American Journal of Engineering and Technology Management
2025, Vol. 10, No. 2, pp. 21-29
https://doi.org/10.11648/j.ajetm.20251002.11

Review Article

Assessment of Maintenance Strategies Adopted for Building Services Installations (BSI) in Higher Education Institution (HEI) Hostel Buildings in Nigeria

Adeleke Jacob Sola[1, *], Buari Tirimisiyu Abiodun[1], Tokede Clement Adedapo[2], Obaju Biodun Nathaniel[1], Apata Olaniyi Clement[3]

[1]Department of Building Technology, Federal Polytechnic Ede, Ede, Nigeria
[2]Department of Architectural Technology, Federal Polytechnic Ede, Ede, Nigeria
[3]Department of Quantity Surveying, Federal Polytechnic Ede, Ede, Nigeria

Abstract

Inadequate maintenance strategies adopted for building services installations (BSI) in hostel buildings in higher education institutions (HEI) has diverse implications on the comfort, safety, convenience, health and well-being of occupants. This study identified the existing BSI in Federal Polytechnic Ede hostel buildings; assessed the maintenance strategies adopted in the maintenance of BSI in the study area; examined the factors influencing the maintenance strategies of the BSI. Data for the study was collected using quantitative and qualitative approach. Questionnaire survey was administered for 10% of the target respondents (60 questionnaires) and in-depth interview was conducted for hostel portals, administrators, works/maintenance unit and students that are drawn from the entire population via stratified and simple random sampling. Data collected were analyzed using, descriptive statistics (percentage and frequency) and RII. The study shows that 80-90% of installed BSIs such as telecommunication network, CCTV, waste water pipes, drainage pipes, lighting system and fire-fighting equipment are in severe conditions and 0-20% of the AC system, boilers and soakaway-pit are in bad condition. The study also shows that the maintenance practices adopted for BSI involves regular inspections of BSI was ranked 1st with RII (0.846), conducting reactive/corrective maintenance of installed BSI due to observed failures was ranked 2nd with RII (0.560), conducting regular cleaning and servicing of BSI was ranked 3rd with RII (0.52). The study further deduced that inadequate funding for carrying out maintenance operations of BSI was ranked 1st with RII (0.760), lack of implementable hostel regulations and policies for end users' of the installed BSI was ranked 2nd with RII (0.733), and lack of training for skilled experts to monitor and carry out routine maintenance of BSI was ranked 3rd with RII (0.710). The study concluded that, the use of ICT based technology to monitor BSI using sensors/monitoring system and comprehensive maintenance programme are key to effective maintenance strategies in ensuring the proper functioning, longevity and improvement of BSI in hostel buildings. The study further recommended adequate funding for maintenance of BSI, policy implementation for hostel building end users and deployment of skilled experts for repairs and maintenance of BSI is crucial for the improvement of BSI in hostel buildings in higher institutions.

Keywords

Maintenance Strategies, BSI, HEI, Hostel Buildings

*Corresponding author: adelekesholla@gmail.com (Adeleke Jacob Sola)

Received: 13 October 2024; **Accepted:** 5 November 2024; **Published:** 27 August 2025

1. Introduction

Building services installations (BSI) encompass a wide range of components, including mechanical, electrical, plumbing and other systems that are essential for the functioning of a buildings (British Standards Institution [2]. Similarly, BSI are aspect of building that involves mechanical, electrical and plumbing (MEP) services system that are responsible for the functioning of buildings. These services includes: water supply and sanitary, heating, ventilation and air-conditioning (HVAC) systems and as well as lifting and securities systems. However, the mechanical services are important to the functioning of buildings, as they ensures that internal environment is conducive, comfortable and safe for occupants. HVAC systems, for instance, are responsible for maintaining the temperature and air quality within a buildings. On the other hand, the electrical services provides the various stages of electrical installations, repair and maintenance. It involves lighting, power distribution, duct work, fire alarms and security systems, communication systems, switches and other components that are necessary for the safe and efficient distribution of electricity [7]. Similarly, both mechanical and electrical services requires a specialized knowledge and expertise to install, maintain and repair. Experts in these fields must be trained to work with complex systems and must stay up-to-date with the latest technologies and regulations. In overall, mechanical and electrical services are critical components of modern BSI and it plays an important role in ensuring the safety, comfort and functionality of buildings [9]. In order to examine the condition of installations of an operation and its efficiency, it is necessary to assess the maintenance strategies adopted for building services installations. This entails assessing the current maintenance strategies, identifying areas that needs improvement and creating plans to improve the maintenance practices. A variety of BSI, including electrical, plumbing, heating, ventilation and air conditioning (HVAC), fire prevention and other building automation systems. Maintenance strategies plays a significance role in ensuring efficient and reliable functionability and operation of BSI in buildings. Consequently, effective maintenance strategies is vital in keeping these systems in optimal conditions, minimize downtime and extend their lifespan [6, 3]. Regular maintenance practice is also essential for BSI as it helps to identify and address potential issues before they escalate into major problems. Similarly, [3] was of the opinion that poor and insufficient maintenance strategies without putting into consideration the integration of sustainability agenda can lead to depletion of equipment, dearth, shut-down and malfunctioning of BSI. Again, ensuring proactive maintenance approach involves conducting routine inspections, servicing equipment, and performing preventive maintenance tasks. By adhering to scheduled maintenance programs, building owners and facility managers can also ensure that these systems continue to operate smoothly, reducing the risk of unexpected breakdowns and costly repairs [4, 10].

