Identification of Factors Responsible for Maintenance Need in Public and Private Buildings in Osogbo, Osun State: The Users Perspective

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Abstract: Living things, both plants and animals do undergo a process of growth that spans a life that terminates with death. Similarly, all elements of the built environment particularly buildings also undergo similar ageing process within the spread of their live span. Right from the day of commissioning that marks, the beginning of a building's life span deterioration or ageing process starts, however, it is the proper or timely maintenance/replacement aged of the building elements that will determine the functional life span. This paper attempts to identify the factors responsible for maintenance need and frequency in public and private building structures in Osogbo the capital of Osun State, Nigeria from professionals' perspective. Well-structured questionnaires were randomly distributed among the staff of Osun State Government Secretariat, Osogbo, public and private schools and some banks. The returned questionnaires were analyzed and the result indicate that, quality of the building elements (materials) and the standard of workmanship are major factors that generate maintenance need in the studied buildings.
Keywords: Building maintenance, Maintenance need, Public and Private Sectors.

Introduction

Buildings generally irrespective of use and scope are made up of components and materials for their construction. These components and materials deteriorate at different rate depending on several factors, hence the need for maintenance of buildings.

Many researchers in the past have identified some factors as responsible for the need of maintenance in buildings. Ashworth (1997) itemized some identified factors to include age, building materials, workmanship and environmental conditions such as weather and local climate.

However, Smith (2003) in his own submission deviate a bit by inputting that irrespective of location, scope and cost, there are other common attributes in building which include flexibility of use, cost effectiveness, efficiency, cleanness, sanitation, accessibility, controlled circulation, aesthetic, safety and sustainability.

It is imperative that these agents responsible for maintenance need should be well identified so as to achieve effective maintenance system in practice and budgeting. Good enough, the factors may be identified from building to building; however, there is a common ground in location and local weather condition.Osogbo, Osun State capital, the study location is in the South Western part of Nigeria with tropical climate of heavy stormy raining season and mild cold, harmattan dry season.

Generation of Building maintenance need

Despite the enormous advancement made in Science in general and medicine in particular, despite the great improvement in human well-being especially in developed countries of the world, their citizens still get sick and die from one ailment or the other. As we human cannot be free of health problems, it is likewise impossible to produce buildings that are maintenance free. However, as good living cultures can guarantee

healthy and longetivity of life in human being, so is good maintenance culture on buildings can ensure the functionality and durability of the building so maintained. According to Amusan (2003) and Adenuga (2006), maintenance work can be minimized by good design, proper workmanship using suitable codes of installation, requisite building materials and methods.

Several studies in the past by various authors have revealed many causes of failure of several building materials and components and they all concluded that the deterioration and eventual failure of these building items and components are the generating need of building maintenance.

Ashworth (1997) attempted to differentiate between deterioration and obsolescence, by stating that "deterioration is inevitable, as ageing process and obsolescence is much more difficult to control, since its root cause generates from uncertain and unpredictable factors such as changes in fashion, technological development, innovation in the design and use of building. Simply put, any alteration in the structure of a building or the conversion of its use generates in obsolescence.

Brereton (1991) inferred that maintenance practically starts the very day the builder finishes his work and leaves the site. Ikpo and Olusola (2000) also acknowledged the fact that building failure and deterioration of building components are established in relation to deviations from their Built State.

It is a widely acclaimed fact in the building industry, that building components and materials used in the construction of building deteriorates at different rate under similar conditions. So much have been written on the causes and nature of failure of these building items, but little is known about their deterioration age and failure rate. Hence, the need for regular checks on buildings for maintenance purpose.

The origin of buildings play major role in determining their maintenance generating factors. These are the stages of development process from site selection; design through to construction and final completion. Maintenance generating factors as listed by Brereton (1991) includes design, materials, weather, workmanship, functions, use, location, age and interrelationship of the factors.

