

**E-Learning System For
Advanced Data Structures Course**

Hietem G. Y. Ibrahim

Universiti Utara Malaysia

2009

CUA
2009
525
1111
1111

**E-Learning System For
Advanced Data Structures Course**

**A Dissertation submitted to college Arts & Sciences in partial
Fulfillment of the requirement for the degree master of Science
(Information Technology)
Universiti Utara Malaysia**

By

Hietem G. Y. Ibrahim 801576

Copyright © Hietem G. Y. Ibrahim 2009. All Rights Reserved

PERMISSION TO USE

In presenting this thesis of the requirements for a Master of Science in Information Technology (MSc. IT) 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 or in their absence, by the Dean of 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 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.

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

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

ABSTRACT

Over the last years, E-learning has gained significant popularity, and it's expected to continue in the future. Learning is a multi-dimensional activity where each dimension should be adequately supported by a learning system to provide a fruitful learning experience to its users. Many problems facing the students during attended the class, which may be not effective and efficient to students and lectures for advanced data structure. Therefore this study focus on development of an E-learning system as a learn material for advanced data structures course, the proposed system designed using Pascal and Delphi language, furthermore the aim of this study is to provides interactive E-learning system for advance data structure and saving the time on the students to attended the classes. Furthermore, the proposed system has been evaluated in terms of interface design and contents by distribute the questionnaire to 40 students and measuring the usability of the proposed system, the result shown the high agreements that proposed system has clear presentation of information (Mean = 7.6) which indicate that the new users agreed with the proposed system.

ACKNOWLEDGEMENT

My gratefulness to my supportive and helpful supervisor, Mawarny Binti Md. Rejab for assisting and guiding me in the completion of this research. With all truthfulness, without her, the project would not have been a complete one. Mawarny Binti Md. Rejab has always been my source of motivation and guidance. I am truly grateful for her continual support and cooperation in assisting me all the way through the semester.

I would like to present my thanks to my wife, my father, my mother and all my family who has always been there for me. Finally, I would like to express my appreciations to all my friends, colleagues, other staff, and everyone who has helped me in this journey.

TABLE OF CONTENTS

Page Num

CHAPTER ONE

INTRODUCTION

1.1 Overview	1
1.2 Background	1
1.3 Problem Statement	2
1.4 Research Question	3
1.5 Objectives of the study	3
1.6 Scope of the study	3
1.7 Significant of study	4
1.8 Organization of the study	4
1.9 Summary	5

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction	6
2.2 Learning process	6
2.3 Complex Visuals with Audio only	8
2.4 E-Learning Vs. E-Training	9
2.5 Interactive tools in the learning and training	11
2.6 Related Works	12
2.7 Summary	20

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction	21
3.2 Analysis	22
3.3 Design	23
3.4 Development	24
3.5 Evaluation	24
3.6 Summary	25

CHAPTER FOUR

ANALYSIS AND DESIGN

4.1 Requirements Gathering	26
4.2 Use Case Diagram for Advanced Data Structure Learning Course	31
4.3 Design	32
4.4 Summary	38

CHAPTER FIVE	
PROTOTYPE DEVELOPMENT AND EVALUATION	
5.1	Introduction 39
5.2	System Architecture 40
5.3	User Interface 41
5.4	User evaluation 47
CHAPTER SIX	
CONCLUSION	
6.1	Introduction 50
6.2	Discussion 51
6.3	Contributions 52
6.4	Limitation 52
6.5	Future work 53
6.6	Epilogue 54
Reference	55
Appendix	61

LIST OF TABLES

Table 4.1: List of software	29
Table 5.1: Descriptive Statistic for the new users on using the E-learning system	46
Table 5.2: Reliability of E-learning System	47

LIST OF FIGURES

Figure 2.1: General Architecture of an Interactive Web- Based Animation	7
Figure 2.2: Effective e-Learning supports critical psychological learning processes	9
Figure 2.3: The visual channel is overloaded with the presentation of written text and graphics	11
Figure 2.4: Animation for search process of some common direct optimization algorithms	15
Figure 2.5: XHTML and XML E-learning Software Solution Interface	17
Figure 2.6: Question, response, and feedback	19
Figure 2.7: the logo theme character; the logo's face; a water-sport recreational screen	19
Figure 3.1: ADDIE :Customized Methodology	22
Figure 4.1: Use Case Diagram for the Advanced Data Structure learning course	32
Figure 4.1: Advanced Data Structure learning course cover page layout	35
Figure 4.3: Activity diagram for the navigation structure	37
Figure 5.1: E-learning System for Advanced Data Structure Course Architecture	40
Figure 5.2: Select Language Page	41
Figure 5.3: Select Contents Page	42
Figure 5.4: Select Graph Page	43
Figure 5.5: Select Search Page	44
Figure 5.6: Select Sort Page	45
Figure 5.7: Navigation Page	46
Figure 5.8: Mean values for the evaluated dimensions	48

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter briefly elaborates the main idea of this study, providing answer of the question why the study was conducted and what is the main element involved in the study. The first sub-topic describes the overall idea in this study through the scenario and the introduction that lead to the implementation of the whole project. This is followed by the problem statement, objectives, scope, and significance of the study. The last sub-topic elaborates the way this project is organized.

