

**VIRTUAL HAJJ (V-HAJJ): A PERSUASIVE HAJJ LEARNING
PROCEDURES COURSEWARE**

MOHD FITRI BIN YUSOFF

**MASTER OF SCIENCE (INFORMATION TECHNOLOGY)
UNIVERSITI UTARA MALAYSIA
2012**

**< INSERT PERAKUAN KERJA TESIS / DISERTASI
(CERTIFICATION OF THESIS / DISSERTATION)>**

Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to :

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok

Abstrak

Kajian ini menumpukan kepada usaha untuk membangunkan satu bahan pembelajaran tambahan prosedur menunaikan Haji. Berdasarkan kajian awal, bahan-bahan tambahan dan kaedah pembelajaran didapati kurang berkesan dalam memberi kefahaman yang jelas kepada pengguna, sama ada yang muda mahu pun yang tua. Kebanyakan bahan tambahan sedia ada adalah berdasarkan pembelajaran pasif. Untuk menyediakan bahan pembelajaran yang lebih baik yang mampu menyokong pembelajaran aktif dan pembelajaran sendiri, kajian ini menggabungkan persekitaran maya (PM) dan teknologi multimedia (MM) untuk membangunkan prototaip Haji Maya (V-Hajj). Garis panduan reka bentuk pembujukan juga telah disesuaikan bagi memujuk pengguna terutamanya orang dewasa untuk mengubah persepsi mereka terhadap penggunaan bahan berasaskan komputer. Dengan menggunakan elemen-elemen penting tertentu, satu model konseptual persekitaran pembelajaran Haji telah dibina. Model ini menitikberatkan prinsip pembelajaran MM, Teori Kognitif Pembelajaran MM, Teori Konstruktivi PM, Prinsip Teknologi Pembujukan, proses pengurangan MM, proses pengurangan PM dan garis panduan reka bentuk pembujukan. Model tersebut dan prototaip perisian merupakan penyumbang utama dalam kajian ini. Metodologi yang digunakan dalam kajian ini merupakan gabungan reka bentuk penyelidikan yang disesuaikan daripada Vaishnavi dan Kuechler pada tahun 2008. Metodologi ini menggabungkan proses dan kaedah yang digunakan untuk pengurangan PM dan pengurangan MM untuk menghasilkan prototaip V-Hajj. Penilaian pakar mendedahkan beberapa batasan prototaip, dan ia telah dibaikpulih. Sementara itu, keputusan penilaian pengguna mendedahkan bahawa prototaip V-Hajj telah memberi indikasi yang baik kepada penggunaan dan kebolegunaan, serta kesan pembujukan prototaip V-Hajj sebagai bahan tambahan pembelajaran Haji kepada pengguna. Kesimpulannya, integrasi MM, PM dan teknologi pembujukan dalam reka bentuk dan membangunkan bahan pembelajaran tambahan Haji membantu pengguna untuk belajar dengan lebih baik. Walaubagaimanapun, terdapat batasan tertentu yang masih perlu diperbaiki pada masa akan datang, seperti menambah bilangan responden dalam kajian.

Kata kunci: Haji, Teknologi multimedia, Persekitaran maya, Teknologi pembujukan

Abstract

This study focuses on an attempt to develop a supplementary learning material for the procedures to perform the Hajj. From the preliminary studies, the existing supplementary materials and learning methods were found to be less effective in giving a clear understanding to the users, whether they are youngsters or elders. Moreover, most of the current supplementary materials are based on passive learning mode. To provide a better supplementary learning material which supports active learning and self-directed learning, this study incorporates virtual environments (VE) and Multimedia (MM) technologies to develop Virtual Hajj (V-Hajj) prototype. Certain persuasive design guidelines were also adapted to persuade users particularly the elders to change their view in using computer-based material. By employing certain important elements, a conceptual model of persuasive Hajj learning environment was constructed. It consists of MM learning principle, Cognitive Theory of MM Learning, VE constructivist theory, persuasive technology principles, MM authoring processes, VE authoring processes and persuasive design guidelines. The model and its courseware prototype are the major contributions of this study. The methodology used in this study is an adaptation of the research design used by Vaishnavi and Kuechler in 2008. It combines the processes and methods used for VE authoring and MM authoring to produce V-Hajj prototype. The expert evaluation revealed some limitations of the prototype and the limitations have been fixed. Meanwhile, the user evaluation results revealed that the V-Hajj prototype provided good indication of the applicability and usability as well as the persuasive effect of the V-Hajj prototype as a supplementary Hajj learning material to the users. In conclusion, an integration of multimedia, virtual environment and persuasive technology in designing and developing a supplementary Hajj learning material has helped users to learn better. However, certain limitations do remain, such as the number of respondents involved in this study. This will be rectified in the future.

Keywords: Hajj, Multimedia technology, Virtual environment, Persuasive technology

Acknowledgement

In the name of Allah, the Beneficent, the Merciful

The Prophet Muhammad (SAW) said: "The seeking of knowledge is obligatory for every Muslim." - Al-Tirmidhi, Hadith 74

Alhamdulillah, grateful to Allah, lastly this thesis is finally completed. During this journey towards completion of this thesis, many new things and experiences have been gained in especially in virtual environment technology, multimedia and also persuasive technology.

My deepest gratitude goes to Ministry of Science, Technology and Innovation, Malaysia and Universiti Utara Malaysia for the financial supports and facilities provided.

A lot of thanks to my both UUM supervisor, Assoc. Prof Abdul Nasir Zulkifli and Mdm. Nur Fadziana Faisal Mohamed for never-ending supports, courage and helps along to complete this thesis.

Special thank goes to my parents for believing in me. Without their faith, this Master Degree would have been mission impossible.

Last but not the least, I would like to thank my colleges and the other peoples who never fail in encouraging me along my completion this thesis until now. Thank you all.

