REQUIREMENT MODEL FOR ONLINE CHEMICAL INVENTORY MANAGEMENT SYSTEM OF CHEMICAL LAB AT SCHOOL OF MATERIAL ENGINEERING, UNIMAP

A project submitted to Dean of Research and Postgraduate Studies Office in partial
Fulfillment of the requirement for the degree
Master of Science (Information Technology)
Universiti Utara Malaysia

By
Mohd Fitri bin Edros

PERMISSION TO USE

In presenting this project 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 project 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 Postgraduate and Research. It is understood that any copying or publication or use of this project 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 project.

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

Dean of Research and Postgraduate Studies
College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman
Malaysia

ABSTRAK (BAHASA MALAYSIA)

Matlamat kajian ini ialah untuk menghasilkan Model Keperluan untuk *Online Chemical Inventory Management System (OCIMS)* bagi Makmal Bahan di Pusat Pengajian Kejuruteraan Bahan, UniMAP. Kajian Model Keperluan ini amat penting untuk memperbaiki beberapa kelemahan yang terdapat pada sistem sedia ada. Metodologi yang digunakan dalam kajian ini ialah *Unified Software Development Software (USDP)*. Terdapat empat fasa yang terlibat dalam kajian ini iaitu *inception*, *elaboration*, *construction* dan *transition*. *Unified Modeling Language (UML)* akan digunakan di dalam kajian ini untuk merekabentuk Model Keperluan. Prototaip untuk kajian ini telah dibangunkan menggunakan Bahasa Pemprograman *Java Server Pages (JSP)*, *Apache Tomcat* akan bertindak sebagai pelayan aplikasi dan *Oracle Express Edition (XE)* akan digunakan sebagai Pangkalan Data. Kaedah *Expert Review* telah digunakan untuk mengesahkan model keperluan yang dibangunkan. Model Keperluan ini akan menjadi panduan kepada pembangunan Sistem Pengurusan Stok Bahan Kimia dan boleh digunakan juga untuk pembangunan sistem yang berkaitan pengurusan stok bahan kimia yang lain. Kajian ini diakhiri dengan membincangkan penemuan dan kekangan yang ditemui sepanjang pembangunan model keperluan ini. Terdapat juga perbincangan berkaitan cadangan kajian pada masa hadapan untuk topik ini.

ABSTRACT (ENGLISH)

The aim of the study is to produce a requirement model for Online Chemical Inventory Management System (OCIMS) for Chemical Lab at School of Material Engineering UniMAP. Due to the limitation of existing system in term of functionality, as to rectify the weaknesses of the existing system, the study on requirement model is essential. The formation of a requirement model for OCIM was approached using a Unified Software Development Software (USDP). There are four main phases involves in this study, which are, inception, elaboration, construction and transition. The Unified Modeling Language (UML) has been used in this study to design the requirement model. The prototype of the system has been used developed using Java Server Pages (JSP), Apache Tomcat and Oracle Express Edition (XE). The Expert Review has been used to validate the requirement model. The requirement model provides a referencing point for the development of a chemical inventory management system, and can be extended for use in development of other chemical inventory management system in meeting the needs of system users. This study was concluded by discussing the findings and constraints as well as limitations arising during the course of producing the model, in addition to recommended future study in this domain.

ACKNOWLEDGEMENT

By the Name of Allah, the Most Gracious and the Most Merciful

First of all, I would like to extend my sincere thanks to my supervisors, Dr Haslina Mohd for the guidance and supervision in the course of my study.

My deepest thanks go to my beloved family (Najdawati Mohd Fadzil, Muhammad Faheem and Naufa) for their love, support and understanding.

My appreciation also goes to all my fellow colleagues and friends who had provided guidance and ideas as well as encouragement that have definitely encouraged me to complete this study.

Lastly, a special thanks to all those who had lent a helping hand in allowing me to materialized thin study.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

1.1   Introduction

The prudent management of hazardous materials, from their procurement to their proper disposal as chemical waste, is a critical element of a departmental laboratory safety program. A successful chemical management program includes standard operating procedures to ensure the safe handling, storage, and transport of chemicals and the proper disposal of chemical waste.

