

**RESEARCH GROUP MANAGEMENT SYSTEM FOR
APPLIED COMPUTING GROUP**

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**FACULTY OF COMPUTING AND INFORMATICS
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APPLIED COMPUTING GROUP**

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DEGREE OF BACHELOR
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2015**

DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, excepts, equations, summaries and references, which have been duly acknowledged.

20 JUN 2015

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HEW POH TENG
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ABSTRACT

In universities, researchers are generally attached to one or a few research groups, units, or institutes. In University Malaysia Sabah (UMS), these researchers are the academic staff and postgraduate students. Each researcher is involved in many activities such as working on research projects, supervise students, produce research publications and involve in charity work. UMS has CV-Online for the academic staff to store and managed their resume and Postgraduate Information System (PPPS) to store academic details of the postgraduate students. These two systems are not designed to manage researchers under a centralized management system. Thus, they are not linked and no statistics of the researchers and research group can be produced. To produce annual statistics for individual researcher or the research group, someone has to manually calculate and produce the reports. Since data of individual researchers are kept by themselves, it is time-consuming and requires significant effort to collect all data to generate the reports. Therefore, Applied Computing Group requested to have a system developed to centralize the management of data and to automate the generation of desired reports. This project is on the development of a web-based research management system for the group. The development methodology is Prototyping. A researcher from the research group is involved in the development by giving feedbacks on the prototypes. Software tests including unit, integration, system and user acceptance tests were carried out at different phases of the development to make sure that the system developed work accordingly and in accordance to the requirements. The system will be hand-over to the research group for installation and deployment.

ABSTRAK

SISTEM PENGURUSAN KUMPULAN PENYELIDIKAN

Di sesebuah universiti, penyelidik-penyelidik biasanya terdiri daripada satu atau lebih kumpulan penyelidikan, unit ataupun institut. Di Universiti Malaysia Sabah (UMS), penyelidik-penyelidik tersebut adalah termasuk staf akademik dan pelajar pasca siswazah. Setiap penyelidik akan terlibat dalam aktiviti-aktiviti seperti projek penyelidikan, penyeliaan pelajar, menghasilkan penerbitan penyelidikan dan penglibatan dalam kerja amal. UMS mempunyai sistem CV-Online yang digunakan oleh staf akademik untuk menyimpan dan mengurus resume mereka. UMS juga mempunyai Sistem Informasi Pelajar Pasca Siswazah (PPPS) untuk penyimpanan informasi akademik pelajar pasca siswazah. Malah, kedua-dua sistem ini tidak direka untuk menguruskan penyelidik-penyelidik dengan menggunakan sistem pengurusan berpusat. Oleh itu, kedua-dua sistem ini tidak dipaut dan statistik-statistik tahunan para penyelidik dan kumpulan penyelidikan tidak dapat dihasilkan. Untuk menghasilkan statistik tersebut, laporan perlu dihasilkan secara manual. Memandangkan informasi penyelidik adalah hanya disimpan oleh penyelidik sendirinya, proses untuk mengutip semua butir-butiran untuk menghasilkan laporan adalah sangat memakan masa dan memerlukan usaha yang banyak. Oleh itu, Kumpulan Penyelidikan Komputing meminta supaya sebuah sistem yang dapat memusatkan semua pengurusan data dan menghasilkan laporan yang dikehendaki secara automatik. Projek ini adalah untuk menghasilkan sebuah sistem pengurusan berasaskan web untuk kumpulan tersebut. Metodologi yang digunakan untuk menghasil sistem pengurusan teersebut adalah Prototyping. Salah seorang penyelidik dari kumpulan penyelidikan tersebut terlibat dalam projek ini juga untuk memberi maklum balas terhadap prototaip. Selain itu, ujian perisian terhadap projek ini adalah ujian unit, ujian integration, ujian sistem dan ujian penerimaan pengguna. Keempat-empat ujian ini telah dijalankan di peringkat pembangunan projek yang berbeza bagi memastikan bahawa sistem yang dibangunkan kerja dengan sewajarnya dan mengikut kepada keperluan. Sistem ini akan dihantar kepada kumpulan penyelidikan untuk pemasangan dan penempatan.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	iv
ABSTRACT.....	v
<i>ABSTRAK</i>	vi
LIST OF FIGURES	x
LIST OF TABLES.....	xv
LIST OF APPENDICES.....	xvii
CHAPTER 1 INTRODUCTION	1
1.1 Problem Background.....	1
1.2 Problem Statement.....	2
1.3 Objectives	3
1.4 Project Scope.....	3
1.5 Organization of the Report.....	5
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction.....	7
2.2 UMS CV-Online.....	7
2.3 UMS Postgraduate Information System	21
2.4 Research Information Management System (InfoCenter FRIM).....	27
2.7 Comparison of Reviewed System and User Requirements	33
2.8 Conclusion	34
CHAPTER 3 METHODOLOGY.....	35
3.1 Introduction.....	35
3.2 Prototyping Methodology	35
3.2.1 Gathering Requirement.....	36
3.2.2 Quick Design.....	37

