et al., 2015). Therefore, investigating the alignment between perceived challenges and implemented strategies can provide valuable insights into potential gaps in comprehension or execution. By acknowledging the historical context and current neglect, the study aims to offer comprehensive insights for developing targeted and effective residential building maintenance strategies.

1.5 Incessant Building Collapse

However, the unceasing menace of building collapse, coupled with its psychological and cost implications has become worrisome. Existing buildings accounted for a higher percentage of building collapse occurrences in Nigeria, which were either total or partial collapse (Windapo, 2006). Several studies confirmed records of both total and partial incidences of building collapse on buildings such as residential and commercial buildings (Adetunji et al., 2018; Oni, et al., 2024). Others are educational, religious (churches and mosques), mercantile (shopping mall), and institutional buildings. This was not without several degrees of injuries inflicted on victims with loss of lives and properties of huge amounts of money as the aftermath. According to some study, between 1978 and 2010 in Lagos State alone, 47 building collapse cases were recorded (Windapo and Rotimi, 2012; Oni, et al., 2024). Similarly, 52 cases were recorded between 1985 and 2013 (Nwankwo and Nwankwo, 2024). The study further noted that existing buildings accounted for the largest percentage of collapse records in Lagos State. The spate of building collapse has also been attributed to the inadequacies in the level of responsiveness of construction participants to their respective duties and responsibilities at mitigating the menace. According to the duties and responsibilities of construction industry participants are diverse (Abisuga, et al., 2017). The requisite knowledge that professionals have acquired by way of education and practical experience makes them well-grounded in their respective disciplines (Khalil and Nawawi, 2008; Ighravwe & Ayoola, 2017). Alabi, et al. (2019) further submitted on the need for construction professionals to carefully exercise their expertise as they would be answerable for any act of omission or commission during the construction process. The big issue has therefore been that some participants engage in their duties and responsibilities to execute building projects. It has also been the usual practice in the Nigerian construction industry to regard anybody supervising a construction project as an engineer. Furthermore, construction participants engage in a blame game of all sorts, with the belief that a party did not play its role effectively on a project (Ayedun et al., 2012; Babalola, 2015). Hence, the failure of a participant to carry out their expected duties and responsibilities adequately as expected is a major problem plaguing the Nigerian Construction Industry (Babalola, 2015; Ighravwe & Ayoola, 2017).

2.0. Methodology

The area of study for this research encompasses the critical role of building maintenance in sustaining infrastructure development, particularly within the University of Benin Junior Staff Quarters and UBTH Staff Quarters B Series in Benin City, Nigeria. The focus is on residential structures within these public institutions, examining the multifaceted nature of maintenance, including technical and administrative actions. The study addresses the challenges associated with building upkeep, emphasizing financial and environmental concerns. The deteriorating state of public residential buildings due to neglect, inadequate maintenance, and substandard materials forms a significant part of the area of study. The specific locations under scrutiny include the University of Benin Junior Staff Quarters and University of Benin Teaching Hospital Staff Quarters B Series. The research aims to assess the current state, practices, challenges, and mitigation strategies related to residential building maintenance within these public institutions, with the ultimate goal of providing meaningful recommendations to address identified challenges.

2.1 Research Design

A quantitative approach was adopted given the primary objective of assessing the difficulties faced by the University of Benin and UBTH in the area of residential building maintenance in the state of Edo, Nigeria. The target population for this study includes 68 households (HHs) residing at the Junior Staff Quarters of the University of Benin and 19 households (HHs) residing at the UBTH B-series. Additionally, heads of sections or units within the Maintenance department in each selected public institution are considered part of the target population. The entire population of study was totally enumerated owing to the limited number under census survey for the occupants at Junior staff quarters, B-series and Maintenance Department for this research. Table 1 shows sample size of the respondents.

Table 1: Target Population

S/N	Population	Sample Size
1	UNIBEN Junior Staff Quarters Occupants	68
2	UBTH B-Series Occupants	19
3	UNIBEN Maintenance Department	5
4	UBTH Maintenance Department	5
Total		**97**

2.2 Research Instruments

Research instruments encompass the tools for data collection in a research study. In the context of the outlined research, various instruments can be applied to obtain pertinent information, with surveys/questionnaires emerging as the chosen method. To gather data for this study, both the physical and online questionnaire form was employed and specifically directed at the relevant stakeholders as highlighted.

2.3 Methods of Data Analysis

The mean score for each criterion for the analysis of the study is based on the Likert scale ranging from 1 to 5 which was determined as follows:

$$\text{Mean Score} = \frac{5n5 + 4n4 + 3n3 + 2n2 + 1n1}{n5 + n4 + n3 + n2 + n1} \quad \text{(i)}$$

Where n_5 = number of responses for Very High, n_4 = number of responses for High, n_3 = number of responses for Average, n_2 = number of responses for Low, n_1 = number of responses for Very Low. The Mean Item Score (MIS) was employed for ranking the areas of competences, personal skill attribute and duties based on the relevance, level of exhibition and level of performance of quantity surveyors and determination of order of significance of identified factors.