However, the maintenance strategies adopted for BSI includes a combination of planned preventive maintenance, reactive maintenance and explores the benefits of such an approach in terms of cost savings and improved system reliability [10]. Similarly, preventive maintenance involves systematically inspecting, cleaning and servicing equipment based on a predetermined schedule. This approach helps to identify and resolve minor issues, such as worn-out of components or loose of connections before they cause significant disruptions [4, 10]. However, despite preventive measures, unexpected breakdowns may occur which are usually referred to as corrective/reactive maintenance, which involves responding to unplanned failures and addressing them promptly. This can include repairing or replacing faulty components, restoring functionality and minimizing downtime. While, reactive maintenance is necessary, it is generally more expensive and can have a greater impact on building occupants and operations [10]. To optimize effective maintenance strategies, building owners and facility managers often leverage technology and automation system, computerized maintenance management systems (CMMS) can also be utilized to streamline work order management, track maintenance activities, and schedule routine inspections. Additionally, advanced sensors and monitoring systems can provide real-time data on the performance of BSI, enabling proactive maintenance interventions and predictive maintenance strategies [11]. By implementing a comprehensive maintenance program that includes preventive and reactive measures, building owners and facility managers can minimize disruptions, extend the lifespan of equipment, and maximize the overall performance of BSI.

Furthermore, hostel buildings are living arrangements with multiple individuals which are built to accommodate students and to share a communal living space for an extended period of time. Similarly, higher education institution (HEI) hostels are built in schools to accommodate students for accessible learning environment. They are expected to typically offer basic amenities such as bunks/beds in rooms, bathrooms and building services installations in rooms, common areas, kitchens or lounges respectively. Hostels that are designed and constructed for HEI are expected to provide affordable temporary lodging and a community-oriented environment for students and the BSI embedded in it are expected to enhance comforts, safety, convenience and well-being of students in the hostels [1]. However, in a study conducted by [5] focused on maintenance management strategies adopted in the maintenance of hostel buildings in Nigeria using field data collected from selected hostel buildings in Federal Polytechnic Oko, the study identified eight key maintenance problems and suggested two effective strategies

for the effective maintenance of these identified problems. Similarly, [8] conducted a study on maintenance requirements of students' residential facilities in higher education institution (HEI) in Nigeria, the study revealed that most of the students request is majorly on floor and wall, reading tables, chairs, lockers and door locks, the study also acknowledged prompt maintenance request to the maintenance personnel but the actual maintenance process takes a lot of time. The study concluded that in order to meet the students' requirement in HEI hostels, the facilities provided should be maintainable, serviceable, and replaceable within the hostels and maintenance manual should be provided for maintenance personnel to develop a maintenance standards that will meet the student's maintenance requirement. In the same vein, past studies on building maintenance strategies focused more on building structure and other moveable components, less emphasis has been placed on the study of maintenance strategies adopted for BSI in hostel buildings. Pilot studies also shows that, majority BSI in hostel buildings are in poor conditions, and the BSI facilities integrated in them over time do not usually meet statutory requirement and statutory standards. Hence, this study identifies the existing BSI in Federal Polytechnic Ede hostel buildings, assess the maintenance strategies/practice adopted in the maintenance of BSI in the study area and assess the factor influencing the maintenance of BSI in the study area. The study focused on assessing the general conditions of BSI among which are water supply system and fittings, waste pipes, security systems, electrical installations, ventilation system, air condition system, lighting, fire-fighting equipment. The study assess the condition of operations of these BSI installations, factors influencing the conditions of operation of these existing facilities and the factors influencing the maintenance of BSI. The study offer suggestions to the institution management on how to better maintain the BSI in the hostel buildings of HEI.