3.2.3	Build Prototype.....	37
3.2.4	User evaluation	37
3.2.5	Refine Prototype.....	37
3.2.6	Product.....	37
3.3	Software and Hardware Requirements	38
3.4	Conclusion	39
CHAPTER 4	SYSTEM ANALYSIS AND DESIGN	40
4.1	Introduction.....	40
4.2	System analysis.....	40
4.3	System Design	40
4.3.1	Entity-Relationship Diagram	41
4.3.2	Data Dictionary	43
4.3.3	Functional Design	47
4.3.4	User Interface Design	63
4.4	Conclusion	94
CHAPTER 5	IMPLEMENTATION.....	95
5.1	Introduction.....	95
5.2	Screen shots of system interfaces.....	95
5.3	Software tools for creating databases.....	131
5.4	IDE Platforms.....	136
5.5	Conclusion.....	137
CHAPTER 6	TESTING	138
6.1	Introduction.....	138
6.2	Unit testing.....	138
6.3	Integration Testing.....	157

6.4 System Testing	166
6.5 Acceptance Testing	172
6.6 Conclusion	172
CHAPTER 7 CONCLUSION AND FUTURE WORK	173
7.1 Introduction.....	173
7.2 Conclusion	173
7.3 Future work	174
REFERENCES	175
APPENDIX A	176
APPENDIX B	181

LIST OF FIGURES

	Page
Figure 2.1: Login page UMS CV online.	8
Figure 2.2: Home page of UMS CV online.	8
Figure 2.3: Teaching Undergraduate/Postgraduate sub-module.	9
Figure 2.4: Postgraduate Supervision sub-module.	9
Figure 2.5: Undergraduate Supervision sub-module.	10
Figure 2.6: Professional Supervision sub-module.	11
Figure 2.7: Publication/Writings sub-module.	11
Figure 2.8: Publication/ Writing sub-module.	12
Figure 2.9: Research Warrant sub-module.	13
Figure 2.10: Research Output sub-module.	13
Figure 2.11: Paper Presenter sub-module under Conference/Seminar module.	14
Figure 2.12: Participant sub-module.	14
Figure 2.13: Secretariat sub-module.	15
Figure 2.17: Consultancy sub-module under Consultancy and Expertise module.	17
Figure 2.18: Clinical Consultancy sub-module.	17
Figure 2.19: Esteem and Leadership Module.	18
Figure 2.20: MyCV sub-module under MyResume module.	20
Figure 2.21 Preview printing pages.	21
Figure 2.22: Login Page of Postgraduate Information System.	22
Figure 2.23: Login into system using an staff account.	22
Figure 2.24: Home page of Postgraduate Information System.	23
Figure 2.25: Grade analysis sub-module under Mark and Result module.	23
Figure 2.26: List of Supervisee sub-module under Supervision module.	24
Figure 2.27: Personal Info of postgraduate student.	24
Figure 2.28: Subject Registration of postgraduate student.	25
Figure 2.29: Report Progress of postgraduate student.	25
Figure 2.30: Supervision Log sub-module under Meeting Log module.	26
Figure 2.31: Supervision log of a Postgraduate Student.	26
Figure 2.32: SMPP Request form under Feedback/Request module.	27

