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ST. MARY UNIVERSITY

SCHOOL OF GRADUATE STUDIES

**MASTERS OF BUSINESS ADMINISTRATION IN
PROJECT MANAGEMENT**

**ASSESSMENT OF MAINTENANCE MANAGEMENT
PRACTICE OF PUBLIC HOSPITAL BUILDINGS
IN ADDIS ABABA**

By:

WORKU BIADGLIGN MAZENGLIA

JUNE, 2021

SMU

ADDIS ABABA

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**A THESIS IS SUBMITTED TO St. MARY'S UNIVERSITY,
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FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
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UNDER THE GUIDANCE OF:

Muluadam Alemu (Ph.D)

JUNE, 2021

SMU

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BY: WORKU BIADGLIGN

APPROVED BY BOARD OF EXAMINERS

_____	_____	_____
Dean, Graduate Studies	Signature	Date
_____	_____	_____
Advisor	Signature	Date
_____	_____	_____
External examiner	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date

DECLARATION

I declare that this work is the result of my own original research. I have made it independently with help of my advisor.

Name: Worku Biadgign

Signature -----

Date -----

JUNE, 2021

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ENDORSEMENT

This thesis has been submitted to St. Mary 's University, School of Graduate Study examination with my approval as a university advisor.

Advisor: Muluadam Alemu (Ph.D)

Signature-----

Date -----

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ABSTRACT

This paper assesses maintenance management practices in public buildings in Addis Ababa. It provides an insight into the concept of building maintenance management in public institutions. Maintenance management is a consolidation of any action carried out to restore or retain an item to an acceptable condition. Buildings cannot remain maintenance-free throughout their entire life, even when they are still new, they still require maintenance and the maintenance doesn't not only affect the life span of the building but also affects the safety and health of persons and properties. The study was conducted at the twelve public hospital buildings (case study). Physical observation, questionnaire surveys, and interviews were used to collect valuable data from the hospital staffs and patients. A literature review was also conducted to provide comprehension of general maintenance management practices in public buildings. Purposive sampling was used to select the key informants of the study and to determine sampling size. The collected data was analyzed using descriptive statistics and presented in form of means, standard deviation, and presented using frequency tables.

The findings indicate that: the public buildings are in a deplorable state because the public hospital buildings have adopted for corrective maintenance and immediate maintenance rather than preventive maintenance which has led to serious deterioration of buildings. Through physical observation, the findings also indicate that the major prevalent defects are: dilapidated roof covering, floor surfaces, ceiling, and defective electrical elements.

The analysis identifies; absence of preventive maintenance practice, deterioration due to age and environment, misuses of user's poor maintenance culture, inadequate funds and inadequate training as the major factors that affect maintenance management in public buildings. In view of these findings and by way of recommendations, it was suggested that the management develops and implement a planned maintenance program, maintenance policy, provides adequate funding, develops and implements a facilities management plan, increases preventive maintenance practices and carries out regular assessment of buildings to ensure effective maintenance of the building elements.

TABLE OF CONTENTS

DECLARATION	iii
ENDORSEMENT.....	iv
ACKNOWLEDGMENT.....	v
Abstract.....	vi
Table of Contents.....	vii
List of tables.....	x
List of Figures	xi
CHAPTRER ONE	1
Introduction.....	1
1.1 Background of the Study.....	1
1.2 Health Care Financing and Health Services Situation in Addis Ababa	4
1.3 Problem of the Statement	6
1.4 Research Objective.....	7
1.5 Research Question.....	7
1.6 Significance.....	8
1.7 Scope of the Study.....	8
1.8 Limitation of the Study	8
1.9 Organization of the Study	8
CHAPTER TWO	9
LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Building Maintenance and Maintenance Management.....	9
2.3 Empirical Review	11
2.4 Maintenance Standard/Implementation.....	13
2.5 Indicators in Measuring Building Maintenance	15
2.6 Buildings and Maintenance Strategies	15

2.6.1	Building Strategy	15
2.6.2	Maintenance Policy	16
2.6.3	Maintenance Strategies or Types.....	16
2.6.4	Maintenance Support and Tools	19
2.6.5	The Importance of Building Maintenance.....	20
2.6.6	Maintenance Management in Hospital Building	21
2.6.7	Public Hospital Building Maintenance in Addis Ababa.....	22
2.6.8	The Effectiveness of Maintenance Management of Public Hospital Buildings.....	23
2.7	Factors Affecting Maintenance Management in Hospital Building	24
2.8	Conceptual Framework	25
2.9	Knowledge Gap.....	27
CHAPTER THREE		28
RESEARCH DESIGN AND METHODOLOGY		28
3.1	Introduction	28
3.2	Research Design.....	28
3.3	Research Population.....	29
3.4	Sampling Techniques	29
3.5	Sample Size	30
3.6	Source of Data.....	30
3.7	Method of Data Collection.....	30
3.8	Data Analysis Method.....	31
CHAPTER FOUR.....		32
DATA PERSENTATION AND ANALYSIS		32
4.1	Introduction	32
4.2	Results and Discussions	32
4.2.1	General Information of Public Hospital Building	32

4.2.2	Operational State of Building Elements	39
4.2.3	Factors Affecting Maintenance Management Practice in Public Hospital Building	42
4.2.4	Factors for Good Maintenance Practice	43
CHAPTER FIVE		45
CONCLUSION AND RECOMMENDATION.....		45
5.1	Introduction	45
5.2	Summary of Findings	45
5.3	Study Implications and Contributions.....	46
5.4	Conclusion.....	46
5.5	Recommendation.....	47
Reference		49
APPENDICES		52
APPENDIX 1: Research Questionnaire.....		52
APPENDIX 2: Interview Guide.....		59

LIST OF TABLES

Table 1. 1 Number of Health Facilities in Addis Ababa.....	5
Table 1. 2 Public hospital characteristic in Addis Ababa	6
Table 2. 1 Indicators of Building Maintenance	15
Table 3. 1 Public hospitals with maintenance location and their idea generating administrative.....	29
Table 3. 2 Number of respondents' response rate.....	30
Table 4. 1 Age of Hospitals	33
Table 4. 2 Maintenance staff years of experience.....	34
Table 4. 3 Frequency of inspection.....	36
Table 4. 4 Response period of maintenance request.....	37
Table 4. 5 Maintenance staff perception about maintenance.....	37
Table 4. 6 Operational State of Building Elements	40
Table 4. 7 Factors affecting for poor maintenance management practice	42
Table 4. 8 Factors affecting good maintenance practice.....	44

LIST OF FIGURES

Figure 2.1 Maintenance strategies (source BS EN 13306:2010).....	17
Figure 2.2 Frame work.....	26
Figure 4. 1 Maintenance employees with experience.....	34
Figure 4. 2 Maintenance types of public hospitals	35
Figure 4. 3 Maintenance inspection of public hospitals with regular time.....	36
Figure 4. 4 Maintenance staff perception	38
Figure 4. 5 Performance of the building with time.....	38
Figure 4. 6 Operational State of Building Elements.....	41
Figure 4. 7 Source of maintenance complaint	41

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

According Oxford Dictionary (2006) maintenance is defined as a continuous repair work done regularly to keep a machine, building, or piece of equipment in good condition and work order and a building is an asset which needs to be maintained to ensure that its value is not worn.

The success of maintenance in building projects is influencing with various factors with varying scales. The success of projects is a core issue to the governments, users and contractors' communities (Alriwaimi and Zainal, 2014). Literature review highlights the construction projects success and some studies focus on the role of contractor in project success. According to (Edmond, 2010), there are so many studies conducted on construction projects rather than building maintenance projects and also there are no study conducted for identifying the factors that affect the success of building maintenance projects. In case, this gives the chance to conduct this study.

Maintenance is defined by British Standards Institution, BS (1974), as a consolidation of any action carried out to restore or retain an item it to an acceptable condition. Akintomiwa (2010) put it as the act of monitoring the use (exploitation), preserving the performance standards, qualities, and lifespan of the property with a view at perpetuating its full capacity benefits. In deeper view, it is defined as the combination of all technical and administrative procedures planned to restore an item to, it should be taken into consideration in any risk management plan (Mubaidin & Alawneh, 2017), retain it to, its acceptable condition, so it can perform its required function well.

Building maintenance is an economic issue and needs to be considered as an asset in maintaining building performance rather than as a reaction to inadequate building performance (Olanrewaju, 2010). BS (1986) stated that building maintenance work is different from every day and repetitive cleaning. Instead, it is essential to maintain the performance of the building fabric and its services. Maintenance work needs those

responsible for managing the maintenance of buildings and their engineering services need to have both management ability and technical expertise.

According to Iyagba (2005), it is impossible to produce buildings that are maintenance-free, but maintenance work can be minimized by good design, and proper workmanship carried out by skilled experts or competent craftsmen using suitable codes of installation, requisite building materials and methods. Although the building is a capital asset of the organization, instead of building owners assume maintenance of the building as a vain liability and not a priority. On a particular occasion, the building owners often find themselves are no longer comfortable with building cracks on walls and floors, leaking water pipes, and corrosion of steel structures. Maintenance is made not only to maintain the building but also for the sake of public safety, including safe consumer building occupants. Maintenance management is responsible for using tools and methods to improve efficiency and to reduce the effects of unplanned stoppages and reduce costs (Oliveira *et al.*, 2014).

The increasing demand for public services in developing countries has resulted in increased development of public buildings (Lee & Wordsworth, 2001). Public hospital buildings are visited by great numbers of people for various services. The health services provided by hospitals have led to become very important buildings. Healthcare has different groups of stakeholders such as patients, public or visitor, administrative and medical staff. These various visits lead to increased wear and tear of the building components, which raises a strong need to have suitable maintenance practices for such buildings to ensure no interruptions to their functions caused by poor maintenance. The maintenance of hospital buildings is a major issue. Maintenance problems also start to set in immediately after buildings are constructed. Therefore, prolonged neglect of maintenance causes public buildings to be in a state of disrepair leading to the increased maintenance costs, collapse and abandonment of the buildings (Blessing & Richard, 2016).

Many developed nations take maintenance of their infrastructure seriously because they invest a lot in infrastructure development, and depend on it as a source of revenue for their economy (Cobbinah, 2010), is the contrary holds true developing countries, where public buildings only receive attention from top management when there is a problem, even when the maintenance is done, it is usually inadequately done because it is not

planned well. According to Ethiopia Proclamation No. 475/1995 of the Federal Republic of Ethiopia defines the Powers and Duties of the Executive Organs' Federal Ministry of Health in details, but it does not include the emphasis about the maintenance of hospital buildings.

The building maintenance practice in Addis Ababa public hospitals has a vital role to keep the service uninterrupted, but no one gives enough consideration and no continuous supervision of the buildings and also the activities of the users. Lack of maintenance may in part arise from a feeling that buildings are long lived assets which deteriorate only gradually. In fact, this is true only of the more robust forms of structure and even these can deteriorate rapidly with the increases of moisture. Therefore, a failure to maintain buildings may affect their functioning in addition to reducing their value. Building size and users' standards are the main factors in maintaining buildings.

A proper maintenance management strategy helps to minimize the problem of a major breakdown (Riza, 2006). Olagunju (2012) identified factors that influence the level of maintenance of public building standard. Factors affecting maintenance of public buildings in Addis Abeba hospital buildings are lack of maintenance culture, lack of preventive maintenance method, insufficient funds to maintain the buildings, lack of building maintenance standard procedures, lack of technical personnel, and there are no materials and technologies which is responsible for public health hospitals in Addis Ababa.

The study examined maintenance management practices of hospital buildings in Addis Ababa. The primary importance of these public hospitals in Addis Abeba is to provide health facilities to the people of Addis Ababa and for other regionals' people. So, to give usual service without interrupted and safe way, maintenance practices are assessed and maintained to protect the system from any damages and breakdown. The success of maintenance in building projects is influencing with various factors with varying scales. The success of projects is a core issue to the governments, users and contractors' communities (Alriwaimi and Zainal, 2014). Literature review highlights the construction projects success and some studies focus on the role of contractor in project success. According to (Edmond, 2010), there are so many studies conducted on construction projects rather than building maintenance projects and also there are no

study conducted for identifying the factors that affect the success of building maintenance projects. In case, this gives the chance to conduct this study.

1.2 Health Care Financing and Health Services Situation in Addis Ababa

According to the 6th National Health Accounts (2013/14), health service in Ethiopia is primarily financed from 4 sources: the federal and regional governments; grants and loans from bilateral and multilateral donors; non-governmental organizations and private contributions. The total health expenditure per capita has increased from \$4.5 per capita in 1995/1966 to 20.77 in 2010/11 and \$28.65 per capita in 2013/14. The share of total health expenditure coming from domestic sources has increased from 50 percent in 2010/11 to 64 percent in 2013/14. Although health financing has improved significantly over the years, it remains a major challenge for the health system of Ethiopia. Since HSDP III, a health care financing strategy was adopted by FMOH, mainly focusing on improving the efficiency of allocation and utilization of public sector health resources. It has also dealt with mobilizing additional resources from international donors and health development partners, retention and utilization of user fee revenues at health facility level, introducing private wings in the public hospitals and, perhaps most importantly, the initiation and development of risk sharing mechanisms such as public and community-based health insurance schemes. The objectives of the health care financing component of HSDP are aimed at achieving a sustainable health care financing system. More specifically, the objectives call for mobilization of increased resources to the health sector, promoting efficient allocation, effective expenditure management for allocating equity, and better utilization of available health resources.

