

**RESEARCH PORTFOLIO SYSTEM
FOR RESEARCH MANAGEMENT AND INNOVATION CENTRE,
UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

MOHD HAMIM BIN HJ SANUSI

**A project report submitted in fulfillment of the
requirements for the award of the degree of
Master of Science (Information Technology-Management)**

Faculty of Computer Science and Information Systems

Universiti Teknologi Malaysia

OCTOBER 2009

“Special to my parents; Hj Sanusi Bin Hj Abd Manan and Asmah bt Yaakop for their prays and support for me. Not to forget for my lovely wife, Jamaunah Bt Hj Adnan, and my lovely kids, kakak, angah, abang, udin, dek na and Ica comel. My friends, Mamat and Fattah, your support keep me up alive. Hopefully, all the dreams will come true...”

ACKNOWLEDGEMENT

First of all, I would like to thank God for his blessing that He showers upon me. Without it, I might not finish this project. I also would like to give my highest appreciation to Assoc. Prof. Dr. Azizah Bt Abd Rahman who is being handy and willingly to sacrifice her time to update the need of her student. Thanks to all lecturers that teach me whether it is associated with this project or not, you made the way I am today.

I would like to give my greatest gratitude to my parents who has been supporting me morally and mentally. Thanks for advises and companion. They are the one that supported me when I was down and till I success and finish the project.

Not also forgetting to my wife and my kids who are really help me doing this project. Thank you for spending your time and energy just to help me until I manage to complete the system successfully. I will never forget your kindness forever. Last but not least, thank you to all the people that I did not mentioned in this section. Thanks to the people who are involved in this project directly and indirectly.

ABSTRACT

Research is one of the important elements for university to achieve their success factor. Each university having their own research management center. University has put their research as a symbol of greatness. Government would recognize university who attained particular position as Research University (RU). Research Management And Innovation Centre (RMIC) was established to enhance research and innovation which is the main critical success factor for Universiti Tun Hussein Onn Malaysia (UTHM). This centre aims to develop a community of researchers among student and staff, as well as to achieve excellence in commercialization and management of The University's Intellectual Property. As such a research portfolio system is needed in order to be a mechanism to increase of research quantity and quality for university. Information technology development can be apply to centralized research activity for replacing manual management system which is less effective. This system shall be developed for RMIC. Systems development model is using Unified Modelling Language (UML) involving graphical software, databases, scripting, operating system, streaming, networking, client and server system. This System will facilitate university staff in references and research supervision via online. Monitoring process and feasible help can be done effectively through online. Furthermore, this system be able to upload all research activities by picture as well as can be accessed via online anytime and anywhere.

ABSTRAK

Penyelidikan merupakan salah satu elemen penting bagi universiti untuk menentukan faktor kejayaan mereka. Setiap universiti mempunyai pusat pengurusan penyelidikan dan inovasi mereka sendiri . Universiti telah menempatkan kajian mereka sebagai simbol keagungan. Kerajaan akan mengiktiraf universiti yang mencapai tahap tertentu sebagai Research University (RU). Research Management Dan Inovasi Centre (RMIC) ditubuhkan untuk meningkatkan penyelidikan dan inovasi yang merupakan faktor penentu kejayaan utama untuk Universiti Tun Hussein Onn Malaysia (UTHM). Pusat ini bertujuan untuk membangunkan komuniti penyelidik di kalangan mahasiswa dan kakitangan, serta untuk mencapai kesempurnaan dalam perniagaan dan pengurusan Universiti Harta Intelek. Dengan demikian sistem portofolio penyelidikan diperlukan untuk menjadi suatu mekanisme untuk peningkatan kuantiti dan kualiti penyelidikan untuk universiti. Perkembangan teknologi maklumat dapat diterapkan untuk aktiviti penyelidikan dengan menukar sistem pengurusan manual yang kurang berkesan kepada sistem pangkalan data yang lebih efektif dan pantas. Sistem ini akan dibangunkan untuk RMIC dan model pembangunan sistem menggunakan Unified Modeling Language (UML) melibatkan perisian grafik, pangkalan data, sistem operasi, streaming, sistem rangkaian pelanggan dan pelayan. Sistem ini akan memudahkan kakitangan universiti sebagai tempat rujukan dan melakukan penyeliaan melalui atas talian. Lebih jauh lagi, sistem ini boleh memuatnaik gambar semua aktiviti penyelidikan serta boleh diakses melalui atas talian pada bila-bila saja dan dimana saja.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGES
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiii
	LIST OF APPENDICES	ix
	PROJECT OVERVIEW	1
	.1 Introduction	1
	.2 Background of the study	2
	.2.1 National Policies in Funding Research	2
	.2.2 Research Management and Innovation Centre	6
	.3 Problem with RPS in UTHM	7
	.4 Problem Statement	7
	.5 Objective of the Project	8
	.6 Scope of the Project	8
	.7 Importance of The Project	9

