

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI, GHANA**

**CHALLENGES OF MAINTENANCE MANAGEMENT OF COMMERCIAL
BUILDINGS IN GHANA: A CASE STUDY OF SOCIAL SECURITY AND
NATIONAL INSURANCE TRUST PROPERTIES IN ACCRA**

BY

ERNEST MENSAH, (PGD, B.Tech (Hons))

A THESIS PRESENTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT

NOVEMBER, 2015

DECLARATION

I hereby declare that this submission is the result of my own original research and this thesis has neither in whole nor in part been prescribed by another degree elsewhere. References to other people's work have been duly cited.

STUDENT: ERNEST MENSAH

Signature Date

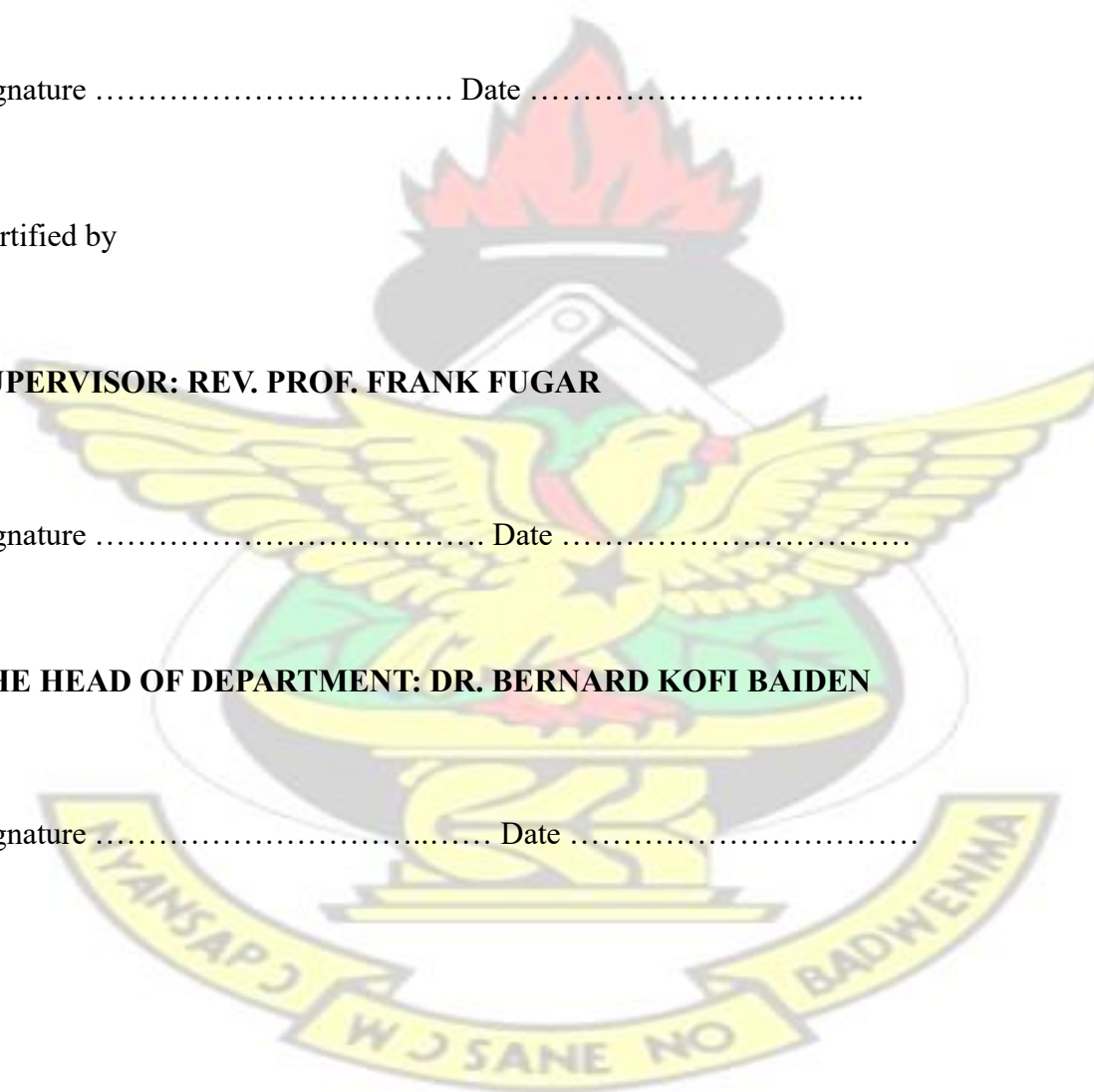
Certified by

SUPERVISOR: REV. PROF. FRANK FUGAR

Signature Date

THE HEAD OF DEPARTMENT: DR. BERNARD KOFI BAIDEN

Signature Date



ABSTRACT

High demand for office buildings and commercial facilities has attracted investment and witnessed the development of high rise commercial properties/facilities in Accra and other regional capitals in Ghana. Notwithstanding, these however are associated with effective maintenance management challenges after buildings are completed and occupied by users. This study concentrate on identifying the challenges of maintenance practices of commercial buildings in Ghana with the view of proposing strategies for improving maintenance management using Social Security and National Insurance Trust (SSNIT) as a case study. It identifies the factors influencing commercial properties maintenance managements, factors contributing to high cost of commercial properties maintenance management and strategies for improving on commercial properties maintenance management. In attaining these objectives, the views of facilities/maintenance managers of SSNIT commercial properties were solicited by administering a quantitative questionnaire to them and data were collected and analysed by using descriptive statistics. The analysis showed that financial delays, contractual delays, tenants' improper use of facilities and clients'/owners' response delays to vital maintenance issues are factors that largely influence maintenance management of commercial properties etc. The analysis also found out that the following factors contribute in varying ways to high cost of maintenance: buildings' external and internal work, ironmongery, security systems etc. The analysis also revealed that the following strategies were very significant and recommended same for improving on maintenance management of commercial buildings: maintenance policy need to be agreed upon by maintenance personnel and top management before implementation, adherence to design details to avoid errors, availability of adequate maintenance funding and prompt response to reported defects. **Keywords:** Commercial buildings, Challenges, SSNIT, Maintenance Management

KNUST



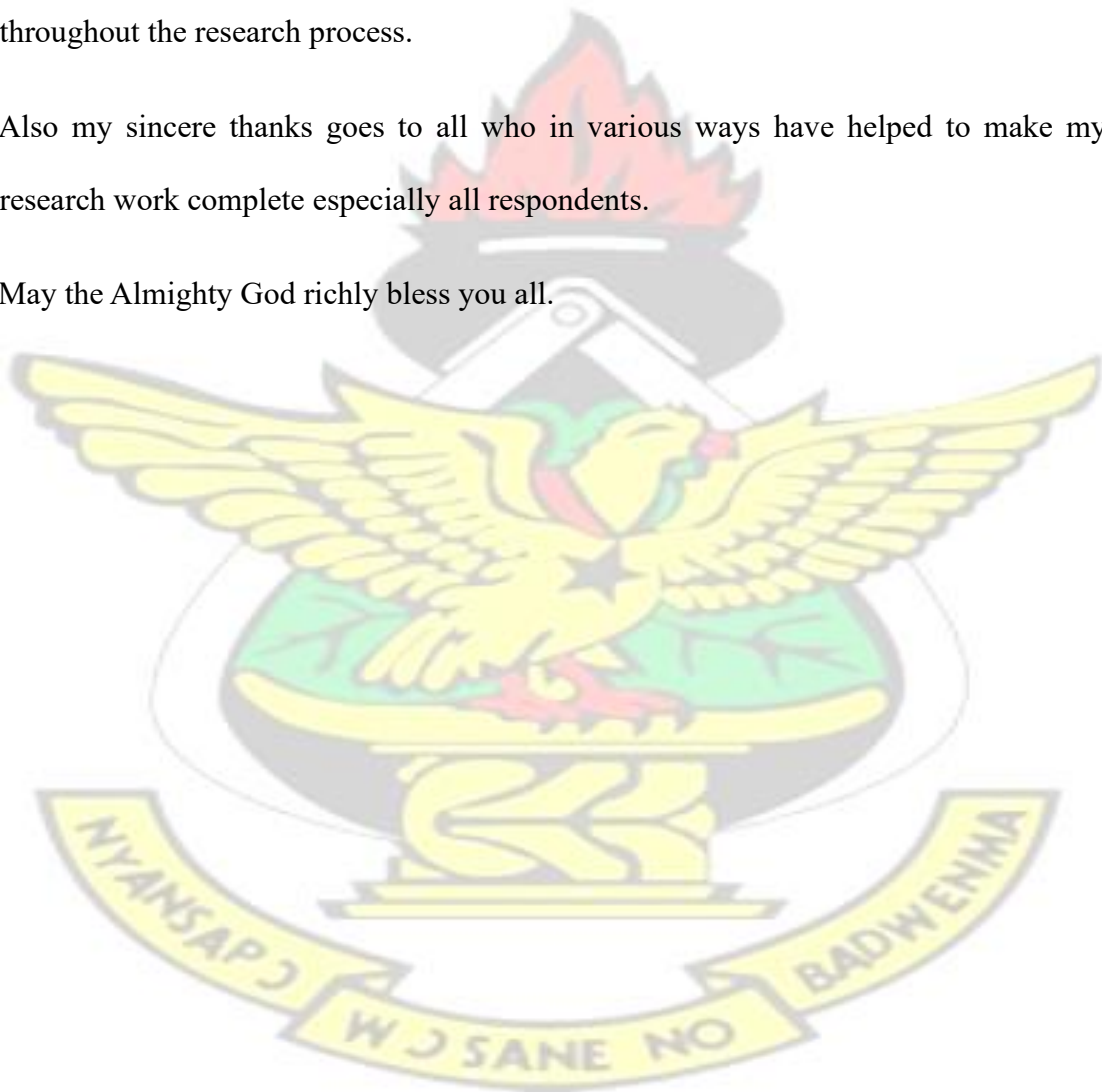
ACKNOWLEDGEMENT

The first thanks goes to the Almighty God for giving me life and strength to carry out this research.

My sincere and profound gratitude goes to my supervisor, Rev. Prof. Frank Fugar, a Lecturer at Department of Building Technology, for his irreplaceable research guidance, reference documents, constructive criticisms, suggestions, and encouragement throughout the research process.

Also my sincere thanks goes to all who in various ways have helped to make my research work complete especially all respondents.

May the Almighty God richly bless you all.



KNUST

DEDICATION

This thesis is dedicated to my wife, REJOICE ADJOA MENSAH, for her immersed support for this research work.



TABLE OF CONTENTS

DECLARATION.....	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
DEDICATION.....	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
CHAPTER ONE: GENERAL INTRODUCTION	1
1.1 BACKGROUND OF THE STUDY	1
1.2 STATEMENT OF THE PROBLEM	2
1.3 RESEARCH QUESTION	4
1.4 AIMS AND OBJECTIVES OF THE STUDY	4
1.5 SIGNIFICANCE OF THE STUDY.....	5
1.6 SCOPE OF STUDY	5
1.7 RESEARCH METHODOLOGY.....	6
1.8 ORGANISATION OF THE STUDY	6
CHAPTER TWO: LITERATURE REVIEW	7
2.2 OVERVIEW OF BUILDING MAINTENANCE MANAGEMENT.....	7
2.2.1 Definitions.....	8
2.2.2 Building Maintenance and Associated Challenges	8
2.3 POLICY FRAMEWORK FOR BUILDING MAINTENANCE	9
2.3.1 Building Maintenance Policy Framework in Context	10
2.3.2 Element of Building Maintenance Policy Statement	11
2.4 FACTORS CONTRIBUTING TO HIGH COST OF BUILDING	

MAINTENANCE	16
2.5 INPUT OF FACILITIES MANAGERS IN THE DESIGN STAGES OF BUILDING	21
2.6 STRATEGIES TO IMPROVE ON PROPERTY/FACILITIES MAINTENANCE MANAGEMENT	25
CHAPTER THREE: RESEARCH METHODOLOGY	27
3.1 INTRODUCTION	27
3.2 RESEARCH STRATEGY	27
3.3 RESEARCH DESIGN	28
3.4 DATA COLLECTION APPROACH	28
3.4.1 Literature Review (Desk Survey)	29
3.4.1.1 Internal Sources	29
3.4.1.2 External Sources	29
3.4.2 Primary Data Source (Field Survey)	29
3.4.3 Descriptive survey	30
3.5 DATA COLLECTION INSTRUMENT.....	31
3.5.1 Development of Questionnaire	31
3.5.2 Questionnaire Design and Distribution	31
3.6 SCOPE OF THE STUDY	32
3.7. RESEARCH POPULATION AND SAMPLING TECHNIQUE.....	32
3.7.1 Research Population.....	32
3.8.2 Technique of Sampling and Determination of Sample Size	32
3.9 DATA ANALYTICAL TOOL	33
3.10 SUMMARY	33
CHAPTER FOUR: ANALYSIS AND DISCUSSION	34

4.1 BACKGROUND INFORMATION OF RESPONDENTS	34
4.3 FACTORS INFLUENCING FACILITIES/PROPERTIES MAINTENANCE MANAGEMENT	37
4.4 FACTORS CONTRIBUTING TO HIGH COST OF MAINTENANCE.....	39
4.5 STRATEGIES FOR IMPROVING COMMERCIAL PROPERTIES / FACILITIES MAINTENANCE MANAGEMENT	42
4.6 SUMMARY	44
CHAPTER FIVE: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS	45
5.1 INTRODUCTION	45
5.2 SUMMARY OF FINDINGS	45
5.2.1 Factors influencing properties/facilities maintenance management	45
5.2.2 Factors contributing to high cost maintenance management	46
5.2.3 Strategies for Improving on commercial properties/facilities maintenance management	46
5.3 RECOMMENDATIONS	47
5.4 LIMITATION OF THE RESEARCH	49
5.5 CONCLUSION	49
REFERENCES	51
APPENDIX 1: QUESTIONNAIRE.....	61
LIST OF TABLES	
Table 4.1: Background Information of Respondents	35
Table 4.2: Factors Influencing Facilities/Properties Maintenance Management	38
Table 4.3: Factors Contributing to High cost of Maintenance.....	40

Table 4.4: Strategies for Improving Commercial Properties/Facilities Maintenance

Management	42
------------------	----

KNUST



CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Within the past decade, the demand for office space has increased substantially throughout Accra. Some of the reasons have been attributed to the influx of foreign investors and the oil production. This has witnessed the development of high-rise commercial buildings mostly in the Central Business District, West Ridge, Airport City, Spintex Road, Achimota etc. (Broll Ghana Report, 2012).