Table of Contents

Permission to Use.....	i
Abstrak	ii
Abstract	iii
Acknowledgement.....	iv
Table of Contents	v
List of Tables.....	xii
List of Figures	xiv
List of Appendices	xvii
List of Abbreviations.....	xviii
CHAPTER ONE: INTRODUCTION	1
1.1 Overview	1
1.2 Research Background.....	1
1.3 Research Problem.....	3
1.4 Preliminary Study	5
1.5 Purpose of the Study	8
1.6 Research Questions	9
1.7 Research Objectives	9
1.8 Research Scope	10
1.9 Research Hypotheses	11
1.10 Research Significances	12
1.11 Thesis Structure.....	13
CHAPTER TWO: LITERATURE REVIEW	15
2.1 Overview	15
2.2 Design Research Methodology	15
2.2.1 Design Research Methodology (Vaishnavi and Kuechler, 2008).....	15
2.2.2 Implications of Design Research Methodology to this Study	17
2.3 Technology and Learning	17
2.3.1 Traditional Methods and Integrating Technologies in Learning	17
2.3.2 Implications of Technology and Learning to this Study.....	19

2.4 Hajj and Learning.....	19
2.4.1 Implications of Hajj and Learning to this Study	21
2.5 Multimedia (MM) Technology	21
2.5.1 MM in Learning Process.....	22
2.5.2 Cognitive Theory of MM Learning	23
2.5.3 Implications of MM Technology to this Study	25
2.6 Virtual Environment (VE).....	26
2.6.1 Types of VE	26
2.6.2 VE in Learning.....	27
2.6.3 VE in Training	28
2.6.4 Active and Self-Directed Learning in VE and MM.....	29
2.6.5 Related Application and Research for Hajj in VE	30
2.6.6 Implications of VE to this Study.....	33
2.7 Constructivist Theory.....	33
2.7.1 Constructivist Approach in Learning.....	33
2.7.2 Constructivist and VE	34
2.7.3 Implications of Constructivist to this Study.....	35
2.8 Persuasive Technology (PT)	35
2.8.1 Relationship VE in PT	36
2.8.2 The Design of PT	37
2.8.3 Principles in PT in Computing Field	38
2.8.3.1 Principle of Cause and Effect	39
2.8.3.2 Principle of Virtual Rehearsal	40
2.8.3.3 Principle of Simulations in Real-World Contexts.....	40
2.8.3.4 Principle of Conditioning	41
2.8.3.5 Principle of Similarity	41
2.8.4 Implications of PT to this Study	42
2.9 Evaluation	42
2.9.1 Formative and Summative Evaluation.....	42
2.9.2 Heuristic Evaluation.....	42
2.9.2.1 Heuristic Evaluation for VE	45
2.9.2.2 Implications of Evaluation to this Study	46

2.10 Technology Acceptance Model (TAM)	46
2.8.1 Attributes of TAM	47
2.8.2 The Uses of TAM in this Study	48
2.8.3 Implications of Evaluation to this Study	50
2.11 Summary of the Literature Review	50
CHAPTER THREE: METHODOLOGY	51
3.1 Overview	51
3.2 Methodology of this Study	55
3.2.1 Awareness of the Problem	55
3.2.1.1 Identify Current Learning Methods	56
3.2.1.2 Choose the Simple Behaviour to Target	58
3.2.1.3 Choose a Receptive Audience	58
3.2.1.4 Find What Is Preventing the Target Behaviour.?	58
3.2.2 Suggestion	59
3.2.2.1 Storyboarding	59
3.2.2.2 Choose an Appropriate Technology Channel	62
3.2.2.3 Find Relevant Examples of PT	62
3.2.2.4 Imitate Successful Examples	63
3.2.3 Prototype Development (VE and MM Authoring)	66
3.2.3.1 Scene Definition (VE)	66
3.2.3.2 Object Modelling (VE)	67
3.2.3.3 Optional Database Conversion (VE)	67
3.2.3.4 VE Authoring	67
3.2.3.5 Acquire Media (MM)	68
3.2.3.6 Digitize Media (MM)	68
3.2.3.7 Edit Media (MM)	68
3.2.3.8 Import Media (MM)	69
3.2.3.9 Add Interactivity	69
3.2.3.10 Package Application	69
3.2.3.11 Testing and Debugging	69
3.2.3.12 Deliver Final Application to Expert and User	70

3.2.4 Evaluation	70
3.2.4.1 Heuristic Evaluation	70
3.2.4.2 User Evaluation	74
3.2.4.3 Test & Iterate Quickly	77
3.2.5 Conclusion	78
3.2.5.1 Final Specific Research Results	78
3.2.5.2 The Expand on Success	78
3.3 Summary of the Methodology	78
CHAPTER FOUR: DESIGN AND DEVELOPMENT	80
4.1 Overview	80
4.2 The Model of Persuasive Hajj Learning Environment	80
4.2.1 VE Constructivist Theories	81
4.2.2 PT Principles	82
4.2.2.1 Principle of Cause and Effect	82
4.2.2.2 Principle of Virtual Rehearsal	83
4.2.2.3 Principle of Simulation in Real-World Contexts.....	84
4.2.2.4 Principle of Conditioning	85
4.2.2.5 Principle of Similarity	86
4.2.3 CTML Theory	87
4.2.4 MM Principles	88
4.2.4.1 MM Principle.....	88
4.2.4.2 Spatial Contiguity Principle	89
4.2.4.3 Temporal Contiguity Principle	89
4.2.4.4 Coherence Principle.....	90
4.2.4.5 Individual Differences Principle.....	91
4.2.5 Persuasive Design	92
4.2.6 MM and VE Authoring Processes	92
4.3 VE Authoring	93
4.3.1 Scene Definition.....	93
4.3.1.1 Tawaf.....	94
4.3.1.2 Sa'ei.....	95

4.3.1.3 Throwing of the Jamarat.....	96
4.3.2 Object Modeling	97
4.3.2.1 Modeling of Tawaf Environment	98
4.3.2.2 Modeling of Sa'ei Environment.....	99
4.3.2.3 Modeling of the Throwing Jamarat Environment	101
4.3.2.4 Character Modeling	102
4.3.3 Optional Database Conversion.....	105
4.3.3.1 Polygon Optimizations	106
4.3.3.2 Converting the Files Format	111
4.3.4 VE Authoring	111
4.3.2.1 Tawaf Section	111
4.3.2.2 Sa'ei Section.....	114
4.3.2.3 Throwing of the Jamarat Section.....	117
4.3.2.4 Character Animation	119
4.4 MM Development Process	120
4.4.1 Pre-Production	120
4.4.4.1 Acquire the Media	120
4.3.4.2 Digitize the Media	121
4.3.4.3 Edit the Media	121
4.4.2 Authoring	123
4.4.2.1 Import Media	124
4.4.2.2 Add Interactivity.....	125
4.4.2.3 Package Application	126
4.4.2.3 Testing and Debugging.....	127
4.4.3 Post Authoring	128
4.4.3.1 Deliver Final Application to Expert and User	128
4.5 Comparison on the Functions and Capabilities between V-Hajj, Virtual Haj and Online Virtual Haj.....	128
4.6 Summary of the Design and Development	130