2. Methodology

The study assess the maintenance strategies adopted for building services installations (BSI) for hostel buildings in Federal Polytechnic Ede. The study utilized the five (5) traditional built hostel accommodation in the study area as case study. That is, Simbiat, Esther, Abubakar, Okunade and Adobayero respectively. The study adopts a mixed research design. This design allows for the collection of quantitative and qualitative data to describe the current maintenance practice and the factors influencing maintenance practice of BSI in the five hostel buildings without manipulating or controlling any variables. The quantitative approach adopts administering of survey questionnaires to gather relevant information from the focused group respondents, while the qualitative approach involves carrying out in-depth interview with randomly selected members of the target group. The sample size for the study was derived from the total population as shown in Table 1. It involved a subset that is drawn from the entire population of the study using both stratified and simple random sampling techniques. 10% of the respondents representing Sixty (60) structured questionnaires were administered to the target group to gather quantitative data on the maintenance practices. The questionnaires was designed to capture information on the commonly installed BSI, maintenance practices adopted and factors influencing the maintenance of BSI. An in-depth interview was also conducted with key stakeholders, such as hostel portals, hostel administrators and staff of maintenance unit to gather relevant information. The interviews provides better insight into their perceptions, experience, and suggestions for improving maintenance strategies. The data collected was analyzed using percentage rating, frequency distribution, quotations and relative important index RII.

Table 1. *Population and Sample Size for the Study.*

S/N	Categories of Respondents	Population	Percentage of the population	Sample Size
1	Male Hostel	216	10% of 216 = 21.6	22
2	Female Hostel	324	10% of 324 = 32.4	33
3	Hostel Administrators	10	10% of 10= 01	1
4	Staff of Works and Maintenance Department	15	10% of 15 = 1.5	2
5	Hostel Portal	15	10% of 15 = 1.5	2
	Total			60

3. Discussion of Results

Table 2 shows the percentage representation of the gender which shows that 33 of the respondents which represents 55% are male while, 27 of the respondents which represent 45% are females. The percentage representation of age also shows that 4 of the respondents represent 6.7% are within age below 20 years, 39 respondents which represent 65% are within age group of 20-25 years while 17 respondents which represent 28.3% are above 25 years. Furthermore, the result of the hostels stakeholders shows that 13% of the respondents which represent 21.7% were from NDI, 18 of the respondents which represent 30% were from NDII, 13 of the respondents which represent 21.7% were from HNDI, 11 respondents which represents 18.3% were from HNDII class respectively, 2 of the respondents which represent 3.3% were hostel portals, 1 of the respondents represent 1.7% is an hostel administrator while 2 of the respondents which represent 3.3% are staff of works and maintenance units. More so, the result from the hostel names revealed that 12 of respondents which represent 20% are from Simbiat, 16 respondents which represent 26.7% are from Esther, 7 respondents which represent 11.7% are from Abubakar hostel, 16 respondents which represent 26.7% are from Okunade while 9 respondents which represent 15% are from Adobayero hostel respectively. The result of the study also shows that 30 respondents which represent 50% are from the male hostels while the other 30 respondents which represent 50% are from female hostels. Furthermore, the table also shows that 39 of respondents which represent 65% where of the opinion that there the hostel is small, 14 respondents which represent 23.3% where of the opinion that their hostel is medium while 7 respondents which represent 11.7% opined that their hostel is large. Similarly, the study also shows that 60 of the respondents which represent 100% are of the opinion that the age of the hotel buildings is 15-20 years. Similarly, 30 of the respondent which represent 50% shows that the frequency of maintenance operation is annually, 20 of the respondents which represent 30% shows that maintenance operation is conducted in two years intervals and 10 of the respondents which represent 20% are of the opinion that maintenance operation is conducted within three years intervals. The results of the demographic characteristics of the respondents simply shows that all stakeholders' involved in the usage and maintenance of hostel facilities are carried along in the questionnaire survey and all the stakeholders supplied relevant quantitative data that was used in the analysis of this study.