Over the course of the HSDPs, various background studies on health care financing issues have contributed to the design and introduction of health financing reforms. Since the first HSDP, there have been four National Health Accounts (NHA) studies conducted. A Proclamation on Health Service Delivery, Administration and Management, including regulations on all the five

Components of the reform was drafted and endorsed. The reform components include: retention and utilization of revenue, administration of the fee waiver system and

establishment of functioning facility governance bodies. Other parts of the reforms have included outsourcing of non-clinical services, establishing private wings in health facilities and the exemption of certain services.

Based on Addis Ababa Socio -Economic Profile (2014) one of the health access indicators is number of health institutions delivering services for the people. Table 1.1 illustrates, the number of health institutions which were operational in Addis Ababa. Until 2014 there were 52 hospitals (40 private and 12 state run), the data shows that the lion share belongs to the private health sector. (Addis Ababa City Administration Finance and Economic Development, 2014)

Table 1. 1 Number of Health Facilities in Addis Ababa

Ownership Type	Number of Health Facilities
	Hospital
Addis Ababa Health Bureau	5
Ministry of Health	4
Addis Ababa University	1
Ministry of Defense	1
Federal police hospital	1
Total Government	12
Private sector	40
Total	52

Source: Addis Ababa Health Bureau (2013/2014) 2004 E.C Annual Report

Public hospitals in Addis Abeba are not only serve the people of Addis Abeba, but also the people throughout the country of Ethiopia. Those regional infected people have gotten the service when they have cleared refer from the hospital where at the first time to be visited. As the result hospitals are complex and huge in structure and also give multi services. Those hospitals are listed in below with their year of establishment, ownership, number of beds and their health system which is described in table1.2.

Table 1. 2 Public hospital characteristic in Addis Ababa

No	Name of hospitals	Year of establishment	Health system	Beds	Ownership
1	Black Lion Hospital	1968	General	800	Addis Ababa university
2	Menelik II Hospital	1910	General	263	Public
3	Alert Hospital	1922	specialized	240	Public
4	St. Amanuel Hospital	1930	Specialized	261	Public
5	Gandi Memorial Hospital	1962	Specialized	103	Public
6	Yekatit 12 Hospital	1923	General	199	Public
7	Zewditu Memorial Hospital	1970	General	166	Public
8	Ras Desta Hospital	1932	General	103	Public
9	St. Paul's Hospital	1969	General	392	Public
10	St. Peter Hospital	1963	Specialized	200	Public
11	Police Hospital	1963	General	252	Police
12	Armed Forces Hospital	1956	General	612	Defense

Those hospitals described in the above have long time to start and almost all fulfill the facility to give social well-being and promote education of in health staff. They give rehabilitation of save, the process of restoring a person's social identity by repossession of his/her normal roles and functions in society relatively with low income. Due provide for the vast people of the country, maintenance must be the vital activity to restore or save the buildings

1.3 Problem of the Statement

According to (Edmond, 2010), there are so many studies conducted on construction projects rather than building maintenance projects and also there are no study conducted for identifying the factors that affect the success of building maintenance projects.

Even though public buildings are considered a national treasure that should be preserved and maintained, developing countries still continue to neglect maintenance

and usually lower its share in their budgets (Khodier, 2009; Adenuga, 2010). Peter (2007) noted that building maintenance has consistently been a neglected area in the construction industry, attracting only a silent recognition of its importance. Poor building maintenance is one of the critical problems confronting public hospitals in developing Countries. In Ethiopia, buildings are built in accordance with construction standard and under tight supervision. However, the maintenance aspects of the building have continued to remain weak. Maintenance of public hospital buildings is often given minimal attention leading to the deterioration of these infrastructures from time to time.

When building maintenance practices is neglected, defects occur, which results in extensive damage. This has led to poor building performance; poor user satisfaction and service break down which has driven some state properties to a point of virtual collapse while others continue to deface and lose value.

The problem of poor maintenance practices in Addis Ababa has attracted a lot of public debate with no accompanying action The research problem appeared from the necessary need to maintain the old age hospital buildings specially the main hospitals and documented the maintenance practices of public hospital buildings in Addis Ababa.

1.4 Research Objective

The main objective is to assess maintenance management practices of public hospital buildings in Addis Ababa. To achieve this objective, the following specific objectives will accomplish.

1. To assess the condition of the public hospitals' building elements in Addis Ababa.
2. To investigate the nature of maintenance management practices in public hospital buildings.
3. To analyze and rank the significant factors affecting the maintaining public hospital buildings in Addis Ababa.

1.5 Research Question

1. How effective is the current maintenance practices of public hospitals in Addis Ababa?
2. What is the condition and nature of the public hospitals' building elements in Addis Ababa?

3. What are the factors affecting maintenance management practice of public hospital buildings?

1.6 Significance

The study aims at assessing maintenance management practices in public buildings with the goal of exploring how maintenance practices and quality of public buildings can be improved in Addis Ababa public hospitals, by recommending the most efficient maintenance management strategies, and sensitizing maintenance managers and stakeholders on maintenance management practices. In addition, the study will assist the ministry of health and maintenance manager of the public hospital buildings to become aware of the current state of buildings and health of its occupiers, and also to put in place adequate measures to prevent new suffer put into decay which eventually leads to increased cost in restoring them to their original state.

1.7 Scope of the Study

The study intended to assess the Maintenance Management Practices in Public Buildings in Ethiopia. The Case study was 12 public hospital buildings in Addis Ababa because buildings visited by a lot of users and this lead deteriorate the buildings gradually.

1.8 Limitation of the Study

In doing, my research the, COVID-19 has imposed many challenges. Besides this in the respondents in the part of Management and Administrative staffs were not well to fill the questionnaires' and give some information about the selected public hospital buildings. Respondents did not return the paper and did not return on the time lines

1.9 Organization of the Study

This research work has been organized under five chapters. **Chapter one**, covers the general introductory and background of the study. It also includes the problem statement, research questions, and objectives, significance of the study and the scope of the research. The **Second chapter** deals with the review of relevant literature on the 8 subjects. That is to say the ideas of some researchers and authors have been reviewed **Chapter three** focused on the methodology adopted in undertaking the research. The analysis of the data gathered is dealt with in **chapter four**, whilst **chapter five** presents a summary of the key findings, recommendations and conclusion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews in-depth, literature on issues relating to the concept of building and the importance that is attached to the maintenance of buildings. It covers secondary materials related to the conceptual issues as well as definitions and concept maintenance of buildings.

2.2 Building Maintenance and Maintenance Management

In developing country including Ethiopia have an increase in building investment, but it has no longer value without the consideration of maintenance. Since from a general perspective, Narayan (2003), defined maintenance as the preservation or restoration of the desired function of a given process, at the lowest total cost. Alshehri (2016) explained that maintenance is work undertaken to restore every facility to an acceptable standard at an acceptable cost. Geraerds (2000) further described maintenance as a set of activities intended to keep technical systems in check and restore them to the conditions required for them to achieve their intended purpose concerning buildings.

According to European standard CEN (2001) Maintenance is defined as the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it, to a state in which it can perform the required function (function or a combination of functions of an item which are considered necessary to provide a given service).

Mohan (2016), defines maintenance as work performed on an asset to preserve it in as near to its original condition or to keep it in proper working order.

Building Maintenance is a combination of technical and administrative actions contributing to the protection and satisfactory operation of the building (Wahab & Basari, 2013). It includes everything from regular cleaning to repairs and replacements of damaged building components and can be as small as replacing a slightly broken window glass, or as large as re-plastering or re-tiling the entire building. Abdul Lateef (2010) defines building maintenance, as the processes and services carried out to

preserve, repair, protect and care for a building fabric after completion, whereby a building encompasses the totality of the environment and infrastructure which provides human comfort, enhancing occupants' health and productivity. Management is a critical force and it is the force that gets things done to acceptable standards. Maintenance management is responsible for using tools and methods to improve the efficiency and to reduce the effects of unplanned stoppages and to reduce costs (Oliveira et al., 2014). Maintenance management evolved from a stand-alone activity to a multifunctional process and is given a strategic position in many institutions because of its importance in achieving primary goals and a key aspect of effective management of buildings (Adamu & Shakantu, 2016). This is because maintenance ensures that the functional, structural and aesthetic conditions of the built facilities are upheld, helps retain the value of the building, extends the buildings life span, reduces the unnecessary failure of building elements, and makes the property more enjoyable to occupy (Yong & Sulieman, 2015). Hence maintenance management is a preventive management philosophy that needs to be considered as a business function that provides opportunities to retain the quality, life, and value of a facility or asset and improve cost, risk and productivity concern in organizations (Alsyof, 2017).

According to BS 3811: 1964 defines maintenance as 'a combination of any actions carried out to retain an item in, or restore it, to an acceptable condition' (Lee, 1981, p.9). Wood ,2009, p.4) defines maintenance as keeping an item at a certain level or of restoring it that position of acceptability, although it does not identify who it is that determines the acceptability condition.

BS 3811: 1984 define maintenance as 'A combination of any action carried out to return or retain an item into an acceptable condition'. Action that will take is not only to the physical execution of maintenance, but it also concerned with its initiation, financing and organization. The concept of an acceptable condition, which understanding and implies or requirement for the effective usage of the building and its parts which in turn compel broader consideration of building performance.

Government owned hospitals are confronted with unique challenges and overcrowding that threaten their existence and led to deterioration of these facilities. And also, Maintenance works in public hospitals are often complex in nature. Maintenance management of hospital buildings is one of the most complex issues in the field of

maintenance. This is occurred due to the fact that the complex nature of hospital buildings, the delicate mechanical and electrical system and inadequate maintenance budget which could affect the performance and operation of the hospital buildings besides the occurrence of numerous building defects.

The maintenance of hospital buildings is a major issue that every responsible one must give attention, but not giving maintenance management in hospital buildings with high priority has led to the deterioration of these hospitals and to the reduction of the health care services.

The quality of the maintenance manager is another factor found to be affecting the execution of maintenance operations in public buildings (Iyagba 2005). This also has a direct impact on staff performance, productivity, satisfaction and turnover.

The need for maintenance must exist because buildings inevitably deteriorate with time due to effect of various causes. In Ethiopia, maintenance is given very little priority in most public hospitals. A more progressive attitude should be to conserve the existing building stock through proper maintenance because it is a major national asset (Hutton and Lloyd, 1993).

In conclusion, the main objectives of building maintenance are to keep the building in perfect condition and ensure that the condition of the buildings meets all statutory requirements by regularly checking or repairing it when failure occurs so that the building can be continued perform in term of acceptable standard.

2.3 Empirical Review

Ghana

A study from Ghana was designed to assess the current condition of public buildings, identify the underlying principle causes of poor maintenance of public buildings, analyze the maintenance policy and practice and capacity of the maintenance and estate departments of public institutions and make suggestions and recommendations towards the adoption of effective maintenance policy and innovations that would address the building maintenance problem in public institutions. The study has established that housing maintenance is a real problem among public institutions in Ghana, with about 83 percent of all residential buildings of public institutions surveyed having maintenance problems. The maintenance problems the study observed have been influenced by the age of the buildings, lack or absence of a national maintenance policy, inadequate funds and high cost of maintenance, low capacity of maintenance staff,

apathy and lack of patriotism on the part of occupants, pressure on buildings due to the number of users among others. (Cobbinah, 2010).

Palestine

The aim of the research was to study the maintenance performance indicators in order to control the operation of hospital building maintenance in the Gaza Strip which was prepared by Farida Emad El Shorafa (2013). Another objective of this research is to study the operational conditions and factors that carried out and affect the maintenance management and deriving a suitable framework for the minimum requirements. The results showed that major of the maintenance department activities in hospitals buildings is getting better and all the large-scale maintenance projects are corrective maintenance. The study recommended developing a team vision for hospital maintenance department, changing the work style and culture towards maintenance, making certified periodic maintenance checklists, developing and implementing adequate KPIs for the Gaza strip hospital status.

Saudi Arabia

Ikhwan and Burney, (1999) developed research in order to assess the existing maintenance practices in Saudi Arabia; a survey was carried out in twenty hospitals of Jeddah and Taif cities. These hospitals were equally divided between the government and private sectors. On combined basis; the results present an encouraging picture of the maintenance practices. The proportion of maintenance staff is high, the workers are provided training facilities, they have vocational qualifications, the system of working includes both predictive maintenance and breakdown maintenance and is fairly well developed, the facilities are mostly provided, various maintenance reports are prepared, and Maintenance Planning and Control Offices are there in most of the hospitals.

The more serious problems faced are regarding non availability of spares, shortage shortages of technical manpower and lack of funds.

Malaysia

A research examined the process of building maintenance and management in Malaysia with the aim of identifying factors causing poor maintenance in various types of buildings, and delivering a new improved process. The results appeared that maintenance work in Malaysia is described as a service industry. Most buildings face similar problems in terms of breakdowns and other weaknesses that have an effect on the quality of the system. Lighting, HVAC, telecommunications and sanitation need the

most maintenance attention. Scheduling and prevention planning would be good solutions to improve this situation (Zawawi et al, 2010). Another study conducted by Yahya and Ibrahim (2012) aimed to develop a maintenance achievement index (MAI) to benchmark the performance of building maintenance from a number of key performance indicators (KPIs). The findings of study had shown that building maintenance practitioners believe quality, safety, time, cost, functionality, and environmental friendliness can be considered as KPIs for building maintenance activities.