CHAPTER FIVE: DATA ANALYSIS AND RESULT	131
5.1 Overview	131
5.2 Heuristic Evaluation.....	132
5.2.1 MM Heuristic Evaluation	133
5.2.1.1 Solutions of Heuristic Evaluation for MM	134
5.2.1 VE Heuristic Evaluation	136
5.2.1.1 Solutions of Heuristic Evaluation for VE.....	138
5.3 User Evaluation.....	139
5.3.1 Sample.....	130
5.3.2 Validity and Reliability of Questionnaire	141
5.3.2 Usability Evaluation.....	143
5.3.2.1 Solutions of Heuristic Evaluation for MM	143
5.3.2.2 Solutions of Heuristic Evaluation for MM.....	143
5.3.2.3 Solutions of Heuristic Evaluation for MM.....	144
5.3.2.4 Solutions of Heuristic Evaluation for MM.....	145
5.3.4 Result of Comparison between Two Groups	145
5.3.4.1 PEOU Measurement	145
5.3.4.2 PU Measurement	146
5.3.4.3 ATTITUDE Measurement.....	147
5.3.4.4 ITU Measurement.....	147
5.3.5 Testing of Hypothesis	148
5.3.5.1 Testing of Hypothesis 1	148
5.3.5.1.1 Summary of Testing Hypothesis 1	149
5.3.5.2 Testing of Hypothesis 2.....	150
5.3.5.2.1 Summary of Testing Hypothesis 2	151
5.3.5.3 Testing of Hypothesis 3.....	151
5.3.5.3.1 Summary of Testing Hypothesis 3	152
5.3.5.4 Testing of Hypothesis 4.....	152
5.3.5.4.1 Summary of Testing Hypothesis 4	153
5.3.6 Persuasive Results in Learning V-Hajj	153
5.4 Summary of the Evaluation.....	155

CHAPTER SIX: DISCUSSION AND CONCLUSION.....	157
6.1 Overview	157
6.2 Discussion	158
6.3 Values of the Research.....	165
6.4 Problems Faced in this Research.....	167
6.5 Future Suggestions	167
6.6 Summary of the Discussion and Conclusion	168
REFERENCES.....	170

List of Tables

Table 1.1: Respondents' Preferences for the Type of Hajj Supplementary Learning Material.....	7
Table 2.1: The Current Hajj Supplementary Material in Passive Medium.....	20
Table 2.2: Benefits of Using MM in Learning (Shepard, 2003).....	23
Table 2.3: Types of VEs (Mujber et al., 2004).....	27
Table 2.4: VE Capabilities for Constructivist Learning.....	34
Table 2.5: Relationship between Persuasive and VE Technology.....	37
Table 2.6: The Type of Formative Evaluations (Trochim, 2006).....	43
Table 2.7: The Methods in Usability Inspection for Formative Evaluation (Albion, 1999)	43
Table 2.8: The Type of Summative Evaluations (Trochim, 2006).....	44
Table 2.9: Heuristic Evaluation (Nielsen, 1994).....	45
Table 2.10: VE Heuristic Guidelines (Sutcliffe & Gault, 2004).....	46
Table 3.1: Key Steps for Creating a VE (Kalawsky, 2000).....	53
Table 3.2: The MM Development Process (Neo & Neo, 2007).....	54
Table 3.3: Heuristic Evaluation Description for MM.....	72
Table 3.4: VE Heuristics for Evaluation of V-Hajj.....	73
Table 3.5: TAM Measurements and Items Used for V-Hajj Evaluation.....	77
Table 4.1: Modelling of 3D Tawaf Environment from Pictures.....	98
Table 4.2: Modelling of 3D Sa'ei Environment from Pictures.....	100
Table 4.3: Modelling of 3D Jamarat Environment from Pictures.....	101
Table 4.4: Modelling of 3D Characters Environment from Pictures.....	104
Table 4.5: Comparison between V-Hajj, Virtual Haj and Online Virtual Haj.....	129
Table 5.1: MM Problems and Suggestions by Experts.....	133
Table 5.2: VE Problems and Suggestions by Experts.....	136
Table 5.3: Summary of Subjects Demographic Data.....	140
Table 5.4: Cronbach Alpha Values for Each Measurement.....	142
Table 5.5: Cronbach Alpha Scale for Each Measurement.....	142
Table 5.6: Comparison between Two Groups for PEOU.....	146
Table 5.7: Comparison between Two Groups for PU.....	146
Table 5.8: Comparison between Two Groups for ATTITUDE.....	147
Table 5.9: Comparison between Two Groups for ITU.....	148
Table 5.10: Group Statistic for PEOU.....	149

Table 5.11: Independent Samples Test for PEOU.....	149
Table 5.12: Group Statistics for PU	150
Table 5.13: Independent Samples Test for PU	150
Table 5.14: Group Statistics for ATTITUDE.....	151
Table 5.15: Independent Samples Test for ATTITUDE	152
Table 5.16: Group Statistics for ITU	152
Table 5.17: Independent Samples Test for ITU	153
Table 5.18: Summary of Evaluation on Each Item	156
Table 6.1: Results of Hypotheses Based on TAM	164

