

Building Performance Measurement as a Tools for Efficient Maintenance of Public Secondary Schools in Bayelsa State

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ABSTRACT

Public school building constitutes a substantial percentage of most educational institutions the performance level of this building is therefore very critical to educational effectiveness. Building performance measurement involves the process of quantifying the efficiency and effectiveness of building actions. It is a framework through the comprehensive use of both objective and subjective field evaluation. However, despite the important role of this building in the education sector, evaluation of building performance is not a mainstream activity in Nigeria. Presently there is limited data in Nigeria to assess how the use of building performance measurement tool facilitate maintenance in public secondary schools. The paper examines building performance measurement as a tool for efficient maintenance in public schools. The study primarily focused on the present condition of building, component of public secondary school building, ranging from floor condition, roof, windows, doors, ceiling, in other to assess its performance, user's perception of the prevailing level of deterioration and the present state of maintenance in public secondary schools. The methodology employed in the study included a review of relevant literature and multiple case studies conducted on six public secondary schools in Bayelsa State. The study adopted a survey research strategy, based on questionnaire, survey, interview walk through observation and photographs of the current condition of the school buildings. Data were collected from 74 respondents of the users of the educational buildings randomly selected from six schools. The descriptive statistical tool such as table, frequency, percentage, means score and relative importance index (RII) were employed in analyzing the data collected.

KEYWORDS: Building Performance Measurement, Building Performance Evaluation, Maintenance.

I. INTRODUCTION:

One of the major forces that contribute to the growth of economic, social and technological advancement of any nation is the development of maintenance culture (Celestine 2009) public school buildings are in very poor and deplorable conditions of structural and decorative repairs, in spite of millions of naira spent to erect these buildings, they are left as soon as commissioned to face premature rapid deterioration Adenuga (2020) Building is built with the aim of providing human being with a pleasant and comfortable environment and protected against extreme weather condition Khahl (2008) Building is the result of a project and planning built and managed based on specific standards established by government, professionals and specialist who must meet current technical requirement of each country. The performance of building deals with the capacity to operate at maximum efficiency fulfilling its function throughout its life cycle Khali (2016) to provide this maximum operation and to improve the economic, physical and functional development of a building ensuring that its objectives are met. Building requires a set level of performance to provide healthy and safe environment. According to Buys (2009) building performance measurement and evaluation are tools to facilitate efficient maintenance in public school buildings. Maintenance enhances the quality of a building structure to meet modern requirement in order to prolong the life span of the building, it is required to ensure the safety of building occupants. Shohet (2002) made it clear that there are increasing

demands on maintenance program to provide tools that will support maintenance planning. This is also affirming by Olangunju (2012) who also stated that the absence of appropriate tools for maintenance of existing buildings can have a detrimental effect on the future of such building. According to Odediran (2012) noted that the ability of a building to provide the required environment for a particular activity is a measure of its functionality, therefore as the components of a building begins to deteriorate it becomes necessary to take some measures to ensure that the desired characteristics of that facility which provide safety and convenience are retained through adequate measurement, evaluation and maintenance.

1.1 AIM AND OBJECTIVES OF THE STUDY

The paper focused on assessing building performance as a tool for efficient maintenance of public secondary schools in Bayelsa state.

The following are the objectives of this study:

- (1) To assess the condition of building components of public schools
- (2) To ascertain the causes of prevailing level of deterioration

1.2 DESCRIPTION OF THE STUDY

Bayelsa is a state in southern part of Nigeria located in the core Niger delta, Bayelsa state was created on 1st October 1996 from Rivers State, its name was derived from the first few letters of the names of the major local government areas from which it was formed from brass L.G. A(BALGA) Yenagoa (YELGA) and Sagbama (SALGA) Bayelsa state consists of eight local government area. Bayelsa state is geographically located within latitude 4°45' on the west and longitude 6°05' on the east, it shares boundaries with Delta on the west, Rivers State on the East. The state has a land area 10,773km² or (4,159sqm), with population of 1,704,515 (2006 census figures). The study was conducted in two local government areas located in Bayelsa the South-South Geopolitical zone of Nigeria. The local government areas are Yanegoa and Ogbia where the Bayelsa State own public secondary schools in each of the local government.