Figure 2.33: Official Website of FRIM (InfoCenter FRIM).	28
Figure 2.34: Directory of Expertise.	29
Figure 2.35: Login page of Research Information Management System.	30
Figure 2.36: Home page.	31
Figure 2.37: Proposal module.	31
Figure 2.38: Project Module.	32
Figure 2.39: Other Module.	32
Figure 3.1: Prototyping Model Methodology.	36
Figure 4.2: Context diagram of Research Group Management System.	48
Figure 4.3: Data Flow Diagram Level 0 for Research Group Management System.	49
Figure 4.4: Data Flow Diagram Level 1 of Login/ Logout module.	53
Figure 4.5: Data Flow Diagram Level 1 of User Profile Management Module.	54
Figure 4.6: Data Flow Diagram Level 1 of Publication Management Module.	55
Figure 4.7: Data Flow Diagram Level 1 of Research Grant Management Module.	56
Figure 4.8: Data Flow Diagram Level 1 of Conference/Workshop/Seminar Module.	57
Figure 4.9: Data Flow Diagram Level 1 of Consultation Management Module.	58
Figure 4.10: Data Flow Diagram Level 1 of External Relation Management Module.	59
Figure 4.11: Data Flow Diagram Level 1 of Awards Management Module..	60
Figure 4.12: Data Flow Diagram Level 1 of Reporting Management Module.	61
Figure 4.13: Data Flow Diagram Level 2 of Reporting Management Module.	62
Figure 4.14: Index page.	63
Figure 4.15: Create New User Page.	64
Figure 4.16: Home Page.	65
Figure 4.17: User Profile.	66
Figure 4.18: Edit user profile.	67
Figure 4.19: View All Users.	68
Figure 4.20: Search user.	69
Figure 4.21: Display searched user.	70
Figure 4.22: Error Message.	70
Figure 4.23 Add new publication.	71
Figure 4.24: View all publications.	72
Figure 4.25: View publication.	73

Figure 4.26: Edit publication.	74
Figure 4.27: Search publication.	75
Figure 4.28: Display searched publication.	75
Figure 4.29: Error Message.	76
Figure 4.30: Add new research grants.	76
Figure 4.31: View all grants.	77
Figure 4.32: View grant.	77
Figure 4.33: Edit grant.	78
Figure 4.34: Search journal title with grant.	79
Figure 4.35: Display journal title with grant.	79
Figure 4.36: Error message.	80
Figure 4.37: Add Conference / Workshop/ Seminar.	80
Figure 4.38: View All Conference /Workshop/ Seminar.	81
Figure 4.39: View conference/ workshop/seminar.	81
Figure 4.40: Edit conference/ workshop/seminar.	82
Figure 4.41: Add new consultation.	83
Figure 4.42: View all consultation.	84
Figure 4.43: View consultation.	85
Figure 4.44: Edit consultation.	86
Figure 4.45: Add new external relations.	87
Figure 4.46: View all external relation.	87
Figure 4.47: View relation.	88
Figure 4.48: Edit external relations.	89
Figure 4.49: Add new awards.	89
Figure 4.50: View all awards.	90
Figure 4.51: View awards.	91
Figure 4.52: Publication Report.	91
Figure 4.53: Full Publication Report.	92
Figure 4.55: View audit log.	94
Figure 5.3: Successfully Logged in message.	97
Figure 5.4: Error Message.	97
Figure 5.5: Create new user.	98

Figure 5.6: Error message for invalid user registration.	98
Figure 5.7: User Profile.	99
Figure 5.8: Edit User Profile.	99
Figure 5.12: Search user.	101
Figure 5.13: Error message for invalid search user.	102
Figure 5.16: Display result search by researcher or postgraduate.	103
Figure 5.17: Add Publication.	104
Figure 5.18: New Publication added notify message.	104
Figure 5.19: Error Message for invalid publication input.	105
Figure 5.20: View All Publication.	105
Figure 5.21: Publication listing view by admin.	106
Figure 5.23: Edit publication.	107
Figure 5.24: Search Publication.	107
Figure 5.25: Display searched result.	108
Figure 5.26: Add research grant.	108
Figure 5.27: New grant added notify message.	109
Figure 5.28: Error message for invalid grant input.	109
Figure 5.29: View all research grants.	110
Figure 5.30: Research grant listing view by admin.	110
Figure 5.33: Search journal title with grant.	112
Figure 5.34: Display searched result.	112
Figure 5.35: Add Conference/ Workshop/ Seminar.	113
Figure 5.36: New conference/workshop/seminar added notify message.	113
Figure 5.37: Error message for invalid conference input.	114
Figure 5.38: Conference/Workshop/Seminar Listing.	114
Figure 5.39: Conference/Workshop/Seminar listing view by admin.	115
Figure 5.40: Display conference details.	115
Figure 5.41: Edit conference page.	116
Figure 5.42: Add consultation page.	116
Figure 5.43: New consultation added notify message.	117
Figure 5.44: Error message for invalid consultation input.	117
Figure 5.45: View all consultation.	118