List of Figures

Figure 1.1: Captology Areas in PT (Fogg, 2003).....	3
Figure 2.1: Design Research Methodology (Vaishnavi & Kuechler, 2008).....	16
Figure 2.2: Traditional Methods in Learning (Neo et al., 2007).....	47
Figure 2.3: The Technology-Enhanced Instructional Communication Process (Neo & Neo, 2000)	18
Figure 2.4: Cognitive Theory of MM Learning (Mayer, 2001).....	24
Figure 2.5: Virtual Haj Game (Jabar et al., 2008).....	31
Figure 2.6: Online Virtual Haj (FRANCE, 2009).....	32
Figure 2.7: Three Type of Persuasion (Harjumaa & Oinas-Kukkonen, 2007)	35
Figure 2.8: The Area of Captology (Fogg, 2003)	36
Figure 2.9: Steps in Designing PT (Fogg, 2009)	38
Figure 2.10: Three Types of PT from the Computer Area (Fogg, 2003).....	39
Figure 2.11: The Original TAM (Park, 2009).....	47
Figure 3.1: The Methodology of Design Research (Vaishnavi & Kuechler, 2008).....	51
Figure 3.2: Steps in PT Design (Fogg, 2009)	52
Figure 3.3: The Design Research Methodology of this Study	57
Figure 3.4: The Main MM Storyboard.....	60
Figure 3.5: The Contents for the MM Storyboard.....	61
Figure 3.6: The Main VE Storyboard	61
Figure 3.7: The Contents for the VE Storyboard	61
Figure 3.8: The Guidelines and Principles Used in this Study	64
Figure 3.9: A Cognitive Model of MM Learning (Mayer, 2001)	65
Figure 3.10: The Relationship between VE, MM and PT and the Research Methodology ...	79
Figure 4.1: The Model of Persuasive Hajj Learning Environment.....	81
Figure 4.2: The Example of the Constructivist Theories Used.....	82
Figure 4.3: The Example of the Principle of Cause and Effect Used	83
Figure 4.4: The Example of the Principle of Virtual Rehearsal Used.....	84
Figure 4.5: The Example of the Principle of Simulations in Real-World Contexts (Real Environment View).....	85
Figure 4.6: The Example of the Principle of Simulations in Real-World Contexts Used	85
Figure 4.7: The Example of the Principle of Conditioning Used	86
Figure 4.8: The Example of the Principle of Similarity Used.....	87
Figure 4.9: The Example of the CTML Used	88
Figure 4.10: The Example of the MM Principle Used.....	89

Figure 4.11: The Example of the Spatial Contiguity and Temporal Contiguity Principle Used	90
Figure 4.12: The Example of the Coherence Principle Used.....	91
Figure 4.13: The Example of the Individual Differences Principle Used.....	92
Figure 4.14: MM and VE Development Processes for V-Hajj	93
Figure 4.15: Scenes for Tawaf	95
Figure 4.16: Scenes for Sa'ei.....	96
Figure 4.17: Scenes for Throwing of the Jamarat.....	97
Figure 4.18: Snap Shot of the Tawaf Environment Model	99
Figure 4.19: Snap Shot of the Sa'ei Environment Model.....	101
Figure 4.20: Snap Shot of the Jamarat Environment Model	102
Figure 4.21: Wearing of Ihram for Men	103
Figure 4.22: Wearing of Ihram for Women	104
Figure 4.23: Snap Shot of the Male Character Model	105
Figure 4.24: Optimization Process of 3D Masjidil Haram Model	107
Figure 4.25: Optimization Process of 3D Sa'ei Model.....	108
Figure 4.26: Optimization Process of 3D Jamarat Model	109
Figure 4.27: Optimization Process of 3D Character Model.....	110
Figure 4.28: Quest 3D File Format	111
Figure 4.29: Channels for VE of Tawaf.....	112
Figure 4.30: Sample of Textures for the Kaabah and Part of Masjidil Haram	113
Figure 4.31: A Snap Shot of the VE for Tawaf in Quest 3D	113
Figure 4.32: The Menu for Tawaf	114
Figure 4.33: Channels for VE of Sa'ei	115
Figure 4.34: Samples of Textures for Sa'ei	115
Figure 4.35: A Snap Shot of the VE for Sa'ei in Quest 3D.....	116
Figure 4.36: The Menu for Sa'ei	116
Figure 4.37: Channels for VE of the Jamarat.....	117
Figure 4.38: Samples of Textures for Jamarat	118
Figure 4.39: A Snap Shot of the VE for Jamarat in Quest 3D	118
Figure 4.40: The Menu for the Jamarat.....	119
Figure 4.41: A Character Performing the Throwing of the Jamarat	120
Figure 4.42: Image Editing in Adobe Photoshop.....	122
Figure 4.43: Audio Editing in Sound Forge.....	122
Figure 4.44: Video Editing in Adobe Premier	123
Figure 4.45: The Interface for Adobe Flash Authoring	124
Figure 4.46: Media Imported in Adobe Flash CS4.....	125

Figure 4.47: Scripting Screen Shot in Adobe Flash CS4 for Interactivity	126
Figure 4.48: The Integration of VE and MM in Adobe Flash	127
Figure 4.49: The Integration of VE and MM Authoring Processes for V-Hajj Development	130
Figure 5.1: Evaluation Process in this Study	132
Figure 5.2: Users' Engagemnet: Before and After Changes	138
Figure 5.3: The Starting Position for Sa'ei as marked by the Red Arrow	139
Figure 5.4: PEOU of the V-Hajj Prototype.....	143
Figure 5.5: PU of the V-Hajj Prototype	144
Figure 5.6: ATTITUDE of the V-Hajj Prototype	144
Figure 5.7: ITU of the V-Hajj Prototype.....	145
Figure 5.8: Preliminary Study on the Use of the Computer Application as Supplementary Hajj Learning Material (Based on Group)	154
Figure 5.9: Percentages of the Elder Users who Agreed on the Use of the V-Hajj Prototype Based on PEOU, PU, ATTITUDE and ITU	155
Figure 6.1: The Model of Persuasive Hajj Learning Environment	160

List of Appendices

Appendix A: Preliminary Study Questionnaires.....	180
Appendix B: User Evaluation Questionnaire (TAM Questionnaires)	183
Appendix C: V-Hajj Prototype Interface Screen Shots.....	186

List of Abbreviations

ATTITUDE	Attitude towards using
CAVE	CAVE Artificial Virtual Environments
CTML	Cognitive Theory of Multimedia Learning
CBT	Computer based training
HMD	Head Mounted Display
ITU	Intention to use
LTH	<i>Lembaga Tabung Haji</i>
MM	Multimedia
PEOU	Perceived ease of use
PU	Perceived usefulness
PT	Persuasive Technology
RAM	Random Access Memory
SPSS	Statistical Package for the Social Sciences
TAM	Technology acceptance model
TRA	Theory of reasoned action
3D	Three-dimensional
VBT	Video based training
VE	Virtual Environments
WBT	Web based training

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the background of the research focus. Then, it leads to the statement of the problems, a preliminary study to validate the problems and the purpose of the study. Finally, it describes the research questions, the research objectives, the research scope, and the research hypotheses of this study.