II. LITERATURE REVIEW:

Modern organizational environment is characterized by rapid and constant changes, as the environment change, so too the demands which are place on building and its facilities. Green and Moss (2012) This implies that organizations and institutions must improve in the provision, management, maintenance and performance of

their building, infrastructure on a continuous basis, in other to achieve greater efficiency and optimal value on investment on buildings, there is need for institutions and organization to recognize the importance of effective building performance measurement on the work environment in other to facilitate maintenance and management of buildings. According to Hung (1994) state that measurement is a key management activity that provides decision makers with the information necessary for decision making. The working environment is related to building facilities that contribute to achieving the intended use of the business future functions. Designing and planning working environment has become an important issue to organization because they are value imbued and therefore represent the largest part of organization assets Elmualim (2010) institutions have become more concern that when facilities are not well managed they tend to generate cost associated with economic environmental and social impacts to existing business Chen (2001) According to Amaratungs (1998) affirms that application of building performance approaches help to optimize life cycle cost and management of people, and process related space, asset, and efficient supply of resources. In order for the institutions organization to effectively achieve long term use of buildings in the competitive market, managers need to apply skilled measures in assessing build performance to effectively achieve long-term use of buildings. Williams (1999) According to Wong (2003) Building performance measurement is a framework, through the comprehensive use of both objective and field evaluation in all performance area serve to understand the critical balance needed to ensure all building performance mandates. The mandate refers to building performance approaches that help to optimize building life cycle, Preiser (2005). The mandate during the process of building performance measurement helps managers to ensure that at the end of evaluation process building does not bring any negative effect on users. The structural and non-structural building performance mandate by Scott (2008) includes the following;

2.1 PHYSICAL PERFORMANCE:

Physical performance addresses the tangible aspects of real property that ensure a sustainable asset base throughout its life circle. These physical aspects include quality and durability of the land base, the buildings and infrastructure according to Lavy (2010) highlighted the physical aspect of the building to include:

Availability of building space to supports the desired function, quality of space amenities, accessibility, site, location, building design, energy efficient, water and materials used in the erecting the building.

2.2 FUNCTIONAL PERFORMANCE:

Functional performance involves measuring building functional aspects that are linked to spatial needs and requirements, system performance as well as durability and efficient maintenance of building physical elements throughout the anticipated life Kyle (2001) managers of building should ensure that building operate at satisfactory standard that enhances occupants, users, with physical and psychological comfort through efficient provision of building elements such as air distribution, lighting, heating, cooling, workspaces system and technology.

Ibem (2003) carried out a study on performance evaluation of residential buildings in public housing estate in Ogun State Nigeria from end user’s satisfaction perspective, based on the notion that user’s satisfaction with building is a measure of the performance of building in meeting needs and expectations of users. The study was a cross sectional survey of 452 household heads in nine public housing estate using structural questionnaire and observation schedule. The study reveals that with a mean satisfaction score of 3.21 observed indicates that respondents were satisfied with the performance of the different components

of the buildings and identifies the most predominant factor that determined satisfaction and the performance of buildings meeting user needs and satisfaction. Furthermore, the study highlight critical areas of attention in order to improve the performance of buildings and user’s satisfaction which are availability of water, electricity, space, facilities.

III. RESEARCH METHODOLOGY:

The study employed survey research design and data collection method involve the use of questionnaires and walk-through observation of public secondary school buildings in Bayelsa State. Nigeria. The populations of the survey research were the school principals, and staffs of the public schools. Sampling was carried out with a total of 90 questionnaires, administered 74 questionnaires were retrieved representing about 71% of the total population which is considered sufficient for the study based on the assertion of Moser (1999) that the result of a survey could be considered as biased and little significant if the return rate was lower than 30% Data gathered were analyzed using simple statistical tools such as mean item score, IRR, percentage and frequency was used to measure and arrive at a reasonable actual position of the respondents, under relative important index (RII) measure, variables are rated using a 5-point Likert scale in order to assess the level of significance of each factor.

Table 3.1 : Questionnaire Administration

Study area	Administered		Retrieved	
	Freq.		Freq.	%
CSS Igbogene	15		13	87
CSS Okolobin	15		12	80
CSS Okordia	15		13	87
GBSS Emeyal	15		11	73
CGSS Emeyal	15		15	100
GSS Kolo	15		10	67
Total	90		74	

Source: Field survey 2020

Research Question 1

Table 3.1: What is the Current condition of the School Building in the Study Area.