The total investment portfolio of Social Security and National Insurance Trust (SSNIT) increased by 30.14 percent from GHC3,972.68 million in 2012 to GHC5,170.13. Its real return on investment was 16.90 percent in 2013 compared to 10.67 percent 2012 (SSNIT annual report, 2013). The information above, clearly indicates that the commercial building industry in Ghana is growing in investment and the Social Security and National Insurance Trust (SSNIT) plays a major role either in ownership or partnership (Broll Ghana Report, 2015).

However, to achieve excellent performance and yield maximum value on investment of commercial buildings, it requires proper maintenance management (Emma and Syahrul, 2009). BS (2001) defines maintenance to be “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”. Maintenance management refers to how well a building is maintained (Yahya and Ibrahim, 2011). Building maintenance management is an action which involves interacting or blend of technical, social, legal and economic elements that governs and manage the use of buildings (Francis et al., 2001).

Commercial buildings are relatively complicated in maintenance management and carrying out maintenance on these facilities comes with serious problems and challenges such as high cost of maintenance, adequate maintenance policy framework, minimal or lack of input of experts of facilities managers during the design stages, etc (Timilli 2014; Omotehinshe et al., 2015). According to Shabha (2003), lack of proper building maintenance policies and strategies, budget, skills, and technology will lead to potential risks challenged during the maintenance stages of the building.

The purpose of this research study is to look at the challenges of maintenance management with the view of recommending strategies for improving maintenance management of SSNIT commercial buildings in Accra.

1.2 STATEMENT OF THE PROBLEM

Commercial building maintenance cannot be undisputable undertaken without challenges (Timilli 2014; Omotehinshe et al., 2015). One of the major challenges that confronts commercial building maintenance is the lack of consideration and poor integration of maintenance policy framework in the widest possible context and deviation from proper procedural system (Timilli 2014; Forster 2009). Most of the recent maintenance policy procedures do not clearly link maintenance needs with building performance with respect to the building users who measure the performance of a building with various criteria which include the condition of the building (Yahya and Ibrahim, 2011). According to Ali et al. (2010), for an effective maintenance management, it requires an appropriate maintenance policy framework.

Building maintenance is also challenged with high cost of maintenance. According to El-Haram and Horner (2002), there are numerous factors that are responsible for the high housing maintenance cost such as building characteristics, human aspects, ways

of implementing maintenance and government policies. Al-khatam (2003) identified and grouped some of the factors into seven (7) categories which include engineering services, labour, building materials, environments, management and administration, budget and finance and building users. This was confirmed by Ali et al. (2010) who found out that factors such as building materials, building services, building age, expectation of tenants, failure to execute maintenance at the right time, maintenance factors, political, outstanding maintenance charges, over budgeting and other factors contribute immensely to high cost of maintenance. Other risk factors contributing to high cost of maintenance as a result of financial losses include poor design and construction practices, poor accessibility for maintenance, poor selection of materials, incompatibility poor specifications, non-availability of spare parts, lack of standard tools and instruments for regular maintenance and environmental conditions (De Silva et al. 2012).

Another challenge of building maintenance is the minimal consideration or lack of input from expertise of facilities managers who takes oversight responsibility of maintenance management in the early design stages. Most of the challenges of building maintenance can be minimised if not avoided if the opinions or inputs of facilities management professionals are fully engaged on maintenance management techniques and operations for consideration during the early design stages (Williamson et al., 2010). Also relevant information provided by facilities managers to designers minimise design errors that leads to unsatisfactory results during facilities maintenance operations phase (Jawdeh et al., 2010). It is necessary to adopt maintenance input in the design stages to ensure that opinions can be used as reference for ease of maintenance in the future in order to reduce design defect which poses challenges for maintenance (Ali et al., 2013). According to Omotechinshe et al., (2015), maintenance aspect are scarcely considered

in most design processes and maintenance professionals are rarely invited into the design teams, this often times raises or leads to maintenance problems which badly affect the performance of such buildings.

On the basis of the above research findings, this study focus on the challenges of maintenance management of SSNIT commercial buildings in Accra.

1.3 RESEARCH QUESTION

The following research question will be tested for acceptance or rejection:

- i. What are the policy frameworks used on SSNIT commercial buildings?
- ii. What are the factors that contribute to high cost of maintenance of SSNIT commercial buildings?
- iii. What are the inputs of facilities/maintenance managers in the design and construction stages of SSNIT commercial buildings?

1.4 AIMS AND OBJECTIVES OF THE STUDY

The aim of the study is to identify challenges of maintenance management of SSNIT commercial buildings in Accra and the objectives are:

- i. To assess the policy framework of maintenance of SSNIT commercial buildings in Accra.
- ii. To identify the factors that contribute to high cost of maintenance of SSNIT commercial buildings.
- iii. To find out input of facilities/maintenance managers in the design and construction stages of SSNIT commercial buildings.
- iv. To propose strategies for improving maintenance management of SSNIT commercial buildings

1.5 SIGNIFICANCE OF THE STUDY

The importance of this research work will not only contribute to the body of academic knowledge, but will also recommend ways for most efficient maintenance management of commercial buildings of SSNIT properties in Accra. It also makes the effort to assess the policy framework of SSNIT commercial buildings, identify the factors that contribute to high cost maintenance, and to find out the input of facilities/maintenance managers during design and construction stages of SSNIT commercial buildings in Accra. More so this research will help facility/property managers to be more knowledgeable and more informed of maintenance of SSNIT commercial buildings. Owners, tenants and users of buildings will also be well informed of the functions of buildings and guide their approach to issues that concerns building maintenance.

1.6 SCOPE OF STUDY

The research seeks to explore challenges of maintenance management of Social Security and National Insurance Trust (SSNIT) commercial property/facilities. The study considers how facilities/maintenance manager administers maintenance management of SSNIT property/facilities. The emphasis of study was limited to SSNIT commercial property/facilities in the Greater Accra Region.

1.7 RESEARCH METHODOLOGY

Primary data was obtained through the use of structured questionnaires. Secondary sources of information will also be obtained from SSNIT.

Primary or field data was collected by the use structured questionnaires administered in person. Data was collected from SSNIT owned commercial property/facilities in Accra either in full ownership or in partnership. Secondary data was collected from books, articles, technical journals, reports and from databases.

The sample frame was SSNIT commercial buildings in the greater Accra region. In total, (15) SSNIT completed and operating commercial buildings (office complex, shopping mall, car park complex etc.) and were being managed by facilities /maintenance managers in the greater Accra region were selected.

Quantitative data collected were analysed by the use of descriptive analysis.

1.8 ORGANISATION OF THE STUDY

This research has been structured in five chapters. The first chapter generally entails introductory and background about the research which are the statement of the problem, questions of the research, the aims and objectives of the study, the significance of the study, the scope and the methodology of the research. The second chapter talks about the relevant literature reviewed on the interested subject. That is to say the ideas of some researchers and authors have been reviewed. The third chapter gives details on the method used for the research. The data collected were analysed in chapter four, and finally main findings were summarised and recommendation and conclusion outlined in chapter five.

CHAPTER TWO LITERATURE REVIEW

2.1 INTRODUCTION

Literature were reviewed on challenges of maintenance practices/management of commercial properties/facilities discussed in various segments. The beginning segment gives a general view of building maintenance management, discussing its definitions, importance and challenges. The second segment discusses in details the policy framework of building maintenance. The third discusses the factors that contribute to

the high cost of building maintenance and the last discusses the input of facilities/maintenance managers during the design stages of buildings.

2.2 OVERVIEW OF BUILDING MAINTENANCE MANAGEMENT

Building maintenance management, not until recently, receives no or little attention in organisations and institutions globally. However it started receiving attention when government begins to intervene and insisted on the need to introduce maintenance management practices in the various institutions as a new culture for the nation. This lead to the introduction of Facilities Management firms which plays an oversight role of building maintenance management. Findings have shown that several improvement have been made in few areas including better conditions of buildings and some awareness of maintenance practices among the maintenance staff and stakeholders. However, findings from studies of some institutions have shown that maintenance management or practices carried out are being challenged in various areas such as policy framework, high cost of maintenance, input from expert of facilities management, etc. (Shabha, 2003). This has become a matter of concern for all stakeholders to be worried of.

2.2.1 Definitions

Maintenance management embraces several operations and functions and Allen, (1993), has described maintenance practices/management as „the effective and efficient utilisation of resources to guarantee that the procedure and its facilities are kept practicable to standards required tenants or users. BS (2001) defined maintenance to be „the blend of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a stste in which it can perform the required functions“. Francis et al., (2001), goes on to define building maintenance

management as an action which involves interacting or blend of technical, social, legal and economic elements that governs and manages the use of buildings; he further explained building maintenance as said to have been the combination of technical and administrative action to ensure the items and elements of a building is in an acceptable standard to perform its required function. A building according to Wikipedia is described as a comparatively immovable bounded construction structure composed of stones, blocks, bricks, wood or other materials form together on a piece of land, covered with roof and having windows, doors, sometimes more floors used for varied activities such as residential, entertainment, offices, manufacturing etc. Commercial buildings, which is a category of building is used for commercial purposes such as offices, hotels, residential, conferences, shopping malls etc.

2.2.2 Building Maintenance and Associated Challenges

EI-Haram and Horner, (2002) and Ali et al., (2010) summarise the aims and objective of properties/facilities maintenance as:

- To guarantee that properties/facilities and their associated services are in a safe conditions
- To maintain a property/facility in an acceptable condition and required standard
- To guarantee that properties/facilities are fit for use
- To guarantee that conditions of properties/facilities meet all statutory requirement
- To maintain or improve the quality of the property/facility
- Retaining investment value
- Conserving historical and architectural value of building

As desirable as carrying out building maintenance, it is generally an undeniable fact that this comes with varied challenges which when not resolved or minimised defeat the aims and objectives of building maintenance and subsequently result in loss of return on investment. Some of the challenges identified by several researchers includes adequate maintenance policy framework, high cost of building maintenance, and input of facilities management experts. The following sections of literature discusses in detail some of the challenges associated with building maintenance management.

2.3 POLICY FRAMEWORK FOR BUILDING MAINTENANCE

The worth of buildings largely rely on the safety, quality and service of the standard of policy given and enforced in them (Yahya and Ibrahim, 2011). The definitions of policy of maintenance have been given as a system by which decisions on maintenance are made (BS 3811:1964). Several studies have defined the policy of maintenance being a framework of management embracing varying type of strategic maintenance to guarantee that properties/facilities are adequately maintained (Lee and Scott, 2008). The policy of maintenance framework stands as document that is official which indicate the parameters, procedure, guidelines in full description. The situations of management of maintenance have no general acceptable suitable layout. A format being used for a specific situation must be geared towards a specified need and programme of the host organisation (RICS, 2013). The policy of maintenance have to guarantee the certainty of worth for money spent are attained and also protect the asset and the resource value of the buildings concerned. It should also ensure that the building owner is not held liable of any breach of statutory or legal obligations (BS 8210:1986). The policy of properties/facilities maintenance standard should yield much profit on expenditure incurred on actions of maintenance (Lee and Scott, 2008).

The safe environment and benefit guaranteed by the maintenance policy has made it much important to stake holders such as facilities/maintenance managers, customers, owners and tenants (Yahya and Ibrahim, 2011).