3.0. Results and Discussion

3.1 Questionnaire Administration

The survey yielded a response rate of 82.46% (Table 2), with 80 questionnaires returned out of 97 administered. Notably, all the ten (10) questionnaires distributed to heads of units were returned and filled completely, resulting in a 100% response rate for this group. The response rate from UNIBEN Junior Staff quarters was 58.77%, while that of UBTH B-series was 13.40%. This corresponds to 68 and 19 responses respectively. Notably, all questionnaires distributed to heads of units were returned, resulting in a 100% response rate for this group.

Table 2: Questionnaire Administered

Respondent	Questionnaire Administered	Questionnaire Received	Percentage (%) Received
University of Benin (UNIBEN)			
Head of units	5	5	5.15
JSQ Occupants	68	57	58.77
University of Benin Teaching Hospital (UBTH)			
Head of units	5	5	5.15
B-Series Occupants	19	13	13.40
Total	97	80	82.46

3.2 Background Information of Respondents

Table 3a and 3b presents information regarding the occupants (UNIBEN JSQ and UBTH B-Series) and heads of units from each institution. The majority of occupants at UNIBEN residences were males (63.78%), with a significant portion holding PhD qualifications (41.21%). The most common professions were administration/management (50.00%) and healthcare/medical (16.70%). Annual rent typically ranged between 90,000 and 150,000 Naira (72.08%), with most households having 2-4 members (42.11%). The duration of residency varied, with nearly a quarter residing there between 11 and 20 years (28.07%). Interestingly, over half (56.14%) believed the responsibility for building maintenance fell on the management. Residents at UBTH skewed slightly male (69.23%) and primarily held M.Sc. qualifications (46.15%). Healthcare/medical professions were most prevalent (46.15%), followed by administration/management (30.77%). Rent fell within the 90,000 to 150,000 Naira range for most residents (84.62%). Similar to UNIBEN, households typically consisted of 2-4 members (46.15%). Residency duration leaned towards 6-10 years (30.77%) and 11-20 years (38.47%). Majority (61.54%) believed building maintenance responsibility belonged to the management.

Table 3a: Background Information of Occupants

Category	Description	UNIBEN-JSQ		UBTH B-Series	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Gender	Males	36	63.78	9	69.23
	Female	21	36.22	4	30.77
	Total	57	100.00	13	100.00
Academic Qualification	HND	2	3.34	0	0.00
	PGD	8	14.73	1	7.69
	B.Sc.	9	16.58	3	23.08
	M.Sc.	14	24.14	6	46.15
	Ph.D.	24	41.21	3	23.08
	Total	57	100.00	13	100.00
Occupation	Administration/Management	28	50.00	4	30.77
	Service Industry	13	22.70	2	15.38
	Healthcare/Medical	10	16.70	6	46.16
	Others	6	10.50	1	7.69
	Total	57	100.00	13	100.00
Annual Rent Paid	30,000 – 60,000	6	11.23	1	7.69
	60,000 – 90,000	10	16.69	1	7.69
	90,000 – 120,000	26	46.25	4	30.77
	120,000 – 150,000	15	25.83	7	53.85
	Total	57	100.00	3	100.00

Table 3a: Background Information of Occupants (Cont'd)

Category	Description	UNIBEN-JSQ		UBTH B-Series	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Household Members	0 – 2	7	12.28	2	15.38
	2 – 4	24	42.11	6	46.16
	4 - 6	14	24.56	3	23.08
	6 – 8	8	14.03	1	7.69
	8 - 10	4	7.02	1	7.69
	Total	57	100.00	13	100.00
Duration of Residency	Less than 1	7	12.28	1	7.69
	1-5	10	17.54	1	7.69
	6-10	13	22.81	4	30.77
	11-20	16	28.07	5	38.47
	More than 20 years	11	19.30	2	15.38
	Total	57	100.00	13	100.00
Building maintenance responsibility	Management	32	56.14	8	61.54
	Residents	21	36.84	3	23.08
	Both	4	7.02	2	15.38
	Total	57	100.00	13	100.00