Nigeria

A study was held by Afolarin, (2012) in South-West, Nigeria covered 46 public hospitals representing to examine the labor composition for maintenance works in the public hospital buildings in South-West, Nigeria, and in the process identified if there are any significant differences in the execution of maintenance works using outsourcing and in-house labor. 40% of the total number of existing public hospitals based on stratified random sampling technique. Data collected were analyzed using mean item score, and spear rank correlation coefficient. Findings of the study revealed that the staff strength of the maintenance departments is inadequate and they are not experienced on hospital maintenance management. Majority of the users of public hospital buildings do not have access to any training on effective use of hospital facilities. The skills considered necessary for an effective maintenance manager in executing maintenance operations in public hospitals are also revealed.

The cause of low motivation in executing the desired maintenance programs was also established.

2.4 Maintenance Standard/Implementation

There is no absolute maintenance standard since the need for building maintenance is typical for each building. But the general maintenance standard is needed as a guide for the owner or tenants/users to maintain their building (Wordsworth, 2001), and should be as a function rather than an object. Wordsworth, (2001) described maintenance standard as a balance between need and resource with the provider or controller of the resource usually having the greatest influence over what this balance may be. It is believed that acceptable maintenance standard is dependent on the available maintenance resources; characteristics related to the building, the tenants, the technical officers, the administrative leaders and political heads (ElHaram and Horner, 2002).

The main idea about maintenance standard is basically the request or maintenance work order from the owner to contractor, which area or defect should be repaired or replaced, and this order should be clear as a standard for the contractor to perform the job. The work order should include sufficient details in order to enable the workman to take with him the correct quantity and type of material when making the maintenance work (Milne, 1985). Lee (1987) as mentioned in building maintenance management described maintenance standards as two parts; lower level and upper level. The lower level is the need for maintenance due to increased probability of failure involving not only enhanced repair costs but also consequential losses where the normal user of the building is interfered with, while the upper level of maintenance is set by the cost of achieving it.

Based on the building individual element, Reginald Lee (1987) divided the maintenance standard as three conditions;

- the physical condition of the elements
- times, and
- Financial criteria.

Physical condition has two related terms, the condition of an element that relates to the magnitude of defect that calls for remedial action, and the second term is the performance or the environmental systems. This system is known as condition-controlled maintenance. The system suggests that there is a regular inspection to measure the condition or the performance of elements. The second condition is how often the repairs or replacements are to be made. This method involves frequent inspections and needs a certain knowledge of the rate of decoration. The balance between frequent inspections, risk, and consequences of failure is an important part that should be achieved. The last condition is financial criteria; which can be taken from the variable sum based on the costs of some primary activity or replacement value, or taken from fixed sum based on historic costs or an analysis of anticipated benefit.

From Milne (1985), a bigger percentage of the maintenance standard should be directed onsite. The engineer or the maintenance department has to visit the site, check and determine the condition of the building that should be maintained. The other advantage of the site visits is that it gives more attention and gives direct instruction to their employees or hired contractors to repair.

2.5 Indicators in Measuring Building Maintenance

The condition of building elements can be assessed using several variables. The commonly measured variables include specific housing elements such as roofs, walls, and foundations that decay as a result of poor maintenance, the age of the buildings, and the design (facilities) of the building (Cobbinah 2010). A set of indicators was developed by Cobbinah (2010) to measure/assess the maintenance conditions in public buildings as indicated in table 2.1 below.

Table 2. 1 Indicators of Building Maintenance

Facilities	Indictor of measuring building maintenance
Roofs	Leakage, rusty, partly ripped off, completely ripped off
Windows and Doors	Partly broken down, completely broken down, no problem
Painting	No paint, faded paint, dirty paint, well painted
Floor	Developed cracks, peeled-off, partly broken down, no problem
Walls	Partly broken down, developed cracks, peeled – off, tilted
Foundation	Exposed, hanging, weak
Age of the building	Old (above 50 years) medium-aged (20-50 years) and younger buildings (less than 20 years)
Housing type	Detached, semi-detached, single store, multi-store and terrace
Housing facilities (toilet, water, bathroom, kitchen, electricity)	Good, fairly good and bad

Source: Cobbinah connustruct,2010

2.6 Buildings and Maintenance Strategies

2.6.1 Building Strategy

A building strategy shall determine the applicable required service and performance specifications for each building. This will also include a strategy to ensure protection

of the property value of the building, whenever applicable. The building strategy should be reviewed at specified regular intervals and whenever there is a significant change in the service or performance requirements; this will ensure that the strategy remains current and meaningful.

2.6.2 Maintenance Policy

In accordance with the purposes of the building strategy and with the applicable legal requirements, the maintenance policy shall establish the service level to be provided by the inspection and maintenance services. It shall also define, if possible, with the support of diagnostic tools the objectives, the maintenance strategies and the intervention priorities to be considered when establishing the maintenance plan. An effective maintenance policy shall optimize cost, according to actual financial resources; the policy shall identify maintenance costs and verify their compatibility with expected results and established priorities, in accordance with the building strategy and within the limits of the financial plan. The policy shall consider, whenever possible, obsolescence factors that may influence the services and performance that have to be provided by the building to its users or to other interested parties. The objective and targets shall be presented qualitatively and as far as possible quantitatively, defining quality standards (i.e., the “building quality” to be assured by means of maintenance) and service levels (characteristics and frequency of interventions and methods of providing/executing maintenance).

2.6.3 Maintenance Strategies or Types

Maintenance strategy of a building is composed of the different sub-strategies for the components of the building. Maintenance involves a combination of planned/preventive and reactive tasks necessary to ensure that the system is kept in such a condition that it can perform its function satisfactorily. (BS EN 13306:2010).

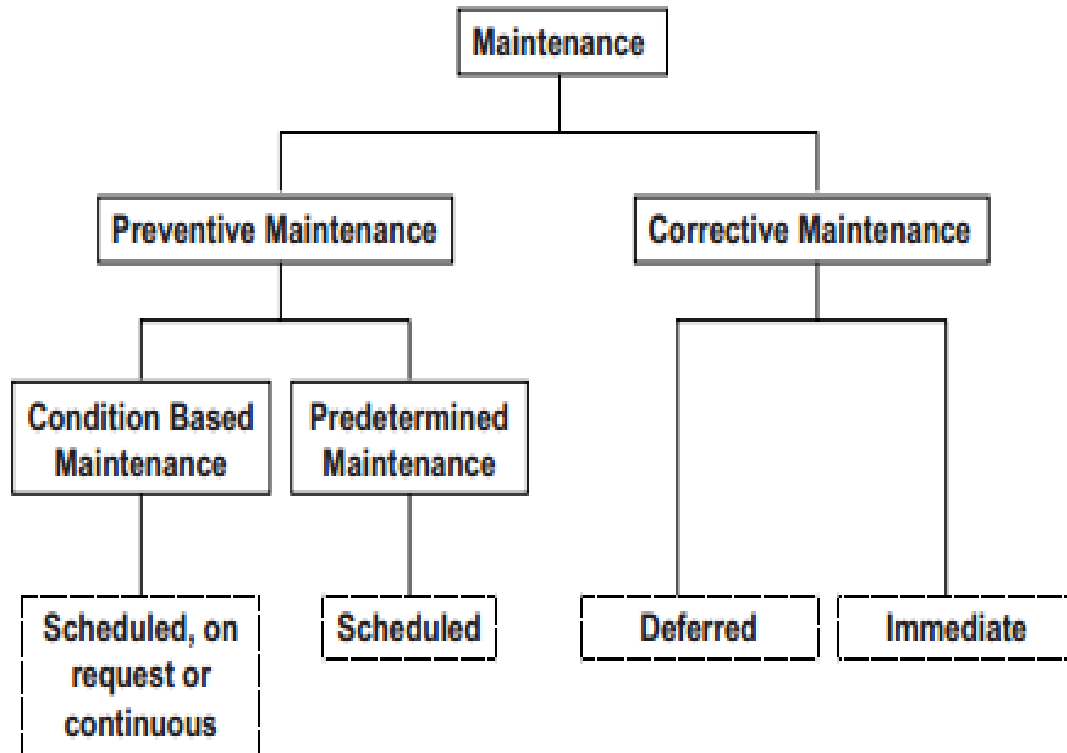


Figure 2.1 Maintenance strategies (source BS EN 13306:2010)

Preventive Maintenance: It is performed with regular schedule of maintenance task such as cleaning, adjustments inspections and others. Preventive maintenance also will reduce the probability of occurrence of failure or defects and avoiding sudden failure and so-called inspection service. This maintenance strategy is referred to as planned maintenance, cyclic maintenance or time-based maintenance, or Preventive maintenance duties are performed in accordance with a predetermined plan at regular, and fixed intervals operating time. Besides of this, the disadvantages of maintenance by corrective can be overcome by preventive maintenance and also has various advantages over the corrective maintenance.

The preventive maintenance tasks are providing several advantages; those are shown as below (Au Wai Hoe, 2008): The equipment will perform more efficiently, Preserve and prolong the life of the building, reduce and avoid the occurrence of failure, save potential energy and prevent energy will go to waste, the preventive maintenance cost is more economical than the corrective maintenance cost.

Predetermined Maintenance: shall be developed for sub-systems and components of the building. The plan shall allow by means of a detailed definition of tasks and resources (manpower, materials, machines) for budget definition and for the

identification of the periods of down state (time during which the service will be unavailable to the user or system).

Condition-based Maintenance: This type is carrying out the maintenance work when the condition of building elements has been changed or deterioration, and the optimal time to execute maintenance works is determined by monitoring the actual state of the system, its performance or other condition parameters. Its concept recognizes that the main reason for carrying out maintenance is due to change in condition or performance of an item, this maintenance tasks is planned by good monitoring to the building's elements, service and equipment before the major failure occur. Long life components or other components that have been identified as critical (e.g., for their functions or their technology) are to be checked periodically in accordance with a pre-established inspection plan; subsequent interventions will be determined by the condition of the item revealed by the inspection activity.

Scheduled Maintenance: This is a type of preventive maintenance that takes place at a predetermined interval of time, number of operation and mileage (Cobbinah, 2010). Scheduled building maintenance is considered to be the simplest, and cost-effective way to protect the building (Broad Services, 2014). It is a post-construction activity that is required to be attended to for the upkeep of the building to resist its early decay and severe damage to it, and saving it from becoming non-functional; It involves items of work which need to be accomplished daily, weekly and periodically. This is also a type of preventive maintenance that occurs at predetermined intervals of time, number of operations, etc.

The difference between predictive maintenance and condition-based maintenance lies in measurement and timing. CBM uses real-time performance data to point out a problem after begins to fail. On the other hand, PdM takes all information into account (past, present, and future) and offers an ideal time for maintenance before any failure, however small, occurs.

Corrective Maintenance: Corrective maintenance performs, where a building element is used until it cannot perform or breaks down or after failure occurred. It is known as repair and covers all activities, including replacement, repair and renew of a building element that has failed to a point at which it cannot perform its required function or cannot carry out the services. This maintenance strategy is carried out the work after a failure or defects has occurred and intended to restore an item to an acceptable state to

perform its required function. Corrective maintenance tasks often take place in response to breakdown or user request.

A corrective maintenance strategy shall only be adopted when it is not feasible - for economical or technical reasons - to adopt preventive measures and when the degraded state (i.e., the state in which the ability to provide the required function is reduced, but within defined limits of acceptability (EN 13306) is acceptable, involving components that are not part of critical or safety systems. Corrective maintenance normally refers to unexpected malfunctions. Nik Elyna (2010) mentions that the corrective maintenance is the most maintenance managers depend on to perform daily maintenance tasks.

Deferred corrective maintenance: corrective maintenance which is not immediately carried out after a fault detection but is delayed in accordance with given rules.

Emergency/ immediate Maintenance: The maintenance which it is necessary to put in practice immediately to avoid serious consequences. Emergency interventions and those related to malfunctions cannot be scheduled. However, based on feedback information, this strategy can provide data for service logistics (signal and alarm systems, warehouse, and technical resource management).

2.6.4 Maintenance Support and Tools

According to BS EN 13306:2010, maintenance support is provision of resources, services and management necessary to carry out maintenance. The provision may include, for example, personnel, test equipment, workrooms, spare parts, documentation, tools, etc.

Line of maintenance: In an organization where specified levels of maintenance are to be carried out on an item. line of maintenance is: field (first line maintenance), workshop (second line maintenance) and manufacturer (third line maintenance). The lines of maintenance are characterized by the skill required of the personnel, the facilities available, the location, the complexity of the maintenance task, etc.

Failure analysis: logical and systematic examination of item failure modes and causes before or after a failure to identify the consequences of failure as well as the probability of its occurrence. Failure analysis is generally performed to improve dependability.

Item register: record of individually identified items and also additional information such as location may also be stored on the item register. The level of individual items to be registered should be specified.

Maintenance record: part of maintenance documentation which contains the history of all maintenance related data for an item. The history may contain records of all failures, faults, costs, item availability, up time and any other relevant data.