2.3.1 Building Maintenance Policy Framework in Context

RICS, (2013); Lee and Scott, (2008) have argued that, the costs sustained, and the sum benefit of properties/facilities maintenance result to substantial influence of users' welfare and output. Management of maintenance henceforth must be perceived to be a significant part in advancing the objectives of the host organisation's business. Consequently, the policy of maintenance have to include with the broader statement of the mission, business strategy and the management's policy of the organisation which oversee the properties/facilities management, be it a tenant, client, or landlord.

In effect, the top management of the organisation should accept and revise the policy of maintenance as an inclusion to the total management strategy involving the facilities/maintenance personnel in the processes. The top management of the organisation must be vigilant of the requirement of maintenance and make suitable available funds expected to guarantee any future hostile penalties if funding is not adequate since it may lead to added expense as a result of carrying out maintenance not planned formerly, which means that planned maintenance is less expensive than corrective maintenance. Where there are no official policies of maintenance, this may result to deficiencies in issues of works maintenance, requirement and funds showing as inappropriate move, misdirection, abandonment and waste of resources. This will eventually lead to unlikely disturbance to users and tenants of the facility creating health hazard, safety hazard, and depreciating asset and deficient value for money. In effect, a policy for maintenance is very vital requirement for an effective and efficient

maintenance to be engaged (RICS, 2013). The type of facility will determine the kind of policy for maintenance to be adopted, hence there is no one policy that is completely suitable for all types of building facility (Lee and Scott, 2008).

2.3.2 Element of Building Maintenance Policy Statement

The following literature argues several issues to be considered or addressed when developing and formulating building maintenance policy statement.

Lee and Scott, (2008); Lee and Scott, (2009) argues that there are three essential elements for consideration when formulating building maintenance policy statement, namely:

a) Maintenance Strategy

Maintenance strategy in a broad-spectrum comprises preventive, corrective and condition based maintenance (Horner et al, 1997). Ollila and Malmipuro (1999) finds out that the key kinds of groups of maintenance includes reactive, preventive, predictive and proactive maintenance. Nevertheless, Coetzee (1999) points out that the maintenance strategies should be based on the comprehensive design of the maintenance cycle for different categories of organisations. Chan et al. (2001) in their understanding had division of five kinds of maintenance strategy, these includes time-based, performance-based, breakdown-based, renovation-based and integration-based and has stated that these five divisions were built-up from the three basic maintenance strategies. Whiles planned-preventive maintenance has been considered as the most effective maintenance strategy especially in the case of frequent breakdown (Seeley, 1976; Wood, 2003b), it has been find out that it is an ineffective resolution since it suggest

too quickly and make needless changes (Spedding, 1987). The discussion of maintenance strategy has become the focus of economic trend leading to reducing operating cost to organisations. Moreover, the study concerning the effectiveness of planned-preventive maintenance with empirical information to hold its potency has since not been enough (Horner et al, 1997; Wood, 2003b). The strategy of maintenance relies on several features including standards, the resource of the organisation, and the objectives of the organisation etc. Among the other strategies of maintenance, are the efficiency of planned preventive strategy of maintenance (Lee and Scott 2009).

b)

c) Maintenance Standard

Acceptable maintenance standards depending on the organisation are interpreted differently, which may be higher or lower than the original standard dependant on the availability of resources. Basically, maintenance standard is compliance to statutory requirements (Lee and Scott, 2009). Acceptability of maintenance standards are being argued due to the difference among organisations about maintenance policy and allocation of maintenance resources (Then, 1996; Zavadskas et al, 1998; Wood, 2003a).

Organisations with sufficient maintenance resources have higher maintenance standards unlike organisations with limited resources who are faced with challenges of maintaining a facility but only for meeting basic statutory requirements. Acceptable maintenance standard is essential because maintenance strategies cannot be planned and organised without defining the maintenance standards (Lee and Scott, 2009). Maintenance standard is also

essential to the procedure of maintenance which is limited by way of use, safety and health (Then, 1996). Users or tenants of the facility and their opinions of the interior condition of room they occupied are the two key components affecting the standard of maintenance. Having enough understanding about the organisation and management raises the maintenance standard (Lee and Scott, 2009).



d)

Maintenance Resource

Due to the economic trend, building maintenance operations as in organisations in the broader spectrum are pressured to minimise operation cost and staff so as to mainly optimise the available constraint resources. As a result in-house maintenance are downsized (Lee and Scott, 2009) and top management also challenges maintenance as wastage of resources (Shen and Lo, 1999; Lam, 2000; Lo et al, 2000; Tse, 2002), however, maintenance represent a high portion of the total cost of operation (Chanter and Swallow 1996; Oberg, 2002). Shen (1997) agreed that maintenance budget for buildings do not meet the maintenance need, nonetheless, with justifiable maintenance objectives, maintenance personnel can get more resources to carry out maintenance works (Then, 1996). It is the concern of senior management on the maintenance resources to analyse various ways to minimise the cost of maintenance. Maintenance at the implementation stage often gives rise to the argument of budget always being below the needs while senior management level condemns the incompetence of the maintenance that contribute to waste and makes it difficult to get more resources (Pitt, 1997).

RICS (2013) also argues that four main primary issues need to be addresses when formulating building maintenance policy statement:

a) The use trend and need of users of the facility

The statement of policy should consider that organisations may possess many buildings on more sites and, certainly, may have a big collection of several different buildings over a big geographical area. This involves identifying basic needs such as main business, secondary need such as giving out for money, the

type of occupants such as tenant, customer, employee, public, the time of occupants such as hour of opening, period of closing, etc. (RICS, 2013; Department for Social Development-UK). It is also recommended that tenants, customers, employers, users etc. are engaged to solicit their needs in order to consider them in policy formulation (Yip, 2001; Department for Social Development, UK)

b) The appropriateness of the facility for their purposive use

The effort is to establish by carrying out a valuation of the buildings' capability so as to determine the place, size, layout and associated components for now and latter projected needs. If unsatisfactory, more inspection can be done in order to establish the most appropriate cost and time limits or better still consider disposal and procure another location (RICS, 2013).

c) The lawful structure of occupancy

The occupancy of the facility usually is administered through the governing framework which often consists of diverse sections of regulation relating to, for example, health and safety, fire safety, disability discrimination and the like (Then, 1996; RICS, 2013). Likewise the conditions of tenancy of the facility hold much significance with regards to the policy of maintenance. Rented space is normally ruled through the conditions defining the standard and tasks for maintenance and charges of services. The conditions of lease and terms may limit the extent of modifications and enhancement to the built environment. Therefore lease conditions and terms must be specified in the policy statement (RICS, 2013).

d)

Environmental policy and sustenance

Several businesses established policy statement with regards to environment issues specifying technics addressing concerns of the environment required by local authority such as policy for waste disposal, management of energy, sources of material etc. to achieve a maintainable business operations (Pulselli,2007; RICS, 2013). The maintenance administration should be planned with the mind that the built environment will be sustained in all social, economic, and environmental activities; in other words it should be fully harmonious with the host organisation's corporate social responsibility policy. Facilities henceforth requires regular maintenance with minimal effect on the environment whiles deriving benefit for users (RICS, 2013).

2.4 FACTORS CONTRIBUTING TO HIGH COST OF BUILDING MAINTENANCE

Building as much as desirable to produce cannot exist without maintaining it to an acceptable standard and also fit for use. Maintaining a building to an acceptable standard are associated with costs comprising of labour, material, spare parts, equipment and tools, administrative, expenses and penalties or loss of income (ElHaram and Horner 2002). Building maintenance costs and expenses contributes about one third and one half of cost dependent on which type of facility, flats, hotel, shopping mall, offices etc. (Ali et al. 2010).

Through literature reviews authors have identified various factors that influence the high cost of building maintenance. Ali (2009), Ali et al. (2010), El-Haram and Horner (2002) identified the following variables and factors that influence decision and contribute to high cost of building maintenance:

a) Existing building conditions

Taking decision on cost of maintenance is complex (Ali, 2009) and one of the solutions is to thoroughly examining the existing conditions of building by applying new technology to assess the state of the building in addition to the physical inspection and survey to obtain adequate information necessary for decision making on cost of maintenance (Pitt, 1997; Lee and Scott, 2009; Ali, 2009).

b) Building characteristics

Building characteristics such as building age, building functions, levels, structure type, finishing, service, material influences maintenance cost (Lateef, 2008; Skinner, 1982; Wong, 2002; Neve et al., 2004; Lam, 2001; Cheung and kyle, 1996). Each facility has its own characteristics which involves different maintenance cost distribution and allocation in order to keep them maintained to an acceptable worthy state (El-Haram and Horner, 2002).

c) Tenant factors

Cost of maintenance is always influence by the tenants or users of the building in several ways such as expectations of the occupant, utilisation of the facility, damage by occupant, delays for report of defects, or no report on defect, access to the facility etc. (Ali et al., 2010; El-Haram and Horner 2002; Olubodun, 2001). The influence of tenants on the building is therefore to be considered when making maintenance budget (Yip, 2001).

Maintenance factors

d)

Maintenance factors are mainly in two parts, technical factors and administrative factors which largely affect cost of maintenance (Ali et al., 2010). It is obvious that if technical aspect such as bad workmanship, bad quality of spare parts and material (Khalid et al., 2006; Al-Hammad et al., 1996) and administrative aspect which includes bad maintenance management, budget constraints, failure to execute maintenance works at the right time and poor budgetary control (Horner et al., 1997; Pascual et al., 2008; El-Haram and Horner, 2002; Narayan, 2003; Ali, 2009; Lee and Scott, 2009) are not accorded the necessary concerns, effective and efficient building maintenance cost is greatly affected (El-Haram and Horner, 2002).

e) **Political factors**

In some situations political factors affect the cost of maintenance particularly when there are variations in policies by the government or local authority (Ali et al., 2010, El-Haram and Horner, 2002). Some of the variable is the new health and safety regulation that often guarantee the issue of habitation certificate by local authorities. Absence or inadequate health and safety measures put the maintenance personnel and occupiers or users of the building at risk Ali et al., 2010).

f) **Other factor**

Third party damage and bad or no training of maintenance personnel influence maintenance cost which often occur in high rise buildings (El-Haram and Horner, 2002; Pascual et al., 2008).

In building maintenance, quite a substantial amount of the budget are spent on rectifying complications and unseen defect resulted from varied deficits in design, bad quality of

construction and insufficient management maintenance. The effect of these deficits is factored in the following risk factors that impact on cost of building maintenance (De Silva, 2012):

a) Accessibility for maintenance

Accessibility must be safe for regular inspection for maintenance works to be undertaken to ensure smooth performance (Wu et al., 2007). Accessibility for maintenance works has direct impact on maintenance cost and the more difficult accessibility is the more costly it becomes (De Silva, 2012).

b) Characteristics of building materials and components

Cost of maintenance is directly affected by the characteristics of building components and materials (De Silva, 2012). Building components characteristics such as service life, tolerance, compatibility and maintenance and deterioration need to be therefore considered in order to monitor its cost effect on maintenance and performance (Shohet and Pacuk, 2004; Teo and Harikrishna, 2006; Yong, 2007).

c) Design Detailing

Errors in design of buildings badly affect the entire life of the building which largely affects the cost of maintenance. Having the correct details of structural strength and standard requirements will minimize the risk of design inefficiency, hence providing effective or efficient cost of maintenance (Chew et al., 2004; Adejimi, 2005; De Silva and Ranasinghe, 2010)

Environmental Conditions

d)

The extent of deterioration is impacted by the internal and external environment round the building. Environmental conditions within which buildings exist have direct influence on cost of maintenance. Environmental conditions in the tropical climate are usually marked by common change in weather and pressure. The greater the impact of environmental conditions on the building, the more costly maintenance will be (Chew and Tan, 2003; Flores-Colen et al., 2008).

e) Requirement for future maintenance

Maintenance cost may be very minimal if the maintenance work is made easy, for instance repair, inspection, replacement, cleaning, and less time spent is made etc. (El-Haram and Horner, 2002). Facilities managers have highlighted the importance of taking complete and collective opinion about maintenance as its being seen as one of the key players in choosing easy to maintain features in design (Buy and Nkado, 2006; Stoy and Kytzia; De Silva, 2011).

f) Constructability and quality of construction

Precise specification detailed in design is able to improved maintenance and contribute positively on cost of maintenance as the construction works follows the details in the design. The higher the constructability technique the minimal error in the procedure of construction (Andi and Minato, 2004; Trigunarsyah, 2004; Low and Wee, 2001).

g) Maintenance management process

Engaging an efficient process for building maintenance management is a prime feature to rightly perform and at large maintenance cost through its service life

(Marquez, 2007; Marquez et al., 2009). The cost of life of facilities are notably minimal as the management procedures are effective (Engelhardt et al., 2002).

2.5 INPUT OF FACILITIES MANAGERS IN THE DESIGN STAGES OF BUILDING

Several literature reviews have suggested the inclusion of facilities managers at the design stages of buildings to assist to minimize future maintenance challenges (Williamson et al. 2010). Usually designers have short term concerns specifically with regards to maintenance in the building they produce. Often they dissociate themselves from the maintenance problems or challenges that emanated from errors in design. The need to include maintenance professionals or facilities managers on the design team here becomes essential in order to consider their input during design and also to provide feedback to design team when there are maintenance challenges. More importantly, maintenance management is less challenged since facilities managers are fully involve and professional knowledge are shared during the design stages to achieve a building with efficient performance (Seeley 1996; Son and Yuen 1993). With the recent procurement system being accepted by the public sector internationally, a concessional period of about twenty-five years in the UK (Private Finance Initiative) is a requirement stipulated in the contract to maintain buildings. Building maintenance is therefore a critical element for consideration in design (Chinyio and Gameson 2009).