Figure 5.46: Consultation listing view by admin.	118
Figure 5.47: Display consultation details.	119
Figure 5.48: Edit consultation page.	119
Figure 5.49: Add external relation.	120
Figure 5.50: New external relations added notify message.	120
Figure 5.51: Error message for invalid external relation input.	121
Figure 5.52: External relations listing view by researcher.	121
Figure 5.53: External relations listing view by admin.	122
Figure 5.54: Display external relation details.	122
Figure 5.55: Edit external relation.	123
Figure 5.56: Add awards page.	123
Figure 5.57: New awards added notify message.	124
Figure 5.58: Error message for invalid award input.	124
Figure 5.59: Awards listing view by researcher and postgraduate.	125
Figure 5.60: Awards listing view by admin.	125
Figure 5.61: Display award details.	126
Figure 5.62: Edit awards page.	126
Figure 5.63: Individual Report.	128
Figure 5.64: Group Report.	130
Figure 5.65: Audit Log page.	131
Figure 5.66: Databases of Research Group Management System.	132
Figure 5.67: Users table.	132
Figure 5.68: Publication table	133
Figure 5.69: Research Grant table.	133
Figure 5.70: Conference/Workshop/Seminar Table.	134
Figure 5.71: Consultation Table.	134
Figure:5.72: External relation table.	135
Figure 5.73: Awards table.	135
Figure 5.74: Audit table.	136
Figure 5.75: Coding platform using notepad++.	136

LIST OF TABLES

	Page
Table 1.1: Functionalities of Each Module.	4
Table 2.1: Comparison of Reviewed Systems and User Requirements.	33
Table 3.1: Software requirements.	38
Table 3.2: Hardware requirements.	38
Table 4.1: Users Entity.	43
Table 4.2: Publication Entity.	44
Table 4.3: Research Grants Entity.	44
Table 4.4: Conference/ Workshop/ Seminar Entity.	45
Table 4.5: Consultation Entity.	45
Table 4.6: External Relations Entity.	46
Table 4.7: Awards Entity.	46
Table 4.8: Audit Log Entity.	47
Table 4.9: List of modules with functionality and descriptions.	50
Table 6.2 Unit Testing of Profile Management Module by admin.	140
Table 6.3: Unit testing of Publication Management Module by admin.	141
Table 6.4: Unit testing of Research Grant Management Module by admin.	142
Table 6.5: Unit testing of Conference/Workshop/Seminar Module by admin.	143
Table 6.6: Unit testing of Consultation Management Module by admin.	143
Table 6.7: Unit testing of External Relations Management Module by admin.	144
Table 6.8: Unit testing of Awards Management Module by admin.	144
Table 6.9: Unit testing of Reporting Management Module by admin.	145
Table 6.10: Unit testing of Audit Log Module by admin.	145
Table 6.11: Unit testing of Profile Module by researcher and postgraduate.	146
Table 6.12: Unit testing of Publication Module by researcher and postgraduate.	147
Table 6.13: Unit testing of Research Grant Management Module by researcher.	148
Table 6.14: Unit testing of Conference/ Workshop/ Seminar Module.	150
Table 6.15: Unit testing of Consultation Management Module by researcher.	151
Table 6.16: Unit testing of External Relations Management Module.	153
Table 6.17: Unit testing of Awards Management Module.	154

Table 6.18: Unit testing of Reporting Management Module.	155
Table 6.19: Integration testing between Login / Logout Module with interfaces.	157
Table 6.20: Integration testing between Profile Module with interfaces.	158
Table 6.21: Integration testing between Publication Module with interfaces.	159
Table 6.22: Integration testing between Research Grant Module with interfaces.	160
Table 6.23: Integration testing of Conference/Workshop/Seminar.	161
Table 6.24: Integration testing between Consultation Module with interfaces.	162
Table 6.25: Integration testing of External Relation Module.	163
Table 6.26: Integration testing between Awards Module with interfaces.	164
Table 6.27: Integration testing between Reporting Module with interfaces.	165
Table 6.28: Integration testing between Audit Log Module with interfaces.	166
Table 6.29: System testing of Research Group Management System.	166

LIST OF APPENDICES

APPENDIX A: Interview Report	176
APPENDIX B: User Acceptance Testing	181

CHAPTER 1

INTRODUCTION

1.1 Problem Background

In universities, researchers are generally attached to one or a few research groups, units, or institutes. Here, the groups, units or institutes are collectively referred to as research groups. In each group, researchers are involved in many activities including producing research publications, work on research projects, supervise students, participate in competitions, and involve in charity work. Often, these data are kept only by individual researchers and whenever a summary of a group's achievement is needed, the group leader will ask everyone to submit their performance data such as publication of journal.