Condition of Floor	F	CSS Igbogene		CSS Okolobiri		CSS Okordia		CBSS Emeyal		CGSS Emeyal		GSS Kolo	
		F	F	F	F	F	F	F	F	F	F	F	
Cracks	6	7	5	5	5	5	4	5	4	2	4	4	7
Completely broken	1	8	1	8	5	38	1	9	4	27	1	10	

down												
Partly broken down	4	31	2	17	1	7			3	20	3	30
Poor condition	2	15	4	33	2	15	1	3	20	61	1	10
Good condition	–	–	2	17	1	0	2	28	1	6	1	10
Total	13	100	12	100	13	100	11	100	15	100	10	100
Condition of Roofs												
Leaking	4	31	2	17	4	32	3	27	3	20	1	10
Partly ripped off	2	15	4	33	3	23	–	0	4	270	4	40
Completely ripped off	3	23	1	8	3	23	6	55	6	40	2	20
Poor condition	3	23	3	25	2	16	–	–	–	0	1	10
Good condition	1	18	2	17	1	7	1	9	2	13	2	20
Total	13	100	12	100	13	100	11	100	15	100	10	100
Condition of Ceiling												
No ceiling board	2	15	4	33	1	7	2	18	3	20	3	30
Sagging	2	15	1	8	–	0	1	10	2	13	1	10
Broken ceiling	5	38	3	25	6	46	3	27	4	27	4	40
Poor condition	4	32	2	16	4	31	3	27	3	20	2	20
Good condition	–	–	2	16	2	16	2	18	3	20	–	0
Total	13	100	112	100	13	100	11	100	15	100	10	100
Condition of Windows												
No windows	2	15	2	16	5	38	5	45	4	27	5	50
Hanging windows frame	5	38	3	25	3	31	2	28	3	20	3	30
Completely broken down	4	32	4	33	3	31	1	10	2	13	2	20
Poor condition	2	15	1	18	2	16	3	27	6	40	–	0
Good condition	–	0	2	16	1	0	–	–	–	0	–	0
Total	13	100	12	100	13	100	11	100	15	100	10	100

Research Question 2

Table 3.2: Prevailing Level of Deterioration in Public Secondary School Buildings at Igbogene

Causes of Deterioration	5	4	3	2	1	EFX	EFX/EF	RII	RANK
	SA	A	U	D	SD				
1. User attitude on school building and facilities	6	2	1	2	2	47	3.61	0.72	4 th
2. Inadequate training of personnel	4	5	2	1	1	50	3.84	0.76	2 nd
3. Noninvolvement of professional in maintenance work	3	4	3	2	1	45	3.46	0.69	7 th
4. Age of the building	5	4	1	2	1	53	4.07	0.81	1 st
5. Inadequate/lack of supervision and inspection	3	6	1	1	2	46	3.53	0.70	5 th
6. Pressure on school compound due to number of users	2	7	3	1	–	49	3.76	0.75	3 rd
7. Non adoption of	4	5	2	1	1	49	3.76	0.75	4 th

appropriate maintenance cycle for building										
8. No provision for the replacement of worn out building materials.	3	7	-	1	1	49	3.76	0.75	3 rd	
9. Building were not properly designed	5	5	1	2	1	46	3.53	0.70	6 th	
10. Inadequate maintenance of plan for the school	4	6	1	1	1	50	3.84	0.72	4 th	

Table 3.3 Prevailing Level of Deterioration in Public Secondary School Buildings at CSS Okolobiri

Causes of Deterioration	5 SA	4 A	3 U	2 D	1 SD	EFX	EFX/EF	RII	RANK
1. User attitude on school building and facilities	4	5	1	1	1	46	3.83	0.76	3 rd
2. Inadequate training of personnel	3	6	1	1	1	45	3.75	0.75	4 th
3. Noninvolvement of professional in maintenance work	2	4	3	1	2	39	3.25	0.65	7 th
4. Age of the building	6	2	2	1	1	47	3.91	0.78	2 nd
5. Lack of supervision and inspection	3	6	1	1	1	45	3.75	0.75	4 th
6. Pressure on school compound due to number of users	2	4	3	2	1	39	3.25	0.65	7 th
7. Non adoption of appropriate maintenance cycle for building	5	3	1	1	2	44	3.66	0.73	5 th
8. No provision for the replacement of worn out building materials.	4	6	1	1	-	49	3.08	0.81	1 st
9. Buildings were not properly designed	3	5	-	2	2	41	3.41	0.68	6 th
10. Inadequate maintenance of plan for the school	5	4	1	1	1	47	3.91	0.78	2 nd

Table 3.4: Prevailing Level of Deterioration in Public Secondary School Buildings at -CSS Okordia