Field experience as professionals in built environment have shown that most developmental decisions in building construction starting from project brief, site acquisition, building, architectural design and other allied professional inputs, choice of materials and engagement of artisans are all made in the light of their financial implications and overall cost effect on the project. These decisions in the final analysis always have great influence upon the future maintenance cost of the completed building. Decision at every stage of a building project always come with attendant problem (Mahmoud, 1998).

Field experience have shown also, that of all the decisions listed above, choice of material takes the lead most especially in private sector projects where cost is traded in for quality and durability which always lead to early deterioration and maintenance need. But, according to Mahmoud (1998), apart from cost, there are other factors that do mitigate the choice of materials which includeavailability of the material locally, economy, climate and building techniques. For this reason, architects and other designers in the building industry must endeavour to avoid wrong choice of materials from design stage and take into consideration the aforementioned factors to avoid designs with materials related problems or inadequate design problems.

In his studies, Obiegbo (2004) listed in-adequate design problems to include the following:
1. Dilemma between form and function
2. Poor building orientation
3. Materials' ability or otherwise to withstand the effects of climate
4. Inability of the materials to fulfill designed functions
5. Clients' imposed problems
6. Materials reacting with surrounding materials
7. Inability of elements to withstand load
8. Mis-match and mis-fit of materials
9. Inadequate provision of access to carry out maintenance activities.

Several authors in the past have stressed the importance for maintenance analysis at the design stage in their academic works. Notable among the authors are Silva, Hing and Ojori (2004) and Bamisile (2004).

However, Akinsola (2005) in his work identified occupiers losers as agents of maintenance generating needs with willful damages, vandalism, overpopulation and mis-use of building as key factors in most public buildings most especially institutional buildings. Below are summarized factors of deterioration of building components that generate maintenance need.
- Building characteristics: location, age, interrelationship of other factors
- Climate/weathering: Radiation, Rain, temperature, air constituents
- Users: Willingful damages, vandalism, over population (extreme user density)

- Maintenance: Absence or hidden access for maintenance and inadequate finance for materials
- Technical: Design, materials, construction methods and workmanship
- Biological: Bacteria or fungi attack on building elements.

Need for Building Maintenance

As in human, whereby bad and carefree living culture can result into short life-span, bad maintenance culture in buildings can also lead to failure or total collapse. In line with the above, Jones (2003) stated in his work that maintenance is just as vital to you and me in every important relationship of life. Seeley (1996) also opined that "the conditions of surroundings in which we live and learn are reflections of the nation's wellbeing". "A stitch in time saves nine says the adage", this is equally application to buildings. Irrespective of scope, building construction is a highly capital intensive (money and time) compared with the cheaper cost of periodical maintenance of the structure over time. Surprisingly, our study of several private and public buildings revealed unsightly buildings at varying degree of dilapidations and disrepair due to long years of maintenance neglect.

Bamisile (2004) noted in his work that "A building must be maintained to ensure optimal performance for its users". It is very evident from the above that neglect of building maintenance has a cumulative effect on the fabrics and finishes of a building with resultant harmful effects on the living occupants.

Factors generating maintenance need

Several studies by researchers on this particular topic had identified several factors that affects maintenance needs in buildings irrespective of scope and whether private or public. According to Oladapo (2004) and Akinsola (2005), the factors include age, construction method, design, environmental factors, use and changing standard. However, this particular study of selected private and public buildings within same locality of Osogbo in Osun State revealed additional factors hitherto not captured in the previous studies. These include the social status of the users which is a dictate of their level of education. Good examples are the densely populated barracks for Junior and Middle level officers at Okefia and the sparsely populated Osun State Government Staff Quarters within same proximity.