.7.1 Administrator	9
.7.2 Researcher	9
.7.3 Stakeholder	10
..8 Chapter Summary	11
LITERATURE REVIEW	12
..1 Introduction	12
..2 Definition of Research Portfolio System (RPS)	13
..3 Literature Review Framework	13
.3.1 Identify Problem	14
.3.2 Root Cause Analysis	14
.3.3 The Current System	15
.3.4 Archiving and References	15
.3.5 Source of data	16
.3.6 Workflow	17
.3.7 Criteria	18
.3.8 Discussion	19
..4 Benchmarking	19
.4.1 Teaching Portfolio UTHM	20
.4.2 Research@Channel, USA	24
..5 Technology Analysis	27
.5.1 Introduction	27
.5.2 Integrated Database Tools	28
.5.3 Relational Database Management System	29
.5.4 MySQL	29
.5.5 Microsoft Share Point	30
.5.6 Web Based Technology	31
.5.7 Web Server	31
.5.8 Scripting Languages	33
.5.9 Dreamweaver	34

..6 Research University (RU)	34
..6.1 Understand RU Criteria	35
..6.2 Type of Grants	39
..7 Summary	42
METHODOLOGY	43
..1 Introduction	43
..2 Framework for RPS	44
..2.1 Basic Framework of Research Portfolio System	44
..3 System Development Methodology	46
..3.1 Planning Phase	47
..3.2 Analysis Phase	48
..3.3 Design Phase	51
..3.4 Implementation Phase	53
..4 Summary	58
ANALYSIS AND DESIGN	59
..1 Introduction	59
..2 Organizational Analysis	60
..3 Organizational structure	60
..4 Determination of Person In Charge	61
..5 Organizational Feasibility	62
..5.1 Research Development Strategy	62
..6 System Design	70
..6.1 Conceptual Design	70
..6.2 Process Modeling for new system	71
..6.3 User Requirement	71
..6.4 Database Design	79

..7 Web Interface	82
..7.1 Usability	82
..7.2 Visualization	82
..7.3 Accessibility	83
..8 Summary	85
IMPLEMENTATION AND TESTING	86
..1 Introduction	86
..2 System Implementation	86
..3 Step By Step Implementation	87
..4 Coding Approach	87
..5 Test Result/ System Evaluation	88
..6 Integration Testing	89
..7 User Acceptance Test	89
..8 Summary	89
ORGANIZATINAL STRATEGY	90
..1 Introduction	90
..2 Implementation Strategy	90
..3 Direct implementation strategies	91
..4 Phased Implementation	92
..5 Pilot Implementation	92
..6 Implementation Framework	93
..6.1 Training	94
..6.2 Motivating Adoption	96
..6.3 Advertisement	97
..6.4 UCiTV	97
..6.5 Printed Material	97
..6.6 Direct Mailing	98
..6.7 SKT (Sasaran Kerja Tahunan)	98

..6.8 Enforcement	99
..6.9 Recognition	99
..7 Installation of Infrastructure Process	99
..7.1 Install Hardware	100
..7.2 Install Software	101
..8 Expected Organizational benefits	101
..9 Impact towards UTHM researchers	101
..10 Impact towards UTHM	102
..11 Contingency Plan	103
..12 Chapter Summary	104
DISCUSSION AND CONCLUSION	105
..1 Introduction	105
..2 Achievement	106
..3 Constrains and challenges	106
..4 Aspiration	107
..5 Future work for the system	108
..6 Summary	109
REFERENCES	110
APPENDIX A - C	112