Table 2. *Demographic Characteristics of the Respondents of Hostel Buildings.*

	Classification	Frequency	Percentage
Gender of Respondents	Male	33	55
	Female	27	45
	Total	60	100
Age	Below 20 years	4	6.7
	20 -25 years	39	65
	25 years and above	17	28.3
	Total	60	100
Stakeholder in hostel building	ND 1	13	21.7
	ND 2	18	30.0
	HND 1	13	21.7
	HND 2	11	18.3
	Hostel Portal	2	3.3
	Hostel Administrator	1	1.7
	Staff of Works and Services unit	2	3.3
	Total	60	100
Name of hostel	Simbiat	12	20.0
	Esther	16	26.7
	Abubakar	7	11.7

	Classification	Frequency	Percentage
	Okunade	16	26.7
	Adobayero	9	15.0
	Total	60	100
	Male	30	50.0
Category of hostel	Female	30	50.0
	Total	60	100.0
	Small	39	65.0
Size of the hostel	Medium	14	23.3
	Large	7	11.7
	Total	60	100.0
	0-5 years	-	-
	5-10 years	-	-
	10-15 years	-	-
Age of the hostel Buildings	15-20 years	60	100
	20 years and above	-	-
	Total	60	100
	Annually	30	50.0
	2 years	20	30.0
	3 years	10	20.0
Frequency of maintenance	5 years	-	-
	Quarterly	-	-
	Total	60	100

Table 3 shows the available and commonly installed building services installations and the condition of maintenance in the HEI hostel buildings, they include: water supply and plumbing installations, electrical installations, lighting, ventilations system, waste and soil appliances with fittings and controls, first aid fire-fighting equipment, heaters and boilers, wireless networks, cable network, internet facilities, sewage pipes, septic tanks/soakaway-pit, comfort facilities such as television, android phones and public address system respectively. The figure further shows that 80-90% conditions of the installed facilities such as cable network, closed circuit television, waste water and drainage pipes, lighting system and first aid fire-fighting and protection equipment are in very bad conditions, similarly, 60-80% of electrical installations, plumbing/sanitary installations/fittings and controls, wireless network are in bad conditions. Similarly, 40-60% of the ventilation system and electrical boilers are in fairly bad conditions. Again, the figure further shows that 40-60% of ventilating system and electrical boilers heater are in average conditions, 20-40% of electrical installations, plumbing installations/fittings, septic tank/soakaway-pit and electronics appliances such as television and decoders are in average condition. Similarly, 0-20% of the installed wireless network, waste and drainage pipes system, lighting system/switches and controls, first aid fire-fighting equipment and air conditioning system are also in average condition. Similarly, 0-20% of air conditioning system, heater and boilers and plumbing pipes and soakaway-pit are in good condition. The study also deduced that majority of the building services installations are not in excellent conditions to meet the comfort, safety, convenience and health and well-being of the hostel end users. Similarly, in the in-depth interview granted,

"100% of the selected respondents opined that the commonly installed BSI are electrical, plumbing, lighting, ventilation system, waste pipes/drainage pipes, boilers & heaters, electronic gadgets, controls, switches and similarly, 80% conditions of these installed BSI are in bad condition while 20% of the respondents opined that the installed BSI are in fair condition"