The heads of the maintenance department at UNIBEN have a balanced distribution of experience, with two individuals having 11-15 years (40%) and two others having 16-20 years (40%). The remaining one respondent possesses over 20 years of experience (20%). In terms of academic qualifications, all respondents hold at least a Bachelor's degree, with equal representation for Postgraduate Diplomas (PGDs) and Master's degrees (MSc) (40% each). The professions of the heads are split between Architects (40%), Builders (20%), and Engineers (20%). All respondents belong to at least one professional membership organization, with the Nigerian Institute of Architects (NIA), Nigerian Institute of Builders (NIOB), Nigerian Society of Engineers (NSE), and Nigerian Institute of Quantity Surveyors (NIQS) each represented by one member (20% each). The respondents equally express a very high (80%) or high (20%) level of knowledge regarding building maintenance. The heads of the maintenance department at UBTH have varying levels of experience, with one respondent having 5-10 years (20%), two having 11-15 years (20%), and two with over 20 years (40%). All respondents hold at least a Bachelor's degree, with equal representation for Bachelors of Science (BSc) and Masters (MSc) (40% each). Interestingly, two respondents hold PhDs (40%). The professions of the heads are spread across Architects (20%), Builders (20%), and Engineers (40%). Similar to UNIBEN, all respondents belong to professional membership organizations, with NIA, NIOB, NSE, and NIQS each having one member (20% each). Their self-reported knowledge of building maintenance is predominantly very high (60%) or high (40%).

Table 3b: Background Information of Head of Units

Category	Description	UNIBEN		UBTH	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Years of experience	5 – 10	0	0.00	1	20.00
	11 – 15	2	40.00	1	20.00
	16– 20	2	40.00	2	40.00
	Above 20	1	20.00	1	20.00
	Total	5	100.00	5	100.00
Academic qualification	PGD	2	40.00	0	0.00
	B.Sc.	1	20.00	1	20.00
	M.Sc.	2	40.00	2	40.00
	Ph.D.	0	0.00	2	40.00
	Total	5	100.00	5	100.00

Table 3b: Background Information of Head of Units (Cont'd)

Category	Description	UNIBEN		UBTH	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Profession of respondents	Architects	2	40.00	1	20.00
	Builders	1	20.00	1	20.00
	Engineers	1	20.00	2	40.00
	Quantity Surveyors	1	20.00	1	20.00
	Total	5	100.00	5	100.00
Professional membership	NIA	2	40.00	1	20.00
	NIOB	1	20.00	1	20.00
	NSE	1	20.00	2	40.00
	NIQS	1	20.00	1	20.00
	Total	5	100.00	5	100.00
Knowledge of maintenance	Very High	4	80.00	3	60.00
	High	1	20.00	2	40.00
	Total	5	100.00	5	100.00

3.3 Current State of Residential Buildings in Public Institutions

To evaluate the current state of residential building in the study, respondents were asked to indicate their agreement on a five-point scale (1-5). Drawing from the interpretation framework proposed by Mohamed (2022), the computed scores were categorised as follows: scores between 4.2 and 5 correspond to "Strongly Agree," scores from 3.40 to 4.19 signify "Agree," scores ranging from 2.60 to 3.39 represent "Neither agree nor disagree," scores between 1.8 and 2.59 indicate "Disagree," and scores from 1 to 1.79 denote "Strongly disagree". The results (Table 4) show the mean scores and rankings for various indicators of structural defects in residential buildings. The most significant issue identified with the current state of the buildings was "evidence of cracks on block walls in the structure (MS=4.55)". Residents strongly agreed with this statement, suggesting significant structural problems. Several other issues received agreement from residents, highlighting areas needing repairs. "Leaks on roofs (MS=4.23)" ranked 2nd and "leaks from plumbing fittings (MS=4.19)" ranked 3rd, indicating the potential for water damage and associated risks. Additionally, residents agreed on the presence of windows and doors in bad condition (MS=4.16), and faulty electrical fittings (mean score: 4.15, rank: 5). Residents also agreed on the presence of cracks on floors in the structure (MS=4.11), Crack and defects on wall painting in the structure (MS=4.09), cracks on Columns in the structure (MS 4.07), and leakage on Ceilings in the structure (MS=3.88).

Table 4: Current State of Residential Buildings

State of residential buildings	Overall		Residents	Unit Head
	MIS	Rank	MIS	MIS
Evidence of cracks on block walls in the structure	4.55	1	4.43	4.67
Evidence of leakage on roof in the structure	4.23	2	4.67	3.79
Evidence of leakage of Plumbing fittings in the structure	4.19	3	4.40	3.98
Evidence of Windows and Doors in bad conditions in the structure	4.16	4	4.26	4.06
Evidence of bad electrical fittings usage in the structure	4.15	5	4.19	4.11
Evidence of cracks on floor in the structure	4.11	6	4.14	4.08
Evidence of crack and defects on wall painting in the structure	4.09	7	4.05	4.13
Evidence of cracks on Columns in the structure	4.07	8	4.00	4.14
Evidence of leakage on Ceilings in the structure	3.88	9	3.94	3.82

The evaluation aligns with the literature review on public housing concerns. Residents strongly agreed on critical issues like cracks in block walls (Rank 1), mirroring the concept of reduced structural life due to

neglect (Kindred, 2004). Agreement on leaks (Ranks 2 & 3) aligns with the literature's emphasis on water damage from poor maintenance (Smith, 2006; Sani, et al., 2011). Even minor cracks in floors (Rank 6) and columns (Rank 8) highlight potential structural neglect. Concerns about aesthetics (windows/doors, Rank 4; paint defects, Rank 7) suggest reduced functionality (Smith, 2006). Notably, resident perception of ceiling leaks (Rank 9) was the lowest, but even occasional leaks can cause damage. Overall, the findings support the importance of proper maintenance in public housing, as highlighted in the literature review.

