

TABLE OF CONTENTS

ABSTRACTiii
-----------------------	------

ACKNOWLEDGEMENTSiv
-------------------------------	-----

TABLE OF CONTENTSv
--------------------------------	----

CHAPTER 1: INTRODUCTION

1.1 Introduction.....	1
1.2 Motivation for Study.....	1
1.3 Aims.....	2
1.4 Research Design and Methodology.....	3
1.5 Limitations of the Study	3
1.6 Outline of the Dissertation.....	4

CHAPTER 2: THEORETICAL FOUNDATION

2.1 Introduction	6
2.2 Human-Computer Interaction	7
2.2.1 Interaction Design.....	8
2.2.2 Components of Human-Computer Interaction.....	8
2.2.2.1 Human.....	8
2.2.2.2 Computer.....	8
2.2.2.3 Interaction.....	9
2.3 Human Performance	9
2.3.1 Measurements of Human Performance	9
2.3.1.1 Accuracy.....	10
2.3.1.2 Speed	10
2.3.1.3 Satisfaction	10
2.3.1.4 Training Time	11
2.3.2 The Human Information Processing System.....	11
2.3.3 Cognitive Processes.....	13
2.3.3.1 Attention	13
2.3.3.2 Perception and Recognition	14
2.3.3.3 Planning, reasoning, problem solving and decision making	15
2.3.3.4 Responding	16
2.3.4 User Characteristics	17
2.3.4.1 Psychological Characteristics.....	17
2.3.4.2 Knowledge and Experience	18
2.3.4.3 Job and Tasks	20
2.3.4.4 Physical Characteristics	20
2.3.4.5 Physical Environment.....	21
2.3.4.6 Tools.....	22
2.4 Usability	22
2.4.1 Definitions	22
2.4.2 Context of Use.....	23
2.4.2.1 The User Context	24
2.4.2.2 The Task Context	26
2.4.2.3 The Environment and Equipment Context	27
2.4.3 Usability Characteristics	29
2.4.4 Usability Goals.....	31
2.4.4.1 Learnability	31
2.4.4.2 Memorability	32

2.4.4.3	Efficiency	32
2.4.4.4	Safety	32
2.4.4.5	Satisfaction.....	32
2.4.4.6	Utility.....	33
2.4.5	Usability Principles	33
2.4.5.1	Consistency.....	34
2.4.5.2	Compatibility.....	34
2.5	Culture	37
2.5.1	Definitions of Culture	38
2.5.2	Metamodels of Culture	38
2.5.2.1	The Iceberg Model	39
2.5.2.2	The Onion Model.....	39
2.5.2.3	The Pyramid Model	39
2.5.2.4	The Objective and Subjective Cultural Model	40
2.5.3	Models of Culture	41
2.5.3.1	Victor's Model of Culture	41
2.5.3.2	Hall's Model of Culture	42
2.5.3.3	Trompenaars' Model of Culture	43
2.5.3.4	Hofstede's Model of Culture	44
2.5.4	Influence of Culture in Human-Computer Interactionl.....	45
2.5.5	Approaches to Culturalisation	48
2.6	Subjective Cultural Interface Design Guidelines	51
2.6.1	Influence of Hofstede's Cultural Dimensions on Cognitive Load	53
2.6.2	Influence of Hofstede's Cultural Model of Usability	54
2.6.2.1	The User Acceptance Perspective	54
2.6.2.2	The Objective Usability Perspective.....	61
2.6.2.3	The Context of Use Perspective	62
2.6.3	Operationalisation of Proposed Metamodel	63
2.7	Summary.....	64

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1	Introduction	66
3.2	Research in Human-Computer Interaction.....	66
3.2.1	The Traditional Science Approach.....	67
3.2.2	The Design Science Approach	67
3.2.3	The Engineering Approach	67
3.2.4	Choosing Appropriate Methods and Techniques	68
3.3	The Research Problem.....	69
3.4	Research Questions	69
3.5	Research Designs	71
3.5.1	Primary and Secondary Data.....	71
3.6	Methods and Techniques in General	72
3.6.1	Experiments	72
3.6.1.1	Single Factor Method	73
3.6.1.2	Multi Factor Method	74
3.6.1.3	Quasi-Experimental Method.....	74
3.6.2	Surveys	74
3.6.2.1	Questionnaires	75
3.6.2.2	Interviews.....	76
3.6.3	Qualitative and Quantitative Methods	76
3.6.4	Data Measurements.....	77
3.6.4.1	Measurement Types.....	77
3.6.4.2	Scales	78
3.6.5	Data Analysis	79
3.6.5.1	Number of Independent Variables and Treatments	79
3.7	Methods and Techniques in Information Systems	80
3.8	Methods and Techniques in Human-Computer Interaction.....	80
3.8.1	User Testing.....	81

3.9	3.8.2 Questionnaires and Interviews	82
	Appropriate Methods and Techniques	83
	3.9.1 Guidelines for Questionnaire Design	84
	3.9.2 T-tests	85
3.10	Summary	85