The Police Barrack buildings property ofFederal Government, despite the high standard of construction implored, the elements such as walls, windows, roofs, doors and other utilities such as the toilet and luncheonettes, the buildings are perpetually in state of disrepair and hence, constant need of repair. The buildings are not only overcrowded with legal occupants and squatters but study revealed that as Junior/Middle officers, their social background is not in tandem with the type of places of above designed for them.
However, the situation in the Osun State Senior Staff quarter in the same neighbourhood is totally opposite. Despite the average status of the buildings in terms of construction standard, the buildings are relatively far better state of maintenance, courtesy of the high social status (income and education) of the users. The buildings are sparsely populated too with far less pressure on the facilities.

The pictures painted above is similar to what our study revealed between maintenance status of buildings in high fee private schools attended by children of the rich and that of free education public schools attended by children from poor social background.

Brereton (1991) reported in his work that, though there is no standard specification for the repair of buildings nor should there be but his work English Heritage listed some main principles of repair, restoration and maintenance of buildings to include:

1. The purpose of repair
2. Need for repair
3. Avoiding unnecessary damage
4. Analyzing causes of defects
5. Adopting proven techniques
6. Truth to materials
7. Restoration of lost features
8. Safe-guarding the future buildings.

The above suggestions are achievable through clear and calculated maintenance practice which should be designed for the requirements of the anticipated life span of the buildings.

According to past studies, there are identified several strategic options available to management and many alternative decisions to be considered in maintaining buildings.

Horner *et al*. (2004) inputs that it may be necessary to decide whether to repair or replace an item and whether to carry out periodic maintenance at fixed intervals or simply to respond to the request of users as the

need arises. Repair and replacement decisions tend to divide into two categories viz: replacement decisions based on the known cost of continuing to repair and item which can be tagged as preventive option. The other option is corrective in nature as it attempts to repair damaged items of the building which is spontaneous and of immediate and not pro-active in nature and practice.

Ikpo (1998) suggested in his work that maintenance may be undertaken in line with the laid down policies analyzed above which may be "preventive" or "corrective" or a combination of the two options.

Methodology

A well-structured questionnaire was used in random survey to get necessary and important information on factors generating building maintenance needs. The respondents are users of public and private buildings within same geographical/environmental vicinity so as to provide common platform on factors such as weather conditions, soil topography and other natural features. Buildings for the study were picked from three major types viz: schools, residential and commercial groups. One public and the other private buildings were chosen from each group for the study. A total of 300 questionnaires were randomly distributed among the users of these buildings.

Group A (Schools)	Private	Public/Semi Public
	Ebun-Oluwa Primary/Secondary School, New Ring Road, Osogbo	Ataoja High School, Osogbo, Osun State.
Group B (Residential)	Oke-fia G.R.A., Osogbo	Nigerian Police Barracks, Oke-fia, G.R.A., Osogbo.
Group C (Commercial)	Ajayi Shopping Complex, Oke-fia, Osogbo.	Skye Bank Plc, Oke-fia Branch, Osogbo.

The data collected was analyzed using mean and standard deviation coupled with calculation of average mean of sub-factors. The Kruskal-Wallis test of agreement was used to test if there is any agreement among the group of users that is the (private and public buildings of same category).

Results and Discussion

Table 1: Descriptive Statistics of Users with generation of building maintenance need.

	N	Minimum	Maximum	Mean	Std. deviation	Average mean
Characteristic						
Age	76	0	4	2.58	2.510	2.36
Location	74	0	4	2.16	1.007	
Natural	73	0	4	2.29	1.060	
Detoriation	75	0	4	2.36	1.009	
Size of building	73	0	4	2.38	1.088	
Height of building	73	0	4	2.42	1.066	
Type of structure	73	0	4	2.34	1.121	
Type finishing	71	0	4	2.39	.978	
Obsolesces						
Change in fashion	73	0	4	2.40	.968	
Technological	74	0	4	2.26	.980	2.3
Development	74	0	4	2.24	1.031	
Innovation in design						
Users						
Social status						
Willlingful damages	75	0	4	2.11	1.192	2.153
Vandalism	75	0	4	2.16	1.242	
Overstress(pollution)	74	0	4	2.19	1.201	
Climate						
Radiation from the sun	77	0	4	2.09	1.248	2.085
Temperature	75	0	4	1.92	1.136	
Rain water	76	0	4	2.41	3.848	
Biological						
Water vapour						
Fungi	73	0	4	1.75	1.256	1.83
Bacteria	75	0	4	1.91	1.199	
Technical						
Design	75	0	4	2.31	1.197	
Workmanship	74	0	4	2.27	1.076	
Maintenance factors						
Access to maintenance	75	0	4		2.31	
Inadequate finance for maintenance valid N(listwise)	74	0	4		2.39	2.35
Average mean	56					2.231