LIST OF TABLES

TABLES	TITLE	PAGES
..1	Distribution of IRPA Grant Between ...	4
..2	Distribution of IRPA Experimental Applied ...	4
..3	Distribution of IRPA PR (Priority Research) and ...	5
..4	Distribution of IRPA Biotechnology Grant in the ...	5
..1	Shows the software requirement for developing the ...	50
..2	Activities for each phase in Project Development ...	54
..1	User requirement for ...	72
..2	Userdata for Create New ...	73
..3	Userdata for ...	73
..4	Userdata for Research ...	74
..5	Userdata for ...	75
..6	Table - ...	80
..7	Table - ...	80
..8	Table - ...	80
..9	Table - ...	81
..10	Table - Intellectual ...	81
..11	Table - ...	81
..1	Black Box ...	88
..1	Tentative ...	96
..2	Detail of ...	100
..3	Detail of ...	101
..1	Database name : ...	124
..2	Table name : ...	124

LIST OF FIGURES

FIGURES	TITLE	PAGE
..1	Basic structure of RPS	.44
..2	System Development Technology	.47
..1	Organization chart	.61
..2	Person In Charge	.62
..3	Number of Grant _	
..4	Research Grant Distribution for 2008	.67
..5	Total No. Of project (2005-2007)	.68
..6	Basic System Structure	.70
..7	Flow of RPS system	.71
..8	User	.76
..9	User and View Research Title	.77
..10	Researcher and View Research Title	.77
..11	Navigation for Main Page	.78
..12	Navigation for Report	.78
..13	Navigation for Researcher/Admin	.79
..14	Database Structure	.79
..15	Homepage of RPS	.83
..16	Login page	.83
..17	Menu for Research Portfolio System	.84
..18	Sample output from Report Menu	.84
..1	Diagram for implementation plan strategy	.93
..1	Homepage of RPS	.113
..2	List of Title Menu	.114
..3	Login Page	.114

.4	Researcher(team leader) homepage	.115
.5	Change Password menu	.116
.6	Create new Research menu	.116
.7	Update abstract menu	.117
.8	Achievement menu	.117
.9	Add new member menu	.118
.10	Logout menu	.118

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	USER MANUAL	112
B	PHP AND JQUERY SNAPSHOT	119
C	DATABASE SNAPSHOT AND USER ACCEPTANCE	123

CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

For at least a century various type of technology-based distance informative programs have attracted enthusiastic supporters. All communication technologies have been used at same point as vehicles to deliver effective amount of data including education, newspaper, music and most recently, computer Web-based connections. On the other hand, the world Wide Web (simple Web) is rapidly being accepted as a universal access mechanism for network information (Bernes-Lee,1994;Bernes-Lee 1995). Therefore implementing a web-based type access for used in research activities is another way to expand the use of web-based connections.

The exclusivity of the visual image including audio presented on the computer screen just like 'magic'. All that at the touch of one's fingertips and some even work at the sound of a personalized voice. No doubt, information technology has contributed greatly in a broad field of activities. In economic, education, social and even keeping abreast with politics are so easy nowadays. Almost all corporations in

the world now are linked in this dissemination of knowledge via high technology. (Prof.Dr Mohd Jamil,2008)

The mastermind behind all this wonderful creation is almost always a researcher. With enthusiasm and dedication towards research, a researcher contributes a product or service which transformed the world by way of a technological revolution. University is a place where researchers have the freedom to discover new knowledge and to innovate. Hence, in line with this, academicians and researchers are the pillars of strength in the University Tun Hussein Onn Malaysia (UTHM).

1.2 Background of the study

1.2.1 National Policies in Funding Research

Malaysia aspires to reach the level of developed nation by the year 2020, as stated in the national agenda known as Vision 2020, with the establishment of a scientific and progressive society that is both innovative and forward-looking. Such a policy will help to change the country from being a mere consumer of imported technology to a contributor to scientific and technology knowledge in the future. National Vision Policy (NVP) was formulated as a blueprint to transform Malaysia into a fully developed nation as envisaged under Vision 2020. The key thrusts under NVP includes: the development of a knowledge-based economy as a strategic move to increase the added value of all economic sectors and optimize the nation's brain power; and strengthening human resource development to produce a competent, productive and knowledgeable work force. Research and Development (R&D) is certainly the main area of focus within the umbrella of education in realizing the country's aspirations. To maintain the competitiveness of Malaysia industry and to

benefit from the knowledge-based economy, it is vital to strengthen the environment for research and innovation.