3.4 Residential Building Maintenance Practices in Use

To evaluate the type of residential building maintenance in practice in the study area, respondents were asked to indicate their agreement using a five-point scale. Drawing from the interpretation framework proposed by Mohamed (2022), the computed scores were categorised as follows: scores between 4.2 and 5 correspond to "Strongly Agree," scores from 3.40 to 4.19 signify "Agree," scores ranging from 2.60 to 3.39 represent "Neither agree nor disagree," scores between 1.8 and 2.59 indicate "Disagree," and scores from 1 to 1.79 denote "Strongly disagree". The results (Table 5) show the mean scores and rankings for various maintenance practices in use in the residential buildings. The top two practices, based on mean scores and ranks, highlight a focus on reactive repairs. Emergency maintenance (immediate response to critical issues) ranked highest (MIS: 4.68, Rank 1), followed closely by corrective maintenance (reactive repairs) (MIS: 4.47, Rank 2). This suggests that resources are primarily directed towards addressing immediate problems rather than preventing them. Practices focused on preventing future issues received lower scores. Predictive maintenance (using data to anticipate needs) ranked third (MIS: 3.45, Rank 3), while practices like planned maintenance (scheduled upkeep) and routine maintenance (regular tasks) fell even lower (Ranks 5 and 6, respectively). Similarly, scores for preventive maintenance (proactive upkeep to prevent equipment failure) and sustainability maintenance (energy efficiency practices) were lower (Ranks 7 and 8, respectively). The lowest score went to lifecycle maintenance (managing needs throughout the building's lifespan) (MIS: 2.14, Rank 9).

Table 5: Building Maintenance Practices in Use

Building maintenance practice	Overall		Residents	Unit Head
	MIS	Rank	MIS	MIS
Emergency Maintenance: Immediate response to critical building issues	4.68	1	4.61	4.75
Corrective Maintenance: Reactive repairs to restore normal operation	4.47	2	4.36	4.58
Predictive Maintenance: Using data to predict maintenance needs	3.45	3	3.66	3.24
Corrective Overhauls: Extensive repairs to address significant wear	3.16	4	3.30	3.02
Planned Maintenance: Scheduled upkeep based on predetermined intervals	2.61	5	3.00	2.22
Routine Maintenance: Regular tasks to maintain building condition	2.42	6	2.59	2.25
Preventive Maintenance: Proactive upkeep to prevent equipment failure	2.33	7	2.50	2.16
Sustainability Maintenance: Practices promoting energy efficiency and sustainability	2.28	8	2.43	2.13
Lifecycle Maintenance: Managing maintenance needs throughout lifecycle stages	2.14	9	2.26	2.02

The study aligns with the importance of building maintenance practices for preserving structures (Akinkunmi, 2016). However, a key difference emerges in the focus on reactive repairs versus proactive strategies. The study identified a prioritization of reactive repairs like emergency and corrective maintenance. This aligns somewhat with rectification work for early problem resolution (Bolaji & Adejuyigbe, 2012). However, Onawoga & Akinyemi (2010) further advocated for a balanced approach with a strong emphasis on preventive maintenance. Practices like servicing (Cobbinah, 2010) and scheduled maintenance (Seeley, 1987 as cited in

Cobbinah, 2010) are crucial for preventing future issues, a concept not as highly reflected in the study's findings. This gap suggests a potential opportunity to improve the current maintenance practices.

3.5 Challenges of Residential Building Maintenance Practices

While investigating the challenges of residential building maintenance in the study area, respondents were asked to indicate their agreement using a five-point scale. Subsequently, the mean scores for each variable were computed and ranked. The results show the mean scores and rankings for various challenges facing residential building maintenance practices in residential buildings (Table 6). The top challenges centered on responsiveness and access. Residents indicated a high mean score for "delayed response to maintenance requests" (MIS: 4.20, Rank 1), suggesting a need for improvement in addressing maintenance needs promptly. Limited access to maintenance services (MIS: 4.16, Rank 2) further highlights potential gaps in communication or service availability. Staffing issues also emerged as significant challenges. "Inadequate skilled personnel" (MIS: 4.14, Rank 3) and "shortages of staff" (MIS: 4.12, Rank 4) suggest a potential need for increased personnel or improved training programs to ensure a skilled workforce. Beyond these, other challenges included poor coordination between stakeholders (MIS: 4.07, Rank 5) and resistance to adopting new maintenance methods (MIS: 4.00, Rank 6). These indicate a potential need for improved communication and collaboration within the maintenance system. The remaining challenges, while scoring slightly lower, included lack of awareness about maintenance practices (MIS: 3.99, Rank 7), structural issues in older buildings (MIS: 3.95, Rank 8), and climate factors (MIS: 3.91, Rank 9).