Table 1 shows the mean and standard deviation of response from users of selected Public buildings in the study area (Osogbo, Osun State) on the various factors that do generate the need for maintenance. The respondents agrees that age of building as a characteristic of public building is a factor that contributes to maintenance need with a mean of 2.58, but the standard deviation shows a diverge opinion of 2.520 while other factors like location, natural deterioration, size of building, buildingtype, finishes, methods of construction and social background of users of education have a mean range of between 2.16 and 2.42 meaning a general opinion that these factors do not generally contribute significantly to need for maintenance. The standard deviation also reveals a concentrated view among the respondents.

Similarly, on the factors like users social/academic background, climate, technical quality and obsolesces, the mean of the respondents range between 2.11 and 2.41 with a standard deviation range of 1.062 and 1.284.meaning a disagreement with theirGalton as responsible to generating maintenance need

Table2: Descriptive Statistics of public building users with generation of building maintenance need.

Obsolesces						
Change in fashion	73	0	4	2.40	.968	
Technological	74	0	4	2.26	.980	2.3
Development	74	0	4	2.24	1.031	
Innovation in design						
Users						
Social status						
Willlingful damages	75	0	4	2.11	1.192	2.153
Vandalism	75	0	4	2.16	1.242	
Overstress(pollution)	74	0	4	2.19	1.201	
Climate						
Radiation from the sun	77	0	4	2.09	1.248	2.085
Temperature	75	0	4	1.92	1.136	
Rain water	76	0	4	2.41	3.848	
Biological						
Water vapour						
Fungi	73	0	4	1.75	1.256	1.83
Bacteria	75	0	4	1.91	1.199	
Technical						
Design	75	0	4	2.31	1.197	
Workmanship	74	0	4	2.27	1.076	
Maintenance factors						
Access to maintenance	75	0	4		2.31	
Inadequate finance for maintenance valid N(listwise)	74	0	4		2.39	2.35
Average mean	56					2.231

From table2, Age of building and access to maintenance with a mean of 2.73 and 2.61 respectively representing an agreement to the faction, and all other factors are marked with disagreement with mean between 1.89 and 2.37. the standard deviation shows a range of 1.154 and 1.287 which indicates that most respondent among the users of public building share same opinion.

Table3 Descriptive statics of private building users with generation of building maintenance needed.

Table 3: Descriptive Statistics of public building users with generation of building maintenance need.

	N	Minimum	maximum	Mean	Std. deviation	Average
Age	55	0	4	2.73	11.209	2.33
Location	53	0	4	2.23	1.154	
Natural deterioration	55	0	4	2.29	1.212	
Size of building	55	0	4	2.11	1.165	
Height of building	55	0	4	2.18	1.249	
Type of structure	55	0	4	2.27	1.233	
Type of finishing	54	0	4	2.37	1.385	
Method of construction	54	0	4	2.31	1.276	
Change in fashion	53	0	4	2.21	1.385	2.17
Technological development	54	0	4	2.02	1.276	
Innovation in design	53	0	4	2.17	1.282	
Willingful damage	56	0	4	1.19	1.175	2.05
Vandalism	54	0	4	2.11	1.208	