In 1986, the National Science and Technology Policy were launched in order to provide guidelines for Science, Engineering and Technology (SET) development in the country. One of the strategies of the Sixth Malaysian Plan (1991-1995) was to promote and further enhance the country effort to increase technological capacity through public sector R&D programmed. The Seventh Malaysia Plan (1996-2000) changed the focus to productivity-driven growth and enhancement of competitiveness. The Eight Malaysian Plan (2001-2005) also adopts the same strategy with some modification in certain areas of research.

The Second National Science and Technology Policy were launched in June 2003 which provides a framework for the improved performance and long-term growth of the Malaysia economy. The goal of the second S&T policy is to accelerate the development of S&T capability and capacity for national competitiveness with twin objectives of increasing the R&D spending to at least 1.5% of the GDP and to achieve a competent workforce of at least 60 RSEs (researchers, scientists and engineers) per 10 000 labor force by the year 2010. In 2002, Malaysia having 18 RSEs per 10,000 labor force compared to 60 for Korea (1999) and 74 for USA (1999). The main thrusts of the second policy emphasizes the intensification of critical mass in RPS of human resource necessary for the development of science and technology by increasing the ratio of students pursuing scientific, technical and engineering disciplines. It's also stipulates the increase in the number of postgraduate students to at least 60% of the total enrolment by the year 2005 and the establishment of science and technology postgraduate research universities.

In recognizing the importance of supporting R&D programs for SET development, the government, through Ministry of Science, Technology and Environment (MOSTE) then has created R&D funding called IRPA (Intensification of Research in Priority Areas) for state universities and research institutes. Amounts of funding allocated for the Seventh Malaysian Plan and the Eighth Malaysian Plan were RM1 billion and RM1,388 billion respectively, see Table-1. In comparison to

other developing countries, the amount of money spent on R&D in Malaysia is only 0.5% of its GDP for the year 2000, while countries like Japan spent 2.8%, South Korea 2.9%, USA 2.5% and Germany 2.3%.

Table 1-1 Distribution of IRPA Grant Between Universities

University	7th Malaysian Plan	8th Malaysia Plan
UPM	123,194,573.00 (646)	167,007,637.00 (498)
<i>UKM</i>	<i>77,326,697.00 (350)</i>	<i>151,734,290.00 (274)</i>
UM	78,868,611.00 (438)	106,348,952.00 (149)
UTM	81,941,118.00 (404)	119,694,845.00 (310)
USM	76,412,225.00 (361)	81,105,845.00 (202)
UiTM	456,600.00 (5)	10,217,616.00 (44)
UIA	2,732,840.00 (27)	4,707,180.00 (14)

Table 1-2 Distribution of IRPA Experimental Applied Research Grant by Sector in the 8th Malaysian Plan

Sector	No.of Projects	Amount (RM)
Science and Engineering	89	14,142,256.00
IT & services	39	7,643,883.00
Social Sciences	33	4,804,857.00
Health	23	3,753,935.00
Environmental	12	2,456,590.00
Energy and Minerals	6	1,282,696.00
Manufacturing	10	1,743,370.00
Agro-Industry	5	953,000.00
Economy	2	330,840.00
Total	219	37,111,427.00

Table 1-3: Distribution of IRPA PR (Priority Research) and SR
(Strategic Research) in the 8th Malaysian Plan by Sector

Sector	Total Project	Budget (RM)
Manufacturing	1	38,207,048.00
Energy and Minerals	1	30,054,764.00
Health	5	13,938,420.00
Agro-Industry	2	4,130,000.00
IT & services	1	2,732,000.00
Science and Engineering	-	-
Total	10	89,062,232.00

Table 1-4: Distribution of IRPA Biotechnology Grant in the 8th
Malaysian Plan by Sector

Sector	Total Project	Budget (RM)
Agro-Industry	2	280,000.00
Energy and Minerals	0	-
Manufacturing	1	74,000.00
IT & services	0	-
Economy	1	2,331,000.00
Health	6	3,675,508.00
Social Sciences	-	-
Environmental	-	-
Sains & Engineering	11	12,268,941.00
Total	21	18,629,449.00

1.2.2 Research Management and Innovation Centre (RMIC)

The Research Management and Innovation Centre (RMIC) of University Tun Hussein Onn Malaysia was established in January, 2006 in order to manage and coordinate the research and innovation activities of the university. This centre aims to build a community of researchers among students and staffs that are involved in the high quality research with a focus on inter disciplinary engagement. This centre also committed to achieve excellence in innovation and commercialization of university's intellectual assets in order to create value for the university, its collaborators and the community at large.

