



**Sekolah Siswazah
(Graduate School.)
Universiti Utara Malaysia**

**PERAKUAN KERJA KERTAS PROJEK
(Certification of Project Paper)**

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, *certify* that)

RAMLI BIN AWANG

calon untuk Ijazah

(candidate for the degree of) Sarjana Sains (Teknologi Maklumat)

telah mengemukakan kertas projek yang bertajuk
(has presented his/ her project paper of the following title)

WEB-BASED ADMINISTRATION OF ONLINE MULTIPLE-CHOICE TEST

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek **tersebut** boleh diterima dari segi bentuk serta kandungan,
dan meliputi bidang ilmu dengan memuaskan.
(that the project paper acceptable in form and content, and that a satisfactory
knowledge of the field is covered by the project paper).

Nama Penyelia

(Name of Supervisor) . Prof. Madya Abdul **Bashah** Mat **Ali**

Tandatangan

(Signature)

: 

Tarikh

(Date)

: 15/05/2003

WEB-BASED ADMINISTRATION OF ONLINE MULTIPLE-CHOICE TEST

A thesis submitted to the Graduate School in fulfillment
of the requirements for the degree
Master of Science (Information Technology)
Universiti Utara Malaysia

BY
Ramli bin Awang

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the University library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or, in their absence, by the Dean of the Graduate School. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without any 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 material in this thesis, in whole or in part should be address to:

Dean of Graduate School
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRAK (BAHASA. MELAYU)

Tujuan projek ini ialah untuk membangunkan satu prototip sistem ujian atas-talian bagi ujian aneka pilihan untuk digunakan di Maktab Perguruan Perlis, Perlis. Sistem ini telah dibangunkan untuk memudahkan pengurusan dan pentadbiran ujian atas-talian. Ia berasaskan intranet dan berakitekturkan pelayan/pelanggan. Metodologi Rekabentuk Pangkalan Data dan teknik *Rapid Prototyping* telah digunakan untuk membangunkan sistem. Sistem ini telah dicuba (*trial-run*) di Maktab Perguruan Perlis pada sekumpulan pelajar dengan menduduki ujian atas-talian. Segala kelemahan dan batasan pada sistem yang dikenalpasti telah dibincangkan dan beberapa syor dikemukakan untuk mengatasi kelemahan ini agar ia dapat membantu dalam pembangunan projek ini pada masa akan datang.

ABSTRACT

The purpose of this project is to develop a prototype of a web-based administration of online multiple-choice test system to be used in Perlis Teachers Training College, Perlis. The system was developed to facilitate in managing and administrating an online test. It is a client/server architecture which is based on intranet. Database Design Methodology and Rapid Prototyping technique were used to build the system. The system was trial-run in Perlis Teachers Training College by a group of students sitting the online test. Problems and limitations discovered were then discussed and recommendations made to overcome the limitations for the future development of the project.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to my supervisor, Associate Professor Abdul Bashah Mat Ali for his continuous encouragement and contributions throughout this project. I appreciate his vast knowledge and expertise in many areas, and his guidance in writing this thesis.

My beloved wife deserves an award for her patience and support during this long journey. I am also grateful to my two daughters for their moral support. Special thanks to my friend Samudin Kassan and Azizah Aziz, both from IPDA for their patient in assisting me in coding using ColdFusion. Finally, I would also like to thank my colleagues Mohd. Akbar Yahya, Sazali Saidin and Chan Bee Chin for their friendship and kindness who helped me go through this hard time.

May Allah bless us.