1.2 Research Background

Hajj is one of the five pillars of Islam. Every capable and able-bodied Muslim is obliged to make the pilgrimage to Mecca at least once in their lifetime. In Malaysia, Lembaga Tabung Haji (LTH) is the entrusted organization to handle Hajj matters before pilgrims leave for Mecca, such as Hajj learning courses. The courses include talks and practical sessions (Tabung Haji, 2010). The Hajj procedures are complex where a lot of information, rules, tasks, practical steps and Al-Quran verses, doa and zikr that have to be learnt and understood. Even though comprehensive courses are provided by the LTH for the pilgrims, supplementary learning materials are still required (Jamaan, 2010). The supplementary materials are available in the form of books, cassettes, CDs/DVDs and video tapes. These approaches seem more likely to be passive rather than active learning approach (Mayer, 2005). According to Mayer (2001), passive learning results in low retention and understanding towards the learning process.

The increasing importance of new and improved techniques and technologies has over the past few years led to the use of new technologies as learning and training

The contents of
the thesis is for
internal user
only

REFERENCES

- Albaina, I. M., Visser, T., van der Mast, C. A. P. G., & Vastenburg, M. H. (2009). *Flowie: A Persuasive Virtual Coach to Motivate Elderly Individuals to Walk*. Paper Presented at the 3rd International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth), London, United Kingdom. Retrieved April 21, 2010 from, <http://studiolab.ide.tudelft.nl/studiolab/vastenburg/files/2011/07/2009PervasiveHealth-Flowie-FA.pdf>
- Albion, P. R. (1999). *Heuristic Evaluation of Educational Multimedia: From Theory to Practice*. Paper Presented at the 16th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, Brisbane, Australia. Retrieved May 10, 2010 from, <http://www.usq.edu.au/users/albion/papers/ascilite99.html>
- Angster, S., & Jayaram, S. (1997). VEDAM: Virtual Environments for Design and Manufacturing. *VR News*, 6(5), 16-19.
- Gasparyan, A. (2007). *Cost-Efficient Video Interactions for Virtual Training Environment*. Bowling Green State University.
- George, D., & Mallery, P. (2003). *SPSS for Windows Step by Step: A Simple Guide and Reference*. Boston: Allyn & Bacon.
- Atkinson, B. (2006). Captology: A Critical Review. *Persuasive Technology. Computer Science*, 171-182.
- Baumann, J. (1993). Military Applications of Virtual Reality. *Human Interface Technology Laboratory*. Retrieved March 10, 2010, from <http://www.hitl.washington.edu/scivw/EVE/II.G.Military.html>
- Beier, K. P. (2004). Virtual reality: A Short Introduction. Retrieved February 2, 2004, from <http://www-vrl.umich.edu/intro/>
- Bertrand, M., & Bouchard, S. (2008). Applying the Technology Acceptance Model to VR with People who are Favourable to Its Use. *Journal of Cyber Therapy & Rehabilitation*, 1(2), 200-210.
- Bétrancourt, M., & Tversky, B. (2000). Effect of Computer Animation on Users' Performance: A Review. *Le Travail Humain: A Bilingual and Multi-Disciplinary Journal in Human Factors*, 4(63), 311-329.
- Bias, R. G. (1994). *The Pluralistic Usability Walkthrough: Coordinated Empathies*. New York: John Wiley & Sons.

- Bluemel, E., Hintze, A., Schulz, T., Schumann, M., & Stuering, S. (2003). *Virtual Environments for the Training of Maintenance and Service Tasks*. Paper Presented at the Simulation Conference, Magdeburg, German. Retrieved March 3, 2010, from <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=01261664>
- Brecke, R., & Jensen, J. (2007). Cooperative Learning, Responsibility, Ambiguity, Controversy and Support in Motivating Students. *A Journal of the Center for Excellence in Teaching and Learning*, 2, 57-63.
- Bryson, S. (1995). *Approaches to the Successful Design and Implementation of VR Applications: Virtual Reality Applications*. London, United Kingdom: Academic Press Ltd.
- Bukvova, H. (2009). *Research as a Process: A Comparison between Different Research Approaches*. Retrieved June 23, 2010, from <http://sprouts.aisnet.org/584/1/ResearchProcess.pdf>
- Burdea, G., & Coiffet, P. (2003). Virtual Reality Technology. *Presence*, 12(6), 663-664.
- Burt, J. (2004). Impact of Active Learning on Performance and Motivation in Female Emirati Students. *Learning and Teaching in Higher Education: Gulf Perspectives*, 1, 1-15.
- Caird, J. (1996). *Persistent Issues in the Application of Virtual Environment Systems to Training*. Paper Presented at the 3rd Symposium on Human Interaction with Complex Systems (HICS '96), Washington DC, USA. Retrieved July 13, 2010, from <http://www.computer.org/csdl/proceedings/hics/1996/7493/00/74930124abs.html>
- Carpenter T.& Anderson L.(1996). *Using Virtual Reality Technology for Learning Design Skills*. Boston, USA: Ed-Media.
- Coakes, S. j., & Steed, L. G. (2003). *SPSS Analysis without Anguish Version 11.0 for Windows*. Australia: John Wiley & Sons.
- Crockett,& Foster, (2005). *Training the Trainer Resource Pack*. Retrieved April21, 2010, from <http://www.archive-skills.com/trainer-pack/fullpack.htm#anchor10>
- Dag, J. N. O., Madsen, O. S., Tufvesson, L., & Ab, T. (2000). *An Industrial Case Study of Usability Evaluation*. Retrieved August 4, 2009, from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.104.3911>
- Dalgarno, B. (2002). The Potential of 3D Virtual Learning Environments: A Constructivist Analysis. *Electronic Journal of Instructional Science and Technology*, 5(2), 3-6.