Overstress(pollution)	54	0	4	2.18	3.143	
Radiator from the sun	54	0	4	2.25	1.304	2.18
Temperature	55	0	4	2.11	1.197	
Rain water	55	0	4	2.18	1.188	
Water vapour	55	0	4	2.25	1.174	2.12
Fungi	55	0	4	2.11	1.272	
Bacteria	55	0	4	2.13	1.263	
Design	54	0	4	2.22	1.269	2.29
Workmanship	56	0	4	2.37	1.287	
Access to maintenance	56	0	4	2.61	1.260	
Inadequate finance for maintenance	54	0	4	2.42	1.287	2.51
Valid n(listwise)	43					
Average mean						2.23

Table 3 shows that all factors considered under building characteristics such as technical quality, obsolesce and maintenance access were ranked by users of private building as not significant to contributing to building maintenance generating need with a mean range of 2.03(obsolesce)-2.40(age) with a high standard deviation between 1.134 and 1.428, indicating a wide spread of view among the category of users. There is a lower mean of 1.39 to 1.95 on factors were users social background and climate within the rank which translate to a disagreement with this factors.

Hypothesis: The hypothesis states that there is no significant agreement among the group of the factors generating maintenance need in private and public building.

The Kruskal-Wallis test of agreement used at 5% significance level and 2 degree of freedom, chi-square calculated (x_2) in 2.230 with asymptotical significance of 0.327, this is far in access of 0.05, hence null hypothesis in rejected, that "there in a strong agreement among the group on the factors generating maintenance need''.

Finding and Recommendation

This study revealed that the users of selected private and public building in the study area inOsogbo Osun state agreed to the fact that building characteristics is a factor that contributes to maintenance need, and age of building is the most favoured sub-factor. Building irrespective of scope are assemblage of element or parts such as foundation,floor,walls,ceiling,roof,windows,door and furnished using appropriate tools and expertise. The building will be of desired quality if the materials/element so put together are of goods quality and standard and put together as by experienced/quality artisans.

However, when the contrary is the case, the product will never be of required quality. Hence guide degeneration of parts, obsolesce wall generating maintenance need and in critical situation total or partial collapse of the buildings. Good supervision and honesty of purpose are panacea to this common problem in the construction industry.

Use of building according to Akinsola(2005) and Oladapo(2004) in addiction to age is a major factor that contributes to need for maintenance in building. However, this study further reveal their importance of the sub-factor of use of building such as social/education background of users, intensive need of use(overpopulation) and the aspect on especially services, appropriateness of otherwise of use building, common with conversion of building from say residential to educational or to commercial. That is from low density of use to high density. The impact on the building fabrics and services contribute immensely to maintenance need.

Another major factor as revealed by own study is inappropriateness of funding. This is applicable to both public and private building as the stakeholder involved have not being responding timely to maintenance need of the buildings, the common excuse is lack of fund. In this vein Oladapo(2004) and Smith(2003) suggested that at least 10% of cost of construction of any building should be set aside for maintenance purpose. But if applicable to public buildings, what of private ones and the problem of enforcement.

Our respective planning authorities are to enforce the maintainability analysis of building by designers at design stage to reduce problems of access to building and their parts for maintenance a suggestion from Bamisile(2004).

Corruption is a major root of the major factors discussed inthis study mainly among the stakeholder in the building industry, the Architect,Engineers,Quantity surveys,Fabricators,artisans on one part and the enforcers of the building code (government agencies) on the other side. Government at all tiers must not limit the responsibility of planning approving agencies to the drawing alone, but to ensure compliance during construction stage too. Arbitrary conversion of building to other uses must be controlled and must be made through strict permission of relevant agencies, according to Adepoju & Adepoju (2016).

Professional bodies in the building industry such as Nigerian institute of Architects (N.I.A), Nigerian institute of building (N.I.O.B), Nigerian institutes of town planners(NISTP) and Nigerian Institution of Estate Surveyors and Valuers(NIESV), among others in the built environment should educate their members by organizing seminars and workshops regularly to preach professional discipline as enshrined in their professional code of ethics.

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