Table 6: Challenges of Building Maintenance Practices

Challenges	Overall		Residents	Unit Head
	MIS	Rank	MIS	MIS
Delayed response to maintenance requests	4.20	1	4.01	4.39
Limited access to maintenance service unity	4.16	2	4.10	4.22
Inadequate skilled personnel	4.14	3	3.96	4.32
Shortages of staff	4.12	4	4.15	4.09
Poor coordination between different stakeholders	4.07	5	4.00	4.14
Resistance to change or reluctance to embrace new maintenance methods	4.00	6	3.35	4.65
Lack of awareness or understanding of maintenance practices	3.99	7	3.56	4.42
Structural failure in older buildings	3.95	8	4.05	3.85
Climate-related factors (e.g., heavy rainfall, extreme temperatures)	3.91	9	3.97	3.85

The study reinforces existing concerns raised in the literature (Barrie & Peter, 2007) about slow response times (Rank 1) and limited access to maintenance services (Rank 2). These issues likely contribute to a backlog of maintenance needs and the decline of the buildings. However, the resident feedback goes beyond these established issues. It suggests communication breakdowns within the system, evidenced by challenges with stakeholder coordination (Rank 5) and resistance to adopting new maintenance methods (Rank 6). This points towards a need for improved communication and collaboration among all parties involved, rather than just focusing on educating residents (Rank 7). Interestingly, the study also reveals a potential gap between residents' perceptions and management's approach to resource allocation, echoing similar concerns raised in the literature (Ofide, et al., 2015). By incorporating resident perspectives and identifying areas for improvement within the existing system, the study builds upon the existing knowledge and offers valuable insights for developing targeted strategies to address these challenges.

3.6 Strategies for Mitigating Challenges of Maintenance Practices

Table 7 presents the results of mean scores and rankings for various strategies for mitigating maintenance practices. The top three strategies emphasized building staff expertise and protocols. "Proper training and certification" (MIS: 4.54, Rank 1) and "standardized maintenance protocols" (MIS: 4.41, Rank 2) were seen

as crucial. Interestingly, "robust safety protocols" (MIS: 4.32, Rank 3) received a high ranking from residents, potentially reflecting concerns about current maintenance practices. Preventive maintenance strategies also received positive scores. "Regular inspections and audits" (MIS: 4.27, Rank 4) and "preventive maintenance schedules" (MIS: 4.27, Rank 5) were viewed favorably by residents. This suggests a potential shift towards a more proactive approach to maintenance. Other strategies, while still important, received slightly lower scores. "Adequate liability insurance" (MIS: 4.27, Rank 6) and "strict material quality control" (MIS: 4.26, Rank 7) were seen as valuable. "Tenant education and feedback" (MIS: 4.24, Rank 8) received a mid-range score, suggesting that while residents may have some understanding of maintenance needs, improved communication could still be beneficial. Finally, "skilled workforce development" (MIS: 4.19, Rank 9) was viewed positively, but ranked lowest, potentially reflecting a perceived gap in current staffing expertise.

Table 7: Strategies for mitigating challenges of residential building maintenance

Strategies	Overall		Residents	Unit Head
	MIS	Rank	MIS	MIS
Proper training and certification	4.54	1	4.65	4.43
Standardized maintenance protocols	4.41	2	4.50	4.32
Robust safety protocols	4.32	3	4.99	3.65
Regular inspections and audits	4.27	4	4.00	4.54
Preventive maintenance schedules	4.27	5	4.00	4.54
Adequate liability insurance	4.27	6	3.95	4.59
Strict material quality control	4.26	7	4.23	4.29
Tenant education and feedback	4.24	8	4.65	3.83
Skilled workforce development	4.19	9	4.35	4.03

The findings align with previous studies, but also highlight resident priorities beyond what the literature emphasizes. Similar to the studies on proper staffing (Muchiri, et al., 2011), the study ranks "proper training and certification" first (MS=4.54) and "skilled workforce development" (Rank 9) highly. This indicates a shared understanding of the importance of a competent workforce for effective maintenance. Furthermore, the emphasis on "standardized maintenance protocols" (Rank 2) aligns with the concept of structured maintenance management systems discussed in the literature (Wireman, 2005). Both advocate for systematic approaches to ensure consistent quality of work. However, the study delves deeper by highlighting resident concerns about safety. The high ranking of "robust safety protocols" (Rank 3) is not explicitly addressed in the literature review, suggesting a potential gap in current practices that residents find concerning. The study also sheds light on resident preferences regarding maintenance approaches. The positive scores for "regular inspections and audits" (Rank 4) and "preventive maintenance schedules" (Rank 5) suggest a desire for a more proactive approach, echoing the benefits of preventive maintenance discussed in the literature (Ofide, et al., 2015). The review delves into aspects not heavily emphasized by residents. Discussions on outsourcing (Muchiri, et al., 2011) and budgeting (Ofide, et al., 2015) are not directly reflected in resident priorities. However, these could be underlying factors influencing the effectiveness of the strategies residents prioritize.