2.6.5 The Importance of Building Maintenance

Most people are unlikely to carry out maintenance work and they have neglected the importance of maintenance work. There are many good reasons for carry out the maintenance work.

- a. Maintenance can be preserving our building, prolong the building's life, reducing the deterioration process of the building, provide a safe environment and maintaining building's appearance.
- b. In the economic sense, maintenance can reduce the major repair projects. Under some circumstances, repairs work can be costly than maintenance work in terms of finances. Thus, it is better to carry out the maintenance work than extending the period of repairs work. For an example, the routine cleaning of the gutter and drains is cheaper and less convenient than having to cope with a serious outbreak of dry rot in timber roof trusses which is neglect for many years.
- c. The appropriate routine management and maintenance will minimize the need for larger repairs or it is the most economical way of sustaining an asset (Beehive, 2010).
- d. Maintenance will also ensure the safety of the building or to person (Jeff, 2008). For instance, maintenance of building fire safety installations. Fire safety installations must be capable performing in standard level to ensure the safety of the building and building users or occupants. Fire safety installations are including fire extinguisher, fire doors, fire hydrants, fire hose reels, emergency lighting and smoke detectors (Queensland Government).
- e. In addition, maintenance also can provide opportunities for employment. Some of the maintenance works are required repair specialist or maintenance professionals to carry out the maintenance or repair works. For example,

- f. cleaning high-level gutters may require specially trained personnel or equipment to carry out the work or some of the maintenance or repair work need a lot of repair specialist to carry out the work therefore it provides an opportunity to earn a living (Beehive, 2010).

2.6.6 Maintenance Management in Hospital Building

Hospitals are a vital component of the healthcare system (McKee & Healy, 2002). According to Nous Hospital Consultants (2002), a hospital is not a mere building, but a complex social institution that handles the dynamics of life and death situations during the process of rendering health care. Furthermore, a mistake in a hospital building management can cost the lives of many human beings at a time. These characteristics represent unique operating conditions and a bottom-line that involves much greater stakes than the profit-only vision of most business ventures. There is need to evaluate the existing maintenance management practices of public hospital facilities in order to improve their standard for effective health care delivery.

There are various factors that affect the performance of hospital such as actual occupancy relative to planned occupancy, age of the building, building surrounding, managerial resources invested and labor sources for implementing maintenance work either in-house or outsourced. Sometimes, what makes any organization fail is bad planning by the management.

According to Shohet, (2003), the performance of hospital buildings and their components depends to a large degree on continuous and planned periodical maintenance. Carlton, (2004) described the existing arrangement for building maintenance especially in public hospital buildings as the type that could no longer stand the test of time. Historically, in both public and the private sectors, maintenance is seen as an avoidable task which is perceived as adding little to the quality of the working environment, and expending scarce resources which could be better utilized (Higher Education Backlog Maintenance Review, 1998).

Building, management, and repairs of healthcare facilities are very complex and entail specialized consultations. Therefore, because they can be easily damaged, the design, construction and especially finishes selected must be functional, durable, and economical to maintain (Milner and Narayan 2005). Kessler (2011) stated a pleasant and clean healthcare environment has a positive impact on patient satisfaction and the

apparent healthcare quality experience. It furthermore increases staff performance and job satisfaction, and makes hospitals more patient friendly (Stankos and Schwarz, 2007).

Hospital buildings are places where care and cure should be available to the public but due to lack of maintenance, public hospital buildings have become a place where people working in the built environment and patients have allergic – like reactions to unspecified stimuli, reactions like dizziness, nausea, irritation of mucous membrane, eye and/or nasopharyngeal irritation and sensitivity to bad odor from human waste, poor toilet facilities, insufficient cleaning methods (Iyagba, 2005).

2.6.7 Public Hospital Building Maintenance in Addis Ababa

Federal Ministry of Health (FMOH) in Ethiopia is considered the main provider of health services (primary and secondary health care). FMOH believes that Ethiopian people deserve the best health services and its sustainability in all health facilities which can be achieved through

improving the quality of the medical staff, maintaining the health facilities buildings in good status and expanding the capacity of health facilities.

In Addis Abeba out of twelve public hospitals the Federal Ministry of Health (FMOH) administers four, two are under the Army and Police, five are under the city government of the Addis Ababa health bureau and one is under the Addis Ababa University. The maintenance and rehabilitation of those public hospitals will be executed by the mentioned responsible offices.

Currently, in Black lion hospital the right wing of the hospital is under major maintenance and additional expansion and design changes are under progress. In Alert Hospital, separate waiting area building for the existing out-patient diagnosis block was constructed and maintenance work for the training center building within the hospital was performed. Because hospitals cannot suspend all medical practices or reject patients, the reconstruction of hospital building must coincide with its normal hospital hours. (Ching et al, 2011). In hospital a lot of hospital entities indoor and outdoor components need maintenance, and the nature of maintenance work according to Stierlin (as cited in Mydin, 2015) and British Standards Institution, 1993 (as cited in Ogunmakinde et al., 2013), nature of maintenance work is classified as follows:

Servicing: it is cleaning process carried out at regular intervals and it is sometimes called day-to-day maintenance. Such as: washing windows monthly, sweeping floor swept daily and polishing weekly, and painting for protection and decoration

Rectification: it usually arises early in the life of the building and occurs from natural mistakes or unsuitability of elements, damage of supplies in installation or shipment, and incorrect assembly. Thus, the performance of the building is affected. It helps guaranteeing that materials and elements fit for their use. Besides, it helps reducing the cost of maintenance, since it is avoidable.

Replacement: If the building is not operating as it is supposed to, the construction material should be replaced. Nearly all of replacement work is executed not so much from the failure of the elements as from deterioration of appearance. It is very difficult to decide the length of life of materials. Replacement can be reduced by using materials of high quality.

Renovations or Modernization: It means restoring a structure, equipment, or a service by a major overhaul to its initial specification and design, to enhance the initial design, or to make it possible to the facility to carry out some new functions.

It is therefore seen that all types of maintenance explained above are dependent on and restricted by situation and factors. One of the factors is cost. It was noted by past researchers that maintenance costs can be minimized by adopting well-known maintenance management practices (Simoes, Gomes, & Yasin, 2011).

2.6.8 The Effectiveness of Maintenance Management of Public Hospital Buildings

In order to identify the effectiveness of maintenance management factors, key performance indicator is the best strategy to measure the performances of the building is fundamental principle in maintenance management. In this study, the building is referring to public hospital. As study routine monitoring and supervision is one of the key elements to assess and identify the performance of organization in implementing plans, policies and procedures of maintenance management that relates to maintenance management. Besides that, routine monitoring and supervision need to be supported by task planning and working schedule. However, task planning and scheduling need to be provided and managed by first line maintenance foreman or supervisor. The lack of

planning and scheduling will definitely restrict a maintenance operation to meet its objective in delivering the optimum service as planned by the organization.

The practice of maintenance approach is recognized as a factor that highly affects the maintenance performance. For instance, mentioned that the reactive maintenance approach does not tackle the problem at the root level and always lead to repetitive failures.

The distinction result between reactive and preventive planned maintenance (PPM) approach where the maintenance work planning program for preventive planned maintenance (PPM) approach drastically reduces errors in day-to-day operations, as well as increase the overall preparedness of plants in the case of an emergency. Policy deployment and organization is another recognized factor that influences the maintenance management effectiveness. As the maintenance organization should consider this factor as one of organizational business strategy in order to improve the overall performance. Nevertheless, the organization also needs to have an appropriate human resource and effective human resource management to run the business efficiently as well to ensure the optimum performance. Furthermore, pointed out that human resource management program is one of the successful factors of maintenance management as the organization must acquire the right person to manage, plan, supervise and execute the maintenance works.

2.7 Factors Affecting Maintenance Management in Hospital Building

Maintainability is however more manifested in healthcare physical maintenance with the quality service focusing on the hospital developing pleasant environs (Brady and Cronin,2001; and Kang and Jeffrey, 2004), well arranged bed-layout, upholding washrooms, well-equipped rooms, and toilets hygiene and locating dustbins in corridors to increase patient satisfaction (Chahal and Mehta, 2013). Atinga *et al.* (2011) acknowledged that maintaining good service quality of a healthcare facility produces an exceptional prospect to meet or surpass patient expectations; increases patients' mood and morale as well as that of healthcare providers; and increases the value of other functions performed by the hospital and customer satisfaction.

Factors influencing of maintenance management of public hospital buildings in Nigeria were studied by Adenuga et al. (2007). According to analysis targeted maintenance officers and some randomly users the results revealed that the most significant factors

affecting maintenance management were attitude of users and misuse of facilities, lack of discernible maintenance culture, inadequate training, and reluctance of some establishment to support innovations.

Abdul Razak and Jaafar (2012) focused on incapability designers at the design phase had the direct impact on the maintenance of hospital that created faulty hospital design. They concluded that inadequate knowledge of the designers through the design phase arises during maintenance due to them to be considered the factors affecting maintenance. They proposed some solutions to this problem such as: using experts with the required knowledge in the design phase, selecting the appropriate materials and finishes, and using the best construction method in order to improve the hospital life cycle.

Factors affecting maintenance cost of private and public hospitals' facilities in Saudi Arabia were targeted the project managers and facilities managers. They categorized the factors into seven groups; factors pertaining: to the statutory requirements, to the design phase, to the construction phase, to the management of the maintenance department, to the budgetary estimates for maintenance activities, to the operations conducted by the maintenance group, and to the community perception about the maintenance industry. Their results showed that transfer of problems from the construction phase to the maintenance phase for resolution, lack of coordination between the construction and maintenance group, and lack of quality control measures during the installation of systems were the maximum significant factors affecting maintenance cost in public hospitals. Besides, duration of the maintenance contract, the method of classifying maintenance contractors, errors conducted during the design of the project, and lack of feedback from the maintenance group to the design team were the most significant factors affecting maintenance cost in private hospitals.

2.8 Conceptual Framework

According to Rydell (1970), operating expense and maintenance are one of the major constituents of factors affecting maintenance management. Nowadays, an issue about the public hospital buildings' maintenance management is often discussed due to the continuous increase in building deterioration and maintenance cost. In order to reduce the maintenance failure, building managers or maintenance manager should adapt some strategies by minimizing the number of maintenance tasks. Based on the literature to be reviewed, this study was adopting the factors of affecting maintenance management

and a framework was developed to accomplish the resolution of this study were examining the influence of the selected number of factors on maintenance management practice performance in hospitals buildings, which were valid in Saudi Arabia, Nigeria, Malaysia, and Ghana. As shown in the framework below, the dependent variable is maintenance management performance, and the independent variables are factors affecting maintenance.

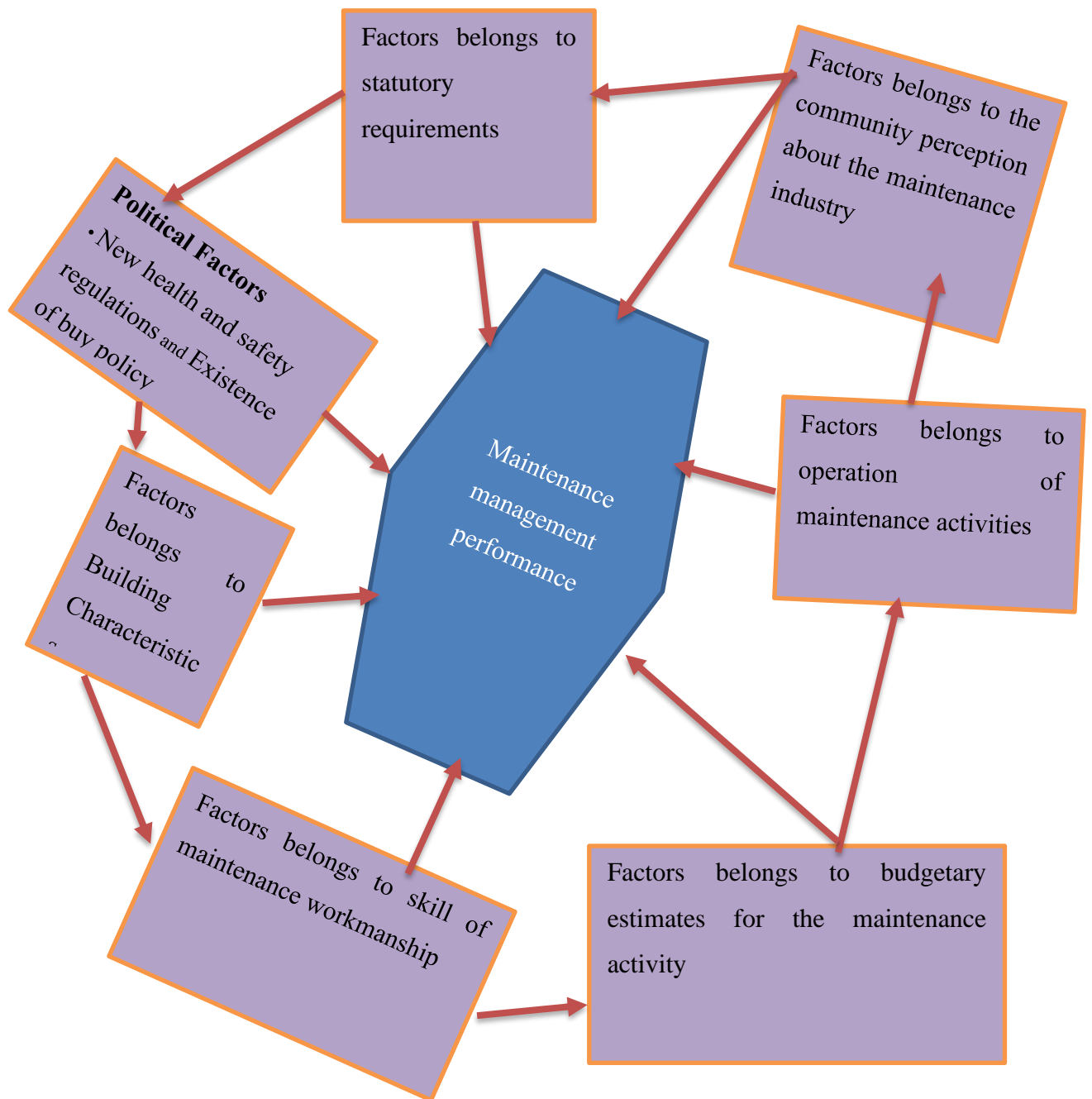


Figure 2.2 Frame work

2.9 Knowledge Gap

Any healthcare organization needs a maintenance program in order to manage all facilities according to Alzaben (2015), it also needs to carry out maintenance at regular intervals to ensure the safety of users and patients and to make sure that the building is operating within specifications. When the age of a building increases, some maintenance works such as painting work, replacement of new roof tiles and other works are required to ensure the sustainability of building. Maintenance management practices were not examined to be selected the best types of practices for sustainability of the buildings and maintainability of the service provided by the hospitals and also there are factors affecting building maintenance and maintenance performance, but such studying findings have not been carried out and documented in public hospital building in Addis Abeba.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Research Methodology is the guidelines in which a researcher approaches and performs the research activities. It provides the researcher with the principles for organizing, planning, designing and conducting good research (Legesse, 2014).