In University Malaysia Sabah (UMS), these researchers are the academic staff and postgraduate students. For each academic staff, he or she has an account on the CV-Online website. After logged into the website, the staff can update their profile, publication data, supervision data, conference data, community service, and so on. This system is sufficient to store all data related to staff. However, as this system is not designed for research group, no functionalities of specifying which research group the researcher belongs to or to produce annual statistics on the performance of the individual or the research group.

For each researcher, to generate statistics on annual achievement is not possible from the CV-Online as the system is only to store the data without generating the statistics. Therefore, when such information such as publication records is required, the staff has to manually process them. This is time consuming and prone to human

errors. To make matter worse, the CV-Online is not accessible all the time especially during the *promotion period* when it will be deactivated.

Lastly, the Postgraduate Student Information System (PPPS) is not linked to CV-Online. The two systems are separated. To access data regarding postgraduate students under supervision, the researcher has to log into the PPPS. The PPPS has not functionality of storing student's publications and awards from competition. Similarly, no summary statistics are available.

From the above mentioned situations, it is clear that the existing systems in UMS are not suitable for central management of research groups. The reason for the need for a research group management system is because every year, each research group has to produce a report on the status of the group. In order to generate the required information, there is a need for a system that allows the researchers to centrally store all data and generate required statistics. Such a system not only can minimize the hassle of collecting the required data from all researchers, which is often time consuming, it also facilitate the generation of required statistics as needed and with less error prone as in manual process.

Based on the problem background, the problems of current systems are:

- i. There is no centralized platform for researchers to store all data related to the research group;
- ii. CV-Online does not provide the functionalities such as centrally data management needed by research groups and it is not always accessible.
- iii. Postgraduate Information system UMS is not linked to CV-Online and does not keep a record of student's publications and awards.
- iv. It is time consuming and require significant effort for researchers to generate statistics report by themselves;

1.2 Problem Statement

Although UMS has CV-Online and PPPS system to store data of researchers, these systems are not linked. The data on the researchers and postgraduate students are not centrally managed. Moreover, there are no functionalities in the systems to allow

researchers to print summary statistics on individual researcher's achievements as well as group's achievements. Therefore, the Applied Computing Group requested a web-based system to be built to centrally manage the data related to the group.

1.3 Objectives

Due to the problems stated in Section 1.2, the Applied Computing Group requested a web-based research group management system to be developed. Therefore, the objectives of the project are:

- i. To implement a web based research group management system;
- ii. To implement the research group management system for Applied Computing Group;
- iii. To test and verify the developed system for user acceptance.

1.4 Project Scope

Research Group Management System is a system for researcher to store data on activities and details related to research group, and to produce required reports. From the interview with the user, there are 9 important modules in this system which included profile management, publication management, research grant management, conference/workshop/seminar, consultation, external relations, awards, audit log and reporting.

The functionalities of each module are shown in Table 1.1:

Table 1.1: Functionalities of Each Module.

Module	Sub-module	Description	Authority
Profile Management	Create new user	Admin create new user account.	Admin
	User Profile	Display user profile Update user profile.	All users
	View all user	Display all user Edit and update user role.	Admin
	Search user	Search other user profile.	All users
		Edit other user role/status.	Admin
Publication Management	Add publication	Add new publication	Researcher and Postgraduate
	View all publication	Display users' own publication listing. Edit, update or delete record.	Researcher and Postgraduate
		Display all users' publication listing.	Admin
	Search publication	Search own publication and also other users' publication as well. Note: admin does not have any publication record.	All users.
Research Grant Management	Add research grant	Add new research grant	Researcher
	View all research grant	Display users' own research grant listing. Edit, update or delete record.	Researcher
		Display all users' research grant listing.	Admin
	Search journal title with grant.	Search own journal title with grant and also other users' publication with grant as well. Note: admin does not have any research grant record.	Researcher and Admin
Conference/workshop/seminar Management	Add conference/workshop/seminar	Add new conference/ workshop/ seminar	Researcher and Postgraduate
	View all conference/workshop/seminar	Display users' own research conference/workshop/ seminar listing. Edit, update or delete record.	Researcher and Postgraduate
		Display all users conference/workshop/seminar listing.	Admin
Consultation Management	Add consultation	Add new consultation	Researcher
	View all consultation	Display users' own research consultation listing. Edit, update or delete record.	Researcher
		Display all users' consultation listing.	Admin