The chemical inventory process is a critical element of chemical management in academia. The amounts of hazardous materials should be carefully monitored in the laboratory. A physical chemical inventory should be performed at least annually, or as requested by the Chemical Hygiene Officer. A thorough inventory will ultimately facilitate the elimination of unneeded or outdated chemicals and provide more efficient use of laboratory storage space (Foster, 2005).

By using effective chemical inventory management, many of these requirements are met. A well-managed inventory system can address Hazard Identification, Storage Incompatibility, Hazard Minimization, and Flammable Liquid concerns before they become issues (Cournoyer, 2005).

Defining system requirements is the most important step in developing or acquiring any information system. If the requirements are not correctly defined, the system will not meet the needs of its users (Association of Public Health Laboratories, 2003).

The contents of the thesis is for internal user only

References

Air Force Research Laboratory. (2003). *Requirements Modeling Technology A Vision For Better, Faster, And Cheaper Systems*. Ohio : Wright-Patterson Air Force Base.

Arlow, J. & Neustadt, I. (2005). *UML 2 and The Unified Process Practical-Oriented Analysis and Design* (2nd ed.). NJ: Pearson Education, Inc.

Association of Public Health Laboratories. (2003). *Requirements for Public Health Laboratory Information Management Systems*. Washington, DC.: Author.

Bobrowski, S. (2006). *Hand-On Oracle Database10g Express Edition for Linux.* New York: McGraw-Hill.

Chemical Inventory Management System, Chims FAQ (2006). Retrieved April 3, 2010, from http://www.ehs.psu.edu/chims/faq.html

Cournoyer, M. E., Maestas, M. M., Porterfield, D. R. & Spink, P. (2005). Chemical inventory management: The key to controlling hazardous materials. *Journal of Chemical Health and Safety*, 12(5), 15-20.

Create a UML use case diagram (2003). Retrieved September 15, 2010, from http://office.microsoft.com/en-us/visio-help/create-a-uml-use-case-diagram-HP081550218.aspx

Erikson, H. & Penker, M. (1998). *UML Toolkit*. Chichester:John Wiley & Sons Ltd.

Foster, B. L. (2005). The Chemical Inventory Management System in academia. *Journal of Chemical Health and Safety*, 12(5), 21-25.

Hall, M. & Brown, L. (2004).*Core Servlets and Java Server Pager* (2nd ed.). California: Prentice Hall.

Jacobson, I., Booch, G. & Rumbaugh, J. (1999). *The Unified Software Development Process*. NJ: Pearson Education, Inc.

Jalloul, G. (2004). *UML by Example*. Cambridge: Cambridge University Press.

Keck, C., Lam, B. & Judith, C. (2003). *Internet Computing* (2nd ed.). Singapore: Prentice Hall.

Kroll, P. & Kruchten, P. (2003). *The Rational Unified Process Made Easy a Practitioner's Guide to the RUP*. NJ: Pearson Education, Inc.

Lewis, C. & Rieman,J. (1994). *Task-Centered User Interface Design*. Retrieved July 24, 2010, from http://hcibib.org/tcuid/index.html

Online system. (2010). In *Encyclopedia Britannica Online*. Retrieved March 27, 2010, from http://www.britannica.com/EBchecked/topic/429262/online-system

Requirement. (2010). In *Merriam-Webster's online dictionary*. Retrieved March 27, 2010, from http://www.merriam-webster.com/dictionary/requirement

Sommerville, I. & Kotanya, G. (1998). *Requirements Engineering Process and Techniques*. Chichester:John Wiley & Sons Ltd.

The UC Irvine online hazardous chemicals, biological and radioactive materials tracking system (2008). Retrieved March 27, 2010, from http://ucirvine.ecompliance.net/

University of Colorado Chemical Inventory Management System (2007). Retrieved March 27, 2010, from http://ucbchemicalinventory.colorado.edu/helpindex.htm