TABLE OF CONTENTS

Permission to use	...	...	...	...	...	...	...	...	i
Abstrak (Bahasa Melayu)	...	...	...	...	...	...	...	...	ii
Abstract	...	...	...	...	...	...	...	...	iii
Acknowledgements	...	...	...	...	...	...	...	...	iv
Table of Contents	...	...	...	...	...	...	...	...	v
List of Tables	...	...	...	...	...	...	...	...	viii
List of Figures	...	...	...	...	...	...	...	...	ix

CHAPTER ONE: INTRODUCTION

1.1	Teacher's Education Division	...	...	...	...	...	...	1
1.2	The Requirements	...	...	...	...	...	...	2
1.3	Problem Statement	...	...	...	...	...	...	3
1.4	Objectives	...	...	...	...	...	...	5
1.5	Project Significance	...	...	...	...	...	...	5
1.6	Project Scope	...	...	...	...	...	...	5
1.7	Hardware and Software Requirements	...	...	...	...	...	...	6
1.7.1	Hardware Requirements	...	...	...	...	...	...	6
1.7.2	Software Requirements	...	...	...	...	...	...	6

CHAPTER TWO: LITERATURE REVIEW

2.1	Online Test and Assessment Scenario	...	...	...	7
2.1.1	Preliminary Online Test and Assessment	...	...	...	7
2.1.2	The Development of Online Test and Assessment	...	...	...	8
2.1.3	Concerns on Online Test and Assessment	...	...	...	8
2.1.4	Optimistic Acceptance of Online Assessment	...	...	...	9
2.2	Software Review: Accomplishment in Online Test and Assessment	...	...	...	10
2.3	The Disadvantage of using <i>off-the-shelf</i> Softwares	...	...	...	12

2.3.1	SCORM Compliant Softwares	...	...	...	12
2.3.2	Script-base Softwares	...	...	...	13

CHAPTER THREE: SYSTEM DESIGN AND DEVELOPMENT

3.1	Database Design	...	...	...	...	...	...	15
3.1.1	Requirement Collection and Analysis				...	...	...	19
3.1.1.1	Use Case Diagram For The Administration Subsystem and Online-Test Subsystem						...	19
3.1.1.2	Definition of Actors in the system	...			...	...	...	21
3.1.1.3	Explanation of Use Cases in the system				...	...	...	22
3.1.2	Sequence Diagram	...	...	...	...	...	...	26
3.1.2.1	Sequence Diagram of Student Log-in				...	...	...	27
3.1.2.2	Sequence Diagram of Delete Student Information...						...	28
3.1.2.3	Sequence Diagram to Display Online Test						...	29
3.1.2.4	Sequence Diagram to Quit the Test and Log-out						...	30
3.1.3	Local Conceptual Data Model			...	...	...	...	31
3.1.3.1	Entity Types of the Online Multiple-Choice Test System						...	31
3.1.3.2	Relationship Types			...	...	...	...	33
3.1.3.3	Attributes	...	...	...	...	...	...	36
3.1.3.4	Attribute Domains	...		...	...	...	...	38
3.1.3.5	Primary and Alternate Key Attributes					...	...	40
3.1.4	Local Logical Data Model			...	...	...	...	40
3.1.4.1	Global Logical Data Model				...	...	...	43
3.1.5	Physical Data Model	...	...	...	...	...	...	44
3.1.5.1	Translation of Global Logical Data Model for target DBMS						...	44
3.1.5.2	Designing base relation for target DBMS				...		...	44
3.1.5.3	Designing enterprise constrains for target DBMS						...	44
3.1.5.4	Designing physical representation				...	...	...	47
3.1.5.4.1	Analyzing transactions				...	...	...	48
3.1.5.4.2	Choosing file organization					...	...	49
3.1.5.4.3	Choosing indexes				...	...	...	50

3.1.5.4.4	Estimation of Disk space requirement	...	...	...	...	...	...	51
3.1.6	Designing User Views	...	...	...	...	...	...	52
3.1.7	Designing Security Measures	...	...	...	...	...	...	52
3.2	Web Development Design	...	...	...	...	...	...	54
3.2.1	Difference between Web Site and Web Application	...	...	...	...	...	...	54
3.2.2	UML's Web Application Extension (WAE)	...	...	...	...	...	...	55
3.2.3	Rapid Software Prototyping (RSP)	...	...	...	...	...	...	56
3.2.3.1	Analyzing Requirement...	...	...	...	...	...	...	56
3.2.3.2	Prototype Design	...	...	...	...	...	...	60
3.2.3.3	Prototype Construction	...	...	...	...	...	...	60

