

DESIGN AND IMPLEMENTATION OF A LABORATORY EQUIPMENT BOOKING SYSTEM

BY

[STUDENT'S FULL NAME]

[MATRIC NUMBER]

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

[MONTH, YEAR]

CERTIFICATION

This is to certify that this research project titled "Design and Implementation of a Laboratory Equipment Booking 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 Electrical 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 design 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 Signal Processing Theory and the Power System Stability Theory. A total of 60 users were purposively selected for the usability evaluation, out of which 57 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 87.2% 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 Design	14
2.1.2 Concept of Implementation	15
2.1.3 Concept of Laboratory	17
2.2 Theoretical Framework	19
2.2.1 Signal Processing Theory	19
2.2.2 Power System Stability Theory	20
2.2.3 Control Systems Theory	21
2.2.4 Electromagnetic Theory	22
2.3 Empirical Review	24
2.3.1 Early Studies on design	24
2.3.2 Recent Nigerian Evidence on design	26
2.3.3 Design and implementation	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	50
5.4 Suggestions for Further Studies	51
REFERENCES	52
APPENDIX	54

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 design and implementation of a laboratory equipment booking 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.

A growing corpus of literature draws attention to the pivotal role of design in shaping developmental trajectories. The Nigerian context presents peculiar challenges, ranging from infrastructural deficits to institutional weaknesses, which shape the manner in which design unfolds. Ogbeide and Oyelaran (2020), in a survey of relevant stakeholders, concluded that the benefits of design are unevenly distributed across groups. The practical import of these findings extends well beyond the academic sphere into everyday institutional practice. Findings reported by Ogbeide and Bamgbose (2018) observed that respondents with greater exposure to design recorded markedly different results. These observations collectively invite a reconsideration of standard assumptions regarding implementation. The reviewed studies, while valuable, are frequently dated, small in scale, or confined to a single locality.

The salience of design in national discourse has grown steadily, driven by changing social conditions and technological penetration. Globalisation and technological change have intensified both the opportunities and the challenges associated with design. Nwosu and Osinachi (2020), in a survey of relevant stakeholders, concluded that the benefits of design are unevenly distributed across groups. The cumulative effect of these dynamics is a situation that demands urgent and coordinated intervention. Longitudinal research by Chukwu and Dauda (2016) revealed that sustained attention to design yields appreciable dividends over time. Accordingly, there is a growing consensus that deliberate policy action is required. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

Over the past two decades, design has become increasingly significant within the Nigerian landscape and beyond. Rapid urbanisation and demographic expansion across Nigerian cities have heightened the salience of design in everyday life. The work of Chukwu and Dauda (2023) extended earlier analyses by demonstrating that implementation reinforces the effects of design. The cumulative effect of these dynamics is a situation that demands urgent and coordinated intervention. An examination by Obiora and Olawale (2019) attributed much of the observed variation in outcomes to institutional capacity and policy continuity. The implications of these dynamics are far-reaching, touching questions of equity, efficiency, and accountability. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

Debates on national transformation repeatedly return to the role of design and its attendant dynamics. Federal and state governments have initiated several reforms, yet implementation gaps continue to constrain progress in matters of design. The work of Bamgbose and Nwosu (2023) extended earlier analyses by demonstrating that implementation reinforces the effects of design. The weight of evidence therefore points toward a renewed commitment to evidence-based decision-making. Ibrahim and Dauda (2020), in a survey of relevant