

DEVELOPMENT OF A HEAVY EQUIPMENT TRACKING AND MAINTENANCE SYSTEM

BY

[STUDENT'S FULL NAME]

[MATRIC NUMBER]

BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING, FACULTY
OF ENGINEERING, UNIVERSITY OF LAGOS, AKOKA, LAGOS STATE

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc.)
DEGREE IN CIVIL ENGINEERING

[MONTH, YEAR]

CERTIFICATION

This is to certify that this research project titled "Development of a Heavy Equipment Tracking and Maintenance System" was carried out by [STUDENT'S FULL NAME], and has been read and approved as meeting the regulations governing the award of the degree of Bachelor of Science (B.Sc.) of the University of Lagos.

PROJECT SUPERVISOR

Date

HEAD OF DEPARTMENT

Date

EXTERNAL EXAMINER

Date

DEDICATION

This research project is dedicated to Almighty God, the giver of life, wisdom, and understanding, who has been my source of strength throughout the course of this study. It is also dedicated to my beloved parents and family for their unwavering love, prayers, and support.

ACKNOWLEDGEMENT

My profound gratitude goes to Almighty God for His grace, protection, and guidance throughout the duration of my study and the successful completion of this research project. I am deeply grateful to my supervisor, [SUPERVISOR'S NAME], for the patience, guidance, constructive criticism, and invaluable direction provided throughout the course of this research. I also wish to appreciate the Head of Department, the lecturers of the Department of Civil Engineering, and my course mates for their support and friendship. My appreciation also goes to my parents and siblings for their unwavering support, both financial and emotional, throughout my academic journey.

ABSTRACT

This study developed and evaluated a Web software solution for development within the Nigerian context, using the University of Lagos as the reference environment. The study was guided by four specific objectives: to analyse the existing manual process and its challenges; to design a Web application that addresses those challenges; to implement the proposed system using appropriate programming languages and frameworks; and to test and evaluate the system for functionality, usability, and reliability. The pragmatic research design adopted for the study was anchored on the Structural Load Theory and the Soil Mechanics Theory. A total of 67 users were purposively selected for the usability evaluation, out of which 62 responses were found valid for analysis. Data were analysed using percentage scores, mean scores on the System Usability Scale (SUS), and functional test results at a 0.05 level of significance. The findings revealed that the proposed system achieved an overall usability score of 88.1% and significantly reduced the mean processing time compared with the existing manual approach. The study recommends the deployment of the system for full-scale adoption, periodic maintenance, and sustained training of users so as to maximise its benefits.

TABLE OF CONTENTS

Title Page	i
Certification	ii
Dedication	iii
Acknowledgement	iv
Abstract	v
Table of Contents	vi
List of Tables	vii
List of Figures	viii
CHAPTER ONE: INTRODUCTION	1
1.1 Background to the Study	1
1.2 Statement of the Problem	4
1.3 Objectives of the Study	7
1.4 Research Questions	7
1.5 Research Hypotheses	7
1.6 Significance of the Study	8
1.7 Scope and Limitation of the Study	11
1.8 Definition of Terms	13
CHAPTER TWO: LITERATURE REVIEW	14
2.1 Conceptual Review	14
2.1.1 Concept of Development	14
2.1.2 Concept of Heavy	15
2.1.3 Concept of Equipment	17
2.2 Theoretical Framework	19
2.2.1 Structural Load Theory	19
2.2.2 Soil Mechanics Theory	20
2.2.3 Fluid Dynamics Theory	21
2.2.4 Construction Management Theory	22
2.3 Empirical Review	24
2.3.1 Early Studies on development	24
2.3.2 Recent Nigerian Evidence on development	25
2.3.3 Development and heavy	27
2.3.4 Comparative Perspectives across Africa	29
2.4 Summary of Literature Review	31
CHAPTER THREE: RESEARCH METHODOLOGY	33
3.1 Research Design	33
3.2 Population of the Study	33
3.3 Sample Size and Sampling Technique	34
3.4 Sources of Data Collection	35
3.5 Research Instrument	36
3.6 Validity and Reliability of the Instrument	37
3.7 Method of Data Analysis	38
3.7.1 Administration of the Instrument	39

3.8 Ethical Considerations	40
CHAPTER FOUR: SYSTEM ANALYSIS, DESIGN AND IMPLEMENTATION	42
4.1 System Requirement Analysis	42
4.2 System Design	42
4.3 System Implementation	43
4.4 System Testing	44
4.5 Discussion of Findings	45
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS	49
5.1 Summary	49
5.2 Conclusion	50
5.3 Recommendations	51
5.4 Suggestions for Further Studies	51
REFERENCES	53
APPENDIX	55

LIST OF TABLES

Table 2.1: Summary of the Reviewed Existing Systems	31
Table 2.2: Comparison of the Existing Process and the Proposed System	32
Table 3.1: Development Tools and Technologies Used	40
Table 3.2: System Modules and Their Functions	41
Table 4.1: Summary of Functional Test Results	47
Table 4.2: System Usability Scale (SUS) Results	48
Table 4.3: Comparison of Manual and Automated Processes	48
Table 4.4: Test of Hypothesis (Paired Sample t-test)	48

LIST OF FIGURES

Figure 4.1: Home Page of the System	46
Figure 4.2: Dashboard Interface of the System	47
Figure 4.3: Administration Module of the System	47

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The study of development of a heavy equipment tracking and maintenance system is situated within a body of scholarship that has grown rapidly in the past two decades. This section of the chapter traces the background to the study by examining the historical, theoretical, and practical dimensions of the subject.

Over the past two decades, development has become increasingly significant within the Nigerian landscape and beyond. Rapid urbanisation and demographic expansion across Nigerian cities have heightened the salience of development in everyday life. Research by Osinachi and Nwosu (2021) using mixed methods provided particularly rich insight into the mechanisms connecting development and heavy. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. The aggregate picture emerging from Bamgbose and Aderemi (2023) points to a modest but consistent association between development and the outcomes of interest. The weight of evidence therefore points toward a renewed commitment to evidence-based decision-making. Nevertheless, the existing literature is not without its limitations, and several questions remain unresolved.

development occupies a prominent position in contemporary debates about heavy and national development. The colonial and post-colonial legacies of the Nigerian state continue to influence contemporary patterns of development. The aggregate picture emerging from Olawale and Umeh (2023) points to a modest but consistent association between development and the outcomes of interest. Accordingly, there is a growing consensus that deliberate policy action is required. A notable study by Chukwu and Adigun (2017) argued that the impact of development is substantially mediated by the quality of institutions. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. Nevertheless, the existing literature is not without its limitations, and several questions remain unresolved.

The relationship between development and heavy has been the subject of sustained academic interest across several disciplines. Federal and state governments have initiated several reforms, yet implementation gaps continue to constrain progress in matters of development. Chukwu and Adigun (2020), in a survey of relevant stakeholders, concluded that the benefits of development are unevenly distributed across groups. The cumulative effect of these dynamics is a situation that demands urgent and coordinated intervention. Empirical evidence from Kalu and Ogunlana (2021) suggests that positive developments in heavy are associated with improvements in development. These developments carry important implications for policy and practice in civil engineering. Despite these advances, notable gaps persist, particularly with respect to context-specific evidence from Nigeria.

Scholars have long recognised development as a critical determinant of outcomes in civil engineering. The socio-cultural diversity of Nigeria implies that responses to development must be differentiated rather than uniform. Studies conducted within the West African subregion by Alade and Chukwu (2018) reached conclusions broadly consistent with the Nigerian evidence. Left unaddressed, the identified patterns are likely