CHAPTER FOUR: IMPLEMENTATION

4.1	The Prototype System Architecture	...	...	...	...	...	...	62
4.2	Network	...	...	...	...	...	...	63
4.3	Web Server	...	...	...	...	...	...	63
4.4	DBMS	...	...	...	...	...	...	63
4.5	Application Server	...	...	...	...	...	...	64
4.6	Web Browser	...	...	...	...	...	...	64
4.7	Administrator	...	...	...	...	...	...	65
4.8	Students	...	...	...	...	...	...	65
4.9	The Trial Run	...	...	...	...	...	...	65

CHAPTER FIVE: EVALUATION

5.1	System Requirement Testing and Results	...	...	...	...	...	...	67
5.2	Evaluation	...	...	...	...	...	...	69

CHAPTER SIX: CONCLUSION

6.1	Problems and Limitations	...	...	...	...	...	...	70
6.2	Recommendations for Enhancement	...	...	...	...	...	...	71
6.3	Future Work	...	...	...	...	...	...	71

REFERENCES	72
------------	-----	-----	-----	-----	-----	-----	-----	----

APPENDICES

APPENDIX A	...	...	...	...	...	...	...	75
APPENDIX B	...	...	...	...	...	...	...	82
APPENDIX C	...	...	...	...	...	...	...	85
APPENDIX D	...	...	...	...	...	...	...	97
APPENDIX E	...	...	...	...	...	...	...	104

LIST OF TABLES

Table 3.1:	Steps in database design using Database Design Methodology	...	...	...	...	17
Table 3.2:	Data dictionary for the collective view of <i>Web-Base Administration of Online Multiple-Choice System</i> showing a description of entities	...	...	...	...	32
Table 3.3:	Data Dictionary for Online Multiple-Choice Test System showing a description of relationships	...	...	...	...	35
Table 3.4:	Data Dictionary for Online Multiple-Choice Test System showing entity attributes	...	...	...	...	36
Table 3.5:	Data Dictionary for Online Multiple-Choice Test System showing attribute domains	...	...	...	...	38
Table 3.6:	Transactions in Local Logical Data Model as depicted in Figure 3.8	...	...	...	...	41
Table 3.7:	Relations that represent the global logical data model	...	...	...	...	43
Table 3.8:	Cross-referencing transactions and relations for Web-Based Administration of Multiple-Choice Online Test System	...	...	...	...	49
Table 3.9:	Secondary Indexes for Web-Based Administration of Online Multiple-Choice Test System	...	...	...	...	51
Table 3.10:	Estimated Disk Space for the Web-Based Administration of Online Multiple-Choice Test System	...	...	...	...	52
Table 5.1:	Actual System Performance	...	...	...	...	67

LIST OF FIGURES

Figure 3.1:	A simplified diagram to illustrate the ...	...	...	...	15
Figure 3.2:	Use case diagram for Web-Based Administration of Online Multiple-Choice Test System	...	...	...	20
Figure 3.3:	Sequence Diagram of student login	...	...	...	27
Figure 3.4:	Sequence Diagram of Deleting Student Information	...	...	...	28
Figure 3.5:	Sequence Diagram to Display online test (Based on the login and Question Set)	...	...	...	29
Figure 3.6:	Sequence Diagram to Quit the Test and Log-out (during this time student's score is calculated )	...	...	...	30
Figure 3.7:	Entity-Relationship diagram showing entity and types of Relationship for <i>Web-Based Administration of Online Multiple-Choice Test System</i>	...	...	...	34
Figure 3.8:	The Local Logical Data Model and User Transaction View for the Web-Based Administration of Online Multiple-Choice Test System	...	...	...	42
Figure 3.9:	Base Relation for target DBMS (SQL Server 2000)	...	...	...	45
Figure 3.10:	Basic Web Site Architecture	...	...	...	54
Figure 3.11:	Basic Web Site Architecture	...	...	...	54
Figure 3.12:	Web Application Model from the Admin (Exam Secretary) Perspective based on Use Case of Figure 3.2	...	...	...	57
Figure 3.11:	Web Application Model from the Admin (Lecturer) Perspective based on Use Case of Figure 3.2	...	...	...	58
Figure 3.12:	Web Application Model from the Student Perspective based on Use Case of Figure 3.2	...	...	...	59
Figure 4.1:	Architecture of <i>Web-Based Administration of Online Multiple-Choice Test System</i>	...	...	...	62