CHAPTER 4: THE EXPERIMENT

4.1	Introduction	87
4.2	Objectives and Hypotheses	88
4.3	Experimental Design.....	88
4.4	Experimental Methodology	88
	4.4.1 Measurement Issues	89
	4.4.1.1 Subjective Cultural Profile of the Test Subjects	89
	4.4.1.2 Other User Characteristics	92
	4.4.1.3 Subjective Cultural Profile of the Test Interfaces	93
	4.4.1.4 Performance	96
	4.4.2 Sample Design and Sampling Method	96
	4.4.2.1 Test Subjects	97
	4.4.2.2 Test Interfaces.....	99
	4.4.3 Data Collection Methods	101
	4.4.4 Data Analysis.....	103
	4.4.5 Shortcomings and Sources of Error	106
4.5	Results	107
	4.5.1 Impact of Power Distance on Usability.....	107
	4.5.2 Impact of Uncertainty Avoidance on Usability	108
	4.5.3 Impact of Masculinity vs Femininity on Usability	109
	4.5.4 Impact of Individualism vs Collectivism on Usability	110
4.6	Analysis and Interpretation	110
4.7	Lessons Learned and Further Work	111
4.8	Summary	114

CHAPTER 5: VARIABLES THAT INFLUENCED THE EXPERIMENT

5.1	Introduction	116
5.2	Variables relating to Subjective Culture.....	117
	5.2.1 Cultural Dimension Strengths	117
	5.2.2 Cultural Dimension Interplays	118
	5.2.3 Relative Impact of Cultural Dimensions on Usability	118
	5.2.4 Other Subjective Cultural Dimensions	119
5.3	Variables relating to the Interface	120
	5.3.1 Partial Representation of Cultural Dimensions	121
	5.3.2 Usability Principles, Heuristics and Guidelines	121
	5.3.2.1 Lack of Context	122
	5.3.2.2 Culturally Biased	123
	5.3.3 Relative Impact of Components.....	127
	5.3.4 Nature of the Cultural Dimensions	128
5.4	Variables relating to User Acceptance	130
5.5	Variables Relating to Speed of Performance	134
5.6	Variables Relating to Objective Culture	135
	5.6.1 Relative Importance of Usability Measures	136
	5.6.2 User Preferences	138
	5.6.3 Cognitive Abilities.....	139
5.7	Performance Determinants	140
	5.7.1 Psychological Characteristics	140
	5.7.2 Knowledge and Experience	140
	5.7.3 Job and Tasks.....	141
	5.7.4 Physical Characteristics.....	141

5.7.5	Physical Environment	141
5.8	Impact of Variables on Experimental Design.....	141
5.8.1	Relative Importance of Usability Measures	142
5.8.2	Compulsory Participation and Time Limits	142
5.8.3	Adaptation of Cultural Profile Questionnaire	143
5.8.4	The Order Effect	143
5.9	Impact of Variables on Prior Studies	145
5.9.1	The Smith and Chang Study.....	145
5.9.2	The Forer and Ford Study	148
5.10	Summary.....	149

CHAPTER 6: THE CONCEPTUAL MODEL OF USABILITY

6.1	Introduction	152
6.2	Conceptual Model of Usability	152
6.3	The User Context	153
6.3.1	User Characteristics	154
6.3.1.1	Physical Characteristics	154
6.3.1.2	Psychological Characteristics.....	154
6.3.1.3	Culture	156
6.3.2	User Knowledge	157
6.3.2.1	System Knowledge.....	158
6.3.2.2	Organisational Experience	159
6.3.2.3	Education.....	159
6.3.2.4	Linguistic Ability	159
6.4	The Task Context	159
6.4.1	Task Characteristics	160
6.4.1.1	Job Category	161
6.4.1.2	Risk.....	161
6.4.1.3	Demands	161
6.4.1.4	Linkages	162
6.4.2	Task Execution	162
6.4.2.1	Dependencies.....	162
6.4.2.2	Flexibility.....	163
6.4.2.3	Frequency.....	163
6.5	The Environment Context.....	163
6.5.1	The Organisational Environment.....	164
6.5.1.1	Organisational Structure.....	164
6.5.1.2	Organisational Culture.....	164
6.5.2	The Technical Environment.....	165
6.5.2.1	Functionality	165
6.5.2.2	Specifications	165
6.5.3	The Physical Environment.....	165
6.5.3.1	Workplace Conditions.....	165
6.5.3.2	Workplace Safety	167
6.5.3.3	Workplace Design	167
6.6	Strategies for Controlling for Variables.....	167
6.6.1	Selection of Test Subjects	168
6.6.1.1	Subjective Culture	168
6.6.1.2	Other User Characteristics	169
6.6.1.3	User Knowledge	169
6.6.2	Identification of Test Interfaces	169
6.6.2.1	User Context Variables.....	170
6.6.2.2	General Usability	171
6.6.3	Setting Test Tasks	171
6.6.3.1	User Context Variables.....	171
6.6.3.2	Technical Environment Variables.....	172
6.6.3.3	Task Context Variables	173
6.6.4	Conducting the Experiment	173

6.6.4.1	Relative Importance of Usability Measures	173
6.6.4.2	The Order Effect	173
6.6.4.3	Compulsory Participation and Time Limits	174
6.6.4.4	Environment Context Variables	174
6.7	Summary	174

CHAPTER 7: THE CONCLUSIONS

7.1	Introduction	175
7.2	Summary of Work Completed	175
7.3	Contribution to Knowledge	176
7.4	Future Research.....	178
7.4.1	Further Validation of the Proposed Variables.....	178
7.4.1.1	Variables with Theoretical Evidence Only	178
7.4.1.2	Variables Requiring Definition of Extent of Impact.....	179
7.4.2	Testing and Adaptation of the Usability Model	179
7.5	Summary	180
	Bibliography	181
Annexure A	Website Evaluations	192
Annexure B	Cultural Questionnaire	203
Annexure C	Test Tasks	210
Annexure D	Satisfaction Questionnaire.....	221
Annexure E	Histograms of Users' Cultural Dimension Strengths	222
Annexure F	Published Papers.....	226