1.2 Background

Nowadays E-learning involves the acquisition, generation and transfer of knowledge using the various methods and techniques that apply to develop and enhance the learning system for different topics which can be much more effective, and cheaper than more traditional learning methods, (Jeffrey, 2002); (Jorge, 2006). With the rapid progress of the communication tools in the many fields, the teacher should to have a mastery of the medium, in other words, a correct handling of new technologies (Michael, 2007), which implies not so much a perfect knowledge of all the mediums, but rather mastery of those which are going to prove basic and strategic for the processes of e-training (E-Learning Advantages and Disadvantages, 2008). However, in many departments of learning the

The contents of
the thesis is for
internal user
only

REFERENCE

Allen M. (2000). E-Publishing FA. (2000). Writing-World.com . From (<http://www.writing-world.com/epublish/FAQ.html>).

Ann M. (2005). E-Books in an Academic Library: Implementation at the ETH Library, Zurich, the Electronic Library 23, no. 1 (2005).

Atle Refsdal, K. S. (2008). Extending UML Sequence Diagrams to Model Trust-dependent Behavior with the Aim to Support Risk Analysis. 197(2): 15-29.

Armstrong C. & Lonsdale R. (1998). The Publishing of Electronic Scholarly Monographs and Textbooks(<http://www.ukoln.ac.uk/dlis/models/studies/elec-pub/elec-pub.htm>).

Bahrami, A. (1999). Object Oriented System Development, McGraw-Hill, United States of America.

Bernard, R., Abrami, Y., Borokhovski, A., Wade, L., Wozney, P., Waiet, M. & Huang B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. Review of Educational Research 74(3): 379–439.

Bennett, S., McRobb, S., & farmer, R. (2002). Object-oriented System Analysis and Design 2nd Edition. UK, McGraw Hill.

Brb G. (2007). E-books: Search and Download in the Life Sciences., 2007 SLA Conference Denver, Colorado, USA.

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row, New York.

Collard, R. (1999). Test Design. *Stqemagazine: Software Testing & Quality Engineering*. Retrieved 2 JAN, 2009 from (www.Softordsif!.s/material/rosscollard I.pdf).

Clark, R. & Mayer, R. (2007). *E-Learning and the Science of Instruction*. 2nd edition. San Francisco: Pfeiffer.

Dennis, A., Wixom, B.H., & Tegarden, D. (2005). *System analysis and design with UML version 2.0: an object-oriented approach with UML*, 2nd edition.

De Villiers, M.R. 2003. *Foundation for structure: a learning theory approach to instructional design for e-learning*. *International Journal of Learning* Vol 10. *Proceedings of the Learning Conference*. Common Ground Publishers. In press.

Dix, A., Finlay, J., Abowd, G.D. and Beale, R. (2004). *Human-Computer Interaction*. Pearson Education, Ltd, Harlow, 318–364.

Dolphin (2006). *One Blind Man, a Passport and a Talking PDA in his Pocket*, from (<http://www.yourdolphin.com/newsitem.asp?id=105>).

E-Learning Advantages and Disadvantages, (2008). *What are e-learning advantages and disadvantages*. Retrieved on 10 JAN 2009, from (<http://www.about-elearning.com/e-learning-advantages-and-disadvantages.html>).

E-learning (2008). *E-learning information advantages* retrieved on 21 July, from (http://www.leftbrainmedia.com/e_advantages.html).

E-learning information advantages (2008). Retrieved on 5 JAN 2009, from (http://www.leftbrainmedia.com/e_advantages.html).

Eriksson, H., & Penker, M. (1998). *UML Toolkit*. USA, John Wiley & Sons, Inc.

Fetaji, B., & Fetaji, M. (2007). Assessing, measuring and evaluating e-learning indicators. In P. Kommers & G. Richards (Eds.), Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications. Chesapeake, VA: AACE.

Foster I., Jennings R. & Kesselman C. (2004). Brain meets brawn: Why grid and agents need each other, Proceedings of AAMAS'04, New York: ACM.

Granda J., Garcia D., Suarez F., Peteira I., and Uria C. (2008). Multimedia Tool for Synchronous Distance E-Training of Employees in Geographically Dispersed Industries, retrieved on 3 Jan 2009.

Hoffer, J. A., George, J. F & Valacich, J. S. (1999). Modern Systems Analysis and Design (2nd Edition). United Kingdom : Addison Wesley Longman.

Hoffer, J. A., George, J. F & Valacich, J. S. (2002). Modern Systems Analysis and Design (3rd Edition). Upper Saddle River, New Jersey: Prentice Hall.

