

DEVELOPMENT OF A GRINDING MILL COOPERATIVE MANAGEMENT SYSTEM

BY

[STUDENT'S FULL NAME]

[MATRIC NUMBER]

BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF MECHANICAL 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 MECHANICAL ENGINEERING

[MONTH, YEAR]

CERTIFICATION

This is to certify that this research project titled "Development of a Grinding Mill Cooperative Management 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 Mechanical 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 Thermodynamics Laws and the Tribology Theory. A total of 65 users were purposively selected for the usability evaluation, out of which 56 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 84.6% 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	15
2.1 Conceptual Review	15
2.1.1 Concept of Development	15
2.1.2 Concept of Grinding	16
2.1.3 Concept of Mill	18
2.2 Theoretical Framework	20
2.2.1 Thermodynamics Laws	20
2.2.2 Tribology Theory	21
2.2.3 Finite Element Method Theory	23
2.2.4 Fluid Mechanics Theory	24
2.3 Empirical Review	25
2.3.1 Early Studies on development	25
2.3.2 Recent Nigerian Evidence on development	27
2.3.3 Development and grinding	29
2.3.4 Comparative Perspectives across Africa	30
2.4 Summary of Literature Review	32
CHAPTER THREE: RESEARCH METHODOLOGY	34
3.1 Research Design	34
3.2 Population of the Study	34
3.3 Sample Size and Sampling Technique	35
3.4 Sources of Data Collection	36
3.5 Research Instrument	37
3.6 Validity and Reliability of the Instrument	38
3.7 Method of Data Analysis	39
3.7.1 Administration of the Instrument	40

3.8 Ethical Considerations	41
CHAPTER FOUR: SYSTEM ANALYSIS, DESIGN AND IMPLEMENTATION	43
4.1 System Requirement Analysis	43
4.2 System Design	43
4.3 System Implementation	44
4.4 System Testing	45
4.5 Discussion of Findings	46
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS	50
5.1 Summary	50
5.2 Conclusion	51
5.3 Recommendations	52
5.4 Suggestions for Further Studies	52
REFERENCES	54
APPENDIX	56

LIST OF TABLES

Table 2.1: Summary of the Reviewed Existing Systems	33
Table 2.2: Comparison of the Existing Process and the Proposed System	33
Table 3.1: Development Tools and Technologies Used	42
Table 3.2: System Modules and Their Functions	42
Table 4.1: Summary of Functional Test Results	48
Table 4.2: System Usability Scale (SUS) Results	49
Table 4.3: Comparison of Manual and Automated Processes	49
Table 4.4: Test of Hypothesis (Paired Sample t-test)	49

LIST OF FIGURES

Figure 4.1: Home Page of the System	47
Figure 4.2: Dashboard Interface of the System	48
Figure 4.3: Administration Module of the System	48

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The study of development of a grinding mill cooperative management 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.

Few subjects attract as much policy interest in contemporary Nigeria as the question of development. Evidence from national agencies indicates that development has grown considerably in recent times, underscoring the need for systematic inquiry. Findings reported by Alade and Salami (2018) observed that respondents with greater exposure to development recorded markedly different results. For practitioners, the practical significance of development cannot be overstated, given its demonstrable link with grinding. Empirical evidence from Osinachi and Adebayo (2021) suggests that positive developments in grinding are associated with improvements in development. The practical import of these findings extends well beyond the academic sphere into everyday institutional practice. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

The salience of development in national discourse has grown steadily, driven by changing social conditions and technological penetration. Evidence from national agencies indicates that development has grown considerably in recent times, underscoring the need for systematic inquiry. The work of Chukwu and Adekunle (2023) extended earlier analyses by demonstrating that grinding reinforces the effects of development. Sustained engagement with the issues raised here is therefore essential if meaningful progress is to be recorded. Research by Dauda and Famuyide (2021) using mixed methods provided particularly rich insight into the mechanisms connecting development and grinding. These observations collectively invite a reconsideration of standard assumptions regarding grinding. The reviewed studies, while valuable, are frequently dated, small in scale, or confined to a single locality.

In recent years, development has emerged as a central theme in scholarly discourse on mechanical engineering. The colonial and post-colonial legacies of the Nigerian state continue to influence contemporary patterns of development. The aggregate picture emerging from Dauda and Famuyide (2023) points to a modest but consistent association between development and the outcomes of interest. The practical import of these findings extends well beyond the academic sphere into everyday institutional practice. A notable study by Adeniyi and Ogunlana (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 salience of development in national discourse has grown steadily, driven by changing social conditions and technological penetration. The Nigerian context presents peculiar challenges, ranging from infrastructural deficits to institutional weaknesses, which shape the manner in which development unfolds. Longitudinal