ENHANCING THE QUALITY OF LEARNING MANAGEMENT SYSTEM



HOOR FATIMA YOUSAF

03-243192-034

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Master of Science (Computer Science)

Department of Computer Science

BAHRIA UNIVERSITY LAHORE CAMPUS, LAHORE

NOVEMBER 2021

Approval for Examination

Scholar's Name: Hoor Fatima Yousaf

Registration No. 38656

Program of Study: Master of Science in Computer Science

Thesis Title: Enhancing the Quality of Learning Management System

It is to certify that the above scholar's thesis has been completed to my satisfaction and, to my belief, its standard is appropriate for submission for examination. I have also conducted plagiarism test of this thesis using HEC prescribed software and found similarity index 11% that is within the permissible limit set by the HEC for the MS degree thesis. I have also found the thesis in a format recognized by the BU for the MS thesis.

Principal Supervisor's Signature: _____

Date: _____

Name: Dr. Abdul Hafeez

Author's Declaration

I, Hoor Fatima Yousaf hereby state that my MS thesis titled "Enhancing the Quality of Learning Management System" is my own work and has not been submitted previously by me for taking any degree from this university Bahria University, Lahore Campus (Name of University) or anywhere else in the country/world.

At any time if my statement is found to be incorrect even after my graduation, the University has the right to withdraw/cancel my MS degree.

Name of scholar: Hoor Fatima Yousaf

Date: _____

Plagiarism Undertaking

I, solemnly declare that research work presented in the thesis titled "_____ _____ _____Enhancing the Quality of Learning Management System_____ __" is solely my research work with no significant contribution from any other person. Small contribution / help wherever taken has been duly acknowledged and that complete thesis has been written by me.

I understand the zero-tolerance policy of the HEC and Bahria University towards plagiarism. Therefore, I as an Author of the above titled thesis declare that no portion of my thesis has been plagiarized and any material used as reference is properly referred / cited.

I undertake that if I am found guilty of any formal plagiarism in the above titled thesis even after award of MS degree, the university reserves the right to withdraw / revoke my MS degree and that HEC and the University has the right to publish my name on the HEC / University website on which names of scholars are placed who submitted plagiarized thesis.

Scholar / Author's Sign: _____

Name of the Scholar: Hoor Fatima Yousaf

To my loving father Rana Muhammad Yousaf Naveed

ACKNOWLEDGEMENTS

I would like to thank everyone who had contributed to the successful completion of this proposal. I would like to express my gratitude to my research supervisor Dr. Abdul Hafeez for his invaluable advice, guidance, and his/her enormous patience throughout the development of the research.

In addition, I would also like to express my gratitude to my loving parent who had helped and given me encouragement.

ABSTRACT

The progress of the board and activity in educational exercises inside academic organizations has revolutionized through Information and Communication Technologies (ICTs). As the utilization of ICTs, with different associations, has helped colleges and educational institutions in helping with setting and accomplishing their procedures. Learning Management System (LMS) is important for this structure, it is profoundly adjusted to help the teaching and learning measures inside instructive organizations and have been exceptionally evolved throughout the long term. For E-Learning there must be the LMS with finest quality. The quality issues of LMS still exist that was not identified before and due to it the usability of LMS is also affecting. The focal point of this study is to assess the quality of LMS regarding different quality factors of Human Computer Interaction (HCI). This study compares different LMS of developing countries against quality factors, figure out quality issues and then reports on how conceptual quality model of LMS can be implemented and promoted in Pakistan using Multi-Criteria Decision Making (MCDM) method. After that the best alternative of LMS will be uncovered using Technique of Order Preference Similarity to the Ideal Solution Method (TOPSIS).

TABLE OF CONTENTS

CHAPTER TITLE PAGE

APPROVAL FOR EXAMINATION iii
DECLARATION iii
ACKNOWLEDGEMENTS.....vi
ABSTRACT vii
LIST OF TABLES xi
LIST OF FIGURES xii
LIST OF ABBREIATIONS.....xiii
LIST OF APPENDICES.....xiv

1 INTRODUCTION.....15
1.1 Background to the Research 15
1.2 Traditional Education.....16
1.3 E-Learning 17
1.4 Need of LMS.....17
1.5 Research Gap 20
1.6 Problem Statement.....21
1.7 Key Research Questions 22
1.8 Aims and Objectives 22
1.9 Expected Outcome 22
1.10 Main Contributions 22
1.11 Research Approach 23
1.12 Thesis Organization.....24
1.13 Chapter Summary.....25

2 LITERATURE REVIEW.....26
2.1 Key Concepts 26
2.1.1 E-Learning.....26
2.1.2 Learning Management System.....27
2.1.3 Software Quality 28
2.1.4 Software Quality Models 28
2.1.6 System Usability Scale.....32

2.1.7 Multi Criteria Decision Analysis (MCDA) 32
2.1.8 Analytical Hierarchal Process (AHP) 33
2.1.9 Technique for Order of Preference by Similarity to Ideal Solution(TOPSIS) 34
2.2 Related Work 34
2.3 Factors and Sub-Factors 39
2.3 Mapping Quality Factors with Quality Models 42
2.4 Chapter Summary 43