Currently, there is no proper system to help researchers to keep track what has been done to their research and enable other researcher for mutual share information and expertise. This also can increase number of researcher and make research community become attractive. Further than that it become valuable reference material in the future.

The Research Portfolio System at UTHM are not well structured, lack of communication and information give bad impact to the organization. The habitual of using document and form give a hard time to update the information.

By using new RPS system, it is hoped that the following can be achievable:

- i. Increased efficiency
- ii. Better quality
- iii. Higher level of integrity
- iv. Better time management
- v. Better information management

1.3 Problem with RPS in UTHM

By observation that been made, RPS in UTHM is having a poor management process whereby it had to be done manually and individually. In RPS of “manually”, it means that the current system is still using a piece of paper to be filled up the information by hand and submit it manually to assistant registrar and key in to the system and keep only for RMIC references.

The current system in UTHM:

- i. By doing some observation with several of lecturer in UTHM, researcher define that the criteria needed are not based on RU
- ii. All information regarding research activity was keep by manually and it's very hard to keep track what was done by researcher
- iii. All completed research not well organizes to become references to other group of researchers to continue the project or apply some innovation to existing system.

1.4 Problem Statement

How to organize and develop appropriate online research portfolio system for Research Management and Innovation Centre, UTHM?

1.5 Objective of the Project

The objectives of the project are:

1. To study and analyze research activity, monitoring and output.
2. To design new system to record research activity and achievement for every research done by researcher
3. To develop prototype of research portfolio system

1.6 Scope of the Project

This study will be done for Research Management and Innovation Centre (RMIC), University Tun Hussein Onn Malaysia , Johor. This project are focusing on archiving and documenting all research activities.

From the research, this project will be focused on the following area:

- i. Study and organize research activities for RMIC
- ii. Help researcher in process of archiving and documenting of research activity through online system
- iii. Facilitate process of generate research report for reference parties concern
- iv. To develop an interactive system that can support university research activities.

1.7 Importance of The Project

By implementing Research Portfolio System (RPS), researcher hope that it can be support faster process of research application and become a system that can provide full support of research activities in term of information and references. Some benefits of the system for administrator, researcher, academician and guest are:

1.7.1 Administrator

- i. To help making decision to approve or reject research application
- ii. Easy to monitor research progress and report
- iii. Easy to generate reports

1.7.2 Researcher

- i. Generate specific report on the individual basis.
- ii. Easy to upload and submit progress report
- iii. Systematic and easy access
- iv. Improves personal efficiency

1.7.3 Stakeholder

- i. Improve quantity and quality of research
- ii. Improve research process application and progress report
- iii. Fulfill customer demand at any time.

By implementing network media to conduct the research activities, hoping that the significant can come out from the project. Some beneficial that been identify by using RPS system are:

- i. Paperless
Since network involved in this project, therefore, there are no need to use any paper or form.
- ii. Time saving
Timing can be a big issue for the as-is system. With RPS system, time can be saving by only looking at the system at anytime and anywhere with connection of internet.
- iii. Manageable information
Data that been collect will be stored in a database which will be in a proper table and information can be handling with care. It also can be update according to needs.
- iv. Monitoring research activities
Researchers are required to submit progress report through online system and RMIC can easily give some advice or suggestion in order *to perform the research on time and spending the grant wisely.*

- v. World Class University
With a deeper development research that will be done, it will help UTHM to achieve the target to be one of the world class high standard university.
- vi. Criteria according to RU
Level of quality for each of academic staff will be higher since the criteria will be aligned with RU needs.

1.8 Chapter Summary

In this first chapter, a brief introduction and the background of the project have been given. From the background of the project, we can see why this project should be implemented and benefit gained by the project not only for the researcher and academician but also for staffs and university as well. The system will help the university staff to increase their research quantity and quality