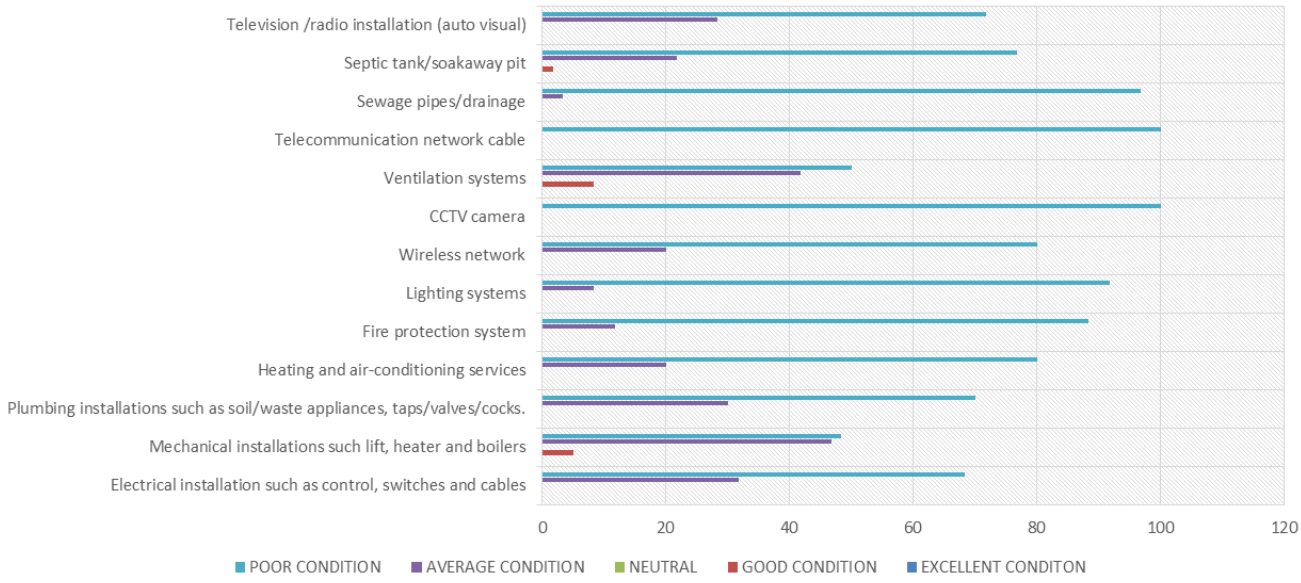

Figure 1. *Conditions of commonly Installed Building Services Installations in Hostel Buildings.*

Table 4 shows the maintenance strategies adopted in the maintenance of building services installations (BSI) in the study area, the study deduced that the present assessment of maintenance strategies adopted for building services installations in the study area include among others are regular inspections of building services installations (BIS) with relative important index (RII) 0.846 which was ranked 1st in the table, conducting reactive/corrective maintenance of installed building services installations due to observed failures with RII value of 0.560 which was ranked 2nd, conducting regular cleaning and servicing of installed building services installations (BSI) with RII value of 0.523 which was ranked 3rd, conduct record keeping and documentation of installed building services installations (BSI) with RII value of 0.346 was ranked 4th, similarly, factors ranked least in the table includes using computerized maintenance management systems (CMMS) to streamline work order management, track maintenance activities with RII value of 0.000 which was ranked 10th, the use of advanced sensors and monitoring systems to provide real-time data on the performance of BSI with RII value of 0.000 was ranked 11th and implementing a comprehensive maintenance program that includes preventive and reactive measures with RII value of 0.000 was ranked 12th. The ranking of variable for various maintenance practices adopted included regular inspections of building services installations (BIS), reactive/corrective maintenance of installed building services installations due to observed failures and regular cleaning and servicing of installed building services installations (BSI), planned and preventive maintenance of installed BSI and training and skilled experts for building services technicians/experts and operatives were ranked high. Similarly, item that are ranked least in the table involves the use of sensors and monitoring system, comprehensive maintenance program and computerized maintenance management systems. The study further deduced that the use of advanced ICT based technology has not been developed for effective and efficient maintenance of the BSI for hostel buildings in the study area and in order to effectively utilized the BSI equipment and to further minimize the degree of deterioration and failures of the installations in the hostel buildings, there is need for the adoption of ICT based technology that will monitor the installations using sensor and monitoring system, provide comprehensive maintenance programme and track maintenance activities in the hostel buildings. Similarly, the report of the in-depth interview conducted revealed that,

"*80% of the selected respondents are of the view that the most common maintenance strategies adopted for the hostel building are regular cleaning and servicing of installed BSI, non-regular inspections of BIS, reactive/corrective maintenance of BSI due to observed failures. While, 20% where of the opinion that outside routine maintenance of BSI, the most common maintenance practice are corrective maintenance*"

Table 4. Maintenance Strategies Adopted for Building Services Installations in Hostel Buildings.

