

**A business Processes Reference Model
for Course Document Management for Supporting Accreditation**

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By
Mohammed. G. S. Ali. Alshish



**KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia**

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Nama Penyelia Utama
(Name of Main Supervisor): **DR. NOR LAILY HASHIM**

Tandatangan
(Signature)

:

DR. NOR LAILY HASHIM

Head Coordinator
Office of Applied Science
UUM College of Arts & Sciences
Graduate Department of Information Technology
Universiti Utara Malaysia

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Abstract

A reference model is a fundamental starting point for the development of new information systems. Reference models are also called universal models, generic models, or model patterns. In order to obtain a higher learning programme accreditation, most of the educational institutions such as private and public universities have to clearly demonstrate that the programmes offered by them meet the quality standards established by the accreditation body. However, there is no complete and effective reference model for the business process of managing courses' document in order to support accreditation. Therefore, this master's thesis is an attempting to design a reference model, which will be as a general reference model for the business processes of managing document of courses in higher educational institutions and universities in order to obtain accreditation. As the processes to obtain the accreditation is almost similar in most universities and higher educational institutions around world, this study tries to design general business processes reference model to these process that can be as a reference for any education institutions to model its own model since the specific model is a partial model of the reference model. Moreover based on this reference model, the requirements model for Universiti Utara Malaysia (UUM) was designed and implemented as web-based system for Courses' document management supporting Accreditation. In addition to this, the purposed reference model covers all processes that are used in most universities and higher educational institutions to store, retrieve and organise the information of the courses. The methodology of this study is the general design research methodology that contained; awareness of problem, suggestion, development, evaluation, and conclusion. To evaluate the system that was designed and implemented based on the reference model, two methods was used. The first one is black box testing to ensure that the functionality specified in the requirement specification works. The other method is the questionnaire to evaluate the usability of the systems in terms of usefulness. The summary of evaluation results emphasises that this system provides an enhancement and improvement to the performance of the users to accomplish their tasks, and enables the users to complete their tasks quickly.

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Table of content

PERMISSION OF USE	I
ABSTRACT	II
AKNOWLEDGEMENT	III
TABLE OF CONTENTS	IV
LIST OF FIGURES	VII
LIST OF TABLES	X
TABLE OF ACRONYMS	XI

CHAPTER 1 INTRODUCTION

1.1	Introduction	1
1.2	Problem statement	2
1.3	Research objectives	3
1.4	Research questions	4
1.5	Research scope	4
1.6	Research significance	4
1.7	Summary	5

CHAPTER 2 LITERATURE REVIEW

2.1	Business process	6
2.1.1	Business process modelling	7
2.1.1.1	Unified Modelling Language (UML)...	7
2.1.2	Reference model	8
2.1.2.1	Reference model for open distributed processing	9
2.2	Programme Accreditation	10
2.2.1	The process for accreditation.....	11
2.2.2	The provider of accreditation.....	12
2.3	Malaysian Qualifications Framework (MQF).....	13
2.4	Malaysian Qualifications Agency (MQA).....	13
2.5	Summary	14

CHAPTER 3 METHODOLOGY

3.1	Introduction	15
3.1.1	Awareness of problem	15
3.1.2	Suggestion	15
3.1.3	Development	16
3.1.4	Evaluation	16
3.1.5	Conclusion	16
3.2	Research schedule	17
3.3	Summary	17

CHAPTER 4 SYSTEM ANALYSIS AND DESIGN

4.1	Introduction	18
4.2	List of requirements	18
4.3	Use case diagram	20
4.4	Use case specification	21
4.5	Sequence diagram	33
4.6	Collaboration diagram	47
4.7	Class diagram	61
4.8	Reference model design	62
4.9	Prototype development	72
4.9.1	Development introduction	72
4.9.2	Functionality	72
4.10	Summary	79