This chapter, therefore, describes and justifies the methods and processes that were used to carry out research activities in this study. It covers the research design, target population, sampling techniques, sample size, sources of data, research instruments, and data presentation, analysis, and interpretation.

To achieve the purpose of the study, a review of literature on identifying the maintenance management practice of public hospital buildings was conducted. This involved identification evaluation of maintenance policy and procedure in public hospital building in Addis Abeba.

3.2 Research Design

According to Akhtar (2016), a research design is a plan of the proposed research work that holds all the elements in a research project together and is a conceptual framework within which research is conducted.

For this particular study, the researcher used descriptive research in the study because it gives an opinion, attitude or behavior held by a group of people on the subject matter, which best responds to the purpose of the study.

Both primary and secondary data was collected, where primary data includes responses of the participants, while secondary data includes a review of literature from related researches, journals, thesis report and articles. Qualitative and Quantitative research design methods were used to achieve accurate, reflective and dependable data backed by detailed logic. The qualitative research design was used to collect data because it is appropriate for gathering descriptive information and describes an existing situation or the current status of an object, whereas, questionnaires under quantitative research design was used to interpret and back up the qualitative data collected.

3.3 Research Population

A research population can be defined as the totality of a well-defined collection of individuals or objects that have a common binding characteristics or traits (Polit and Hungler, 1993). Burns *et al.*, 1993 added that a population is defined as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study.

The target population for this study involves 12 public hospitals in Addis Abba which are included under different administration category. Those hospitals which are specifying in below in the table 3.1.

The Federal Ministry of Health (FMOH) administers four, two are under the Army and Police, five are under the city government of the Addis Ababa health bureau and one is under the Addis Ababa University.

Table 3. 1 Public hospitals with maintenance location and their idea generating administrative

No	Maintenance location	Administrative
1	Ministry of Health	Alert, St. Amanuel, St. Paul's and St. Peter Hospitals
2	Addis Ababa University	Black lion hospital
3	Addis Ababa Health Bureau	Gandi Memorial, Menelik II, Yekatit 12, and Zewditu Memorial Hospitals, Ras Desta Hospital
4	Ministry of Defense	Armed Forces Hospital
5	Federal Police	Police Hospital

3.4 Sampling Techniques

purposive sampling was utilized in attaining the sample size because of the difficulties encountered in assessing the population size of the class. Purposive sampling refers to strategies in which the researcher exercises his or her judgment about who will provide the best perspective on the phenomenon of interest, and then intentionally invites those specific perspectives into the study.

It involved the selection of respondents based on assumptions regarding knowledge on building maintenance because the researcher was targeting a team that has technical knowledge in the area of maintenance.

3.5 Sample Size

In order to get adequate information and to reach a realistic and effective conclusion, the sample size for the structured questionnaire (quantitative data) was determined using subjective method that was covenant to the study.

Sample size has determined by enough sampling size was taken to get deceive and reasonable information, therefore the sample size was taken from the 12 public hospitals 40 maintenances staff,60 medical staff, 15 from patients and 35 from administrative and management staff.

As the result, the questionnaires were developed in English and 150 questionnaires were sent out to the eleven public hospitals. The sample size and the response rate are shown in below table

Table 3. 2 Number of respondents' response rate

Category	Sample size	Number returned	Response rate
Maintenance staffs	40	33	82.5%
Administrative and Management staffs	35	25	71.4%
Medical staffs	60	38	63.3%
Patients	15	14	93%
Total	150	110	77.55%

3.6 Source of Data

In order to get sufficient and relevant information about the study, both primary and secondary data were used. Primary data was obtained from maintenance staff, hospital staff and patients Whereas, secondary data was gathered from organizational textbooks, journal articles, thesis reports, presentations and research publications.

3.7 Method of Data Collection

The two methods were used to collect data. For the primary data collection purpose, the researcher used questionnaire, observation and structured interview method. The questionnaire was distributed to maintenance staff, hospital staff and patients. And for secondary data was gathered from textbooks, journal articles, thesis reports,

presentations and research publications on maintenance management practices in public hospital buildings.

3.8 Data Analysis Method

Data analysis is the process of evaluating data using analytical and statistical tools to discover useful information and aid in decision making (Sridhar, 2018). Data analysis for this study was done using both qualitative and quantitative analytical techniques. Quantitative data collected through the use of questionnaires was analyzed using statistical tools such as descriptive method, mean and ranking via statistical package for social sciences (SPSS); where the scores assigned to each factor by the respondents was entered and consequently, the responses from the questionnaires subjected to statistical analysis for further insight.

The conclusion was then drawn regarding the situation of the building elements, the nature of maintenance management practices in public buildings, the factors that affect effective maintenance management in public buildings; and suggestions for improving maintenance management in public buildings were put forward in line with the reported experiences and proposals of the building occupants.

CHAPTER FOUR

DATA PERSENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the findings, analysis, and discussions of the data collected. The research was conducted through physical inspection of the buildings, questionnaires distribution to staff public hospital staff and interviews of maintenance officers. Data presentation and analysis were based on the following research objectives: the present state and condition of public buildings; the nature of maintenance management practices in public institutions; the factors affecting maintenance management of public hospital buildings; and recommendations towards improvement of maintenance management in public buildings.

4.2 Results and Discussions

The findings of the study in relation to each of the specific objectives are discussed below in relation to each objective were compared with the literature review. The findings of the study:

4.2.1 General Information of Public Hospital Building

4.2.1.1 Age of Hospitals

As shown below, the age of the hospital with maximum 111 and the minimum 53 years of old, 50 % of the selected public hospitals are in between 50-60 years, 17% in between 61-90 years and 33% in between 91-120 years old. The study was performed in the first building of that operated from the starting of the establishment. According to the survey studied alert hospital, Yekatit 12 hospital, and Black Lion Hospital have carried out expansions to eradicate the shortcoming of beds and poor-quality services.

Table 4. 1 Age of Hospitals

Hospital name	Age
Black Lion Hospital	53
Menelik II Hospital	111
Alert Hospital	99
St. Amanuel Hospital	91
Gandi Memorial Hospital	52
Yekatit 12 Hospital	98
Zewditu Memorial Hospital	51
Ras Desta Hospital	89
St. Paul's Hospital	52
St. Peter Hospital	58
Police Hospital	58
Armed Forces Hospital	65

4.2.1.2 Maintenance Staff by Year of Experience

According to Velloso Neto (2006), the maintenance management of building faces a market

deficient knowledge about how to deal with the problems commonly found in buildings and year of experience is one of key performance indicator of maintenance practice (Shohet,2002). Adenuga, (2007) research in public hospital environment of Lagos, the maintenance departments in the public hospitals have the number of employees ranging between 10 and 20 years of experiences. In contrast, Ethiopia, Addis Abeba public hospitals which have underestimate maintenance year of experience. From interviewed, the only maintenance staff, Ato Melaku in Yekatit 12 hospital has 30 years' maintenance experience and he is the chief maintenance officer.

Table 4. 2 Maintenance staff years of experience

N ^o	Maintenance staff	Year of experience	Percentage
1	15	1-5	45%
2	9	6-10	27%
3	4	11-15	12%
4	3	16-20	9%
5	1	21-25	3%
6	1	26-30	3%
Total	33		

Alert hospital has the greatest number of maintenance staffs with qualified or not more qualified with different category of maintenance skill such as carpentry, metalwork, plumbing, electrical works. The other hospitals have in between 2- 15 number of maintenance staff. Maintenance year of experience also described ion below figure 4.1

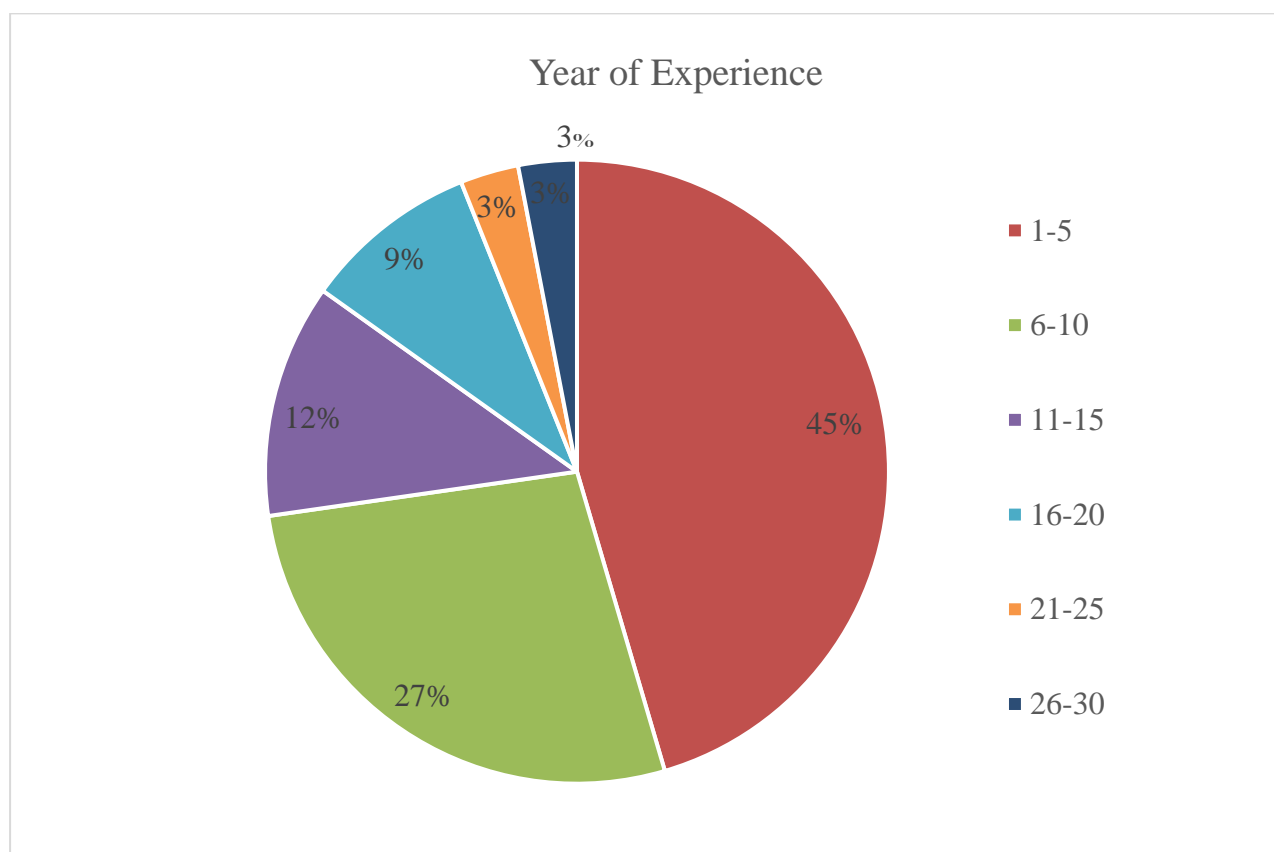


Figure 4. 1 Maintenance employees with experience

1.9.1.1 Maintenance Types of Selected Public Hospitals

Comparing the study by Kanyesigye. (2017), Preventive maintenance is the practice of regularly repairing building components on a pre-determined schedule so that they do

not develop disastrous failures and perform better over their useful lifecycle. The goal of a preventive maintenance program is to establish consistent practices designed to improve the performance and safety of the building components.