External Relation Management	Add external relation	Add new collaboration details.	Researcher
	View all external relation	Display users' own research external relation listing. Edit, update or delete record.	Researcher
		Display all users' external relation listing.	Admin
Awards Management	Add awards	Add new awards details	Researcher and Postgraduate
	View all awards	Display users' own research awards listing. Edit, update or delete record.	Researcher and Postgraduate
		Display all users' awards listing.	Admin
Reporting Management	Publication, research grant, conference, consultation, external relation, awards, individual, and group report	Display reports to users and allow them to print the report. Consultation and external relations report only can view by researcher. Group report only can view and print by admin.	All users
Audit Log	View audit log	Display time, user and activity carried out by users.	Admin

1.5 Organization of the Report

This report is divided into 7 chapters. They are Introduction, Literature Review, Methodology, System Analysis and Design, Implementation, Testing, Conclusion and Future Work.

Chapter 1: Introduction, it introduce to motivation, objectives, and project scope of the project. It also includes the description of modules identified for the system to be developed.

In chapter 2: Literature Review, it reviews existing systems that are similar to the project. A comparison between the existing systems in terms of user requirements is made in the end of the chapter.

In chapter 3: Methodology, it presents system development methodology. It covers reason for the chosen methodology and the activities involved in each phase in the methodology. It also included are the software and hardware for the system development.

In chapter 4: System Analysis and Design, it explains the system design which included interface design, database design, and functional design as well. Besides, it also included flowchart such as DFD, ERD, context diagram and others depending on the system development model used.

In chapter 5: Implementation, it presents the implementation of whole system. It covers software tools for coding and creating database involved in each user interfaces as well.

In chapter 6: Testing, it presents the testing by using test cases to ensure the success functionality of the system. It covers unit testing, integration testing, system testing and lastly acceptance testing.

In chapter 7: Conclusion and Future Work, it concludes and summarizes the six chapters of the report. Besides, it also presents the project limitations, advantage and recommendations for future work of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing systems that are similar to the project. Three systems have been reviewed. They are UMS CV-Online, UMS PPPS system, and Research Information Management System (InfoCenterFRIM). To motivate the reasons why a new system needs to be developed as requested by the Applied Computing Group, a comparison of functionalities requested by the users with those provided in the existing systems is also presented.

2.2 UMS CV-Online

UMS CV-Online system (<https://hronline.ums.edu.my>) is an online resume system. It allows UMS staff to manage data related to their career. UMS CV-Online has many modules such as research and publication, conference, seminar and workshop and so on as shown in Figure 2.2. In reviewing this system, the user of this system is a lecturer and the data provided is private and confidential.

Figure 2.1 shows the login page to UMS CV-Online. Each user is required to key in his/her login details to proceed.

REFERENCES

- Dennis, W. W. (2006). *System Analysis and Design 3rd Edition*. John Wiley & Sons Inc.
- Dr.Dobb's. (2008, October 20). *SDLC: SDLC Models Advantages and disadvantages*. Retrieved January 7, 2015, from <http://www.drdoobbs.com/architecture-and-design/sdlc-sdlc-models-advantages-disadvantag/228701074>
- Institute Postgraduate Studies(IPS System)*. (2014). Retrieved January 8, 2015, from <http://cgsonline.ump.edu.my/ORGSAppl/indexCGS.jsp>
- Keng, D. L. (2014, 9 9, 2014, 3 11, 2015, 13 3, 2015, 24 3, 2015, 1 6). Interview Report . (H. P. Teng, Interviewer)
- Postgraduate Information System*. (2012). Retrieved October 6, 2014, from Official Portal of Centre of Postgraduate Studies: <http://smpp.ums.edu.my>
- Pvt.Ltd, K. S. (n.d.). *HR Cube HRIS Software*. Retrieved September 26, 2014, from Softonic: <http://hr-cube-the-hris-software.en.softonic.com/>
- RBCS. (2003-2011, May). In *ISTQB Certified Tester- Foundation course in software testing-ctfl* (pp. 1-274). Kuala Lumpur: Customedia Sdn Bhd. Retrieved from EasyCounter: <https://www.easycounter.com/report/webvirtua.ums.edu.my#>
- Tarr, A. (2012). *PHP and MySQL 24-Hour Trainer*. Indiana: John Wiley & Sons, Inc.
- UMS CV-Online*. (2009-2014). Retrieved October 6, 2014, from Official Portal of HR online UMS version 3: <https://hronline.ums.edu.my/>