- Dasgupta, S., Granger, M., & McGarry, N. (2002). User Acceptance of E-Collaboration Technology: An Extension of the Technology Acceptance Model. *Group Decision and Negotiation*, 11(2), 87-100.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982-1003.
- Dede C., Salzman M., Loftin R.(1996). *Science Space: Research on Using Virtual Reality to Enhance Science Education*. Paper Presented at the ED-MEDIA 96, Boston, USA. Retrieved May 5, 2010 from, <http://www.virtual.gmu.edu/pdf/edmedia.pdf>
- Dror, I. E. (2008). Technology Enhanced Learning: The Good, the Bad, and the Ugly. *Pragmatics Cognition*, 16(2), 215-223.
- Dyer, J. E., & Observe, E. (1996). Effects of Teaching Approach on Achievement of Agricultural Education Students with Varying Learning Styles. *Journal of Agricultural Education*, 37, 43-51.
- El-Mounayri, H., Aw, D., Wasfy, T., & Wasfy, A. (2005). *Virtual Manufacturing for Training and Education*. Paper Presented at the ASEE Annual Conference and Exposition, Portland, Oregon. Retrieved March 19, 2010 from, <http://asciencecorp.com/papers/ASEE2005-AVML-PAPER-V4.pdf>
- England, E., & Finney, A. (1999). *Managing Multimedia: Project Management for Interactive Media*. Boston, USA: Addison-Wesley.
- Felder, R. M., & Silverman, L. K. (1988). Learning and Teaching Styles in Engineering Education. *Engineering Education*, 78(7), 674-681.
- Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Boston, USA: Addison-Wesley.
- Flew, T. (2002). *Beyond Ad Hocery: Defining Creative Industries*. Retrieved June 23, 2010, from <http://eprints.qut.edu.au/archive/00000256>
- Fogg, B. J. (2003). *Persuasive Technology: Using Computers to Change What We Think and Do*. Amsterdam: Morgan Kaufmann.
- Fogg, B. (2009). *Creating Persuasive Technologies: An Eight-Step Design Process*. Paper Presented at the 4th International Conference on Persuasive Technology, California, USA. Retrieved July 20, 2009 from <http://www.varunkhanduja.com/8%20Step%20process.pdf>
- Folmer, E., & Bosch, J. (2004). Usability Patterns in Software Architecture. *Human-Computer Interaction: Theory and Practice*. New Jersey: Lawrence Erlbaum Association.

- FRANCE. (2009). 'Virtual Haj' Allows Internet Users to Make 'Pilgrimage'. Retrieved March 3, 2009, from <http://www.france24.com/en/20091125-virtual-hajj-allows-internet-users-make-pilgrimage-islam-online-internet#>
- Hannafin, M. J., & Rieber, L. P. (1989). Psychological Foundations of Instructional Design for Emerging Computer-Based Instructional Technologies: Part II. *Educational Technology Research and Development*, 37(2), 102-114.
- Harjumaa, M., & Oinas-Kukkonen, H. (2007). Persuasion Theories and IT Design. *Persuasive Technology*. Paper Presented at the 2nd International Conference on Persuasive Technology, Berlin, Heidelberg. Retrieved August 18, 2009 from, <http://dl.acm.org/citation.cfm?id=1780452>
- Hofstetter, F. (2001). *Multimedia Literacy*. New York: McGraw-Hill.
- Hooper, S., & Hannafin, M. J. (1988). Learning the ROPES of Instructional Design: Guidelines for Emerging Interactive Technologies. *Interactive Video*, 30-41.
- IJsselsteijn, W., de Kort, Y., Midden, C., Eggen, B., & van den Hoven, E. (2006). Persuasive Technology for Human Well-Being: Setting the Scene. *Persuasive Technology*, 39(62), 1-5.
- Jabar, M. F., Daud, S. K., Abdullah, C. Z., & Ahmad, A. H. (2008). *Virtual Haj, Game via Experiential Design*. Retrieved September 13, 2009 from , <http://www.cms.livjm.ac.uk/library/AAA-GAMES-Conferences/GDTW/2008/Papers/PDF/SP9.pdf>
- Jamaan, A.R. (2010). *Panduan Lengkap Haji & Umrah*. Johor: Universiti Teknologi MARA.
- Jang, D. P., Kim, I. Y., Nam, S. W., Wiederhold, B. K., Wiederhold, M. D., & Kim, S. I. (2002). Analysis of Physiological Response to Two Virtual Environments: Driving and Flying Simulation. *CyberPsychology & Behavior*, 5(1), 11-18.
- Jonassen, D. (1999). Designing Constructivist Learning Environments. *Instructional-Design Theories and Models*, 2, 215-239.
- Jusoh, W. N. H. W., & Jusoff, K. (2009). Using Multimedia in Teaching Islamic Studies. *Journal Media and Communication Studies*, 1(5), 086-094.
- Kalawsky, R. (1993). *The Science of Virtual Reality and Virtual Environments: A Technical, Scientific and Engineering Reference on Virtual Environments*. England: Addison Wesley Publishing Company.
- Kalawsky, R. (2000). *Human Factors Aspects of Virtual Design Environments in Education*. Retrieved December 28, 2009 from, http://www.jisc.ac.uk/uploaded_documents/jtap-048.pdf on, 7.