As I reviewed respondents' answer, all maintenance practices have been shown in public hospitals, but majority of maintenance practices is unplanned maintenance (corrective and immediate) this leads problems on saving of the people and poor quality of service.

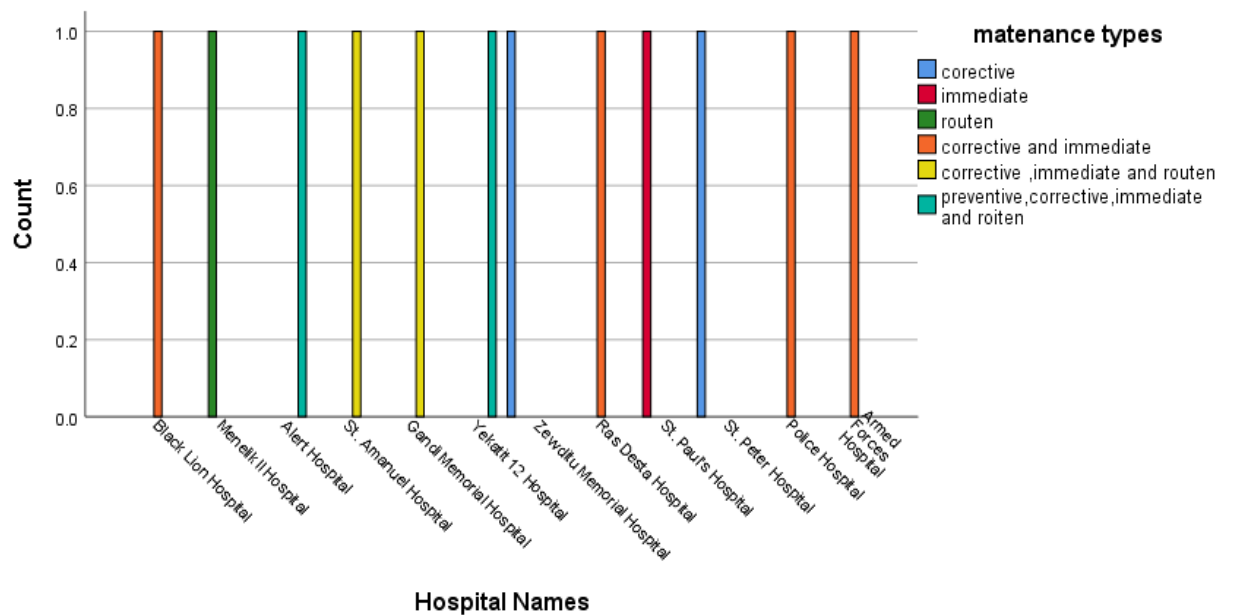


Figure 4. 2 Maintenance types of public hospitals

As shown in the figure 4.2, Alert and Yekatit 12 hospitals are practiced all types of maintenance types such as preventive, corrective, immediate and routine. Menelik hospital exercise routine types of maintenance and four types of hospitals have been used corrective and immediate type of maintenance to preserve the assets and performance of the hospitals

4.2.1.3 Maintenance Inspection

A maintenance inspection is the process of evaluation the condition of equipment or machines. The purpose of a maintenance inspection is to determine what tools, materials, and labor are needed to keep them in good working condition. Resulting from the figure 4.3 in below, maintenance inspection of public building hospitals is inspected

the average value below 50%, the really difficult to sustain the function of it in the safe way.

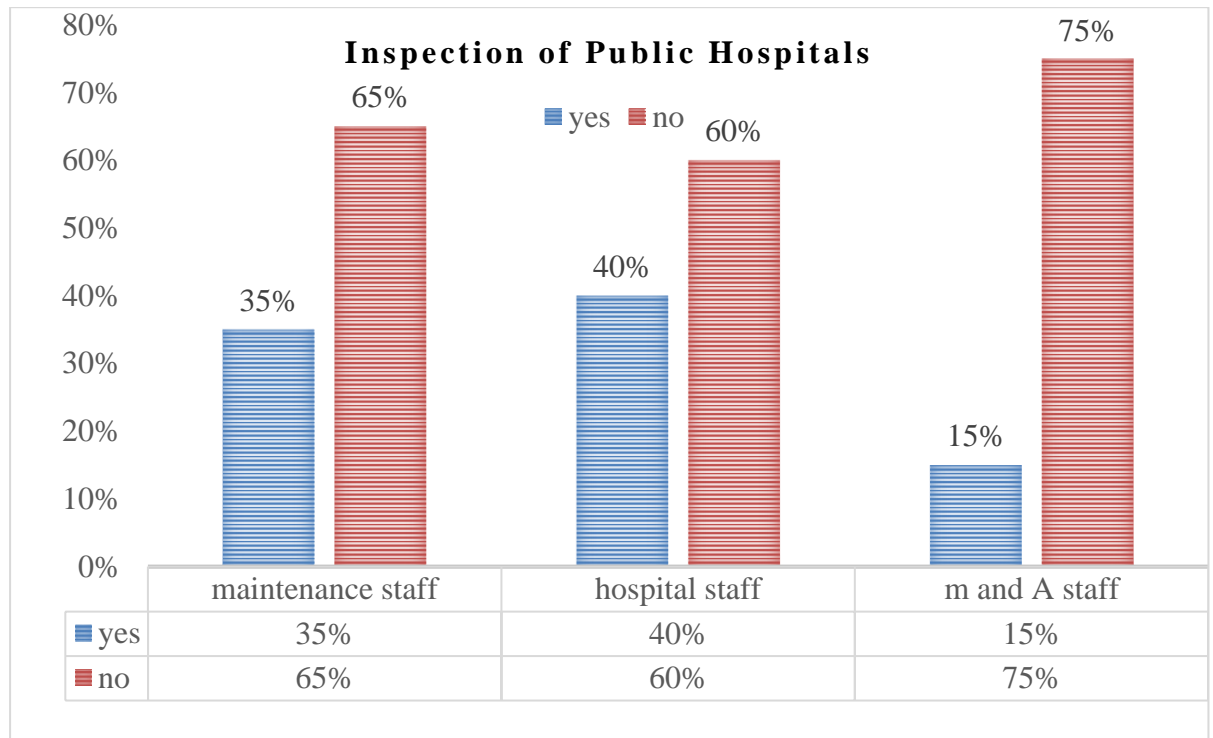


Figure 4. 3 Maintenance inspection of public hospitals with regular time
 Since, inspection of hospitals is carried out monthly, annually, quarterly and bi-
 manually, the response rate of from the respective value of the respondents are
 described in below the table. Under yes category the maximum 75%of inspection
 accomplished monthly.

Table 4. 3 Frequency of inspection

Time period	Frequency of inspection
bi-annually	0%
annually	10%
Quarterly	15%
Monthly	75%

Check walls, ceilings, and floors for damage, leaks, or other deterioration. Be sure to
 remove hazards and ensure proper operation of doors and locks. Check paint, walls,
 windows, and doors for damage regularly as well as any foliage that may damage the
 walls or foundation. Inspect the roof, drains, and gutters. Inspect sidewalks, driveways,
 and railings for hazards and damage. The overall public hospitals are inspected with
 75% monthly, 25% quarterly and 10% annually.

4.2.1.4 Response Period of Maintenance Request

The response timelines for maintenance request as shown in the table 4.4. the response rate of maintenance staff, hospital staff, management and administrative are 72%,5.3%and 5 % respectively responded with in 1 to 4 days. The time taken weekly and monthly have resulted great malfunction of buildings.

Table 4. 4 Response period of maintenance request

Response time period	Maintenance staff	Hospital staff	M and A staff
1-4 days	72%	5.30%	5.00%
Week	12%	15.70%	20.00%
Month	16%	26.3	25%
more than month	0%	52.6% 1	50%

4.2.1.5 Competency/Perception of Maintenance Staff

The competency of maintenance staff is shown in below in the table 4.5, maintenance staffs have varied in their experience from the view of themselves and other staff responded. So, the capability of them from the table shown 35% of maintenance have strong perception ,12 very strong ,19 poor and 9 are very poor.

Table 4. 5 Maintenance staff perception about maintenance

		Maintenance staff	Hospital staff	M and A staff	Total
Perception of maintenance-by-maintenance staff	Very poor	2	5	2	9
	Poor	6	8	5	19
	Strong	14	15	6	35
	Very strong	5	3	4	12
Total		27	31	17	75

Experience of the maintenance staff have also the factors the perception of maintenance-by-maintenance staff. the result is shown also in figure 4.4.

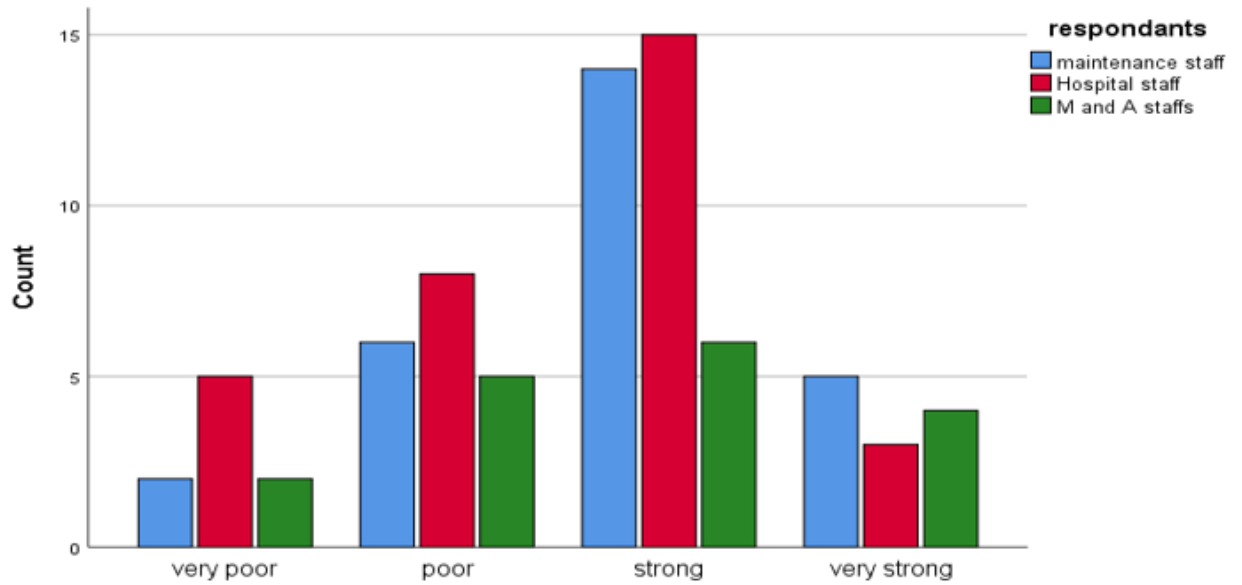


Figure 4. 4 Maintenance staff perception

4.2.1.6 Performance Condition of Public Hospital Buildings

Most hospitals were technically incompetent and operating at suboptimal scale size and indicate that many hospitals may improve their performance through efficient utilization of health resources to provide the current level of health services. Based the respondents' public hospitals' view the performance condition of hospitals enhanced with 75% and stayed with 25% and the result also described in below the fig 4.5.

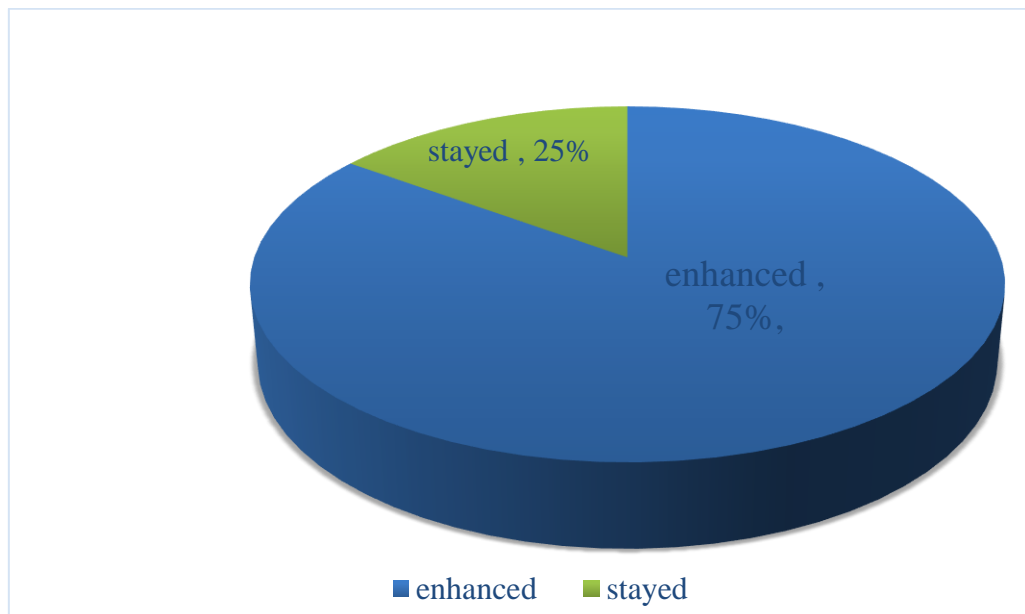


Figure 4. 5 Performance of the building with time

4.2.2 Operational State of Building Elements

Examination of the maintenance condition was done by assessing significant defects in the following main elements: floor finishes, roof covering, walls and wall finishes, ceilings, windows and doors, mechanical and electrical installations, and waste management services

Based on the response in the table 4.6, the structural elements of the buildings that comprises beams, columns, upper floor slabs and stairs are in an average state, but, the response of the respondents' (maintenance, medical, management, administrative and patients), believed some structural element of the buildings is bad. The other building components in the average stat are finishes (wall finishes, floor finishes and ceilings), Services (sanitary appliances, building service equipment, disposal installation, water, ventilation, electrical, gas, lifts, protection installation, drainages, external services), Fittings and furniture and Sanitation of the environment even if they have part of very bad and bad conditions. The examined significant defect described in below with berief way.