4.0. Conclusions

This study concludes that evidence of cracks on block walls **i**s a physically seen on the residential buildings which was a major issue pertaining the current state of the buildings and the maintenance practice adopted by units responsible was the emergency type. Delayed responses to maintenance requests is equally the norm and work ethics of the units saddled with this responsibility which is the challenges bedeviling the proper maintenance of the buildings. The study also concluded on the need for proper training and certification of maintenance staff as an essential strategy to mitigating the challenges identified. Addressing these challenges through the proposed mitigation strategies is crucial to ensure the long-term sustainability and safety of the built environments in these public institutions. Failure to take corrective action could lead to further deterioration and eventual collapse, thereby compromising the well-being of occupants and potentially incurring significant costs for the institutions. Conducting a comprehensive structural assessment and initiating immediate remediation efforts to address the identified defects, prioritizing critical areas that pose immediate safety risks was further recommended.

References

Abdul Lateef, O. A., Khamidi, M. F., & Idrus, A. (2011). Appraisal of the building maintenance management practices of Malaysian universities. *Journal of Building Appraisal*, *6*(3), 261-275.

Abisuga, O. A., Ogungbemi, A. O., Akinpelu, A. A., & Oshodi, O. S. (2017). Assessment of building maintenance projects success factors in Lagos, Nigeria. *Journal of Construction Business and Management*, *1*(1), 29-38.

Adejimi, A. (2005) Poor Building Maintenance in Nigeria: Are Architects Free from Blames? ENHR International Conference on―Housing: New Challenges and Innovations in Tomorrow's Cities, Iceland, 29 June-3 July 2005, 6-8.

Adetunji, O. R., Owolabi, S. M., Adesusi, O. M., Dairo, O. U., Ipadeola, S. O., & Taiwo, S. O. (2018). Effect of computerized maintenance management system on a cement production plant. *International Journal of Integrated Engineering*, *10*(4).

Ajiero, I., Antia, M. E., & Akpan, U. (2022). Assessment of Building Maintenance Management Procedures of Higher Institutions: A Case Study of University of Uyo. *Covenant Journal of Research in the Built Environment (CJRBE)*, *10*(1), 46-52.

Akinkunmi, T. (2016). Assessment of Maintenance Management Culture of Tertiary Institutions in Nigeria. *Assessment*, *8*(6).

Alabi, E. O., Owodunni, A. S., Audu, R., & Saba, T. M. (2019). Maintenance Practices Adopted in Electrical Distribution Network for the Reduction of Electrical Power Losses in Niger State. *AITIE 3rd International Conference and Workshop on Innovation, Technology and Education* (ICWITE, Abuja 2019) pp 250-258.

Ayedun, C. A., Durodola, O. D., & Akinjare, O. A. (2012). An empirical ascertainment of the causes of building failure and collapse in Nigeria. *Mediterranean Journal of Social Sciences*, *3*(1), 313-322.

Babalola, H.I. (2015). Building collapse: causes and policy direction in Nigeria. *International Journal of Scientific Research and Innovative Technology*, 2(8), 1-8.

Bakri, N.N.O. & Mydin, M.A.O. (2014). General building defects: causes, symptoms and remedial work. *European Journal of Technology and Design*, *3*(1), pp.4-17.

Basri, E. I., Abdul Razak, I. H., Ab-Samat, H., & Kamaruddin, S. (2017). Preventive maintenance (PM) planning: a review. *Journal of quality in maintenance engineering*, *23*(2), 114-143.

Bentley, T. (2012) Learning beyond the Classroom: Education for a Changing World. Routledge, Abingdon-on-Thames.

Bolaji, B. O., & Adejuyigbe, S. B. (2012). Evaluation of maintenance culture in manufacturing industries in Akure metropolitan of Nigeria. *Journal of Information Engineering and Applications*, *2*(3), 37-45.

Catalano, R. F., Haggerty, K. P., Oesterle, S., Fleming, C. B., & Hawkins, J. D. (2004). The importance of bonding to school for healthy development: Findings from the Social Development Research Group. *The Journal of school health*, *74*(7), 252-261. https://doi.org/10.1111/j.1746-1561.2004.tb08281.x

Chanter, B. & Swallow, P. (2008) Building Maintenance Management. John Wiley & Sons, Hoboken.