S/N	OPTION	Probability of occurrence							
		5	4	3	2	1	Total	RII	Ranking
1	Regular inspections of building services installations	22	34	-	1	3	60	0.846	1st
2	Planned preventive maintenance of installed building services	3	7	-	16	34	60	0.296	5th
3	Reactive\corrective maintenance of installed building services due to failure	5	21	-	25	9	60	0.560	2nd
4	Routine cleaning and servicing of installed building services (BSI)	10	8	-	33	9	60	0.523	3th
5	Regular inspections and record-keeping and documentation of installed BSI	2	2	-	30	26	60	0.346	4th
6	Training and skill development of building services experts	7	5	-	41	7	60	0.183	6th
7	Adhering to scheduled maintenance program for BSI	-	-	-	-	-	60	0.000	7th
8	Combining of planned Preventive maintenance and reactive maintenance								
9	Building owners and facility managers often leverage Technology and automation.	-	-	-	-	-	60	0.000	8th
10	Using computerized maintenance management systems (CMMS) can be Utilized to streamline work order management, track maintenance activities	-	-	-	-	-	60	0.000	9th
		-	-	-	-	-	60	0.000	10th
11	Advanced sensors and monitoring systems can provide real-time data on the performance of BSI,	-	-	-	-	-	60	0.000	11th
12	Implementing a comprehensive maintenance program that includes preventive and reactive measures	-	-	-	-	-	60	0.000	12th

Table 5 shows the factors influencing the maintenance of building services installations in the study area. It was deduced from the study that inadequate funding for carrying out maintenance works and operation of installed building services (BSI) with RII value of 0.760) was ranked 1st, lack of good regulation and documented policy for hostel users on the usage of (BSI) equipment with RII value of 0.733 was ranked 2nd, lack of training of skilled professionals to monitor and carry out maintenance of building services installations (BSI) with RII value of 0.710 was ranked 3rd, while environmental factors such as rainfall, sun and high temperature affecting the installed building services equipment that is exposed to environment condition with RII value of 0.653 was ranked 4th, similarly large population of students and wrong usage of the installed building services (BSI) in the hostels with RII value of 0.540 which was ranked 5th and lastly, the ageing of building services installations and fittings in the hostel buildings was rated with RII value of 0.533 was ranked 6th. The study further admitted that despite inadequate funding that was rated first and observed as a major factors influencing the maintenance practice of building services installations in the hostel buildings due to poor budgetary allocations allotted to carry out maintenance of buildings and building services installations in the study area. Similarly, lack implementable policy regulations for the hostel users' and lack of skilled experts available for the repair and maintenance for the ageing facilities and equipment are critical factors which when addressed could influence a better BSI in the hostel buildings. Similarly, from the report of the in-depth interview conducted shows that.

"90% of the respondents are of the opinion that the major factor influencing the maintenance of BSI in hostel build-

ings are due to insufficient funding for the maintenance of BSI, ageing of the BSI and poor maintenance practices while 10% of the respondents are of the opinion that inadequate policy and regulations provided for hostel end users and inadequate funding are major factors influencing the maintenance of hostel BSI"

Table 5. *Factor Influencing the Maintenance of Building Services Installations in the Study Area*

S/N	OPTION	Probability of occurrence							
		5	4	3	2	1	Total	RII	Ranking
1	Inadequate funding and maintenance of installed building services (BSI)	26	18	-	10	6	60	0.760	1st
2	Environmental factors affecting the installed (BSI)	7	29	-	19	7	60	0.653	4th
3	Lack of skilled professionals to monitor and carry out maintenance of building services installations (BSI)	24	16	-	9	11	60	0.710	3rd
4	Over population of student in the hostel and usage in respect to the installed building services (BSI)	19	9	-	19	13	60	0.540	5th
5	Ageing of fittings and components in the hostel buildings	19	9	-	19	13	60	0.533	6th
6	Lack of good implementable regulations and policy for end users' of the installed BSI in hostel buildings	16	31	-	3	10	60	0.733	2nd

4. Summary of Findings

The maintenance of plumbing, electrical and mechanical systems and all other building services systems plays a crucial role in ensuring the proper functioning, longevity, and safety of building services. The study deduced that the most commonly installed BSI in HEI hostel buildings are electrical, plumbing, lighting, ventilation system, waste pipes/drainage pipes, boilers & heaters, electronic gadgets, controls, switches and similarly, 80% conditions of these installed BSI are in bad condition while 20% of the installed BSI are in fair condition. The study revealed that regular inspections of building services installations (BSI) through planned and preventive maintenance, reactive/corrective maintenance, regular cleaning and servicing, record-keeping are key maintenance strategies adopted for building services installations (BSI). The study further deduced that the major factors influencing maintenance are lack funding, inadequate implementable regulations and policy for the hostel end users' and lack of skilled experts that are required for repair and maintenance of BSI for enhanced the longevity. The study also suggests that limited financial resources allocated for the maintenance pose a lot of challenges in effectively maintaining BSI particularly for the hostel buildings.