CHAPTER 5 RESULT AND DISCUSSION

5.1	Black box testing	80
5.1.1	Test case format	81
5.2	Evaluation of the usability.....	82
5.2.1	Respondents profile	83
5.2.2	Descriptive statistics for usefulness	84
5.3	Summary	88

CHAPTER 6 CONCLUSION AND RESULT

6.1	Achievement of the objectives	89
6.2	Contribution of the study	89
6.3	Problems and Limitation	90
6.4	Recommendation and Conclusion	90

REFERENCES	91
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APPENDIXES

APPENDIX (A) Documents of courses from UUM	95
APPENDIX (B) Gantt chart	122
APPENDIX (C) Questionnaire	124
APPENDIX (D) The code of the system functionalities	127

LIST OF FIGURES

Figure 2.1 Simple activity diagram describing the order processing and account	8
Figure 3.1 The general methodology of design research	17
Figure 4.1 Use case diagram of CDMS system	21
Figure 4.2 Log in sequence diagram	34
Figure 4.3 View course documents sequence diagram	34
Figure 4.4 Manage programme sequence diagram – Add new programme	35
Figure 4.5 Manage programme sequence diagram – Update programme	36
Figure 4.6 Manage programme sequence diagram – Delete programme	37
Figure 4.7 Manage course sequence diagram – Add new course	38
Figure 4.8 Manage course sequence diagram – Update course	39
Figure 4.9 Manage course sequence diagram – Delete course	40
Figure 4.10 Manage lecturer sequence diagram – Add new lecturer	41
Figure 4.11 Manage lecturer sequence diagram – Update lecturer	42
Figure 4.12 Manage lecturer sequence diagram – Delete lecturer	43
Figure 4.13 Manage course to lecturer sequence diagram – Assign course to lecturer	44
Figure 4.14 Manage course to lecturer sequence diagram – Remove lecturer	45
Figure 4.15 Monitor lecturer activity sequence diagram	45
Figure 4.16 Manage course documents sequence diagram	46
Figure 4.17 Log in collaboration diagram	47
Figure 4.18 View course documents collaboration diagram	47
Figure 4.19 Manage programme collaboration diagram – Add new programme.....	48
Figure 4.20 Manage programme collaboration diagram – Update programme	49
Figure 4.21 Manage programme collaboration diagram – Delete programme	50
Figure 4.22 Manage course collaboration diagram – Add new course	51
Figure 4.23 Manage course collaboration diagram – Update course	52
Figure 4.24 Manage course collaboration diagram – Delete course	53
Figure 4.25 Manage lecturer collaboration diagram – Add new lecturer	54
Figure 4.26 Manage lecturer collaboration diagram – Update lecturer	55
Figure 4.27 Manage lecturer collaboration diagram – Delete lecturer	56
Figure 4.28 Manage course to lecturer collaboration diagram – Assign course to lecturer..	57
Figure 4.29 Manage course to lecturer collaboration diagram – Remove lecturer	58
Figure 4.30 Monitor lecturer activity collaboration diagram	59