- Karaduman, H., & Gültekin, M. (2002). *The Effect of Constructivist Learning Principles Based Learning Materials to Students' Attitudes, Success and Retention in Social Studies*. Retrieved May 28, 2009 from, http://perweb.firat.edu.tr/personel/yayinlar/fua_39/39_37974.pdf#page=99
- Kates, L. (2009). *Erikson's Stages of Psychosocial Development*. Retrieved June 20, 2010, from http://www.franciscopais.com/uploaded_images/Laura-750834.jpg
- Kato Y., Kawanobe A., Kakuta S., Hosoya K, Fikuhara Y. (1996). *Advanced Collaborative Educational Environment Using Virtual Shared Space*. Paper Presented at the ED-MEDIA, Boston, USA. Retrieved June 15, 2010 from, http://www.editlib.org/index.cfm/files/paper_8362.pdf?fuseaction=Reader.DownloadFullText&paper_id=8362
- Lange, B., Williams, M., & Fulton, I. (2006). Virtual Reality Distraction during Paediatric Medical Procedures. *Paediatric Pain Letter*, 8(1), 6-10.
- Laws R. J. (1996). *Comparing Virtual Reality Toolkits*. (Master Thesis, University of Hull, 1996).
- Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The Technology Acceptance Model: Past, Present and Future. *Communications of the Association for Information Systems*, 12(50), 752-780.
- Li, J. R., Khoo, L. P., & Tor, S. B. (2003). Desktop Virtual Reality for Maintenance Training: An Object Oriented Prototype System (V-REALISM). *Journal of Computers in Industry*, 52(2), 109-125.
- Lindstrom, R. (1994). *The Business Week Guide to Multimedia Presentations: Create Dynamic Presentations That Inspire*. New York: McGraw-Hill.
- Macpherson, C., & Keppell, M. (1998). Virtual Reality: What Is the State of Play in Education? *Australian Journal of Educational Technology*, 14, 60-74.
- Manetta, C., & Blade, R. (1995). Glossary of Virtual Reality Terminology. *International Journal of Virtual Reality*, 1(2), 35-39.
- Masrom, M. (2007). *Technology Acceptance Model and E-learning*. Retrieved May 5, 2010, from <http://eprints.utm.my/5482/>.
- Mayer, R. E., & Moreno, R. (2002). Aids to Computer-Based Multimedia Learning. *Learning And Instruction*, 12(1), 107-119.
- Mayer, R. E. (2001). Multimedia Learning. *Psychology of Learning and Motivation*, 41, 85-139.
- Mayer, R. E. (2005). *The Cambridge Handbook of Multimedia Learning*. New York, USA: Cambridge Univ Press.

- Meschtscherjakov, A., Wilfinger, D., Scherndl, T., & Tscheligi, M. (2009). *Acceptance of Future Persuasive In-Car Interfaces Towards A More Economic Driving Behaviour*. Paper Presented at the 1st International Conference on Automotive User Interfaces and Interactive Vehicular Applications, Essen, Germany. Retrieved April 4, 2010, from <http://dl.acm.org/citation.cfm?id=1620526>
- Mikropoulos, T., Chalkidis, A., Katsikis, A., & Kossivaki, P. (1997). Virtual Realities in Environmental Education: The Project LAKE. *Education and Information Technologies*, 2(2), 131-142.
- Mujber, T. S., Szecsi, T., & Hashmi, M. S. J. (2004). Virtual Reality Applications In Manufacturing Process Simulation. *Journals of Material Processing*, 155, 1834-1838.
- Nasution, F. N. (2004). *Penggunaan Teknologi Informasi Berdasarkan Aspek Perilaku (Behavioral Aspect)*. Retrieved September 13, 2009, from <http://repository.usu.ac.id/handle/123456789/1194>.
- Neo, M., & Neo, K. T. K. (2000). Innovative Teaching: Using Multimedia in a Problem-Based Learning Environment. *Educational Technology & Society*, 4(4), 19–21.
- Neo, T. K., Neo, M., & Teoh, B. S. P. (2007). *Designing a CD Based Learning Environment for a Multimedia Animation Course: A Malaysian Experience*. Paper Presented at the Australasian Society for Computers in Learning in Tertiary Education, Singapore. Retrieved April 15, 2009 from, <http://www.questia.com/googleScholar.qst?docId=5002483795>.
- Ng, K., & Komiya, R. (2000). *Introduction of Intelligent Interface to Virtual Learning Environment*. Paper Presented at the Multimedia University International Symposium on Information and Communication Technologies 2000 (M2USIC'2000), Selangor, Malaysia. Retrieved August 13, 2009 from <http://www.jsor.org/stable/10.2307/3250989>.
- Nielsen, J. (1993). *How to Conduct a Heuristic Evaluation*, Retrieved August 23, 2010, from http://www.useit.com/papers/heuristic/heuristic_evaluation.html.
- Nielsen, J. (1994). Heuristic Evaluation. *Usability inspection methods*, 25-62.
- Nugent, G. C. (1982). Pictures, Audio, and Print: Symbolic Representation and Effect on Learning. *Educational Technology Research and Development*, 30(3), 163-174.
- Oinas-Kukkonen, H. (2008). *Persuasive Technology*. Paper Presented at 3rd International Conference of Persuasive Technology , Oulu, Finland.

- Orlich, D. C., Harder, R. J., Callahan, R. C., Trevisan, M. S., & Brown, A. H. (2009). *Teaching Strategies: A Guide To Effective Instruction*: Wadsworth Pub Co.
- Ornstein, A., & Hunkins, F. (1998). *Curriculum: Foundations Principles, and Issues*. Boston, MA: Allyn & Bacon.
- Orrr, K. L., Golas, K. C., & Yao, K. (1994). *Storyboard Development for Interactive Multimedia Training*. Retrieved May 6, 2009, from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.118>.
- Pan, Z., Cheok, A. D., Yang, H., Zhu, J., & Shi, J. (2006). Virtual Reality and Mixed Reality for Virtual Learning Environments. *Computers & Graphics, 30*(1), 20-28.
- Park, S. Y. (2009). An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use E-learning. *Educational Technology, 12*(3), 150-162.
- Roussos, M., Johnson, A., Moher, T., Leigh, J., Vasilakis, C., & Barnes, C. (1999). Learning and Building Together in An Immersive Virtual World. *Presence: Teleoperators & Virtual Environments, 8*(3), 247-263.
- Rowley, D. E., & Rhoades, D. G. (1992). *The Cognitive Jogthrough: A Fast-Paced User Interface Evaluation Procedure*. Paper Presented at the SIGCHI Conference on Human factors in computing systems, New York, USA. Retrieved June 6, 2010 from <http://dl.acm.org/citation.cfm?id=142869>.
- Salam, S. N. A. (2010). *The Development and Effects of a Persuasive Multimedia Learning Environment (PMLE) In Reducing Children Dental Anxiety*. (PhD Thesis, Universiti Sains Malaysia, 2010).
- Sánchez, J., Lumbreras, M., & Silva, J. (2001). *Virtual Reality and Learning: Trends and Issues*. Retrieved May 27, 2009 from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.286884>.
- Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1997). *Teaching with Technology: Creating Student-Centred Classrooms*. New York: Teachers College Press.
- Schar, S. G., & Krueger, H. (2000). Using New Learning Technologies With Multimedia. *Multimedia, IEEE, 7*(3), 40-51.
- Schlager, M., Boman, D., Piantanida, T., & Stephenson, R. (1993). *Forecasting the Impact of Virtual Environment Technology on Maintenance Training*. Paper presented at the Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992), USA. Retrieved November 13, 2009 from, <http://mdl.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=N9411570AH&q=Forecasting+the+Impact+of+Virtual+Environment+Technology+on+Maintenance+Training.+&uid=791763670&setcookie=yes>

