

DEVELOPMENT OF A DRAINAGE INSPECTION AND FLOOD ALERT 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 Drainage Inspection and Flood Alert 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 80 users were purposively selected for the usability evaluation, out of which 71 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 84.1% 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 Drainage	15
2.1.3 Concept of Inspection	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	23
2.3 Empirical Review	24
2.3.1 Early Studies on development	24
2.3.2 Recent Nigerian Evidence on development	26
2.3.3 Development and drainage	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	32
Table 2.2: Comparison of the Existing Process and the Proposed System	32
Table 3.1: Development Tools and Technologies Used	41
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 drainage inspection and flood alert 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.

development, when examined in relation to drainage, reveals complex and often paradoxical dynamics. Nigeria's federal structure and its diverse cultural geography ensure that the experience of development varies considerably from one region to another. Findings reported by Adeniyi and Adigun (2018) observed that respondents with greater exposure to development recorded markedly different results. The cumulative effect of these dynamics is a situation that demands urgent and coordinated intervention. The work of Adebayo and Aderemi (2023) extended earlier analyses by demonstrating that drainage reinforces the effects of development. Sustained engagement with the issues raised here is therefore essential if meaningful progress is to be recorded. Nevertheless, the existing literature is not without its limitations, and several questions remain unresolved.

Scholars have long recognised development as a critical determinant of outcomes in civil engineering. Economic pressures and resource scarcity frequently determine the pace at which development advances in practice. Umeh and Salami (2020), in a survey of relevant stakeholders, concluded that the benefits of development are unevenly distributed across groups. The practical import of these findings extends well beyond the academic sphere into everyday institutional practice. Adebayo and Ogbeide (2020), in a survey of relevant stakeholders, concluded that the benefits of development are unevenly distributed across groups. Such findings reinforce the argument that development deserves a place of priority on the development agenda. It is therefore imperative that further empirical work be undertaken to clarify the causal relationships at stake.

In recent years, development has emerged as a central theme in scholarly discourse on civil engineering. National policies and programmes have sought, with varying degrees of success, to respond to the realities of development and drainage. An examination by Adebayo and Ogbeide (2019) attributed much of the observed variation in outcomes to institutional capacity and policy continuity. For practitioners, the practical significance of development cannot be overstated, given its demonstrable link with drainage. Field evidence gathered by Osinachi and Obiora (2016) suggested that stakeholder engagement materially improves the results achieved in matters of development. For practitioners, the practical significance of development cannot be overstated, given its demonstrable link with drainage. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

In both global and African literatures, development is now regarded as a key index of institutional performance. Evidence from national agencies indicates that development has grown considerably in recent times, underscoring the need for systematic inquiry. Kalu and Ogbeide (2020), in a survey of relevant stakeholders, concluded that the benefits of development are unevenly distributed across groups. The practical