Figure 4.31 Manage course documents collaboration diagram	60
Figure 4.32 CDMS Class diagram	61
Figure 4.33 New programme activity diagram	63
Figure 4.34 Update programme activity diagram	64
Figure 4.35 Delete programme activity diagram	65
Figure 4.36 New course activity diagram	65
Figure 4.37 Update course activity diagram	66
Figure 4.38 Delete course activity diagram	66
Figure 4.39 New lecturer activity diagram	67
Figure 4.40 Update lecturer activity diagram	67
Figure 4.41 Delete lecturer activity diagram	68
Figure 4.42 Assign course to lecturer activity diagram	68
Figure 4.43 Remove assign course to lecturer activity diagram	69
Figure 4.44 Manage course documents	69
Figure 4.45 Monitor lecturer activity diagram	70
Figure 4.46 View course documents activity diagram	70
Figure 4.47 Programme accreditation business processes reference model activity diagram	71
Figure 4.48 Screen shot for main login page	73
Figure 4.49 Screen shot for manager main menu page	73
Figure 4.50 Screen shot for manage program main page	74
Figure 4.51 Screen shot for add new programme page	74
Figure 4.52 Screen shot for add new course page	75
Figure 4.53 Screen shot for add new lecturer page	75
Figure 4.54 Screen shot for manage course to lecturer page	76
Figure 4.55 Screen shot for display activity of lecturer	76
Figure 4.56 Screen shot for lecturer main menu page	77
Figure 4.57 Screen shot for mapping soft skills and teaching methods	77
Figure 4.58 Screen shot for mapping course learning outcomes and taxonomy	78
Figure 4.59 Screen shot for mapping course learning outcomes and PLO	78
Figure 4.60 Screen shot for mapping course learning outcomes and soft skills	79
Figure 5.1 Black box testing	80
Figure 5.2 Question 1 Histogram	85
Figure 5.3 Question 2 Histogram	86

Figure 5.4 Question 3 Histogram	86
Figure 5.5 Question 4 Histogram	87
Figure 5.6 Question 5 Histogram	88

LIST OF TABLES

Table 4.1 Functional requirements	19
Table 4.2 Use case login	22
Table 4.3 Use case log out	23
Table 4.4 Use case view course documents	24
Table 4.5 Use case manage programme	25
Table 4.6 Use case manage course	27
Table 4.7 Use case manage lecturer	28
Table 4.8 Use case manage course to lecturer	30
Table 4.9 Use case monitor lecturer activity	31
Table 4.10 Use case manage course documents	32
Table 4.11 Most of business processes	62
Table 5.1 test case template	81
Table 5.2 List of black box testing and the results	81
Table 5.3 Profiles of respondents	83
Table 5.4 Descriptive statistics for usefulness aspect of CDMS	84
Table 5.5 Question 1 response	85
Table 5.6 Question 2 response	85
Table 5.7 Question 3 response	86
Table 5.8 Question 4 response	87
Table 5.9 Question 5 response	87

Table of Acronyms

Acronym	Full name
HTML	Hyper Text Mark-up Language
UUM	Universiti Utara Malaysia
CDMS	Courses' Documents Management System
PU	Perceived Usefulness
SPSS	Statistical Package for Social Science
CLO	Course Learning Outcome
PLO	Program Learning Outcome
UML	Unified Modeling Language
ABET	Accreditation Board for Engineering and Technology
ECPD	Engineers Council for Professional Development
CSAB	Computing Sciences Accreditation Board
MQF	Malaysia Qualification Framework
MQA	Malaysia Qualification Agency
CAC	Computing Accreditation Commission
ODP	Open Distributed Processing
RM-ODP	Reference Model for Open Distributed Processing

CHAPTER 1

INTRODUCTION

1.1 Introduction

A business process is a group of tasks or activities that are performed at some organisations based on some rules to achieve a specific objective. A business process model contains and describes all the elements that are involved in performing the business processes and the rules that controlling their execution (Axenath et al., 2005).

To analyse, design, implement, and deploy the information system, information modeling is considered as an efficiency way to do perform these processes (Wand et al., 2002). However, the modeling of process often lead to failure and is resource consuming, when it be conducted without any guide or previous experience. To avoid these problems and to model process efficiently, the idea of reference modeling is introduced (Mertins et al., 1998; Scheer et al., 2000).

While an application model represents a particular enterprise system, a conceptual model represents a class of similar enterprise systems. It is a conceptual framework that can be used as a blueprint for information system construction (Fettke et al., 2003). To use a particular reference model, it must be adapted to the requirements of a particular enterprise. Reference models are also called universal models, generic models, or model patterns. The term reference model for business processes refers to a specific type of reference model. A process reference model represents dynamic aspects of an enterprise for example, activity sequences, organisational activities require to satisfy customer needs, control-flow between activities, and particular dependency constraints (Becker et al., 2003).