Williamson et al. (2010) explained as much as building owners are willing to allocate funds for maintenance of buildings especially when the building is comparatively old, it is not their expectation to allocate excess funds for maintenance for their new buildings at the early stages. He concluded in his investigations that most of the early maintenance challenges experienced with new buildings can be minimized and save cost if provisions are made for the input of facilities managers in design to consider the following technique to be utilized in the operations of maintenance management of the building:

a) Value management (VM)

Value management (VM) is a suitable technique to practice for maximising value and for the minimisation of future maintenance challenges if the precise stress is used at the outset (Dallas, 2006; Williamson et al., 2010). The owner needs to have a viewpoint and appreciation of the consequences of whole life costs, which will comprise the future maintenance demand and therefore maintenance needs are to be considered at the owner's briefing stage (Woodward, 1997). The owner will need their selected project manager and facilities manager, to pay attention on the maintenance issue to make sure that the objective of minimising challenges of maintenance is attained (Williamson et al., 2010).

b) Whole life costing (WLC)

Whole life-costing is basically an accounting process applied to the decisions made concerning the technology to be adopted (Ellingham and Fawcett, 2006). The life cycle cost looks at equilibrium among the start and expected expenses (Flanagan et al., 1989). The fundamental knowledge of a little bit of expense

in the present may well minimise expenditures in the future. In addition, more perceptible profits may flow from increased initial expenditures in terms of: improved quality, reduced disruption during refurbishment or planned maintenance, or increased income generating power for the building (Williamson et al., 2010). It is at the design stage that the greatest value gains can be achieved (AEC, 2007). Owners who have a long-term interest in the property concerned typically adopt WLC (Williamson et al., 2010).

c) Design quality indicator (DQI)

To satisfy an accepted standard is defined in construction as quality management (Rounce 1998). An instrument for measuring design is known as DQI and its the processes for considering the now and forthcoming implication of design need of occupants (Whyte and Gann, 2003). The achievement of DQI largely hinge on guaranteeing the relevant parties in the project are represented, and that the project team as a whole will be dedicated to producing what will be appropriate to the benefit of occupants. It also appears that the DQI can make a positive contribution to delivering acceptable quality buildings, but the question still remains as to whether, firstly, its usage will continue to grow in the future and, secondly, if it will be an effective method of reducing future building maintenance challenges (Williamson et al., 2010).

RICS, (2013) argued in their discussion on “Impact of design on maintainability” how significant to have facilities management expert appointed to the design/construction team, supported by appropriate terms of reference that are agreed to by all parties.

These will in effect arrived at a good design taking into account the facility's life span and expected tenancy impacting on maintenance such as:

- accessibility to associated facilities such as plant and equipment and other areas for maintenance (Wu et al., 2007);
- the choice of material and product that provide suitable state for maintenance that fit for the facility to perform, budget for maintenance and the anticipated state of quality of the facility (Cheumg and Kyle, 1996);
- sufficient facility(ies) in the building that allow maintenance works and cleaning works (RICS, 2013);
- appropriate state of available maintenance material and parts (Cheumg and Kyle, 1996);
- attaining the design while reducing, or use of other option to, specialised maintenance (Williamson et al., 2010).

Future alteration to maintain a property/facility can be further expensive to undertake. Variations to a property/facility after construction can even be further costly comparable to variations undertaken right from the initial state (at project briefing stage). The appointment of a facilities management expert will assist in the integration of variations to make better the maintenance of the building facility throughout the lifetime of the building. This also facilitates the making of informed choices by the host organisation in the choice of other optional design (Williamson et al., 2010; RICS, 2013).

Facilities/maintenance managers and other professional personnel must contribute to the aftermath occupancy assessment of facilities. This provide responses to the design

team to determine if design have really attained a fruitful facility, provide knowledge for future consideration in project design (RICS, 2013).

2.6 STRATEGIES TO IMPROVE ON PROPERTY/FACILITIES

MAINTENANCE MANAGEMENT

For effective maintenance management of building properties, Lee and Scott (2008), suggested that maintenance policy needs to be agreed upon by maintenance personnel and top management before implementation and the development the development of maintenance policy should be based on objectives of maintenance in consideration with the organisation"s objectives. This is to resolve misunderstanding and differences which often arise between maintenance personnel and top management on technicalities and approach of maintenance and resource provision for maintenance.

De Silva, (2012) also suggested that maintenance management of buildings can in a large extent be improved in terms of high cost of expenditures on maintenance if measures are taken to resolve the following identified risk factors in the early stages of design and construction of buildings:

- a) Access to permit maintainability
- b) Building material and component features
- c) The details of design
- d) Condition of the environment
- e) Forthcoming maintenance requirement
- f) Quality of construction and constructability
- g) Procedure and process of maintenance management

(Wu et al., 2007; Cheumg and Kyle, 1996; Chew et al., 2004; Chew and Tan, 2003; Andi and Minato, 2004; Marquez, 2007).

RICS (2013) argued that the following input and ideas of facilities/maintenance managers are brought to light for consideration during design and construction when they are included in the design team to achieve effective and efficient maintenance management of buildings:

- accessibility to associated facilities such as plant and equipment and other areas for maintenance
- the choice of material and product that provide suitable state for maintenance that fit for the facility to perform, budget for maintenance and the anticipated state of quality of the facility;
- sufficient facility(ies) in the building that allow maintenance works and cleaning works;
- appropriate state of available maintenance material and parts;
- Attaining the design while reducing, or use of other option to, specialized maintenance

(Wu et al., 2007; Cheumg and Kyle, 1996; Chew et al., 2004; Chew and Tan, 2003; Andi and Minato, 2004; Marquez, 2007).

CHAPTER THREE RESEARCH METHODOLOGY

3.1 INTRODUCTION

To aid in attaining the aim and objectives of the research, this chapter assesses research methods with the view of looking out to the suitable method to respond to the research questions posed. The effort of most research method and research design known internationally is to give a course in the preparation and application of the research in a way more probable to achieve the envisage objective. Collis and Hussey (2003) contended, research methods is generally the approach to the design procedure from the theoretical bases to the gathering of data and analysis modified for a research.

Methods are therefore technique for which advance information concerning the world are obtained, attempting to ascertain the way the assignment can be gotten what is certainly correct (Chritou et al., 2008). Henceforth, this chapter begins by discussing the viewpoint that supports the approach taken for the study, discussing the researcher's positivism posture to research and the consequential selection of a quantitative approach. The following segment deliberates the approach to data gathering and then the data collection instrument. The chapter also gives a general view of the population of the study and the method of sampling and analysis unit.

3.2 RESEARCH STRATEGY

This part of the study gives the course the researcher takes in undertaking the research. Studies have described research strategy as the examination of the objectives of the research (Naoum, 1998). Three key categories of strategies of research includes triangulation, qualitative and quantitative (Baiden, 2006). Nevertheless, selection of these categories to use relies on the research purpose, information available and the research kind (Naoum, 1998; Baiden, 2006). Henceforth, this study uses the

quantitative strategy, as the key data gathering techniques such as the use of the questionnaires.

3.3 RESEARCH DESIGN

Adams & Schvaneveldt (1985); Ogoe, (1993) have defined a design study as a group of guidelines for collection of data. This talks about the body for collecting and analysing data which affect the way for collecting and analysing data and make available the link concerning experimental data and its conclusion in a reasonable format to the fundamental question of the research (Yin, 2003; Bryman, 2004; Baiden 2006). This study uses survey type of questionnaire to pursue and identify the challenges of maintenance management of commercial buildings of Social Security and National Insurance Trust (SSNIT) in the Greater Accra Region. The necessity for broad view in the findings across commercial buildings affected the selection of questionnaire survey. Questionnaire survey improves uniformity of comments and advances repetition as a result of its integral consistent formation of measurement and sampling methods (Oppenheim, 2003).

3.4 DATA COLLECTION APPROACH

Data collection is vital in research, because it add to a better apprehension of an academic background (Bernard, 2002). Henceforth, it is imperious that in choosing the way in which the data will be attained and who it will be collected from, it should have been undertaken well without doubt, particularly when no extent of assessment explains for inappropriately data gathered (Bernard et al., 1986; Tongco, 2007).

Naoum (1998), inferred that, field study (collection primary data) and literature review (collection of secondary data) are the two main methods for data collection. To obtain a more credible and strong research study, it requires the use of more than one

instrument for collecting data (Patton 2002). This research will use several sources of data for the reason of added advantage related with several sources. Henceforth, the use of this approach for data collection was in two main parts, desk survey and field survey for this research study.

3.4.1 Literature Review (Desk Survey)

The literature review constitutes a vital section of the study because it sets the pace for the advancement of field survey instruments using questionnaires, and interview (Fadhley, 1991 and Owusu, 2008). Books, articles, journals were used secondary sources of information which mainly were internal source and external sources.

3.4.1.1 Internal Sources

The internal secondary sources of information were gathered from publications within companies and organizations, such as annual and quarterly reports and information booklets.

3.4.1.2 External Sources

External secondary sources of information have been termed as primary literature sources of collecting data (Wahab, 1996). Consequently, it is the most precise sources of information as it comprises the original research, which are textbooks, journals, and internet sources.

3.4.2 Primary Data Source (Field Survey)

The field survey covers the collection of experiential data which can be related with two practical approaches. These involve survey approach and the case study approach (Naoum, 2007). According to Mouton (2001), a survey is used to gather original data for telling a population very wide to observe directly. With the use of self-report, a

sample of individual gives out information through survey; in other words, people answer a couple of questions modelled to them by the researcher. (Polit et al., 1993). By reason of limited time frame and a number of respondents to be visited, this research adopted the use of descriptive survey (Robson, 2002).

3.4.3 Descriptive survey

Descriptive survey is a study that observes and gives insight about the presence, frequency or absence of features of an occurrence as it normally take place, so as to get more information (Burns et al. 2001). Polit et al. (1999) explained that, descriptive survey research primarily is aimed at describing the situations, preference, practice, opinion, concern or interest of the occurrence. The descriptive survey respond to questions like: how many, who, what is happening, where, and when (Naoum 2007). It counts the view and attitude of the size of respondents with particular objectives and later examined to match or demonstrate reality and trends. This process is relatively simple and can also be utilised to gather information (Mouton, 2001). The descriptive survey was chosen in that it gives a precise representation and interpretation of the characteristics such as conduct, views, capabilities, and knowledge of a specific individual, situation, or group (Naoum, 2007). In the effort to achieve the objectives of this research, this model was selected in order to identify the challenges of maintenance management of SSNIT commercial buildings.

3.5 DATA COLLECTION INSTRUMENT

3.5.1 Development of Questionnaire

Oppenheim 1996 outlined that it was critical to create information to gather pertinent questions that will be asked. Thought of petition to responses, simplicity of reading and supply of vital information directed most set-p of the questions. This improved

suitable use of time in data collection. The questionnaires' format comprises open ended and close ended questions. The respondent's views strength will be weighed using the likert response scale. Some of the benefits of using self-administered questionnaire are effective method to gather statistical measurement of information and effective technique as most respondent will be reached in minimal space of time (Twumasi 1993). The questionnaire were organised exactly with the main objectives of the study. Nevertheless, the questionnaire was organised in a manner that attained the main aim of this study, thus satisfying the obligation of this study. Precautions were also taken so that the question(s) of the questionnaire are of the simplest language, free and empty of technical words so as to reduce possible mistakes from the respondents.

3.5.2 Questionnaire Design and Distribution

As formerly indicated, the questionnaires were designed in line with the main objectives of the research which are in two sections. Section one talks about the background of the respondents and section two deals with the challenges of maintenance management of SSNIT commercial buildings. The questionnaires were dispersed and re-collected in person to ensure that the targeted recipient were reached and questionnaires duly completed to attained a better response rate.

3.6 SCOPE OF THE STUDY

By location, the research was conducted entirely with facilities/maintenance managers of SSNIT commercial buildings in Accra, Ghana and by context, the challenges of maintenance management of SSNIT commercial buildings will be identified.

3.7. RESEARCH POPULATION AND SAMPLING TECHNIQUE

3.7.1 Research Population

A research population was defined by Polit and Hungler (1993) as an entirety of a distinct collection of entities or objects that have a common, binding features or characters. Population is defined as all components (individuals, objects and events) that satisfy the sample standards for addition in a study. The research covers a population of fifteen (15) facilities/maintenance managers of completed SSNIT commercial buildings (Office complex, shopping malls, car park complex etc.) in Accra which are in operation. This group of persons were chosen because their activities have direct relationship on maintenance management of the building.