Integrated Technology Group (2006), EduWave, the Comprehensive e-Learning Platform for the Educational Community, Integrated Technology Group.

Integrated Technology Group, EduWave, the Comprehensive e-Learning Platform for the Educational Community, Integrated Technology Group, 2006.

Jacobson, I., Christerson, M., Johnsson, P. & Overgaars, G. (2004). Object-oriented Software Engineering: A Use Case Driven Approach (revised). Harlow, England: Addison-Wesley.

Jeffrey, S. (2002). An Interactive Web-Site for Distance Learning Students, from (www.au.af.mil/au/aui/bibs/distancelearn.htm).

Jonassen, D. 1999. Designing Constructivist Learning Environments. In Instructional-Design Theories and Models: A New Paradigm of Instructional Theory Volume II. C.M.

Jorge, F., Sandra, R., & Roseli, D. (2006). Computer Graphics, Interactive Technologies and Collaborative Learning Synergy Supporting Individuals' Skills Development, from (www.portal.acm.org/citation.cfm?id=261190).

Klauser, F., Schoop, E., Gersdorf, R., Jungmann, B. & Wirth, K. (2004). The Construction of Complex Internet-Based Learning Environments in the field of Tension of Pedagogical and technical Rationality, Research Report Impuls.

Lange F. (2001). The Philips-Open TV Product Family Architecture for interactive Set-Top boxes. In 4th product family engineering, Springer.

Magda, M., & Harry, P. (2003). Digital Rights Management in e-Learning Problem Statement and Terms of Reference, from (ieeexplore.ieee.org/iel5/4303009/4303010/04303011.pdf).

Matt, B. (2006). A Learning System Engineering Approach to Developing Online Courses, from (www.portal.acm.org/citation.cfm?id=1151877).

Matthew, F. (2005). 50 Ideas for Free E-learning. From (mpira.ub.uni-muenchen.de/view/year/2005.html).

Molenda, M. (2003). The ADDIE model. Encyclopedia of Educational Technology, ABC-CLIO.

Michael, E., & Jens B. (2007). Instructional Design of a Programming Course. Learning .

Michael, E., & Jens B. (2007). Instructional Design of a Programming Course. Learning Theoretic Approach, from (portal.acm.org/citation.cfm?id=1288580.1288595).

Naomi S., Cliff M., & Anne M. (2008). Electronic Books: Children's Reading Practices and Comprehension, assessed on 2 Oct 2008, Department of Information Science, Loughborough University.

Nielsen, J. (2000). Designing Web Usability: The Practice of Simplicity. New Riders Publishing, Indianapolis, ISBN 1-56205- 810-X.

Norshuhada S., Monica L., Forbes G. and Shahizan H. (2000). E-Book Technology and Its Potential Applications in Distance Education, 19-2-2003.

Nunamaker ,J.F.J.,chan,M.,&purdin,T.D.M,(1991). System development information.

Omnexus, (2008). E-Training Courses Agenda, retrieved on 20 Jan 2009, from (<http://www.omnexus4adhesives.com/services/etrainings.asp>).

Paula J. (2006). Trails: The New E-Book Readers, Information Today 23, iss. 10. 1, 22-24. 20 Lisa Cross, e-Book Reader as Best Seller.

Pool, C. (1997). A new digital literacy: A conversation with Paul Gilster. nEducational Leadership, 55 (3). Retrieved Jan 7, 2009, from (<http://www.ascd.org/readingroom/edlead/9722/pool.html>).

Ruth C. (2007). Leveraging multimedia for learning, Use instructional methods proven to align with natural learning processes.

Shneiderman, B. (1998). Codex, Memex, Genex: The Pursuit of Transformational Technologies, *International Journal of Human-Computer Interaction*.

Silva, P.P.D. & Paton, N.W. (2003). UML: The Unified Modeling Language for Interactive Applications. Retrieved on 20 March. From: <http://scholar.google.com/scholar?q=UMLi:%20The%20Unified%20Modeling%20Language%20for%20Interactive%20Applications&hl=en&lr=&oi=scholar>.

Schmuller, J. (2002). SAMS Teach Yourself UML in Hours. SAMS Publishing, Indiana.

Syrjakow M. (2000). Interactive Web-Based Animations for Teaching and Learning. Retrieved on 23 Feb 2009. From (<http://intractivitytowards.com>).

Wilkins L., Coburn M., Burrows P., & Loi, D. (2001). The Trials of Technology: the Brisbane E-Book Reader.

Zhang, D.J. Zhao, L., Zhou, L.F. Nunamaker, J. (2004). Can e-learning replace Classroom learning. *Communications of the ACM*, from (www.isedj.org/isecon/2007/2543/ISECON.2007.Zhang.ppt).

Ziming L. (2005). Reading Behavior in the Digital Environment: Changes in Reading Behavior over the Past Ten Years,"*Journal of Documentation* 61, iss.