According to Scheer (1990) to develop new information system, the reference model is a fundamental beginning point. Every reference model is a model which can be consulted for the development of other models (Hars 1994). Scheer (1997) abstracted from information models and sees a reference model as a model which can serve as the starting point for the development of solutions based on concrete problems. Thus, Becker et al., (2003) refers to information models used as initial solutions for the development of project-specific models, as reference models.

According to Aalst et al., (2002), reference models can be considered as general models which contain recommended practices for a specific domain. The focus on the reference model is always on all aspects of the same domain. For example, the Dutch NVVB (<http://www.nvvb.nl/>) provides a

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References

Aalst, W.V.D., & Hee, K.M.V. (2002). Workflow Management. Models, Methods, and Systems. MIT press, Cambridge, MA, 2002.

Axenath, B., & Kindler, E., & Rubin, V. (2005). Proceedings of the Workshop on Business Process Reference Models (BPRM 2005). Satellite workshop of the Third International Conference on Business Process Management (BPM) Nancy, France, September 5, 2005

ABET (2004). SELFSTUDY QUESTIONNAIRE FOR REVIEW of the COMPUTER SCIENCE PROGRAM, Retrieved on January 5, 2010 from <http://www.abet.org/forms.shtml>, 2004.

Athena, P. (2004). Protos User Manual. Pallas Athena BV, Plasmolen, the Netherlands.

Beeri, C., & Eyal, A., & Kamenkovich, S., & Milo, T. (2006). Querying business processes. In Proc. Of VLDB, 2006.

Becker, J., & Kugeler, M., & Rosemann, M. (2003). Process Management. Springer.

Becker, J., & Rosemann, M., & Uthmann, C. (2000). Guidelines of Business Process Modeling. Business Process Management. Models, Techniques and Empirical Studies. W. Aalst, J. Desel, A.Oberweis. Berlin, Springer: 30-49, 2000; pp. 30-49.

Bernus, P.(1998). Generalised Enterprise Reference Architecture and Methodology, IFIP-IFAC Task Force, 1998

Caetano, A., & Silva, A. R., & Tribolet, J. (2005). Using Roles and Business Objects to Model and Understand Business Processes. 2005 ACM 1-58113-964-0/05/0003

Davenport, T. H. (1993). Process Innovation. Reengineering Work Through Information Technology. Boston, MA: Harvard Business School Press, 1993.

Davis, F.D. (1989). Perceived Usefulness, perceived Ease of Use, and User Acceptance of Information Technology.MIS Quarterly,13(3), 319-340.

Dedeke, A.L., B. (2006). Qualifying use case diagram associations. Computer and Information Technology, 2004. CIT '04. The Fourth International Conference. P.23-29

Eertink, H. W., & Janssen, P., & Luttighuis, W., & Teeuw, C., & Vissers, A. (1999). Business Process Design Language, World Congress on Formal Methods, Springer, 1999, pp. 76-95.

Erl, T. (2005). Service-Oriented Architecture. Concept, Technology, and Design. Prentice Hall.

Fabjan, D. A., & Jermol, M. (2008). Public evaluation and analysis of reference business process model. TOOL-EAST Jozef Stefan Institute.

Feisel, D. L. (2009). Accreditation: Quality assurance for education. Accreditation journal 0278-6648/09 l. IEEE 2009

Fettke, P., Loos, P. (2003). Classification of reference models - a methodology and its application. Information Systems and e-Business Management 1 (2003) 1, 35-53

Glinz, M. (2007). On Non-functional Requirements. Proceeding of the 15th IEEE International Requirements Engineering Conference, Delhi, India. 21-26.