3.8.2 Technique of Sampling and Determination of Sample Size

Naoum (1998) explains sample as a section of an entire population selected to represent the residual. This research therefore used a smaller proportion of the population known as a sample. The sampling technique adopted for the research work is convenient sampling. The researcher having decided on what knowledge are essential, sets out to reach persons willing and can give the information base on their knowledge and experience (Bernard, 2002; Lewis and Sheppard, 2006; Tongco, 2007). The targeted sets of people for this research were the facilities/maintenance managers, hence, the use of convenience sampling to achieve the sample size due proximity and convenience to the researcher. The sample size chosen and contacted for this research was fifteen (15) completed and operating SSNIT commercial buildings (office complex, shopping mall, car park complex etc.) being managed by facilities/maintenance managers.

3.9 DATA ANALYTICAL TOOL

The selection of tool for analysis is reliant on complete appraisal of analytical and statistical tool available. The resolution of considering statistics was to select either statistical test of non-parametric or parametric. The selection among the two tests much rest on the extent that measurement is attained in the research and the kind of variable. The main statistics tool that was used is the non-parametric statistical testing adopting descriptive statistics, specifically mean and standard deviation.

3.10 SUMMARY

This chapter discusses the method for the study and the use of the methods. The research approach used and the method of data collection was discussed, that is, the use of the survey type of questionnaire. In conclusion of this chapter, the research process discusses matters including the research area, data sources, development of questionnaire, response trend of questionnaire, questionnaires' design and content, questionnaire distribution, respondents targeted, survey questionnaire scope, determination of size of sample and data analytical tool.

CHAPTER FOUR ANALYSIS AND DISCUSSION

This chapter discusses and analyses the data gathered intended to attain the objectives of this research. It explains the background information of respondents, factors influencing properties/ facilities maintenance management, factors contributing to high cost of maintenance and strategies for improving commercial building maintenance management.

This analysis represents a total of 15 organisations contacted, and 13 responded to questionnaires, representing 86.66 percent of retrieved questionnaires. A quantitative

data was used to retrieve data from the questionnaires and analysed using excel spreadsheet and descriptive statistics

4.1 BACKGROUND INFORMATION OF RESPONDENTS

The outcome from the survey on the background information of respondents was presented and analysed using descriptive analysis. The background information was centred on senior personnel involved in the maintenance management of SSNIT commercial buildings in Accra. Among the background information of respondents considered were profession, qualification, years of experience, and the type of commercial property being managed. The others were the mode of maintenance management being practiced, the preferred maintenance management strategy, philosophy of maintenance management, organisation of maintenance work, and response to maintenance request. These questions were to have confidence from whom the data being collected and also to have a general overview of the nature of maintenance management of the property/facility being managed. The results were presented in table 4.1.

Table 4.1: Background Information of Respondents

No.	Background Information	Frequency (n=13)	Percent
1.	Profession of respondents		
	Maintenance Engineer	1	7.69
	Facilities Manager	8	61.53
	Finance officer	-	-
	Forman of works	-	-
	Foreman of works/supervisor	-	-
	Others (Administrators, Accountants etc.)	4	30.76
2.	Years of experience in organisation		
	Less than 1 year	1	7.69
	1 to 2 years	5	38.46
	2 to 5 years	5	38.46
	More than 5 years	2	15.38
3.	Qualifications of respondents		

	PhD	-	-
	Msc	5	38.46
	Bsc	7	53.84
	HND	1	7.69
4.	Type of Property/Facility being managed		
	Shopping Mall	3	23.07
	Office complex	5	38.46
	Hotel	2	15.38
	Residential Apartment	-	-
	Office and Shopping Mall	3	23.07
5.	Mode of maintenance management		
	Planned maintenance	1	7.69
	Preventive maintenance	-	-
	Planned preventive maintenance	3	23.07
	Routine maintenance	-	-
	Emergency maintenance	-	-
	Planned inspection	-	-
	Combined mode	9	69.23
6.	Type of maintenance strategies practice believed to be effective		
	Planned maintenance	1	7.69
	Preventive maintenance	-	-
	Planned preventive maintenance	1	7.69
	Routine maintenance	-	-
	Emergency maintenance	1	7.69
	Planned inspection	-	-
	Combined strategies	11	84.61
7.	Philosophy of maintenance		
	To ensure continuous uninterrupted usage of all properties	2	15.38
	To make planned preventive maintenance topmost priority	1	7.69
	To ensure maintenance financing does not hold back effort for effective maintenance	-	-
	To encourage facility users/tenants to report request for maintenance early to ensure early response	-	-
	To respond promptly to request for maintenance by users/tenants	2	15.38
	Combined philosophy	6	46.15
8.	How maintenance work is organised		
	Direct labour within the organisation	-	-
	Labour only subcontractors	-	-
	Contract labour	-	-

	Building/maintenance contractors	1	7.69
	Specialist firms	-	-
	Supply and fix firms	1	7.69
	Combined use of form of work organisation	11	84.61
9.	What necessitates the carrying out of maintenance on buildings		
	Upon inspection	1	7.69
	Upon request	-	-
	Before occupancy of new tenant	-	-
	Utilises of all actions	12	92.30
10.	Average response time to maintenance request from occupants/tenants		
	Less than one week	7	53.84
	More than one week	1	7.69
	Less than one month	-	-
	1-3 months	-	-
	6-12 months	-	-
	More than 12 months	-	-
	Upon release of financial/material resources	-	-
	Response time depending on nature of work	5	38.46

Source: Field Survey, 2015

From Table 4.1, out of the total of 13 responded questionnaires, majority are facilities managers representing 61.53% of respondents and most respondent attained a working experience between 1-2 years and 2-5years both representing (38.46%). First degree was the most recorded qualification of respondents (53.84%). Majority of the respondent indicated that they manage an office complex facility/property (38.46%). Information retrieved from the questionnaires indicated that about (69.23%) of respondent practice combined mode of maintenance management rather than adopting only one mode whiles 84.61% believed the combined type will be the most effective strategy. Most of the respondents (62%) indicated that their maintenance philosophy embraces more than one philosophy. Majority of the respondents (84.61%) indicated adopting combined use of form of work organisation for maintenance works. Also almost all of the respondents (92.30%) indicated carry out maintenance by combining

inspection, upon request and other measured seen appropriate for their maintenance operations. The average response time of most respondents (53.84%) is less than one week.

4.3 FACTORS INFLUENCING FACILITIES/PROPERTIES MAINTENANCE MANAGEMENT

Factors influencing facilities/properties maintenance management of SSNIT commercial buildings were assessed in this section of the research with the aid of Likert Scale type of questionnaire. The respondents were presented with questionnaires comprising questions to confirm the factors influencing facilities/ properties maintenance management identified. The respondents were required to choose from „not important“ to „very important“ in confirmation of factors influencing facilities/properties maintenance management identified. The results are presented in Table 4.2 below.

Table 4.2: Factors Influencing Facilities/Properties Maintenance Management

No	Factors	Not Important	Somewhat Important	Important	Very Important	No response	Ranking
		1	2	3	4		
		Frequency and percentages (n=13)					
1	Financial delays	-	-	1 (7.69)	12 (92.30)	-	1 st
2	Contractual delays	-	1 (7.69)	7 (53.84)	5 (38.46)	-	2 nd
3	Tenant's improper usage of facility	1 (7.69)	2 (15.38)	6 (46.15)	3 (23.07)	1 (7.69)	3 rd
4	Client/Owner's response delays	-	1 (7.69)	5 (38.46)	6 (46.15)	1 (7.69)	3 rd
5	Lack of implementation of maintenance policy if any	-	3 (23.07)	5 (38.46)	4 (30.76)	1 (7.69)	4 th

6	Lack of input of Facility managers at design & construction stages	-	3 (23.07)	5 (38.46)	5 (38.46)	-	4 th
7	Poor quality of materials and spare parts	2 (15.38)	1 (7.69)	3 (23.07)	5 (38.46)	2 (15.38)	4 th
8	Incompetent Staff	3 (23.07)	1 (7.69)	5 (38.46)	2 (15.38)	2 (15.38)	4 th

Rank: [not important-1, somewhat important-2, important-3, very important-4] Source:

Field Survey, 2015

From Table 4.2, out of the total respondents of (13), 92.3% believed that financial delays is a very important factor and ranked first (1st) as the most important factor influencing maintenance management of commercial facilities/properties. Contractual delays ranked second (2nd) as 53.84% of respondents believes that it's an important factor influencing maintenance. Tenant's improper usage of facility and Client/Owner's response delays both ranked third (3rd), recording 46.15% of respondents each indicating how important and very important these factors influences maintenance management respectively. Lack of implementation of maintenance policy, if any, Lack of input of Facility managers at design & construction stages and Incompetent Staff factors all ranked fourth (4th) and recorded 38.46% of respondents who indicated how important all these factors influences maintenance management. Lastly, Poor quality of materials and spare parts which also ranked fourth (4th), recorded 38.46% of respondents who indicated how this factor is a very important influence on maintenance management.

It is obvious that majority of the respondents are in support of the factors influencing effective maintenance management of commercial buildings generally.

4.4 FACTORS CONTRIBUTING TO HIGH COST OF MAINTENANCE

With the aid of Likert scale type of questionnaire, respondents were given 12 factors that contribute to high cost of maintenance of SSNIT commercial properties/facilities.

They were to indicate the major expenditure areas incurred in maintenance and rate them choosing between very low and very high. The results are presented in Table

4.3.

Table 4.3: Factors Contributing to High cost of Maintenance

No	Factors	Very low (1)	Low (2)	Moderate (3)	High (4)	Very high (5)	No response	Ranking
Frequency and percentages (n=13)								
1	Building's external works (ie driveways, drainage, rainwater, goods etc.)	-	3 (23.07)	6 (46.15)	3 (23.07)	1 (7.69)	-	1 st
2	External surface (paintings, cleaning etc.)	-	-	5 (38.46)	6 (46.15)	2 (15.38)	-	1 st
3	Replacement of building's ironmongery	-	4 (30.76)	3 (23.07)	6 (46.15)	-	-	1 st
4	Security systems (CCTV cameras, security personnel, etc)	-	-	6 (46.15)	5 (38.46)	2 (15.38)	-	1 st
5	Building's internal (i.e. plumbing, electrical etc.)	-	2 (15.38)	5 (38.46)	6 (46.15)	-	-	1 st
6	Delays in responding to reported defect	6 (46.15)	-	4 (30.76)	1 (7.69)	2 (15.38)	-	1 st
7	Air/ventilating handling equipment	-	-	3 (23.07)	5 (38.46)	5 (38.46)	-	2 nd
8	Mechanical/electrical equipment i.e. lifts, generators etc)	-	-	-	5 (38.46)	8 (61.53)	-	2 nd

9	Accessibility for maintenance	1 (7.69)	5 (38.46)	4 (30.76)	3 (23.07)	-	-	2 nd
10	Errors in design of building	2 (15.38)	3 (23.07)	4 (30.76)	-	4 (30.76)		3 rd
11	Environmental Conditions (Internal and External) weather, atmospheric conditions etc.	2 (15.38)	2 (15.38)	4 (30.76)	1 (7.69)	3 (23.07)	1 (7.69)	3 rd
12	Availability of funds	1 (7.69)	3 (23.07)	2 (15.38)	3 (23.07)	2 (15.38)	2 (15.38)	4 th

Rank: [very low-1, low-2, moderate-3, high-4, very high-5]

Source: Field Survey, 2015

From table 4.3, out of the total respondents of (13), a high record of 46.15% indicated that building's external works (i.e driveways, drainage, rainwater, goods etc.) and security systems (CCTV cameras, security personnel, etc) has moderate contributing factor to high cost of maintenance in commercial facilities/property, however 46.15% responses indicated that external surface (paintings, cleaning etc), replacement of building's ironmongery as well as building's internal (i.e plumbing, electrical etc) have high effect on cost of maintenance; while most of the respondents (38.46%) believes that air/ventilating handling equipment respectively have both high and very high impact on cost of maintenance, and errors in design of buildings also respectively have both moderate and very high effect on cost of maintenance with most record of 30.76%. Also majority of respondents (23.07%) believe that availability of funds respectively have both low and high effect on cost of maintenance while 30.76 majority indicated that environmental conditions have moderate cost implications on maintenance. However, mechanical/electrical equipment (i.e lifts, generators, etc.) records a high percentage of 61.53%, indicating that cost implication of maintenance is very high in

this regards. The remaining respondents (38.46%) and 46.15% mostly indicated that the cost effect on maintenance with respect to accessibility for maintenance and delays in responding to reported defect are low and very low respectively.

In summary, the first six (6) factors were ranked first (1st) as the most contributing factors to cost of maintenance, followed by the other three (3) factors ranked second (2nd), followed by another two (2) factors ranked third (3rd), then the last one ranked fourth (4th). Generally the respondents agreed to the factors contributing high cost of maintenance

4.5 STRATEGIES FOR IMPROVING COMMERCIAL PROPERTIES / FACILITIES MAINTENANCE MANAGEMENT

A Likert scale type of questionnaire was used as an aid for respondents to indicate and rank in their opinion 6 factors identified as strategies for improving on maintenance management of commercial properties/facilities. They are to choose between very significant to not significant. The result is presented in table 4.4.

