TABLE OF CONTENTS

		Pg No
	Declaration	ii
	Supervisor's Certificate	iii
	Acknowledgements	iv
	Abstract	vi
	List Of Tables	xiii
	List Of Figures	xvi
	Abbreviations	xvii
CHAPTER 1: INTRODUCTION 1-		
1.1	INTRODUCTION	1
1.2	SOFTWARE QUALITY	3
1.3	SOFTWARE MAINTAINIBILITY: AN ESSENTIAL FACTOR OF	5
	SOFTWARE MAINTAINIBLITY	
1.4	OBJECT ORIENTED TECHNOLOGY	7
	1.4.1 Design Properties Of Object Oriented Systems	7
1.5	MAINTAINIBILITY FACTORS	8
1.6	OBJECTIVE OF THE PROPOSED RESEARCH WORK AND	11
	PROBLEM STATEMENT	
1.7	MOTIVATION AND SIGNIFICANCE OF OUR WORK	13

1.8	OUTLINE OF THESIS	14
1.9	SUMMARY	15
CHAI	CHAPTER 2 : LITERATURE SURVEY	
2.1	INTRODUCTION	17
2.2	RELATED WORK	20
	2.2.1 Maintainability at Analysis Phase	20
	2.2.2 Maintainability at Design Phase	22
	2.2.3 Maintainability at Code Phase	30
	2.2.4 Maintainability at Development Life Cycle	31
2.3	MAINTAINIBILITY FACTORS	35
	2.3.1 Design properties that influenced maintainability	37
2.4	LITERATURE SURVEY ON CHANGEABILITY	39
2.5	LITERAURE SURVEY ON STABILITY	44
2.6	SIGNIFICANT CONCLUSIONS	49
		51-65
СНА	PTER 3 : CHANGEABILITY EVALUATION MODEL (CEM ^{OOD})	
3.1	INTRODUCTION	51
3.2	ESTABLISHING RELATIONSHIP BETWEEN	53
	CHANGEABILITY AND OBJECT ORIENTED DESIGN	
	PROPERTIES	

3.3	CHANGEABILITY EVALUATION MODEL (CEM ^{OOD})	54
3.4	STATISTICAL DIFFERENCE BETWEEN CHANGEABILITY	57
	AND DESIGN CHARECTERISTICS OF OBJECT ORIENTED	
	SOFTWARE	
3.5	EMPIRICAL VALIDATION OF CHANGEABILITY	62
	EVALUATION MODEL (CEM ^{OOD})	
3.6	SUMMARY	65
СНА	PTER 4: STABILITY EVALUATION MODEL (SEM ^{OOD})	66-77
4.1	INTRODUCTION	66
4.2	MAPPING BETWEEN STABILITY AND DESIGN PROPERTIES	67
4.3	STABILITY EVALUATION MODEL (SEM ^{OOD})	68
	STATISTICAL SIGNIFICANCE BETWEEN STABILITY AND	71
4.4	OBJECT ORIENTED DESIGN PROGRAMS	
4.5	EMPIRICAL VALIDATION OF STABILITY EVALUATION	74
	MODEL	
4.6	SUMMARY	77
CHAPTER 4: MAINTAINABILITY EVALUATION MODEL		78-92
(MM ^{OOD})		
5.1	INTRODUCTION	78

5.2	MAINTAINABILITY EVALUATION MODEL DEVELOPMENT	80
5.3	STATISTICAL SIGNIFICANCE BETWEEN	84
	MAINTAINABILITY CHANGEABILITY AND STABILITY	
5.4	EMPIRICAL VALIDATION MAINTAINABILITY	87
	EVALUATION MODEL	
5.5	COMPARITIVE ANALYSIS BETWEEN MM ^{OOD} AND	90
	RELATED EXISTING MODELS	
5.6	SUMMARY	92
CHA	PTER 6: CONCLUSION AND FUTURE WORK	93-96
6.1	CONCLUSION	93
	6.1.1 Maintainability factors Identification	94
	6.1.2 First contribution: Changeability Evaluation Model (CEM ^{OOD})	94
	6.1.3 Second contribution: Stability Evaluation Model (SEM ^{OOD})	94
	6.1.4 Third contribution: Maintainability Evaluation Model	95
	(MM^{OOD})	
6.2	FUTURE WORK	95
	Appendix I	97
	Appendix III	100
	Appendix III	100
	References	104
	List of Publications	118