Gourley, M., & Qian, G., Sung, H., & Turner, T (2008). SEEKING ABET ACCREDITATION OF A COMPUTER SCIENCE PROGRAM AT A PUBLIC REGIONAL UNIVERSITY. CCSC: South Central Conference 2008. Consortium for Computing Sciences in Colleges. USA

Hammer, M., & Champy, J. (1993). Reengineering the Corporation. A Manifesto for Business Revolution. London, U.K.: Brealey.

Hars, A. (1994). Referenzdatenmodelle. Grundlagen effizienter Datenmodellierung. Wiesbaden : Gabler, 1994 (in German)

Havey, M. (2005). Essential Business Process Modelling. Sebastopol, CA: O'Reilly.

Hoffer, J.A., George, J.F., & Valacich, J.S. (2002). Modern systems analysis & design (3rd Ed.). New Jersey: Prentice Hall.

Holm, Ivar (2006). Ideas and Beliefs in Architecture and Industrial design: How attitudes, orientations, and underlying assumptions shape the built environment. Oslo School of Architecture and Design. ISBN 82-547-0174-1.

Huba, M. E., & Freed, J. E. (2000). Learner-Centered Assessment on College Campuses- Shifting the Focus from Teaching to Learning, Allyn & Bacon.

Huguet, M P. (2002). Extending Agent UML protocol Diagrams, Technical Report ULCS02-014, Department of Computer Science, University pf Liverpool.

Impagliazzo, J. (1997). Accreditation in the Computing Profession. Proceedings of the 1997 Conference on Systemics, Cybernetics, and Informatics, SCI'97, 1997.

Kumaran, V. S. (2006). Web-based Course Information System supporting Accreditation using ASP.NET; the Division of Computing Studies, Arizona State University, Mesa, AZ 85212, USA 2006

Jakob, N (1994), Usability Inspection Methods, Morgan John Wiley & Sons, ISBN 0-471-01877-5

Larman, C. (2001). Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process, 2nd edition, prentice Hall PTR Upper Saddle River, NJ, USA.

Laycock, G. T. (1993) (PostScript). The Theory and Practice of Specification Based Software Testing. Dept of Computer Science, Sheffield University, UK. Retrieved 2008-02-13.

Malaysian Qualifications Agency (2009): Retrieved from <http://www.lan.gov.my/eng/introduction.cfm> MQA In Brief

Mayr, H. C., & Kop, C., & Esberger, D. (2007). Business Process Modeling and Requirements Modeling, Proceedings of the First International Conference on the Digital Society (ICDS'07), 2007 IEEE,

Mertins, K., & Bernus, P. (1998). Reference Models. In: Schmidt, G. (ed.) Handbook on Architectures of Information Systems. Springer, Berlin et al. (1998) 615-617

Ministry of Higher Education (2008): Retrieved from Quality Assurance Division - About Us (retrieved June 7, 2008)

Misic, V. B., & Zhao, J. L. (2000): Evaluating the quality of reference models. 19th International Conference on Conceptual Modeling, Salt Lake City, Utah, 2000; pp.

Misic, V. B., & Zhao, J. L. (1999). Reference models for Electronic Commerce [Electronic version]. the 9th Hong Kong computer society database conference: Database and electronic commerce. Retrieved December 18, 2003 from <http://www.ops2.moc.go.th/pdf/HKDC-MisicZhao-pdf>.

Naumenko, A. (2001). Reference model for Open Distributed Processing [Electronic version]. Retrieved January 15, 2004 from <http://lamswww.epfl.ch/reference/rm-odp>.

Razavian, M., & Khosravi (2008). Modeling Variability in Business Process Models Using UML: Fifth International Conference on Information Technology: New Generations . 2008 IEEE,

RM-ODP overview. (2003). [Electronic version]. Retrieved February 14, 2004 from <http://jmxuodp.sourceforge.net/rm-odp-in-a-natshell.html>.