Dilapidated floor surfaces: Cracks on floor surfaces and dilapidated splash apron were observed around the buildings.

Dilapidated Ceiling: Dirty and collapsing soft board ceiling, stained ceiling boards due to roof leakages makes the buildings unsuitable for occupation

Defective Electrical Elements: Electrical insulation breakdowns, loose wires, and faulty fittings are among the electrical defects identified. This indicates that inspection, testing, and maintenance of electrical installations is not regularly carried out, yet electricity is a very potentially dangerous system in a building, due to the serious risk of electrocution.

Defective Plumbing and drainage System: Dilapidated plumbing (i.e. blocked water pipes and broken wash hand basins) results in frequent disruption of water supply in the taps and sanitary appliances. Broken sewerage system with signs of leakages were also identified.

Ineffective Waste Disposal Services: This was identified as one of the common maintenance problems in public buildings. Piles of garbage, dilapidated vehicles, and old vehicle tires can be seen in almost all corners of the public hospital building. This

causes environmental pollution, health problems and disaster outbreaks like fire to the building occupants.

Dilapidated Openings (Windows and Doors): Missing and broken glass panes on some of the windows and doors; missing and defective ironmongery - fasteners, stays, bolts, and locks; loss of color on the framing of doors, windows and ventilators; loose and shaky glass panes.

Table 4. 6 Operational State of Building Elements

Elements of building	Frequency respondents' answer				
	Very bad	Bad	Average	Good	Very good
Structural components (beams, columns, upper floor slabs and stairs)	1	4	26	17	3
Walls (external and internal walls)	1	16	14	12	8
Finishes (wall finishes, floor finishes and ceilings)	4	8	17	15	6
Windows and doors (internal and external)	4	10	13	16	7
Roofs	1	15	12	12	11
Services (sanitary appliances, building service equipment, disposal installation, water, ventilation, electrical, gas, lifts, protection installation, drainages, external services)	5	7	14	13	12
Fittings and furniture	4	12	16	14	15
Sanitation of the environment	2	10	13	13	11

The research study, consist of maintenance staff, hospital staff, management and administrative staff and some patients that have given response about the state of building elements. Within all staffs and patients have all responses in shown in the fig 4.6 below

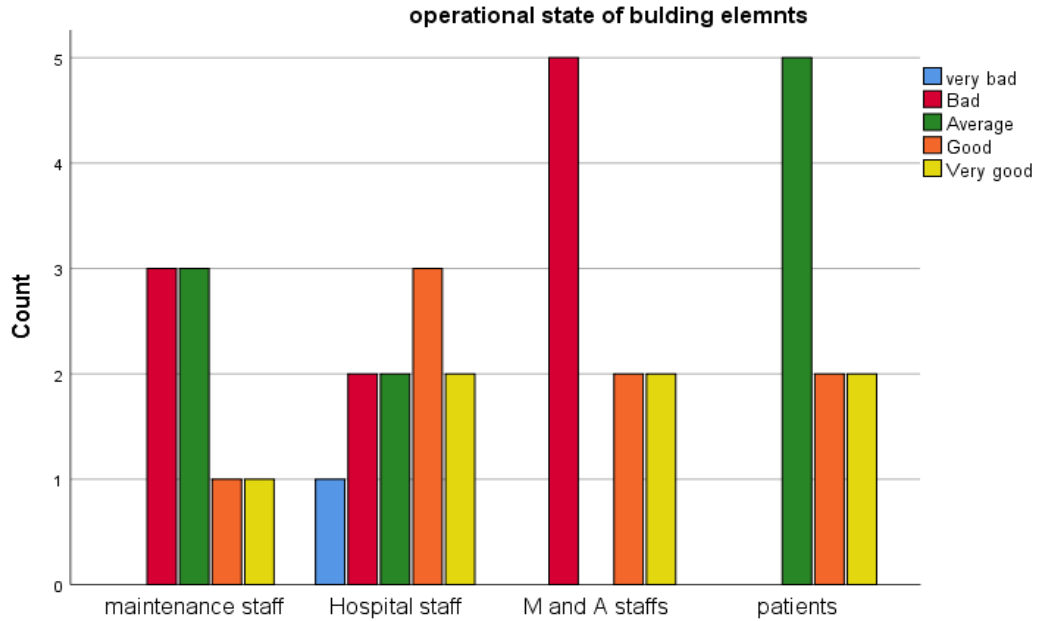


Figure 4. 6 Operational State of Building Elements
 The observation result of the researcher and respondents of the about the main area of the building components that need maintenance described in fig 4.7

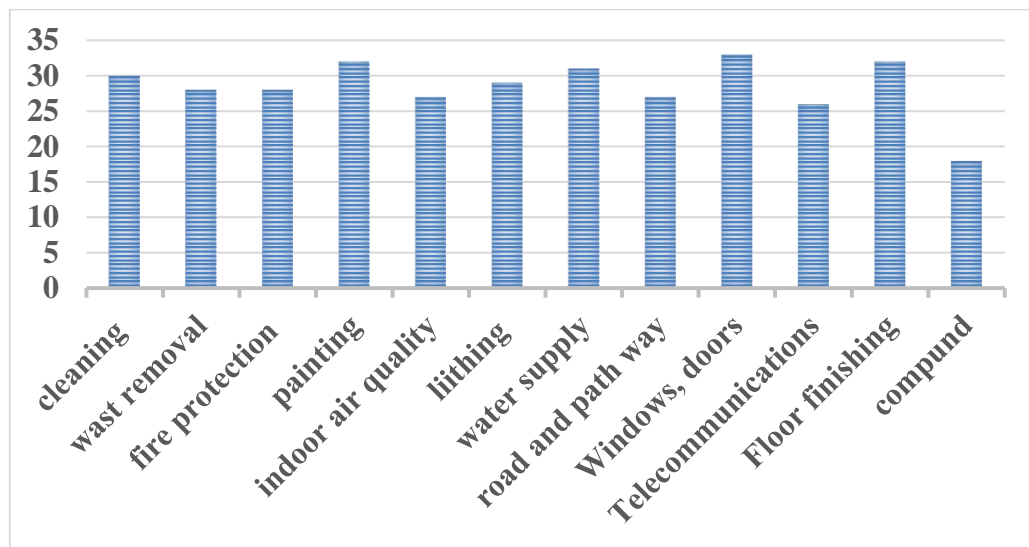


Figure 4. 7 Source of maintenance complaint
 Bin Hashem, (2006) discussed that the main supporting system such as waste disposal, lift system, electrical system, firefighting system, plumbing and sanitary system, cleaning services, choice of materials, sound penetration and telecommunication system that should be working properly without any disturbance and affecting the entire hospital work process. The source of complaint in the Addis Abeba public hospitals are described in the above figure from the most sensitive issue to the least that windows

and doors, painting, water supply, cleaning, lighting, water removal and fire protection etc.

4.2.3 Factors Affecting Maintenance Management Practice in Public Hospital Building

This section of the study assesses the factors responsible for affecting maintenance management of the public hospital building on Addis Abeba Ethiopia.

The study on the assessment of factors affecting maintenance management of Public Hospital Buildings in Lagos State, Nigeria (Adenuga,2012) shows; the maintenance staff and the users both agreed that insufficiency of fund for maintenance programme is a dominant factor for poor maintenance management of public hospital buildings.

Comparing the result in the above, all staffs in Addis Abeba public hospitals were believed that those 11 factors have major cases for poor maintenance practice from the least to the highest contribution. The variables were also ranked with the aid of the mean responses of the respondents. The result is presented in Table 4.7.

Table 4. 7 Factors affecting for poor maintenance management practice

Factors affecting for maintenance management practice	Summary of the response			
	N	Mean	Std. Deviation	Rank
Lack of skilled manpower to maintain work in buildings designed and constructed by expatriates	85	2.5882	1.11584	11
Inefficient inventory system	84	2.6071	1.17215	10
Lack of skilled personnel in maintenance department	83	2.6265	1.10112	9
Lack of structure maintenance policy	80	2.8125	1.09190	8
Poor or lack management system	84	2.8452	1.26581	7
poor maintenance culture	78	2.94	1.188	6
Inadequate moneys/funds to maintain the building	86	2.9419	1.21127	5

Inadequate training and development of personnel	84	3.1429	1.12092	4
Attitude of users and misuse of facilities	87	3.2644	1.41799	3
deterioration due to age and environment	88	3.3977	2.43320	2
Absence of preventive maintenance practice	89	3.4157	1.09554	1

Considering the mean value of the factoring affecting maintenance were absence of preventive maintenance practice, deterioration due to age and environment, inadequate training and development of personnel and inadequate moneys/funds to maintain the building ranked 1st, 2nd, 3rd and 4th respectively. The age of public hospitals in Addis Abeba ,50% are around 5th and 6th decades and others are around century. In most hospitals except Alert and Yekatit 12 hospitals have no preventive maintenance program, sine the deterioration of building and poor performance of buildings have been increased.

The other major factors that are ranked 5th, 6th are attitude of users and misuse of facilities and inadequate training and development of personnel respectively are the major factors that contributed to the poor maintenance practice.

4.2.4 Factors for Good Maintenance Practice

This section of the study assesses the factors responsible for good management practices on the Addis Abeba public hospital building. According to Mallam (2013), asses' factors affecting for good maintenance practice on Ghana Highway Authority and dictates that the major three factors for good maintenance practices on the buildings of the tenants interviewed were planned maintenance programmes, involvement of maintenance experts at the design stage, and maintenance programme by the maintenance department ranked 1st, 2nd and 3rd respectively.

Considering the mean responses of the questioner and interviewed, that includes all 12 public hospitals in Addis Abeba, factors affecting good maintenance practice are described in table 4.4.

Therefore, the major factors affecting good maintenance practice are planned maintenance program, innovate supports services, involvement of maintenance experts at the design stage, Adequate/appropriate maintenance of facility plant and equipment for maintenance operations and Proper maintenance policy are ranked 1st,2nd,3rd,4th, and 5th respectively based on the mean result.

Table 4. 8 Factors affecting good maintenance practice

Factors for good maintenance practice	Response rate			
	N	Mean	Std. Deviation	Rank
Adequate/appropriate maintenance of facility plant and equipment for maintenance operations	77	2.97	1.20	4
Proper maintenance policy	78	2.83	1.13	5
Involvement of maintenance experts at the design stage	78	3.10	1.32	3
Innovate supports services	78	3.40	1.23	2
planned maintenance program	75	3.60	1.26	1

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter comprises summary of findings, conclusion and recommendations.

5.2 Summary of Findings

This study focused on the assessment of maintenance management practices in public buildings in Addis Ababa with objectives of assessing the current condition of the building elements; investigating the nature of maintenance management practices; identifying the factors that affect effective maintenance management; and proposing recommendations towards the improvement of maintenance management in public buildings.

The study revealed that about 50% of the public hospitals in Addis Ababa are in their 5th and 6th decade of service. Regarding the employees of maintenance department's, the average number of employees' ranges between 2 and 15 for each hospital. Yekatit 12 hospital has the 2 maintenance staffs even if there is more experienced staff.

Public hospitals in Addis Abeba practiced corrective and immediate types of maintenance in most, a few hospitals such as Alert, and Yekatit use preventive and routine whereas Menelik hospitals have practiced routine types of maintenance. The rest of hospitals that are experienced corrective and immediate response to the maintenance complain.

Operational state of building elements Structural components (beams, columns, upper floor slabs and stairs), Finishes (wall finishes, floor finishes and ceilings) and Services (sanitary appliances, building service equipment, disposal installation, water, ventilation, drainages, electrical, protection installation, gas, lifts, external services) are in average operational state and Walls (external and internal walls) and roofs are bad operational states.

The research result reveals the major factors affecting poor maintenance practices those are absence of preventive maintenance practice, deterioration due to age and

environment, attitude of users and misuse of facilities, inadequate training and development of personnel and inadequate moneys/funds to maintain the building 1st, 2nd, 3rd, 4th and 5th with diverse effect on maintenance.

planned maintenance program, innovative supportive service and involvement of maintenance expert are factors for good maintenance practice.

5.3 Study Implications and Contributions

This study is useful to researchers, maintenance experts and other members concerned with maintenance in understanding the importance of maintenance management in buildings. It gives useful references and promotes patent change in attitude towards maintenance management of buildings (from corrective maintenance to preventive maintenance). The study is essential in the sense that it does not only contribute to knowledge and theory but also contributes to ways of improving maintenance practices in the public hospital buildings in Addis Abeba where the survey was carried out. It will also have contribution future researchers in the field of maintenance management in identifying literature gaps and direct research efforts appropriately.