LIST OF TABLES

		Pg No
Table 2.1	A Systematic View of Maintainability Models Consider by Various researchers.	32
Table 2.2	Maintainability Factors Considered by various experts	36
Table 2.3	Object oriented design properties contributing in maintainability evaluation	38
Table 3.1	Changeability and related Object Oriented design factors	52
Table 3.2	Coefficients for Changeability Evaluation Model	55
Table 3.3	Changeability Evaluation Model Summary	56
Table 3.4	Group and Projects for proposed Evaluation model CEM ^{OOD}	57
Table 3.5	Descriptive Statistics for System G	58
Table 3.6	Correlation Analysis for System G	58
Table 3.7	Descriptive Statistics for System H	59
Table 3.8	Correlation Analysis for System H	59
Table 3.9	Descriptive Statistics for System I	60
Table 3.10	Correlation Analysis for System I	60
Table 3.11	Correlation Analysis Summary	61
Table 3.12	Known Changeability Value	62
Table 3.13	Known Changeability Rank	62
Table 3.14	Calculated Changeability Value Using Proposed Model	63

Table 3.15	Calculated Changeability Rank Using Proposed Model CEM ^{OOD}	63
Table 3.16	Computed Rank, Actual Rank and their Relation	64
Table 4.1	Coefficients for Stability Evaluation Model	69
Table 4.2	Stability Evaluation Model Summary	70
Table 4.3	Group and Projects for Proposed SEM ^{OOD}	71
Table 4.4	Descriptive Statistics for System D	71
Table 4.5	Correlation Analysis for System D	71
Table 4.6	Descriptive Statistics for System E	72
Table 4.7	Correlation Analysis for System E	72
Table 4.8	Descriptive Statistics for System F	73
Table 4.9	Correlation Analysis for System F	73
Table 4.10	Correlation Analysis Summary	73
Table 4.11	Known Changeability Value	75
Table 4.12	Known Changeability Rank	75
Table 4.13	Calculated Stability Value Using Proposed Model SEM ^{OOD}	75
Table 4.14	Calculated Stability Rank Using Proposed Model SEM ^{OOD}	75
Table 4.15	Computed Rank, Actual Rank and their Relation	75
Table 5.1	Coefficients for Maintainability Evaluation Model	83
Table 5.2	Maintainability Evaluation Model Summary	84
Table 5.3	Descriptive Statistics for System A	85
Table 5.4	Correlation Analysis for System A	85
Table 5.5	Descriptive Statistics for System B	85

Table 5.6	Correlation Analysis for System B	86
Table 5.7	Descriptive Statistics for System C	86
Table 5.8	Correlation Analysis for System C	86
Table 5.9	Correlation Analysis Summary	87
Table 5.10	Known Maintainability Value	88
Table 5.11	Known Maintainability Rank	88
Table 5.12	Calculated Maintainability Value Using Proposed Model MM^{OOD}	88
Table 5.13	Calculated Maintainability Rank Using Proposed Model MM^OOD	89
Table 5.14	Calculated Ranks, Known Ranks and their Relations	89
Table 5.15	Rank Correlation Comparison between: Proposed Model MM ^{OOD} to models proposed by Rajendra et al. and MEM ^{OOD}	91

LIST OF FIGURES

		Pg No.
Fig. 3.1	Mapping between changeability and Object Oriented Design Properties	54
Fig. 3.2	Graph showing Spearman's rank correlation between known and calculated values of changeability.	64
Fig. 4.1	Mapping between stability and Object Oriented Design Properties	68
Fig. 4.2	Graph showing Spearman's rank correlation between known and calculated values of stability.	76
Fig. 5.1	Mapping between maintainability and Object Oriented Design Properties	81
Fig. 5.2	Graph showing Spearman's rank correlation between known and calculated values of maintainability.	90

ABBREVIATIONS

CEM^{OOD} Changeability Evaluation Model for Object Oriented Design

SEM^{OOD} Stability Evaluation Model for Object Oriented Design

MM^{OOD} Maintainability Evaluation Model for Object Oriented Design

OOD Object Oriented Design

Fig. Figure

Eq. Equation