Table 4.4: Strategies for Improving Commercial Properties/Facilities Maintenance Management

No	Factors	Very Significant (1)	Significant (2)	Somewhat Significant (3)	Not Significant (4)	No response	Ranking
		Frequency and percentages (n=13)					
1	Availability of adequate maintenance funding	8 (61.53)	1 (7.69)	-	3 (23.07)	1 (7.69)	1 st
2	Building maintenance policy need to be agreed upon by maintenance personnel and top management before implementation.	7 (53.84)	2 (15.38)	2 (15.38)	2 (15.38)		2 nd

3	Building maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation's objectives	7 (53.84)	3 (23.07)	2 (15.38)	-	1 (7.69)	2 nd
4	Adherence to design details avoid errors	6 (46.15)	3 (23.07)	3 (23.07)	1 (7.69)		3 rd
5	Training of maintenance personnel	6 (46.15)	3 (23.07)	3 (23.07)	1 (7.69)		3 rd
6	Prompt response to reported defects	6 (46.15)	2 (15.38)	1 (7.69)	3 (23.07)	1 (7.69)	3 rd

Rank: [very significant-1, significant-2, somewhat significant-3, not significant-4]

Source: Field Survey, 2015

From table 4.4, out of the total respondents of (13), majority of respondent (53.84%) believes that building maintenance policy need to be agreed upon by maintenance personnel and top management before implementation as well as building maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation's objectives are very significant for strategies for improving commercial property/facilities maintenance. Most respondents (46.15%) indicated Training of maintenance personnel, adherence to design details and prompt response to reported defect are also very significant for improving commercial properties/facilities maintenance whiles the majority (61.53%) agrees that prompt response to reported defect is also very significant for improving commercial property/facilities maintenance management.

Availability of adequate maintenance funding was ranked first (1st) as a strategy for improving commercial properties/facilities maintenance management, followed by the 2nd and 3rd factors which was ranked second (2nd) then subsequently 4th, 5th and 6th

factors ranked third (3rd). In general, majority of the respondents supported most of the strategies to improve on commercial property/facilities maintenance management of commercial buildings.

4.6 SUMMARY

Generally, the results of the surveys as discussed were found to be a true reflection of SSNIT commercial building properties/facilities in Accra. It shows that respondents responded to the questionnaires based on their experience over the years. It started by giving a brief discussion of the respondent of the survey, and the outcome of the descriptive statistics retrieved from the field thereof. In conclusion the chapter by the mean score index analyses the factors influencing effective property/facilities maintenance, factors contributing to high cost of maintenance and strategies for improving on commercial property/facilities maintenance management. The results obviously demonstrate the significance of the need of maintenance management of commercial buildings in Ghana.

CHAPTER FIVE SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

The aim of the research is to identify challenges of maintenance management of Social Security and National Insurance Trust (SSNIT) commercial properties/facilities with the view of recommending strategies for improving maintenance management of building properties/facilities. In this chapter, the research questions and the objectives were again looked at to give in detail the scope by which the study's aim has been attained through the several levels of the study. This chapter further gives some recommendations of the research based on the findings of the study.

5.2 SUMMARY OF FINDINGS

5.2.1 Factors influencing properties/facilities maintenance management

- The study showed that financial delays is a very important factor influencing effective maintenance scoring a high percentage of 92.30% representing 12 out of 13 total responses which ranked first (1st).
- The study further indicated that contractual delays is an important factor scoring 53.84% representing 7 out of 13 total respondents, ranking second (2nd).
- 46.15% was recorded for tenant's improper usage of facility as an important factor that influences maintenance management, ranking third (3rd).
- And finally, client/owner's response delays to maintenance issues recorded from the study 46.15% indicating that it is a very important factors influencing maintenance management, ranking third (3rd).

- The analysis also showed that lack of implementation of maintenance policy if any and lack of input of facilities/maintenance managers at design and construction stage are important factors recording the highest percentage of 38.46% representing 5 out of 13 respectively, ranking fourth (4th).
- Also the study revealed that poor quality of materials and spare parts are also very important factors influencing maintenance management recording 38.46% representing 5 out of 13 respondents, ranking fourth (4th).
- Again the research find out that incompetent staff is another important factor recording 38.46% of total respondent of 13, ranking fourth (4th).

5.2.2 Factors contributing to high cost maintenance management

A number of factors were identified with various extent of impact contributing to high cost of maintenance established on the bases of responses gotten from the field survey and presented in the previous chapter of this research work. Generally, almost all the respondents averagely ranked all the identified factors i.e building's external work, external surfaces of buildings, replacement of building's ironmongery, security systems, ventilation equipment, mechanical & electrical equipment, building's internal, errors in design of buildings, environmental conditions, availability of funds, accessibility for maintenance and delays in responding to reported defect as contributing in varying ways to high cost of maintenance.

5.2.3 Strategies for Improving on commercial properties/facilities maintenance management

- The study revealed that a high score of 61.53% respondents, ranking first (1st), agreed that availability of adequate maintenance funding is very significant.

- The research showed that a high score of 53.84% of respondents, ranking second (2nd), indicated that it is very significant that building maintenance policy are agreed upon by maintenance personnel and top management before implementation.
- The analysis also showed a high score of 53.84% of respondents, which also ranked second (2nd), believed that it is very significant that building maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation"s objectives
- The study revealed also that a high score of 46.15% of respondents, ranking third (3rd) supported that it is very significant to train maintenance personnel
- The study further noted a score of 46.15% of respondent, also ranked third (3rd) that agreed that it is very significant that design details are followed to avoid errors
- And finally, majority percentage of 46.15%, respondents also ranked third (3rd) believe that prompt response to reported defect is very significant.

5.3 RECOMMENDATIONS

Having assessed the policy framework of building maintenance, identified the factors contributing to high cost of maintenance, and the input of facilities/maintenance managers at the design and construction stage, the following findings of this research are expected to assist to adopt strategies to enhance effective maintenance management of commercial properties/facilities.

- Building maintenance policy need to be agreed upon by maintenance personnel and top management before implementation. The data from the findings

recorded a high percentage of respondents (53.84%) who believe the point that maintenance personnel and top management need to agree on the issues of the maintenance policy framework before implementing them.

- Building maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation's objectives. The data from the findings recorded higher percentage of 53.84% respondents who supported the fact that maintenance objectives should be considered in relation to the organisation's objectives.
- Training of maintenance personnel. The research findings recorded as high as 46.15% of respondents who supported the idea of maintenance personnel being trained.
- Adherence to design details to avoid errors. Also a high percentage 46.15% of respondents supported the point of adhering to design details to avoid errors.
- Availability of adequate maintenance funding. High percentage of 61.53% respondents agreed to the availability of adequate maintenance funding.
- Prompt response to reported defect. A higher record of 46.15% respondents agreed that prompt response to reported defect are very significant to maintenance management.

These recommended strategies from the result of the analysis ranks among the first three position, hence seen as a very significant strategies for improving maintenance management.

5.4 LIMITATION OF THE RESEARCH

There were problems faced in the course of undertaking the research at the field work phase, posing constraints to the execution of the research. Meeting with senior officers was tedious because of their busy schedules procedures and long delays in response to the questionnaires circulated.

5.5 CONCLUSION

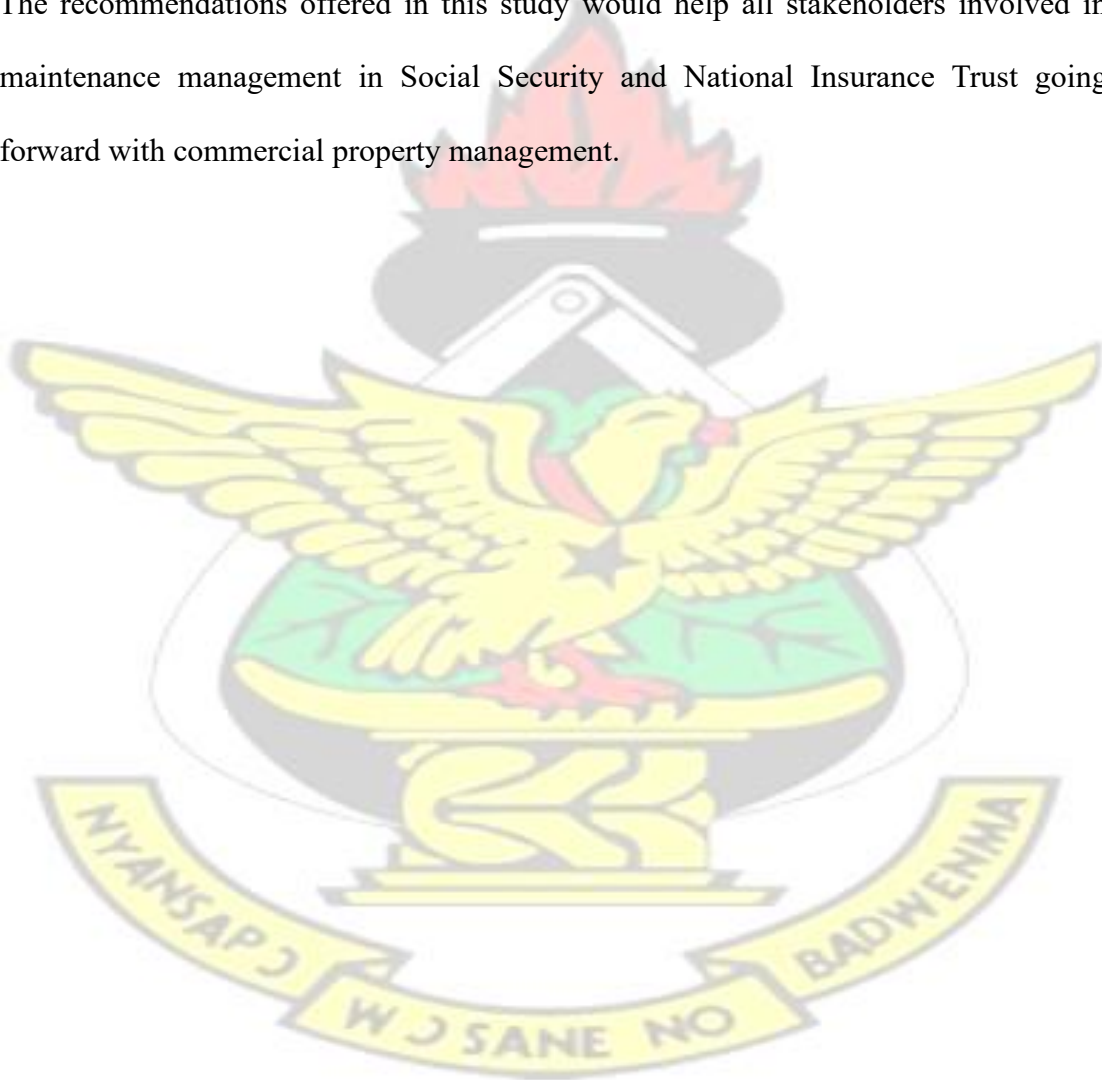
The importance in maintenance management is increasing. With a progressively and hastily varying nature of commercial properties, the responsibility lies on designers, facilities/maintenance managers, clients/owners to improve their attitude towards maintenance management thereby guaranteeing effective utilisation of resources. Out of the six (6) strategies and recommendations raised in the effort to achieve the objectives of the study, an average of 51.27% of respondents generally believe that the strategies outlined are very significant for maintenance management of commercial properties, that is:

- After assessment of policy framework of commercial properties/facilities, majority of respondents believe that maintenance personnel and top management need to agree on issues of the maintenance policy framework before implementing them, and also maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation's objectives.
- Generally, the majority of the respondents confirmed almost all of the factors identified to contribute to high cost of maintenance, these includes building's external work, external surfaces of the buildings, replacement of building's ironmongery, security systems, ventilation equipment, mechanical and

electrical equipment, building's internal, errors in design of buildings, environmental conditions, availability of funds, accessibility for maintenance and delays in responding to reported defects.

- Majority of the respondents also agreed that the input of facilities/maintenance managers are important matter to consider at the design and construction stages of building after the survey.

The recommendations offered in this study would help all stakeholders involved in maintenance management in Social Security and National Insurance Trust going forward with commercial property management.