Rozanski, E. P. (1994). ACCREDITATION: DOES IT ENHANCE QUALITY?. 1994 ACM 0-89791-646-3/94/0003

Scheer, A. W. (1990). Unternehmensdatenmodell. In: Information Management 5 (1990), no. 1, pp. 92–94 (in German)

Scheer, A. W., & Nüttgens, M. (2000). ARIS Architecture and Reference Models for Business Process Management. In: Oberweis, A. (ed.) Business Process Management - Models, Techniques, and Empirical Studies. Springer, Berlin et al. (2000) 376-389

Schütte, R. (1998). Grundsätze ordnungsmäßiger Referenzmodellierung. Wiesbaden, Gabler, 1998.

Scheer, A. W. (1997). House of Business Engineering: Konzept zur Beschreibung und Ausführung von Referenzmodellen. In: Becker, J.; Rosemann, M.; Schütte, R. (eds.): Entwicklungsstand und Entwicklungsperspektiven der Referenzmodellierung : Proceedings zur Veranstaltung vom 10. März 1997. Münster : Institut für Wirtschaftsinformatik, Westfälische Wilhelms-Universität, 1997, pp. 3–15 (in German)

Spady, W., & Marshall, K. (1994). “Light, not heat on OBE”, The American School Board Journal, pp. 29-33, Nov. 1994.

Souza, D. F., & Wills, A. C. (1998). Object, Components and framework with UML: The Catalysis Approach. Addison-Wesley.

PHP web site (2010). Retrieved on April 30, 2010 from <http://php.net/index.php>

Pressman, R (2001). *Software Engineering: A Practitioner's Approach*. Boston: McGraw Hill.

USA Federal Enterprise Architecture (2005). Federal Enterprise Architecture Records Management Profile Version 1.0. Architecture and Infrastructure Committee, Federal Chief Information Officers Council December 15, 2005.

U.S. Department of Education (2009). Retrieved on 2009 from <http://ope.ed.gov/accreditation/FAQAccr.aspx>.

Vaishnavi & Kuechler. (2004). Design Research in information System. Retrieved on May 4th 2008, from <http://www.isworld.org/Researchdesign/drisISworld.htm>

Wiggins, B. (2000). Effective document management: unlocking corporate knowledge. Gower USA

Walford, T. (1999). Business Process Implementation for IT Professionals and Managers, Artech House, MA, 1999.

Wand, Y., & Weber, R. (2002). Research Commentary: Information Systems and Conceptual Modeling - A Research Agenda. *Information Systems Research* 13 (2002) 4, 363-377

Wen, J., & Zhang, Y., & Xia, S., Yan, Y. (2005). A Web-based Examination System Based on PHP+MySQL. Engineering in Medicine and Biology Society,2005. IEEE-EMBS 2005. 27th Annual International Conference.p.2882-2885.

Wilkinson, R., & Arnold-Moore, T., & Fuller, M., & Sacks-Davis, R., Thom, J., & Zobel, J. (1998). Document computing : technologies for managing Electronic document collections. Kluwer Academic Publishers. Massachusetts

Workflow management coalition (1996). The workflow management coalition specification – terminology and glossary. Brussels, Belgium, 1996.

Yamamoto, R., & Ohashi, K., & Inomata, J. (2005). Development of a Business Process Modeling Methodology and a Tool for Sharing Business Processes, Proceedings of the 12th Asia-Pacific Software Engineering Conference (APSEC'05), 2005 IEEE,

Yao, J.F., & Liu, Y., & Grubb, Y., & Williams, G. (2007). COURSE ASSESSMENT FRAMEWORK THAT MAPS PROFESSIONAL STANDARD AND ABET ACCREDITATION CRITERIA INTO COURSE REQUIREMENTS. Southeastern Conference. Consortium for Computing Sciences in Colleges 2007.

Zimmermann, O., & Tomlinson, M., & Peuser, S. (2003). Perspectives on Web Services – Applying SOAP, WSDL and UDDI to real-world projects. Springer.