3 RESEARCH METHODOLOGY 44
3.1 Introduction 44
3.2 Learning Management Selection 45
3.3 Research Methods 46
3.3.1 Phase 1: Identification of factors affecting the quality of the LMS 46
3.3.2 Phase 2: Ranking of Quality Factors 47
3.3.3 Phase 3: Quality Framework for Assessing the quality of LMS 51
3.3.4 Phase 4: Ranking the Universities for Best Alternative of LMS 51
3.4 Chapter Summary 52

4 RESULTS AND DISCUSSIONS 53
4.1 Overview of Research Findings 53
4.2 Empirical Evaluation 53
4.2.1 Participants 53
4.2.2 Usability Questionnaire 54
4.2.3 Procedure 54
4.2.4 Results 54
4.2.4.1 Descriptive Statistics 54
4.2.4.2 Graphical Statistics 55
4.2.4.3 Discussion 55
4.3 Analytical Hierarchy Process (AHP) 56
4.3.1 Participants 56
4.3.2 Results 59
4.3.2.1 Pairwise Comparison Matrix 59
Decision Matrix of main dimensions 60
Decision Matrix of Usability's sub-criteria 62
Decision Matrix of Efficiency's sub-criteria 64
Decision Matrix of Portability's sub-criteria 66
Decision Matrix of Reliability's sub-criteria 67
Decision Matrix of Maintainability's sub-criteria 68
4.3.2.2 Normalized Eigen Vector and Criteria Weights 69
4.3.3 Framework for enhancing the quality of LMS 76
4.4 Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) 77

4.4.1 Participants 77
4.4.2 Results 78
4.4.2.1 Decision Matrix of main dimensions 78
4.4.2.2 Decision Matrix of sub-dimensions 80
4.4.2.3 Normalized Decision Matrix of main dimensions 83
4.4.2.4 Normalized Decision Matrix of sub-dimensions 84
4.4.2.5 Weighted Normalized Decision Matrix of main dimensions 87
4.4.2.6 Weighted Normalized Decision Matrix of sub-dimensions 88
4.4.3 Ranking of Universities based on Performance Score 91

5 CONCLUSION 92
5.2 Limitations of the Study 94
5.3 Future Work 94

REFERENCES 95
APPENDICES A-Y 103-123

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Quality Factors and Sub-Factors	30
2.2	State of Art Table	37
2.3	Quality Factors and Sub-Factors with References	41
2.4	Mapping of Quality Factors with Quality Models	42
3.1	Satty's Scale	49
3.2	Random Index Values	51
4.1	Descriptive Statistics of SUS	55
4.2	Demographic information of AHP experts	56
4.3	Pairwise Comparison Scale	59
4.4	Decision Matrix of main dimensions	60
4.5	Decision Matrix of Usability	62
4.6	Decision Matrix of Efficiency	64
4.7	Decision Matrix of Portability	66
4.8	Decision Matrix of Reliability	67
4.9	Decision Matrix of Maintainability	68
4.10	Priority weight and Consistency Check of main factors	70
4.11	Priority weight and Consistency Check of Usability	71
4.12	Priority weight and Consistency Check of Efficiency	72
4.13	Priority weight and Consistency Check of Portability	73
4.14	Priority weight and Consistency Check of Reliability	73
4.15	Priority weight and Consistency Check of Maintainability	74
4.16	Local and Global Rankings of Criteria and Sub-Criteria	75
4.17	Demographic information of TOPSIS experts	77
4.18	Decision Matrix of main dimensions	78
4.19	Decision Matrix of sub dimensions	80
4.20	Normalized Decision Matrix of main dimensions	83
4.21	Normalized Decision Matrix of sub-dimensions	84
4.22	Weighted Normalized Decision Matrix of main dimensions	87
4.23	Weighted Normalized Decision Matrix of sub-dimensions	88
4.24	University Ranking	91

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
1.1	Research Approach	24
1.2	Thesis Organization	25
2.1	DeLone and McLean Model	29
2.2	Hierarchy of AHP	34
3.1	Research Methodology	45
3.2	Flow of AHP	48
3.3	Hierarchical Structure of Quality Factors and Sub-Factors	49
4.1	Graphical Statistics of SUS	55
4.2	Hierarchy of Quality Factors for Severity Ranking	57
4.3	Framework for Enhancing the Quality of LMS	76

LIST OF ABBREIATIONS

LMS	-	Learning Management System
HCI	-	Human Computer Interaction
MCDM	-	Multi-Criteria Decision Making
AHP	-	Analytical Hierarchy Process
CI	-	Consistency Index
CR	-	Consistency Ratio
PW	-	Priority Weight
TOPSIS	-	Technique for Order of Preference by Similarity to Ideal Solution
UE	-	University of Education
BU	-	Bahria University
RIIU	-	Riphah Islamic International University
PROMTHEE	-	Preference Ranking Organization Method for Enrichment Evaluation

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Empirical Evaluation Survey	103
B	AHP Questionnaire Survey	105
C	TOPSIS Questionnaire Survey	118