REFERENCES

- Achieving Excellence in Construction [AEC] (2007), "Procurement Guide 07:WholeLife Costing. Office of Government Commerce [OGC].
- Adams, G.R. and Schaneveldt J.D (1985) Understanding Research Methods, New York: Longman Publishers.
- Adejimi, A. (2005), "Poor Building Maintenance in Nigeria: Are Architects Free From Blames?", Proceedings of ENHR International Conference on Housing: New Challenges and Innovations in Tomorrow's Cities, Iceland, 29 June-3 July.
- Al-Hammad, A., Al-Mubaiyadh, S. and Mahmoud, T. (1996), "Public Versus Private Sectors Assessment of Problems Facing the Building Maintenance Industry in Saudi Arabia", Building Research & Information, Vol. 24 No. 4, pp. 245-54.
- Ali, Azlan-Shah, Kamaruzzaman, Syahrul-Nizam, Sulaiman, and Peng, Yong Cheong, (2010), "Factors Affecting Housing Maintenance Cost in Malaysia", Journal of Facilities Management, Vol. 8 Iss 4 pp. 285-298.
- Ali, A.S., Keong, K.C., Zakaria, N., Zolkafli, U., Akashah, F., (2013), "The Effect of Design on Maintenance for School Buildings in Penang, Malaysia", Structural Survey, Vol. 31 Iss 3 pp. 194-201.
- Ali, A. S. (2008), "Integrative Mechanisms in the Design Process of Building Refurbishment Projects, "Unpublished PhD Thesis, Universiti Teknologi MARA, Shah Alam.
- Ali, A. S (2009), "Cost Decision Making in Building Maintenance Practice in Malaysia". Journal of Facilities Management, Vol. 7, No.4, pp. 298-306.
- Al-khatam, Jalal A., (2003), "Building Maintenance Cost". Unpublished Thesis (Msc), King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia.
- Allen, David (1993), "What is Building Maintenance?", Facilities, Vol. 11 Iss. 3 pp. 7-12.

- Andi, S. and Minato, T. (2004), "Representing Casual Mechanism of Defective Designs: exploration Through Case Studies", *Construction Management and Economics*, Vol. 22 No. 2, pp. 183-92.
- Baiden, B. K. (2006) Framework for the Integration of the Project Delivery Team. Unpublished Thesis (PhD), Loughborough University, United Kingdom
- Bernard, H.R. (2002) *Research Methods in Anthropology: Qualitative and Quantitative Methods*. 3rd ed. California: Alta Mira Press, Walnut Creek.
- Bernard, H.R., Pelto, P.J., Werner, O., Boster, J., Romney, A.K., Johnson, A., Ember C.R., & Kasakoff A. (1986) The Construction of Primary Data in Cultural Anthropology. *Current Anthropology*, 27, pp. 382-396
- British Standard Institution. BS3811:1993, "Glossary of terms used in terotechnology".
- British Standard Institution. BS 8210: 1986, "British Standard Guide to Building Maintenance Management".
- Broll Ghana Quarterly Office Barometer, Review of second quarter, 2012.
- Bryman, A. (2004b) Qualitative Research on Leadership: A Critical but Appreciative Review, *Leadership Quarterly*, 15, pp. 729-769.
- Burns, N. and Grove, S.K. (2001) *The Practice of Nursing Research: Conduct, Critique & Utilization*. 4th ed. Philadelphia, WB Saunders
- burns, P. (1997) Advanced Integrated Maintenance Strategies. January/February 1997 Issues of *AFE Facilities Management Journal*, pp. 27-36.
- Buyts, F. and Nkado, R. (2006), "A Survey of Maintenance Management System in South African Tertiary Educational Management", *Construction Management and Economics*, Vol. 21 No. 10, pp. 997-1005.
- Chan, K. T., Lee, R.H.K. and Burnett, J. (2001), Maintenance Performance: A case study of Hospitality Engineering Systems. *Facilities* 19 (13/14): 494-503.
- Chanter, B. and Swallow, P. (1996) "Maintenance Organisation. In: *Building Maintenance Management* London: Blackwell Science.

- Cheung, M. S. and Kyle, B. R. (1996), "Service Life Prediction of Concrete Structures by Reliability Analysis, "Construction and Building Materials, Vol. 10, No1, pp.45-55.
- Chew, M. Y. L. and Tan, P. P. (2003), "Façade Staining Arising From Design Features". Journal of Construction and Building Materials, Vol. 17 No. 3, pp. 181-7.
- Chew, M. Y. L., De Silva, N. and Tan, S. S. (2004), "A Neutral Network Approach to Assessing Building Façade Maintainability in the Tropics", Construction Management and Economics, Vol. 22, pp. 581-94.
- Chinyio, Ezekiel., and Gameson, Rod., (2009), "Private Finance Initiative in Use. In: A. Akintoye and M. Beck, (eds.) Policy Finance and Management for PublicPrivate Partinership. UK: Wiley-Blackwell".
- Christou, E., Valachis, I. and Anastasiadou, C. (2008) Research Methodology in Hospitality Industry: The role of the Inquiry Paradigm.
- Coetzee, J.L. (1999) A Holistic Approach to the Maintenance "Problem". Journal of Quality in Maintenance Engineering 5(5): 276-280.
- Collis, J. and Hussey, R. (2003) Business Research: A Practical Guide for Undergraduate and Postgraduate Students, 2nded, New York: Palgrave Macmillan.
- Dallas, M. F. (2006), "Value and Risk Management: A Guide to Best Practice, UK: Blackwell.
- De Silva, N. (2011), "Promoting the Facilities Management Profession in the Project Development Phase of High-Rise Buildings in Sri Lanka", Built EnvironmentSri Lanka, Vols 9/10 Nos ½ pp. 37-44.
- De Silva, N. and Ranasinghe, M. (2010), "Maintainability Risk of Condominiums in Sri Lanka", Journal of Financial Management of Property and Construction, Vol. 15 No. 1, pp. 41-60.
- De Silva, Nayanthara, Ranasinghe, De Silva, C.D., (2012), "Risk Factors Affecting

- Building Maintenance Under Tropical Condition”,;: Journal of Financial Management of Property and Construction, Vol. 17 Iss 3 pp. 235-252.
- Department for Social Development: <https://www.dsdnigov.uk/housing-maintenance>. Retrieved on 20/7/2015.
- El-Haram, M.A., and Horner, M.W. (2002), “Factors Affecting Housing Maintenance Cost”,;: Journal of Quality in Maintenance Engineering, Vol. 8, No. 2 pp. 115-23.
- Ellingham, I and Fawcett, W. (2006), “New Generation Whole-Life Cycle Costing. Oxon: Taylor and Francis.
- Emma, M. A. Z., and Syahrul, N. K., (2009), “Personnel Characteristics of Maintenance Practice: A Case of High-rise Office Building in Malaysia”,;: Journal of Sustainable Development, Vol. 2 No.1, pp. 111-6.
- Engether, M., Skipworth, P., Savic, D. A., Walters, G. A. and Saul, A. J. (2002), “Determining Maintenance Requirements of a Water Distribution Network Using Whole Life Costing”, Journal of Quality in Maintenance Engineering, Vol. 8 No. 2, pp. 152-64.
- Fadhley, S. A. (1991) A Study of Project Finance Banking with Special reference to the Determinants of Investment Strategy, Unpublished Thesis (PhD), Loughborough University.
- Flanagan, R., Norman, G., Meadows, J and Robinson, G. (1989), “Life Cycle Costing: Theory and Practice. Oxford: Blackwell Scientific.
- Flores-Colen, I., De Brito, J. and De Freitas, V. P. (2008), Staining in Facades” Rendering- Diagnosis and Maintenance Techniques” Classification”, Construction and Building Materials, Vol. 22, pp. 211-22.
- Forster, Alan M., Kayan, Brit., (2009), „Maintenance for Historic Buildings: A Current Perspective“, Structural Survey, Vol. 27 Iss 3 pp. 210-229.
- Francis, W. H. Y., Lee, W. L. and Ng, C. K., (2001), “Building Energy Efficiency and Remuneration of Operation and Maintenance Personnel”,;: Facilities, Vol. 20, pp. 406-13.

- Horner, R.M.W., El-Haram, M.A., and Munns, A.K (1997) Building Maintenance Strategy: A New Management Approach. *Journal of Quality in Maintenance Engineering* 3(4): 273-280.
- Jawdeh, Habib Bu., Wood, Gerard., Abdul-Malak, M. Asem., (2010), “Altering Design Decisions to Better Suit Facilities Management Processes”: Proceedings of the Tenth International Conference for Enhanced Building Operations, Kuwait, October 26-28, 2010.
- Khalid, K., Marosszeky, M. and Davis, S. (2006), “Managing Sub-contractor Supply Chain for Quality in Construction”, *Engineering, Construction and Architectural Management*, Vol. 13 No. 1 ,pp. 27-42.
- Lam, K. C (2000) “Planning and Execution of Business-Centered Maintenance for Perfect Buildings, <http://www.absc.org/pdfs/centeredmaintenance.pdf>.
- Lam, K. C (2001) “Quality Assurance System for Quality Building Services Maintenance”, Paper Presented at the Chartered Institution of Building Services Engineers National Conference, July, www.cibse.org/pdfs/99.pdf.
- Lateef, O. A. (2008), “Building Maintenance Management in Malaysia”, *Journal of Building Appraisal*, Vol. 4. No.3, pp. 207-14.
- Lee H Y, Hackman and Scott, David., (2008), “Development of a Conceptual Framework for the Study of Building Maintenance Operation Process in the Context of Facility Management”, *Surveying and Built Environment*, Vol. 19(1), 81-101, December 2008. ISSN1816-9554.
- Lee H Y, Hackman and Scott, David., (2009), “Overview of Maintenance Strategy, Acceptable Maintenance Standard and Resources from a Building Operation Perspective”, : *Journal of Building Appraisal*. www.palgravejournals.com/jba/journal/v4/full/jba200846.html. Retrieved on 20/7/2015.
- Lewis, J.L. & Sheppard, S.R.J. (2006) Culture and Communication: Can Landscape Visualization Improve Forest Management Consultation With Indigenous Communities? *Landscape and Urban Planning*, 77.pp.291–313.

- Lo, S. M., Lam, K. C and Yuen, K. K (2000) Views of Building Surveyors and Building Services Engineers on Priority Setting of Fire Safety Attributes for Building Maintenance. *Facilities* 18(13/14): 513-523.
- Low, S. P and Wee, D. (2001), "Improving Maintenance and Reducing Building Defect Through ISO 9000", *Journal of Quality in Maintenance Engineering*, Vol. 7 No. 1, pp. 6-24.
- Marquez, A. C., De Leon, P. M., Fernandez, J. F. G., Marquez, C. P. and Campos, M. L. (2009), "The Maintenance Management Framework: A Practical View to Maintenance Management", *Journal of Quality in Maintenance Engineering*, Vol. 15 No. 2 , pp. 167-78.
- Marquez, A. C. (2007), "The Maintenance Management Framework, Models and Methods for Complex Systems Maintenance, Springer, London.
- Mouton J (2001) *How to Succeed in your Master's and Doctoral Studies*, Pretoria, South Africa: Van ;Schaik
- Naoum, S. G. (2007) *Dissertation Research and Writing for Construction Students* 2nded, Butterworth-Heinemann
- Naoum, S.G. (1998) *Dissertation Research and Writing for Construction Students*. Oxford: Bultermouth-Heinemom.
- Narayan, V. (2003), *Effective Maintenance Management: Risk and Reliability Strategies for Optimizing Performance*, Industrial Press, New York, NY.
- Neves, L. C., Frangopol, D. M. and Cruz, P. S. (2004), "Cost of Life Extension of Deteriorating Structures Under Reliability-Based Maintenance", *Computers & Structures*, Vol. 82 Nos 13-14, pp. 1077-89.
- Oberg, C. P. (2002) "Managing Maintenance as a Business, <http://www.maintenance sources.com/ReferenceLibrary/ezone/epac.html>.
- Ogoe, E.K (1993) *Decentralisation and Local Government Reforms in Ghana: GNDC's Decentralisation Policies: The Case of Ahanta West District Assembly*.
- Ollila, A. and Malmipuro, M. (1999), Maintenance has a role in Quality. *The TQM Magazine* 11 (1): 17-21.

- Olubodun, F. (2001), "A Multivariate Approach to the Prediction of Maintenance Needs in Public Housing: the Tenant Dimension", *Structural Survey*, Vol. 19 No. 2, pp. 133-41.
- Ometehinshe, O.J., Dabara, D.I., & Guymu, J. (20015), „Design Inadequacies and the Maintenance of University Buildings in Ile-Ife, Nigeria. *Journal of Environment and Science*, 5(2) 175-187.
- Oppenheim, A. N. (1996) *Questionnaire Design, Interviewing and Attitude Measurement*. London: Pinter.
- Oppenheim, A. N. (2003) *Questionnaire Design, Interviewing and Attitude Measurement*. New ed. London: Continuum International Publishing Group.
- Owusu M. D., (2008) *Equipment Investment Finance Strategy for Large Construction Firms in Ghana Unpublished Thesis*, Kwame Nkrumah University of Science and Technology, Ghana.
- Pascual, R., Meruane, V. and Rey, P. A. (2008), "One Effect of Downtime Costs and Budget Constraint on Preventive and Replacement Policies", *Reliability Engineering & System Safety*, Vol. 93 No. 1, pp. 144-51.
- Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods*, Sage Publications, Thousand Oaks, Calif.
- Pitt, T. J. (1997) "Data Requirements for the Prioritization of Predictive Building Maintenance. *Facilities* 15 (3/4): 97-104.
- Polit, D. F. and Hungler, B. P. (1993) *Essentials of Nursing Research: Methods, Appraisals and Utilisation*, 3rd ed. Philadelphia, Lippincott-Raven Publisher.
- Pulselli, R. M., Simoncini, E., Paulselli, F. M., Bastianoni, S. (2007) *Emergy Analysis of Building Manufacturing, Maintenance and Use: Em-Building Indices to Evaluate Housing Sustainability*: Department of Chemical and Biosystems, University of Siena, Via Della Diana 2a, 53100 Siena, Italy.
- RICS, (2013) *Draft Guidance Note- Building Maintenance: Strategy, Planning and Procurement*, 3rd Edition. <https://consultations.rics.org/consult.t/building>. Retrieved on 18/7/2015.