CHAPTER 1

INTRODUCTION

This project is initiated upon the request of course TZ6996 as one of the requirement of MSc(IT) course. The purpose of this project is to develop a prototype system of a web-based administration of online multiple-choice test for Perlis Teachers Training College. Database Design Methodology and Rapid Software Prototyping Technique will be used in modeling the system. For the notation, Unified Modeling Language (UML) and its Web Application Extension (WAE) are chosen because they are now standard notations for most methodologies.

This chapter gives an overview of Teacher's Education Division of Ministry of Education Malaysia, brief explanation about RDBMS and web database application. The problem statement, objectives, project scope, hardware and software requirements of the project are also discussed.

1.1 Teacher's Education Division

Teacher's Education Division is a one of the divisions in Ministry of Education. Its sole function is to manage all the teacher's training colleges. Currently there are 27 teacher's training colleges located all over Malaysia (Kementerian Pendidikan Malaysia, 2003).

Teacher's training college is a formal institution, responsible for giving training to teacher trainees. Courses are also conducted to the existing teachers in order to enhance

The contents of
the thesis is for
internal user
only

REFERENCES:

- Alexander, M., Bartlett, J., Truell, A. & Ouwenga, K. (2001). Testing in a Computer Technology Course: An Investigation of Equivalency in Performance Between Online and Paper and Pencil methods. *Journal of Career and Technical Education*, Vol. 18, No.1, Fall 2001.
- American Psychological Association (APA). 1986. *Guidelines for Computer-based Tests and Interpretations*. American Psychological Association, Washington DC. Washington DC.
- Bicanich, E., Slivinski, T., Hardwicke, S., & Kapes, J. (1997). Internet-based testing: A vision or reality? *THE Journal*, 25(2), 61-65.
- Bishop, P. (2000). *CTI maths and stats workshop 18*. Retrieved from <http://www.bham.ac.uk/ctimath/workshops/wass.htm>
- Bocij, P., & Greasley, A. (1999). Can computer-based testing achieve quality and efficiency in assessment? *International Journal of Educational Technology*, 1(1), 1-18. Retrieved from <http://www.outreach.uiuc.edu/ijet/v1n1/bocij/index.html>
- Bull, J. (1996). *Computer based assessment: Some issues for consideration*. Retrieved from <http://www.cti.ac.uk/publ/actlea/issue1/bull/>
- Chauncey, H., Jr. (1995). A calm before the storm? *Yale Alumni Magazine*, 58(7), 30-31.
- Cochran, E. P. (1998, March-April). The mouse replaces the pencil: TOEFL goes electronic. *ESL Magazine*, 1(2), 10-12.
- Daly, T. (2000). *Computer based assessment (CBA)*. Retrieved from <http://www.mcc.ac.uk/newsletters/Local/issue72/cba.html>
- Doughty, G., Magill, J., & Turner, I. (1996). *Interactive multimedia computer based assessment*. Retrieved from <http://www.cti.ac.uk/publ/actlea/issue1/doughty/>
- Elmasri, R., Navathe, S. (2000). *Fundamentals of Database Systems (3rd Edition)*. Addison-Wesley pp 42-43.
- Gibson, E. J., Brewer, P. W., Dholakia, A., Vouk, M. A., & Bitzer, D.L. (2000). *A comparative analysis of web-based testing and evaluation systems*. Retrieved from <http://renoir.csc.ncsu.edu/MRA/Reports/WebBasedTesting.html>
- Gokhale, A. A. (1996). Effectiveness of computer simulation for enhancing higher order thinking. *Journal of Industrial Teacher Education*, 33(4), 36-46.
- Greenberg, R. (1998). Online testing. *Techniques*, 73(3), 26-28. Retrieved from <http://47.226.94.254:5239/per?sp.nextform=fullrec.htm&sp.usernumber.p=459434>