Causes of Deterioration	5 SA	4 A	3 U	2 D	1 SD	EFX	EFX/EF	RII	RANK
1. User attitude on school building and facilities	4	5	2	1	1	49	3.77	0.75	5 th
2. Inadequate training of personnel	4	4	2	2	1	45	3.46	0.69	5 th
3. Noninvolvement of professional in maintenance work	4	5	2	2	-	50	3.85	0.77	2 nd
4. Age of the building	3	4	3	3	-	46	3.54	0.71	4 th
5. Lack of	3	5	2	1	2	45	3.46	0.69	5 th

supervision and inspection										
6. Pressure on school compound due to number of users	5	4	1	1	2	48	3.69	0.74	3 rd	
7. Non adoption of appropriate maintenance cycle for building	2	6	1	3	2	43	3.31	0.66	5 th	
8. No provision for the replacement of worn out building materials.	3	5	1	2	2	44	3.38	0.68	6 th	
9. Buildings were not properly designed	4	6	2	-	1	51	3.92	0.78	1 st	
10. Inadequate maintenance plan for the school	2	5	2	2	2	42	3.23	0.65	7 th	

Table 3.5: Prevailing Level of Deterioration in Public Secondary School Buildings at CBSS Emeyal

Causes of Deterioration	5 SA	4 A	3 U	2 D	1 SD	EFX	$\frac{EFX}{EF}$	RII	RANK
1. User attitude on school building and facilities	3	3	1	2	2	36	3.27	0.65	2 nd
2. Inadequate training of personnel	2	5	1	3	-	39	3.54	0.70	5 th
3. Noninvolvement of professional in maintenance work	3	6	-	1	1	42	3.81	0.76	2 nd
4. Age of the building	3	5	2	-	1	38	3.45	0.69	6 th
5. Lack of supervision and inspection	1	8	1	1	-	42	3.81	0.76	6 th
6. Pressure on school compound due to number of users	5	3	1	1	1	43	3.90	0.78	1 st
7. Non adoption of appropriate maintenance cycle for building	4	4	1	1	1	42	3.81	0.70	2 nd
8. No provision for the replacement of worn out building materials.	3	5	2	1	-	43	3.90	0.78	1 st
9. Buildings were not properly designed	21	3	2	1	1	41	3.72	0.74	3 rd
10. Inadequate maintenance of plan for the school	2	6	1	1	1	40	3.63	0.72	4 th

Causes of Deterioration	5 SA	4 A	3 U	2 D	1 SD	EFX	$\frac{EFX}{EF}$	RII	RANK
1. User attitude on school building and facilities	5	5	1	2	2	47	3.91	0.78	2 nd
2. Inadequate training of personnel	4	4	3	2	2	45	3.50	0.60	9 th
3. Noninvolvement of professional in	5	5	2	2	1	50	3.23	0.66	4 th

4.	maintenance work Age of the building	5	6	2	1	1	54	3.00	0.72	2 nd
5.	Lack of supervision and inspection	3	5	2	3	2	35	3.26	0.65	5 th
6.	Pressure on school compound due to number of users	5	6	2	2	–	59	3.93	0.79	1 st
7.	Non adoption of appropriate maintenance cycle for building	4	5	1	2	3	50	3.33	0.66	7 th
8.	No provision for the replacement of worn out building materials.	6	4	3	–	2	46	3.03	0.62	4 th
9.	Buildings were not properly designed	5	4	2	2	2	52	3.46	0.69	3 rd
10.	Inadequate maintenance of plan for the school	2	7	3	1	2	51	3.40	0.68	4 th

Table 3.6 Prevailing Level of Deterioration in Public Secondary School Buildings at CGSS Emeyal

Table 3.7: Prevailing Level of Deterioration in Public Secondary School Buildings at CSS Kolo

Causes of Deterioration	5 SA	4 A	3 U	2 D	1 SD	EFX	EFX EF	RII	RANK
1. User attitude on school building and facilities	3	3	1	2	1	35	3.50	0.70	5 th
2. Inadequate training of personnel	3	4	1	1	1	37	3.70	0.74	3 rd
3. None involvement of professional in maintenance work	3	2	2	2	1	34	3.40	0.68	6 th
4. Age of the building	2	4	3	–	1	36	3.60	0.72	4 th
5. Lack of supervision and inspection	1	6	1	1	1	35	3.50	0.70	5 th
6. Pressure on school compound due to number of users	4	2	2	1	1	39	3.90	0.78	2 nd
7. None adoption of appropriate maintenance cycle for building	3	3	1	1	2	34	3.40	0.68	6 th
8. No provision for the replacement of worn-out building materials.	3	5	2	–	–	41	4.10	0.82	1 st
9. Buildings were not properly designed	2	3	2	2	1	33	3.30	0.66	7 th
10. Inadequate maintenance of plan for the school	3	3	2	1	1	36	3.60	0.72	4 th

IV. DISCUSSION OF FINDINGS:

This paper discusses the key findings of the study into the following section.

(1) The condition of the major component of the public-school buildings.