Chiang, Y. H., Li, V. J., Zhou, L., Wong, F., & Lam, P. (2016). Evaluating sustainable building-maintenance projects: Balancing economic, social, and environmental impacts in the case of Hong Kong. *Journal of Construction Engineering and Management*, *142*(2), 06015003.

Cobbinah, P. J. (2010). Maintenance of buildings of public institutions in Ghana. Case study of selected institutions in the Ashanti region of Ghana. *Kwame Nkrumah University of Science and Technology, Kumasi*.

Faremi, O.J. & Adenuga, A.O. (2012) Evaluation of Maintenance Management Practice in Banking Industry in Lagos State, Nigeria. International Journal of Sustainable Construction Engineering and Technology, 3, 45-53.

Flanagan, R., & Jewell, C. (2008). *Whole life appraisal for construction*. John Wiley & Sons.

Ganisen, S., Mohammed, A. H., Nesan, L. J., & Kanniyapan, G. (2015). Critical success factors for low cost housing building maintenance organization. *Jurnal Teknologi (Sciences & Engineering)*, *74*(2).

Ghavifekr, S., & Hussin, S. (2011). Managing systemic change in a technology-based education system: A Malaysian case study. *Procedia-Social and Behavioural Sciences*, *28*, 455-464. https://doi.org/10.1016/j.sbspro.2011.11.088

Ighravwe, D. E., & Ayoola O. S. (2017). Ranking maintenance strategies for sustainable maintenance plan in manufacturing systems using fuzzy axiomatic design principle and fuzzy-TOPSIS. *Journal of Manufacturing Technology Management*, *28*(7), 961-992.

Izobo-Martins, O. O. (2014). Maintenance Strategies and Condition of Public Secondary School Buildings in Ado-Odo/Ota Local Government Area Ogun State, Nigeria. *Covenant University: PhD Thesis in Architecture*.

Izobo-Martins, O. O., Ekhaese, E. N., Ayo-Vaghan, E. O., & Olotuah, A. O. (2018). Assessing users' perceptions of the current maintenance disorder of public secondary school in Ogun, Nigeria. *Journal of Building Construction and Planning Research*, *6*(2), 90-101.

Kenley, R., Heywood, C., & Harfield, T. (2011). Maintenance of ageing social housing stock: Australia asset management in practice.

Khalil, N. & Nawawi, A.H. (2008) Performance Analysis of Government and Public Buildings via Post Occupancy Evaluation. Asian Social Science, 4, 103-112.

Khozaei, F., Ayub, N., Hassan, A.S. & Khozaei, Z. (2010) The Factors Predicting Students' Satisfaction with University Hostels, Case Study, University Sains Malaysia. Asian Culture and History, 2, 148-158. https://doi.org/10.5539/ach.v2n2p148

Kindred, B. (2004). Maintaining value through maintenance. *Context: IHBC*, *85*, 21-22.

Kuuskorpi, M. & González, N.C. (2011) The Future of the Physical Learning Environment: School Facilities That Support the User. CELE Exchange, OECD.

Lateef, O.A. (2010) Case for Alternative Approach to Building Maintenance Management of Public Universities. Journal of Building Appraisal, 5, 201-212. https://doi.org/10.1057/jba.2009.19

Levitt, M. (2013). Perceptions of nature, nurture and behaviour. *Life Sciences, Society and Policy*, *9*(1), 13.

Mahmud, I., Ismail, I., Abdulkarim, A., Shehu, G. S., Olarinoye, G. A., & Musa, U. (2024). Selection of an appropriate maintenance strategy using analytical hierarchy process of cement plant. *Life Cycle Reliability and Safety Engineering*, *13*(2), 103-109.

Márquez, A. C., de León, P. M., Fernández, J. G., Márquez, C. P., & González, V. (2008). The maintenance management framework: A practical view to maintenance management. In *Safety, Reliability and Risk Analysis* (pp. 707-712). CRC Press.

Moghaddam, K. S., & Usher, J. S. (2010). Optimal preventive maintenance and replacement schedules with variable improvement factor. *Journal of Quality in Maintenance Engineering*, *16*(3), 271-287.

Mohammed, A. A., Mohamed, A., El-Naggar, N. E. A., Mahrous, H., Nasr, G. M., Abdella, A., ... & Ali, A. S. (2022). Antioxidant and antibacterial activities of silver nanoparticles biosynthesized by Moringa Oleifera through response surface methodology. *Journal of Nanomaterials*, *2022*(1), 9984308.

Mokaya, Z. M. (2013). *Influence of school infrastructure on students' performance in public secondary schools in Kajiado County, Kenya* (Doctoral dissertation, University of Nairobi,).

Muchiri, P., Pintelon, L., Gelders, L., & Martin, H. (2011). Development of maintenance function performance measurement framework and indicators. *International Journal of Production Economics*, *131*(1), 295-302.