- Hazari, S. (1998). *Online testing methods for web courses*. Presented at the 1998 Distance Teaching and Learning Conference. (ERIC Document Reproduction No. ED422835)
- Judge, G. (1999). The production and use of online web quizzes for economics. *Computers in Higher Education Economics Review*, 13(1). Retrieved from http://www.ilrt.bris.ac.uk/ctiecon/cheer/ch13_1/ch13_1p21.htm
- Kumar, D. (1996). *Computers and assessment in science education*. (ERIC Document Reproduction No. ED395770)
- Miller, L. W. (2000). Computer integration by vocational teacher educators. *Journal of Vocational and Technical Education*, 14(1). Retrieved from <http://scholar.lib.vt.edu/ejournals/JVTE/v14n1/JBTE-3.html>
- Newby, M., & Fisher, D. (1998). *The association between computer laboratory environment and student outcomes*. Paper presented at the Australian Association for Research in Education Annual Conference, Adelaide, Australia. Retrieved from <http://www.swin.edu.au/aare/98pap/new98037.html>
- Newman, C. (2000). Online testing rated. *Advertising-Age*, 71(20), 64. Retrieved from <http://147.226.94.254:5239/per>
- Norton, K. (May, 1999). *Applying cross functional evolutionary methodologies to webdevelopment*. Proc. First ICSE workshop on web engineering, ACM, Los Angeles.
- Pilypas, H. (1997) *The Use of the Computer as a Tool for Testing Reading Comprehension*. Retrieved on January 18 2003, from <http://www.ed.sturt.flinders.edu.au/edweb/onpub/THESES/pilypas97a/>
- Pressman, Roger, S. (2001). *Software Engineering. A Practioner's approach. (5th Edition)*. McGraw-Hill Higher Education. New York
- Shermis, M. D., & Lombard, D. (1998). *Effects of computer-based test administrations on test anxiety and performance*. (ERIC Document Reproduction No. EJ561400)
- Song, J. K. (1998). *Using the world wide web in education and training*. Presented at 1998 Information Technology in Education and Training Conference - session 1. (ERIC Document Reproduction No. ED417703)
- Stretch, L. 1995. Technology use in language arts instruction. Seminar presented at California State University, Longbeach, April 27.
- Thomson, J. S., & Stringer, S. B. (1998, August). *Evaluating for distance learning: Feedback from students and faculty*. Paper presented at the Annual Conference on Distance Teaching and Learning, Madison, WI. (ERIC Document Reproduction No. ED422835)

- Treadway, R. (1998, June). *An integrated computerized instructional system for classroom and lab*. Paper presented at the Association of Small Computer Users in Education: Proceedings of the ASCUE Summer Conference, North Myrtle Beach, SC. (ERIC Document Reproduction No. ED425736)
- Williams, A. 1997. Throw out skills test, says expert. *Sunday Mail*, 30 March, p. 5.
- Williams, D. and Monhardt, J. 1997. Internet Literacy Exam. Exam for students in Arts Technology at Illinois State University. [Online] Available: <http://www.orat.ilstu.edu/classes/ORAT389.88Seminar/documents/litexam.html> [1997, April 20]
- Wilson, F.R., Genco, K.T. and Yager, G.G. 1985. Assessing the equivalence of paper-and-pencil vs. computerized tests: Demonstration of a promising methodology. *Computers in Human Behaviour*. Vol. 1, 265-267.
- Zakrzewski, S., & Bull, J. (1998). The mass implementation and evaluation of computer based assessments. *Assessment and Evaluation*, 23(2), 141-152.