- Robson, C. (2002) *Real World Research: A Resource for Social Scientists and Practitioner – Researcher*. Oxford. Blackwell Publishing
- Rounce, G (1998) Quality, waste and cost considerations in architectural building design management. *International Journal of Project Management*. 16(2), 123-27.
- Seeley, Ivor Hugh (1996), “Building Economics”, 4ed.UK: Macmillan.
- Seeley, I. H. (1976), “Building Maintenance. London. Macmillan.
- Shaba, Ghasson., (2003), “A Low-cost Maintenance Approach to High-rise Flats”,
Facilities, Vol. 21 Nos 13/14, pp. 315-22.
- Shen, Q. (1997) “A Comparative Study of Priority Setting Methods for Planned Maintenance of Public Buildings. *Facilities* 15(12/13): 331-339.
- Shen, Q. P. and Lo, K. K. (1999) “Optimisation of Resources in Building Maintenance- Analytical Approach. *The Journal of Building Surveying, HKISI* (1): 27-32.
- Shohet, I. M. and Paciuk, M. (2004), “Service Life Prediction of Exterior Cladding Components Under Standard Conditions”, *Construction Management and Economics*, Vol. 22, No. 10, pp. 1081-90.
- Skinner, N. P. (1982), “Local Authority House Maintenance – the Variation in Expenditure”. *Housing Review*, pp. 92-4.
- Social Security and National Insurance Trust Annual Report, 2013, posted 4/5/2015, www.ssnit.org.gh/downloads.php#reports.
- Son, Lee How., and Yuen, George C S., (1993), “Building Maintenance Technology. London: Macmillan.
- Spedding, A. (1987), “Building Maintenance Economics and Management”. London: E. & F. N. Span.
- Stoy, C. and Kytzia, S. (2006), “Occupancy Costs: A Method for Their Estimation”, *Facilities*, Vol. 24 Nos 13/14, pp.476-89.
- Teo, E. A. –L. and Harikrishna, N.(2006), “A Quantitative Method for Efficient

Maintenance of Plastered and Painted Facades” Construction Management and Economics, Vol. 24 No. 12, pp. 1283-93.

The British Standard (BS) EN 13306 (BSI 2001).

The Broll Ghana Report 2014/2015, pp.26, www.broll.com/asset/uploads/documents/2015/04/The_Broll_Report_2014-2015.pdf

Then, D. S. S. (1996), “A conceptual Framework for Describing Built Assets Maintenance Standards. Facilities 14 (7/8): 12-15.

Timilli, Adrian, (2014), “The Impact of Maintenance of Buildings and Infrastructure Facilities to the National Economy (A Case Study of Shell Camp Housing Estate, Oweri, Imo State, Nigeria.

Tongoco, D.C. (2007) Purposive Sampling as a Tool for Informant Selection, Enthobotany Research & Applications, 5,pp.147-158. Available at <http://hdl.handle.net/10125/227>[Accessed on [04/04/2013].

Trigunarsyah, B. (2004), “Review of Current Practice in Constructability Improvement: Case Study on Construction Projects in Indonesia”, Construction Management and Economics, Vol. 22 No. 6 pp. 567-80.

Tse, P. W. (2002) “Maintenance Practices in Hongkong and the Use of the Intelligent Scheduler. Journal of Quality in Maintenance Engineering, 8(4): 369-380.

Twumasi, P. A. (1993) Social Research in Rural Communities. 2nd ed. Accra: Ghana Universities Press.

Wahab, I.A. (1996) Financing the Growth of Small Manufacturing Firm. Unpublished Thesis, Loughborough University, UK.

Whyte, J. and Gann, D. (2003), “Design Quality Indicators: Work in Progress. Building Research and Information. 31(5), 387-98.

Williamson, Anthony., Williamson, Chris., Gamesor, Rod., (2010), “The Consideration of Maintenance Issues During The Design Process in The UK Public Sector. In: Egbu C. (Ed) Procs 26th Annual ARCOM Conference, 6-8

- September 2010, Lead, UK, Association of Researchers in Construction Management, 1091-1100.
- Wong, L.T. (2002), “A Cost Model for Plumbing and Drainage Systems”. *Facilities*, Vol. 20 Nos 11/12, pp. 386-93.
- Wood, B. (2003) “Building Care. Oxford, UK: Blackwell Science.
- Wood, B. (2003a) “Approach the Care-Free Building. *Facilities* 21 (3/4): 74-79.
- Woodward, D. G. (1997), “Life Cycle Costing-Theory, Information Acquisition and Application. *International Journal of Project Mangement*. 15(6), 335-44.
- Wu, S., Lee, A., Tah, J. H. M. and Aouad, G. (2007), “The Use of a Multi-Attribute Tool for Evaluating Accessibility in Buildings: The AHP Approach”. *Facilities*, Vol. 25 Nos 9/10, pp. 375-89.
- Yahya, Mohamad Ridzuam and Ibrahim, Md Najib., (2011), “Building Maintenance Policy for Office High-rise Building in Malaysia: A preliminary Study in Klang Valley, International Conference on Project & Facilities Management (ICOPFM 2011), 18 & 19 May 2011, Kuala Lumpur, Malaysia”.
- Yin, K.Y. (2003) *Applications of Case Study Research*, 2nded California: Sage Publications, Inc.
- Yip, N. M. (2001), “Tenant Participation and the Management of Public Housing-the Estate Management Advisory Committee of Hong Kong”, *Property Management*, Vol. 19 No.1, pp. 10-18.
- Yong, M. E. (2007), “Dampness Penetration Problems in Granite Buildings in Aberdeen, UK: Causes and Remedies”, *Construction and Building Materials*, Vol. 21, No.9, pp. 1846-59.
- Zavadskas, E., Bejder, E. and Kaklauskas, A. (1998) “Raising the Efficiency of the Building Lifetime with Special Emphasis on Maintenance. *Facilities* 16(11): 334-340.

APPENDIX 1: QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI, GHANA

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

CHALLENGES OF MAINTENANCE MANAGEMENT OF COMMERCIAL

BUILDINGS IN GHANA

A CASE STUDY OF SOCIAL SECURITY AND NATIONAL INSURANCE

TRUST PROPERTIES IN ACCRA

BY

ERNEST MENSAH, PGD, B.tech (Hons)

Dear Sir,

I am a graduate student of KNUST, conducting research into the Challenges of Maintenance Management of Commercial Buildings in Ghana. This is in partial fulfilment for the award of Masters of Science degree in Construction Management.

Your participation in the research will be appreciated by responding to the attached questionnaire which has been designed to capture data on strategies for improving performance in certain areas of building maintenance.

Any information you provide will be treated with strictest confidence and would only be used for the purpose of this research without mentioning your name or organisation except if you wish to be mentioned in the main report.

I am counting on your cooperation. Please if you have any further questions and contributions about this research, please do not hesitate to contact me on my email at **ernemens68@gmail.com** or call on **020-8484945**.

Thank you in advance for your participation and assistance with this study.

Sincerely Yours,

Ernest Mensah

SECTION A: BACKGROUND INFORMATION

Please kindly respond to the following questions by ticking (✓) the appropriate box(s) for each item.

RESPONDENT'S PROFILE

Name..... (Please ignore if you wish to remain anonymous)

1. Position in organization:

- ☐ Maintenance Engineer
- ☐ Facilities Manager
- ☐ Finance officer

☐ Foreman of works/Supervisor

☐ Other.....(please specify)

2. No. of years in organization.

☐ Less than 1 years

☐ 1-2years

☐ 2 – 5years

☐ More than 5 years

3. Highest qualification (please do not tick more than two boxes)

☐ PhD

☐ MSc

☐ BSc

☐ HND

☐ Professional qualification..... (please specify)

☐ Other..... (Please specify)

4. Please kindly indicate areas of property management where you are usually involved (you may tick more than one box)

☐ Shopping Mall ☐

Office complex

☐ Hotel

☐ Residential Apartment

☐ Others (please specify).....

5. Please kindly indicate mode of maintenance management that is normally used in your sector:

☐ Planned maintenance

☐ Preventive maintenance

☐ Planned preventive maintenance

☐ Routine maintenance

☐ Emergency maintenance

☐ Planned inspection

☐ Other (Please state type)

6. Please indicate the type of maintenance management strategy that you personally believe is most effective for your sector of operation.

☐ Planned maintenance

☐ Preventive maintenance

☐ Planned preventive maintenance

☐ Routine maintenance

☐ Emergency maintenance

☐ Planned inspection

☐ Other (Please state type)

7. Please which one of the following is the maintenance philosophy of your sector?

☐ To ensure continuous uninterrupted usage of all our properties/facilities

☐ To make planned preventive maintenance our topmost priority

☐ To ensure maintenance financing does not hold back our effort to ensure effective use of our properties/facilities

☐ To encourage our facility users/tenants to report request for maintenance early to ensure our early response

☐ To respond promptly to request for maintenance by our tenants/users

☐ Other

.....
.....
.....
.....

(please describe accurately)

8. Please kindly indicate how maintenance work is organised within your sector.

(You may tick more than one box)

☐ Direct labour within organisation

☐ Labour only subcontractors

☐ Contract labour

☐ Building/maintenance contractor

☐ Specialist firms

☐ Supply and fix firms

☐ Other (please describe)

9. Please indicate what necessitates the carrying out of maintenance on your buildings?

☐ Upon inspection

☐ Upon request

☐ Before occupancy of new tenant

☐ Other (please specify).....

10. Please indicate average response time when maintenance request are received by occupants/users. ☐ Less than one week

☐ More than one week

☐ Less than one month

☐ 1-3 months

☐ 6-12 months

☐ More than 12 months

☐ Upon release of financial/material resources

☐ Other (please specify).....

SECTION B: FACTORS INFLUENCING FACILITIES/PROPERTY MANAGEMENT MAINTENANCE

11. The following factors have been identified as major influencing factors that causes impediments to the achievement of effective facilities maintenance management. In your experience, indicate the extent to which these factors influences commercial properties in your organization. Please rank in order of importance as: **4 = Very Important 3= Important; 2= Somewhat Important; 1= Not Important** (Please list the relevant factors according to your literature review and design your own tables to suite your work....)

Factors influencing effective Property/Facilities Maintenance

No	Factors	Not Important	Somewhat Important	Important	Very Important
		1	2	3	4
1	Financial delays				
2	Lack of implementation of maintenance policy if any				

3	Lack of input of Facility managers at design & construction stages				
4	Contractual delays				
5	Poor quality of materials and spare parts				
6	Incompetent Staff				
7	Tenant's improper usage of facility				
8	Client/Owner's response delays				

If other (please specify)

.....

.....

.....

.....

SECTION C: FACTORS CONTRIBUTING TO HIGH COST OF MAINTENANCE

12. Please kindly indicate in your opinion/experience, the major expenditure areas incurred in maintenance management of the property(s) which you manage.

Please rank in order of importance as: **1= Very low, 2= Low, 3= Moderate, 4= High, 5= Very high**

No	Element	Ranking				
		1	2	3	4	5
1	Building's external works (ie driveways, drainage, rainwater, goods etc.					
2	External surface (paintings, cleaning etc)					
3	Replacement of building's ironmongery					
4	Security systems (CCTV cameras, security personnel, etc)					
5	Air/ventilating handling equipment					
6	Mechanical/electrical equipment i.e. lifts, generators etc)					
7	Building's internal (i.e. plumbing, electrical etc.)					

8	Errors in design of building					
9	Environmental Conditions (Internal and External) weather, atmospheric conditions etc.					
10	Availability of funds					
11	Accessibility for maintenance					
12	Delays in responding to reported defect					

If other (please specify)

.....

.....

.....

SECTION D: STRATEGIES FOR IMPROVING ON COMMERCIAL PROPERTIES / FACILITIES MAINTENANCE MANAGEMENT

13. In your experience, which of the following strategies in your opinion can be most useful in improving commercial property/facility maintenance management in your organization?

Please rank in order of importance as: **1= Very Significant, 2= Significant, 3= Somewhat Significant, 4= Not Significant**

Strategies to improve on maintenance management of commercial properties/facilities

No	Element	Ranking			
		1	2	3	4
1	Building maintenance policy need to be agreed upon by maintenance personnel and top management before implementation.				
2	Building maintenance objectives which are the bases for developing maintenance policy must be considered in relation to organisation's objectives				
3	Training of maintenance personnel				
4	Adherence to design details avoid errors				
5	Availability of adequate maintenance funding				
6	Prompt response to reported defect				

If other (please specify)

.....

.....

.....

Thank you

KNUST