Nwankwo, S. I., & Nwankwo, C. V. (2024). Evaluating building defects and maintainability of tertiary institutions in Owerri Metropolis, Nigeria. *Journal of Building Pathology and Rehabilitation*, *9*(2), 105.

Odediran, S. J., Opatunji, O. A., & Eghenure, F. O. (2012). Maintenance of residential buildings: users' practices in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences*, *3*(3), 261-265.

Ofide, B., Richard, J., & Emmanuel, A. (2015). Assessment of building maintenance management practices of higher education institutions in Niger State, Nigeria. *Journal of design and built environment*, *15*(2).

Ofori, I., Duodu, P. M., & Bonney, S. O. (2015). Establishing factors influencing building maintenance practices: Ghanaian perspective. *Journal of economics and sustainable development*, *6*(24), 184-193.

Oladimeji, B., Rahbarianyazd, R., Abubakar-kamar, A. T., & Mohammed, F. E. (2025). Assessment Of Housing Condition and Maintenance Practice In Nigeria University Staff Quarters: A Case Study of University Of Ilorin. *A+ Arch Design International Journal of Architecture and Design*, *11*(1), 35-49.

Olanrewaju, A. L., Khamidi, M. F., & Idrus, A. (2010). Building maintenance management in a Malaysian university campuses: a case study. *Australasian Journal of Construction Economics and Building, The*, *10*(1/2), 101-114.

Onawoga, D.T. & Akinyemi, O.O. (2010). Development of Equipment Maintenance Strategy for Critical Equipment. *Pacific Journal of Science and Technology,* 11(1):328-342.

Oni, B., Madson, K., & MacKenzie, C. (2024). Evaluation of maintenance decisions to optimize navigable inland waterway lock conditions. *Journal of Infrastructure Systems*, *30*(3), 04024013.

Parnes, C., Guillermin, J., Habersang, R., Nicholes, P., Chawla, V., Kelly, T., & Smith, C. (2003). Palivizumab prophylaxis of respiratory syncytial virus disease in 2000-2001: results from The Palivizumab Outcomes Registry. *Pediatric pulmonology*, *35*(6), 484-489. https://doi.org/10.1002/ppul.10288

Pickens, J. (2005). Attitudes and perceptions. *Organizational behavior in health care*, *4*(7), 43-76.

Raghavaiah, N. V. & HariPrasad, I. (2019). Maintenance and Reliability Strategy of Mechanical Equipment in Industry. *International Research Journal of Engineering and Technology (IRJET),* Vol 6 (6), pp 3430-3432

Rahman, A., & Chattopadhyay, G. (2007). Optimal service contract policies for outsourcing maintenance service of assets to the service providers. *International Journal of Reliability and Applications*.

Sánchez-Fernández, R., & Iniesta-Bonillo, M. Á. (2007). The concept of perceived value: a systematic review of the research. *Marketing theory*, *7*(4), 427-451.

Sani, S. I. A., Mohammed, A. H., Shukor, F. S., & Awang, M. (2011). Development of maintenance culture: A conceptual framework. In *International Conference of Management Proceeding* (pp. 1007-1013).

Smith, B. J. (2006). Optimising the maintenance function-it's just as much about the people as the technical solution. In *Engineering Asset Management: Proceedings of the 1st World Congress on Engineering Asset Management (WCEAM) 11–14 July 2006* (pp. 568-575). London: Springer London.

Smith, S. M. (2008). *School building quality and student performance in South Carolina public high schools: A structural equation model* (Doctoral dissertation, Clemson University).

Tan, Y., Shen, L., Langston, C., Lu, W., & CH Yam, M. (2014). Critical success factors for building maintenance business: A Hong Kong case study. *Facilities*, *32*(5/6), 208-225.

Tucker, M., & Smith, A. (2008). User perceptions in workplace productivity and strategic FM delivery. *Facilities*, *26*(5/6), 196-212. https://doi.org/10.1108/02632770810864989

Waziri, B. S., & Vanduhe, B. A. (2013). Evaluation of factors affecting residential building maintenance in Nigeria: User's perspective. *Civil and Environmental Research*, *3*(8).

Windapo, A. O., & Rotimi, J. O. (2012). Contemporary issues in building collapse and its implications for sustainable development. *Buildings*, *2*(3), 283-299.

Windapo, B. (2006). The threat of building collapse on sustainable development in the built environment in Nigeria. In *Proc., 36th Annual Conf. and General Meeting of the Nigerian Institute of Building on Sustainable Development in the Built Environment* (pp. 59-67). Lagos, Nigeria: NIOB.

Wireman, T. (2005). *Developing performance indicators for managing maintenance*. Industrial Press Inc..

Yang, S. K. (2004). A condition-based preventive maintenance arrangement for thermal power plants. *Electric Power Systems Research*, *72*(1), 49-62.

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