5. Conclusion and Recommendations

The study concluded that the use of traditionally based approach record-keeping for the maintenance of HEI hostel BSI is in-effective but however, suggest the use of ICT based technology that utilize sensors in the monitoring of BSI and to also provide comprehensive maintenance programme are key to effective maintenance strategies in ensuring the proper functioning and longevity and improvement of BSI in hostel buildings. Based on the findings of the study, the following recommendations were suggested:

1. Allocate sufficient financial resources to support the maintenance of BSI. Adequate funding can help address issues promptly, replace outdated BSI components, and ensure regular maintenance.
2. The study recommends adequate implementable policy and regulations for hostel end users' for the HEI hostel buildings
3. The study also recommended regular training and deployment of skilled experts for the repairs and maintenance of BSI as crucial for the improvement of BSI in HEI hostel buildings.
4. Establishment of facility management unit to facilitate regular cleaning and servicing schedules for BSI. This

includes routine cleaning of equipment as well as timely servicing of mechanical and electrical components to achieve optimal performance.

5. The school management should implement computer based programme record-keeping practices to track maintenance activities, repairs, and replacements of building BSI. This information can help identify trends, plan future maintenance activities, and ensure compliance with regulations and standards.
6. Invest in the training programs to enhance the skills and knowledge of maintenance personnel responsible for BSI. This includes technical training on specific BSI components and emerging technologies to ensure efficient and effective maintenance practice.

Abbreviations

BSI	Building Services Installations
HEI	Higher Education Institution
ICT	Information and Communication Technology
CMMS	Computerized Maintenance Management System
RII	Relative Important Index
CCTV	Closed Circuit Television
HVAC	Heating Ventilation and Air Conditioning
ACS	Air Conditioning System

Author Contributions

Adeleke Jacob Sola: Conceptualization, Methodology, Writing - original draft, Writing - review & editing

Buari Trimisiyu Abiodun: Data curation, Formal Analysis, Software, Visualization, Writing - review & editing

Tokede Clement Adedayo: Data curation, Funding acquisition, Investigation, Project administration, Resources, Validation, Visualization

Obaju Biodun Nathaniel: Formal Analysis, Resources, Software, Supervision, Validation

Apata Clement Olaniyi: Data curation, Funding acquisition, Project administration, Resources, Software

Conflicts of Interest

The authors declared no conflicts of interest.

References

[1] Adeboyejo R. A. (2000). A practical approach to effective utilization and maintenance of physical facilities in secondary school. *In a proceeding of educational planning and administration in Nigeria in the 21st century Ondo*. *NEPA*, 83-103.

[2] British Standards Institution. (2017). BS 8539:2012+A1:2017: Guide to the selection and procurement of materials for the repair, maintenance, and improvement of buildings. British Standards Institution.

[3] Cheshire, D., & Maunsell, F. (2007). Chartered Institute of Building Services Engineers. Sustainability Meets AHARAE Guide.

[4] Fanger, P. O., & Aydin, O. (2019). Thermal comfort: A condition for productivity and well-being. *Building and Environment*, 152, 67-73.

[5] Fidelis I. E., & Lovina A. N. (2021). Strategies for the Maintenance of Hostel Buildings in Nigeria. *British Journal of Environmental Sciences*. 9(3), 10-25.

[6] International Facility Management Association (2019). Operations and Maintenance Benchmarks Report. *International Facility Management Association*.

[7] Korman, T. M., Simonian, L. and Speidel, E. (2010). How building information modelling has changed the MEP coordination process. *In Ghafoori (Ed.) Challenges, Opportunities and Solutions in Structural Engineering and Construction*, Taylor & Francis, London, 959-63.

[8] Ogundayo, B. F., & Aigbavboa, O. C. (2019). Maintenance requirements of students' residential facility in higher education institution (HEI) in Nigeria. *In IOP Conference Series. Material Science and Engineering*. 640(1), 012014. IOP Publishing.

[9] Okon, B. B., & Okon, V, E., (2018). Building Services Equipment and Effective Maintenance Culture: The Experts' Standpoint. *Journal of Engineering and Automation*. 8, 35-42.

[10] Pati, R. K., Parida, A., & Kumar, U. (2017). An integrated approach for maintenance management of buildings: A case study. *Journal of Quality in Maintenance Engineering*, 23(4), 455-477.

[11] Ramesh, S. S., & Prakash, R. (2019). A survey of building maintenance practices in South Africa. *Journal of Facilities Management*, 17(4), 436-453.