- Schnotz, W., & Grzondziel, H. (1996). *Knowledge Acquisition with Static and Animated Pictures in Computer-Based Learning*. Paper Presented at the Annual Meeting of the American Educational Research Association, New York, USA. Retrieved July 7, 2009 from, http://eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_ERICExtSearch_SearchValue_0=ED401878&ERICExtSearch_SearchType_0=no&accno=ED401878.
- Shank, P. (2005). *The Value of Multimedia in Learning*. Retrieved on May 10, 2009, from http://www.adobe.com/designcenter/thinktank/valuemedia/The_Value_of_Multimedia.pdf.
- Shephard, A. (2003). *Case for Computer-Based Multimedia in Adult Literacy Classrooms*. Retrieved June 23, 2010, from http://www.familyenrichment.info/2009/cbtAdultLit/cbt_adultLit.php
- Shiratuddin, N., & Hassan, S. (2010). *Design Research in Software Development: Constructing and Linking Research Questions, Objectives, Methods and Outcomes*. Sintok, Kedah: Universiti Utara Malaysia Press.
- Stone, R. (2001). Virtual Reality for Interactive Training: An Industrial Practitioner's viewpoint. *International Journal of Human-Computer Studies*, 55(4), 699-711.
- Sutcliffe, A., & Gault, B. (2004). Heuristic Evaluation of Virtual Reality Applications. *Interacting with Computers*, 16(4), 831-849.
- Sutcliffe, A. G., Kurniawan, S., & Shin, J. E. (2006). A Method and Advisor Tool for Multimedia User Interface Design. *International Journal of Human-Computer Studies*, 64(4), 375-392.
- Sutcliffe, A. G., & Kaur, K. D. (2000). Evaluating the Usability of Virtual Reality User Interfaces. *Behaviour And Information Technology*, 19(6), 415-426.
- Sweller, J. (2004). Instructional Design Consequences of an Analogy Between Evolution by Natural Selection and Human Cognitive Architecture. *Instructional Science*, 32(1), 9-31.
- Tabung Haji. (2010). *Panduan Lengkap Kursus Haji*. Kuala Lumpur: Tabung Haji.
- Tarr, M. J., & Warren, W. H. (2002). Virtual Reality in Behavioral Neuroscience and Beyond. *Nature Neuroscience*, 5, 1089-1092.
- Tavanti, M., Le, H. H., & Dang, N. T. (2003). *Three-Dimensional Stereoscopic Visualization for Air Traffic Control Interfaces: A Preliminary Study*. Paper Presented at the Digital Avionics Systems Conference, Indianapolis, IN. Retrieved February 1, 2010 from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=1245852

- Taylor, C. D. (1992). *Choosing a Display Format for Instructional Multimedia: Two Screens vs. One*. Paper Presented at the Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology, USA. Retrieved June 6, 2009 from <http://eric.ed.gov/PDFS/ED348029.pdf>
- Thangarajoo, Y. (2008). *Computer-Based Motorcycle Engine Diagnosis and Troubleshooting Module Usability and Training Evaluation*. (Master Thesis, Universiti Utara Malaysia, 2008)
- Trochim, W. (2006). *Introduction of Evaluation*. *Research Methods Knowledge Base*. Retrieved August 4, 2010, from <http://www.socialresearchmethods.net/kb/intreval.htm>
- Vaishnavi, V. K., & Kuechler, W. (2004). *Design Science Research Methods and Patterns: Innovating Information and Communication Technology*. Boston, MA: Auerbach Publications.
- Vaishnavi, V. & Kuechler, B. (2008). On Theory Development in Design Science Research: Anatomy of a Research Project. *European Journal of Information Systems*, 17(5), 489-504.
- Vaughan, T. (2007). *Multimedia: Making it work*. USA: McGraw-Hill.
- Wharton, C., Rieman, John., Lewis, C., & Polson, P. (1994). *The Cognitive Walkthrough Method: A Practitioner's Guide*. Retrieved 6 August, 2010, from <http://ics.colorado.edu/techpubs/pdf/93-07.pdf>
- Winn, W. (1993). *A Conceptual Basis for Educational Applications of Virtual Reality*. Retrieved April 2, 2010, from <http://www.hitl.washington.edu/publications/r-93-9/>.
- Woodard, B. S. (2005). Technology and the Constructivist Learning Environment: Implications for Teaching Information Literacy Skills. *Research Strategies*, 19(3-4), 181-192.
- Wright, E. E. (1993). Making the Multimedia Decision: "Strategies for Success". *Journal of Instruction Delivery Systems*, 7(1), 15-22.
- Yahia, M. (2007). *IOL Virtual Hajj in Second Life*. Retrieved March 23, 2010, from <http://www.islamonline.net/servlet/Satellite>.
- Yusoff, M. F., Zulkifli, A. N., & Mohamed, N. F. F. (2010). Virtual Environment As Aids in Persuading Users in Learning Process. *Proceeding of Regional Conference on Knowledge Integration* (pp. 316-323). Selangor, Kolej Universiti Islam Antarabangsa Selangor (KUIS).
- Yusoff, M. F., Zulkifli, A. N., & Mohamed, N. F. F. (2010). V-Hajj Development Utilizing Virtual Environment and Multimedia in Persuading User to Learn Hajj and Umrah. *Proceedings of 4th National Seminar of Hajj Best Practices*

Through Advances in Science & Technology. Penang, Universiti Sains Malaysia.

Zhang, Z., Basili, V., & Shneiderman, B. (1999). Perspectived-based Usability Inspection: An Empirical Validation of Efficacy. *Empirical Software Engineering*, 4(1), 43-69.

Zolna, J. S. (2006). Multimedia, Multimodal Effects, and Universally Designed Instruction. *Visual Languages and Human-Centric Computing*, 248-252.

Zouaoui, Z., & Mallon, A. (1997). *Guidelines for Multimedia Design and Development*. Retrieved July 3, 2009 from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=648554.