(2) The causes of prevailing level of deterioration.

The study revealed that the condition of different component of the buildings which include, doors, roofs, windows are faced with various stages of disrepair.

Floor Condition of Public Secondary Schools

Table 4.1: This is the part of the building that experience the most activity, users walk on the floor and heavy morale loads are stationed to stand on the floor on a particular spot for a long hone without repositioning, all these causes wearing of the floor from the analysis of survey result. The public secondary school buildings in the survey area are faced with various forms of disrepair ranging from cracked floors, partly broken down floors, the main flooring materials were cement and sand screed and due to lengthy usage and age of school buildings, the floors of the school building are in bad condition and needs urgent maintenance.



Plate 4.1: Picture showing the condition of floor in the school building (CSS IGBOGENE)

Source: Field survey 2020

Door Condition: From the survey it was evident that the doors are in poor state of disrepair that needs urgent repairs, some of the doors have partially broken down, while some are completely broken. The doors in the school were expected to be shutting out noise outside, however this was not the case in most of the academic buildings sampled.

Roof Condition: The roof of a building is an important part of a building, it shelters the occupants from rain, sun and other environmental effects. From the survey conducted, leaking roofs have resulted in damaging some of building element especially walls, the roof in the study area is faced with various facet of disrepair such partly ripped off, while some completely ripped off, and sagging when such roofs are left unrepair, deface

the building and also put stress on the building components.



Picture showing the roof condition (CBSS Emeyal (Ogbia))

Window Condition: This element of a building helps to regulate the amount of air and sunlight that penetrate into a building, from the survey conducted shows that majority of the windows have pulled out and broken, the wooden members of the building are partly and completely broken down as a result of the rotten due to the penetration of water, properly designed windows play an important role in achieving user's comfort, health and satisfaction.

The school buildings still have wooden windows.

Window Condition of Public Secondary Schools.

This element of a building helps to regulate the amount of air and sunlight that penetrates into a building from the survey conducted in table 4.1 shows that majority of the windows have been broken. The major problems with the wooden members of the public secondary school buildings surveyed are either partly or completely broken down as a result of the rotten wood due to the penetration of water. Furthermore, properly designed windows play an important role in achieving energy efficiency, users comfort, health and satisfaction. However, a window should be installed in a building, strictly for light and ventilation but in some of the public secondary school buildings, students were seen sitting on the windows seals from the result on window condition, it is evident that the users were not handling the windows properly.



Picture showing the conditions of windows (CSS IGBOGENE)

Source: Field survey 2020

Ceiling Condition of Public Secondary School.

Table 4.1 shows the condition of the ceiling was also rated by the users of the buildings, the respondents indicates that there is no ceiling board in the public secondary school buildings. The study revealed that the ceiling of the public school buildings is in various level of poor condition. Such as sagging, broken ceiling were predominant in the study area.



Picture showing the ceiling condition (CBSS Emeyal (Ogbia)

Source: Field survey 2020

CAUSES OF THE PREVAILING LEVEL OF DETERIORATION.

The study revealed that more than half of the respondents with a mean score of >3.00 agrees that user attitude on school buildings, age of the building, pressure on school compound due to number of user's, non-provision for the replacement of worn-out building materials, and inadequate maintenance plan for the school were the factors that causes the level of deterioration in public secondary school buildings.

V. CONCLUSION

In order to improve the conditions of public secondary school buildings and infrastructure there is need to carryout effective building performance measurement as tool for efficient maintenance. building is as asset that contributes a secure environment if it is well maintained leads to continuous improvement throughout its life cycle. Building performance is an attribute of a building that expresses how well that building carries out its function. The study found that the physical condition of some secondary school buildings does not meet up to the desire expectations. Decaying and deteriorating building elements such as partly broken-down doors, completely broken down doors, no doors, leaking roofs, partly ripped off roofs, sagging ceiling, broken ceiling, partly broken doors, hanging window frame. Building Performance measurement of school buildings ensures that buildings meet the infrastructural challenges of educational institutions. This implies that the effectiveness of buildings also meets user satisfaction.

5.1 RECOMMENDATIONS

- 1) Government should create efficient inventory system of building components qualified and experienced building performance evaluation staff should be appointed to prepare evaluation plans, schedule of building performance aspects and well-motivated performance evaluation budget for public schools.
- 2) Performance evaluation database for buildings in educational institutions should be developed in Nigeria; this would provide information on performance standard.
- 3) Government should employ maintenance officer in each school and a maintenance body for each state of the federation, the department should be adequately staffed with manpower, appropriate training to competently and safely carrying out building, maintenance in other to improve the condition of public secondary school buildings.

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