5.4 Conclusion

Maintaining building properties is necessary in order to keep the assets, protect the building and offer health service. Despite its significance, the case study results indicate that the maintenance management practices in public hospital buildings are ineffective and inefficient, which has left most of the public buildings in a very poor and unhealthy condition that calls for refurbishment and improvement on the maintenance measures and procedures.

It is evident that maintenance only receives management attention when everything has gone wrong and severe deterioration and failures have occurred. This has left most public buildings in a deplorable state, hence leaving users and the public dissatisfied with the quality of the services rendered by such institutions.

The maintenance staff of Addis Abeba public hospitals has inadequate experience and maintenance types in most hospitals are corrective and immediate this leads to some breakdown of building elements and interruption of service in the hospitals, a few hospitals are followed preventive and routine that have planned maintenance program.

The major operational state of building elements like service lines are in bad situation and in most of public hospitals routine / periodic inspections by the maintenance departments are not well exercised.

Based on the findings, several challenges have been identified as the constraint factor of public hospital building maintenance. The major factors affecting maintenance management practice of that leads poor maintenance is absence of preventive maintenance, deterioration due to age and environment, attitude of users and misuse of facilities, inadequate training and development of personnel, and inadequate moneys/funds to maintain the building, poor maintenance culture, poor or lack management system, lack of structure maintenance policy, lack of skilled personnel in maintenance department, lack of skilled personnel in maintenance department and lack of skilled manpower to maintain work in buildings designed and constructed by expatriates.

5.5 Recommendation

According to the research findings, and conclusions, the following recommendations are needed in order to improve maintenance practice public hospitals in Addis Abeba.

Public Institutions should proactively hold preventive maintenance tasks and look at building maintenance as an essential task that contributes to the success of the institution, and incorporating planned preventive maintenance programs in the annual works programs.

Maintenance staff development program should be incorporated and also the number of maintenance staff increase according to the hospital size.

Public hospital institutions should strongly consider and take into considerations building age and characteristics building element, that some part of building elements is in lines of bad performance condition, those must be inspecting routinely.

In Addis Abeba public hospitals there are a lot factors affecting for poor maintenance, absence of preventive maintenance, deterioration due to age, miss use of customers and son, the institution must be those factors record in the database.

It is envisaged that these recommendations if implemented, will significantly contribute to improving the maintenance management practices in not only public buildings but private buildings as well.

REFERENCE

- Ayman Alshehri, Ibrahim Motawa, & Stephen Ogunlana. (2015). The common problems facing the building maintenance departments. *International Journal of Innovation, Management and Technology*, Vol. 6, No. 3
- MOH (2015). Ethiopian ministry of health development program IV
- Ampofo, J.A. (2020). Constraints factors to maintenance of government senior high school buildings in WA Municipal. *International Journal of Management & Entrepreneurship. Research*,2(3), P.No. 139-160.
<https://www.researchgate.net/publication/342820723>
- Nahdatul Arm Abd Rania, Mohamad Rizal Baharuma, Anis Rosniza Nizam Akbarb, Abdul Hadi Nawawib. 25-27 August 2014 “Perception of Maintenance Management Strategy on Healthcare Facilities” in Asian Conference on Environment-Behaviour Studies Chung-Ang University, Seoul, S. Kore
- Ajetomobi.O, and Olanrewaju.S. (September 2015). Evaluation of the factors affecting housing maintenance and its probable solutions in Nigeria. Vol.1(4): 59-64.www.ijlret.com
- Roslan Talib, A Ghafar Ahmad, Noorzawati Zakaria, Mohd Zailan Sulieman, (2014). Assessment of Factors Affecting Building Maintenance and Defects of Public Buildings in Penang, Malaysia. *Architecture Research* Vol. 4(2): 48-53
- Adenuga, O. A, Odusami, K. T, Faremi, J. O, (2007). Assessment of Factors Affecting Maintenance Management of Public Hospitals in Lagos, State Nigeria
- AbdulLateef, A. O, Mohd, F. K and Arazi, (2011). Validation of Building Maintenance Performance Model for Malaysian Universities. *International Journal of Educational and Pedagogical Sciences*, Vol.5, No.8

- UKEssays. (November 2018). Building Maintenance literature review. Retrieved from <https://www.ukessays.com/essays/construction/a-study-on-building-maintenance-of-residential-apartment-construction-essay.php>.
- Kanyesigye. (2019). Assessment of maintenance management practices in public buildings in ministry of lands, housing and urban development Uganda [unpublished Master's Thesis]. Makerere University
- Adenuga, Olumide Afolarin. (2017). Maintenance management practices in public hospital-built environment: Nigeria case study. *Journal of Sustainable Development in Africa* (Volume 14, No.1)
- KERAMA, N. S. (2013). Factors affecting housing maintenance management cost in kakamega municipality [unpublished Master Thesis]. University of Nairobi
- ISSAHAKU, M. I. (2013). Evaluation of maintenance management practices in Ghana highway authority's bungalows in greater Accra region [Master's thesis, Kwame Nkrumah University]. @Inproceedings {Issahaku2013 Evaluation OM.www.semanticscholar.org
- Abdul Lateef O., Idrus A., Khamidi M. F., (2011) "Investigating Building Maintenance Practices in Malaysia: A case study", *Structural Survey*.
- Yong, C. Y. & Sulieman, M. Z. (2015). Assessment of Building Maintenance Management Practice and Occupant Satisfaction of School Buildings in Perak, Malaysia
- Talib R., Ahmad A. G., Zakaria N., & Sulieman M. Z., (2014). Assessment of Factors Affecting Building Maintenance and Defects of Public Buildings in Penang, Malaysia. *Architecture Research 2014*, USM Pulau Pinang, Malaysia.

Henry, A.M. (2017). Analysis of Factors influencing reported housing maintenance costs in Sweden's public and private rental sectors. *International journal of strategic property management*, Volume 21(3): 284–295

Ogunmakinde, O.E, Akinola, A.A. and Siyanbola, A.B. (2013). analysis of the factors affecting building maintenance in government residential estates in akure, ondo state, Nigeria. *Journal of Environmental Sciences and Resources Management*, Vo.4(2)

APPENDICES

APPENDIX 1: Research Questionnaire

FACTORS AFFECTING MAINTENANCE MANAGEMENT PRACTICES OF PUBLIC HOSPITAL BUILDINGS IN ADDIS ABEBA

This research questionnaire is aimed at “Assessing factors affecting Maintenance Management Practices in Public Hospital Buildings in Addis Abeba”, with a focus on the twelve public hospitals. Therefore, be very appreciative if you participated in the research study by responding to the attached questionnaire. The questionnaire has been designed in such a way that you can make suggestions as part of your invaluable contributions to this work. The information provided is for study purposes only and will be treated with stringent confidentiality.

SECTION A: BACKGROUND INFORMATION

1. Name of Hospital -----
2. Hospital location -----
3. Occupancy -----
4. Year/age of hospital building -----
 45-55 years 56-65 years More
than 86 years
 66-75 years 76-85 years
5. What type of maintenance management practice is carried out in public hospitals?
 Preventive maintenance Corrective maintenance
 Immediate maintenance Routine maintenance
6. Does the maintenance/estate department undertake regular inspection of the building?
 Yes No
7. If yes, how often it does
 Monthly Quarterly

Annually Biannually

8. How long does it take for maintenance request to be responded to?

1-4 Days Week Month More than month

9. What is your perception of the maintenance staff concerning the condition of the building?

Very poor Poor strong very strong

10. Is there a request form to fill when there is a want for maintenance?

Yes No

11. Have building conditions in the hospital enhanced or stayed at acceptable levels from year to year?

Yes No

12. Number of beds -----

SECTION B: OPERATIONAL STATE OF BUILDING ELEMENT

In your experience, please indicate the working state of the following elements by ticking the appropriate boxes. **Very Bad (VB), Bad (B) Average (AV) Good (G) Very Good (VG)**

no	Elements of building	VB	B	AV	G	VG
11	Structural components (beams, columns, upper floor slabs and stairs)					
12	Walls (external and internal walls)					
13	Finishes (wall finishes, floor finishes and ceilings)					
14	Windows and doors (internal and external)					
15	Roofs					

16	Services (sanitary appliances, building service equipment, disposal installation, water, ventilation, electrical, gas, lifts, protection installation, drainages, external services)					
17	Fittings and furniture					
18	Sanitation of the environment					

19. Based on your observation what are the main areas in need of maintenance?

Please

tick as many as apply

- | | | |
|------------------------------------------|---------------------------------------------|---------------------------------------------|
| <input type="checkbox"/> Cleaning | <input type="checkbox"/> Indoor Air Quality | <input type="checkbox"/> Windows, doors |
| <input type="checkbox"/> Waste Removal | <input type="checkbox"/> Lighting | <input type="checkbox"/> Telecommunications |
| <input type="checkbox"/> Fire Protection | <input type="checkbox"/> Water Supply | <input type="checkbox"/> Floor Finishing |
| <input type="checkbox"/> Painting | <input type="checkbox"/> Road & Pathway | <input type="checkbox"/> compound |

20. Please specify if you know

SECTION C: FACTORS AFFECTING MAINTENANCE MANAGEMENT PRACTICE IN PUBLIC HOSPITAL BUILDING

In this section please tick (✓) the most proper response for each of the questions in the table below. **Least(L), Lower (LO), High(H), Higher (HR), Highest (HT)?**

Factors

No	Maintenance factors	L	LO	H	HR	HT
1	Poor maintenance culture					

2	Lack of structure maintenance policy					
3	Inadequate moneys/funds to maintain the building					
4	deterioration due to age and environment					
5	Inadequate training and development of personnel					
6	Lack of skilled personnel in maintenance department					
7	Attitude of users and misuse of facilities					
8	Poor or lack management system					
9	Inefficient inventory system					
10	Lack of skilled manpower to maintain work in buildings designed and constructed by expatriates					
11	Absence of preventive maintenance practice					
12	Attitude of users and misuse of facilities					

13. please specify other factors affecting maintenance

SECTION D: GOOD MAINTENANCE PRACTICES

Use the scale to tick (√) the most appropriate response for each of the questions in the table below: Extremely Important (**EI**); Very Important (**VI**); Important (**I**); Fairly Important (**FI**); less important (**LI**)

No	Factors for good maintenance	EI	VI	I	FI	LI
1	Adequate/appropriate maintenance of facility plant and equipment for maintenance operations					

2	Proper maintenance policy					
3	Involvement of maintenance experts at the design stage					
4	Innovate supports services					
5	Practice of planned maintenance programmes					

5. describe the factors that responsible to good maintenance practice

Questionnaire for Patients

FACTORS AFFECTING MAINTENANCE MANAGEMENT PRACTICES OF PUBLIC HOSPITAL BUILDINGS IN ADDIS ABEBA

This research questionnaire is aimed at “Assessing factors affecting Maintenance Management Practices in Public Hospital Buildings in Addis Abeba”, with a focus on the twelve public hospitals. Therefore, be very appreciative if you participated in the research study by responding to the attached questionnaire. The questionnaire has been designed in such a way that you can make suggestions as part of your invaluable contributions to this work. The information provided is for study purposes only and will be treated with stringent confidentiality.

Part A: General information

1. Hospital name _____
2. His/ her stayed in the hospital _____
3. In general, describe the situation of the building
 - Bad
 - Good
 - Very Bad

SECTION B: OPERATIONAL STATE OF BUILDING ELEMENT

In your experience, please indicate the working state of the following elements by ticking the appropriate boxes. **Very Bad (VB), Bad (B) Average (AV) Good (G Very Good (VG)**

no	Elements of building	VB	B	AV	G	VG
3	Structural components (beams, columns, upper floor slabs and stairs)					
4	Walls (external and internal walls)					
5	Finishes (wall finishes, floor finishes and ceilings)					

6	Windows and doors (internal and external)					
7	Roofs					
8	Services (sanitary appliances, building service equipment, disposal installation, water, ventilation, electrical, gas, lifts, protection installation, drainages, external services)					
9	Fittings and furniture					
10	Sanitation of the environment					

11. Please specify if you know

1. Based on your observation what are the main areas in need of maintenance? Please tick as many as apply

- | | | |
|------------------------------------------|---------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Cleaning | <input type="checkbox"/> Indoor Air Quality | <input type="checkbox"/> Windows, doors |
| <input type="checkbox"/> Waste Removal | <input type="checkbox"/> lightning | <input type="checkbox"/> Telecommunication |
| <input type="checkbox"/> Fire Protection | <input type="checkbox"/> Water Supply | <input type="checkbox"/> Floor finishing |
| <input type="checkbox"/> Painting | <input type="checkbox"/> Road & Pathway | <input type="checkbox"/> Compound |

APPENDIX 2: Interview Guide

Insights into the Factors Affecting Maintenance Management Practices in Public Hospital Buildings (Case Study: Public hospital buildings in Addis Abeba)

1. As a technical staff in charge of Maintenance and Management of public hospital buildings, which maintenance methods do you use to carry out maintenance works?
2. In case of a maintenance request from the users, how long does it take to respond to maintenance requests/needs?
3. Public hospitals in Ethiopia are old enough, and work 24/7 days, how much give attention to factors affecting maintenance management?
4. Does the institution have maintenance staff development program? If yes how training program is proceed?