

CHAPTER 6

SYSTEM DESIGN, DEVELOPMENT, IMPLEMENTATION AND TESTING

6.1 Introduction

This chapter discusses the user requirements necessary for the development of a Knowledge Management (KM) tool in Higher Education Institution (HEIs) to support the curriculum enhancement process. Research objective four is addressed in this chapter, which is to design and develop knowledge management system that can support the employability of ICT graduates and the improvement of curriculum review process. The user requirements are required for building a prototype KM tool. The main focus of this chapter is on website development that would serve the HEIs, students and employers. Finally, a summary of the chapter is presented.

6.2 Overview on Waterfall Method

Among the traditional development approaches, the waterfall is the oldest software development process model. It has been commonly used in both large and small projects and has been reported as a successful development approach (Jim, 2000). The major advantage of waterfall method is that, the project requires the fulfillment of one phase, before going on to the next. So, if there is any fault, it will be identified and improved during the initial phase. Besides that, a lot of emphasis is laid on paperwork in this method as compared to the newer methods. The Waterfall Model is also a straight forward method. It will clearly show the stage the project is in progress. The Waterfall method is also well known amongst the software developers because it is simple to use. Besides that, another main benefit of this model is because it will indicate the customer requirements up front. This approach also assumes that the main design specifications can be completely laid out in advance. In this methodology, the quality should be built

into design of product and services in the initial stage. Therefore, the study selected waterfall methodology to develop the KM tool.

6.2.1 Requirements Analysis

System requirements analysis enables the system engineer to specify software elements, establish design constraints that software must meet and the problem that the product is expected to solve. A complete understanding of software requirements is important to the success of a software development effort. Analysis includes understanding the business environment and limitation, the role of the product, the performance levels it must remain and its compatibility to the external systems. Some of the techniques that might be used to obtain this understanding include survey, interviews, use cases, and document review.

In this study, the system requirements have been obtained mainly through the literature review, survey questionnaire and interviewing. Requirement analysis is divided into two main categories viz, Functional Requirements and Non-Functional Requirements. A system's utility is determined by both its functionality and its nonfunctional characteristics, such as usability, flexibility, performance, interoperability and security.

6.2.2 Functional Requirement

Functional requirements document the needs for information processing technology and system requirements, which describe the essential characteristics of the hardware and software that will meet those needs. The proposed KM tool would not be complete if there is an absence of the functional requirements. The proposed KM tool was developed based on the conceptual framework (Chapter 3) which was designed based on the WST as discussed in Chapter 2. As shown in the layer 1 of conceptual framework,

firstly the system needs to identify the participants by deciding on the people who perform the work. The direct participants are the employers, current students, graduated students and HEIs.

In the second layer, the employer will be providing the information and knowledge on what is required in the job market to the KMS. Based on the information and knowledge gathered from the industry, the HEIs or faculty could compare the existing curriculum and what is required in the current job market during the curriculum review process. The HEIs could look at the curriculum information, skill information and knowledge information during the curriculum review process. By looking at the result of the assessment, the university may support the existing curriculum. This will generate competent graduates who could satisfy the employers' need. The employer could upload both the part-time and full-time job vacancies information on the KM tool. This will enable the current students and graduated students to apply for the posted job vacancies on the KM tool. The applicants could upload their information and resumes. Once the required information and resume were uploaded on the KM tool, the employers could view the information and resume. The employer could select the qualified applicants and invite them for an interview through the proposed KMS.

Once all the information from all the participants is identified, in the third layer of the conceptual framework which is the technology, it includes tools and techniques that WST participants use while doing their work. In this study, a KM tool has been developed for curriculum review process using KM approach. The KM tool could support the HEIs by creating employment based curriculum involving the HEIs, industry and employer. The proposed KM tool could be successful by developing a strong relationship between the industry, HEIs and students.

The forth layer is process and activities. It includes everything that happens within the WST. In this study, the business processes and activities are information

processing that occur between HEIs, industry and students, sense making and thinking that involve in decision making and the physical actions that taken place such as inviting for interviews. Besides that, in the KM tool, there is a proper two-way communication between the industry, HEIs and students. The main purpose of the KM tool is to support the curriculum to satisfy the employers need.

Once the processes and activities are identified, in the fifth layer the product and services are identified. The main concern of this study is to support the curriculum review process by providing the required skills, knowledge and job vacancies. This could be achieved by developing stronger relationships between industry, HEIs and students. This could assist the HEIs to better link the students to the job market.

In the sixth layer, the customers of the KMS are identified. Customers are people who receive direct benefit from products and services the WST produces. In this study, the customers for the 'teaching products' of a HEIs can be seen as including students, the general community, government, business and professional bodies.

Once the customers are clearly identified, in the seventh layer, the outcomes of KMS forces clarity as to what the project is all about and what is to be achieved. The outcome of the study is to support the curriculum review process by improving the student's skills and knowledge, which assist in improving the employability. The eighth layer is the ultimate goal. The ultimate goal of this study is to produce competent graduates by supporting the employability of ICT graduates and the improvement of curriculum review process using KM tool.

Some of the modules includes in the KM tool for HEIs are such as the faculty member login module, student login module, employer login module, job module, job category module, job position module, course module, subject module, skill module, course subject module, subject skill module, course skill module, course category module, program course category module, view current curriculum module, view

statistics module, compare current curriculum weightage with employer's needs module and variance between employer requirements and faculty offer module. All users can access this system through the Internet (<http://www.kms.somee.com>) but they only can view the KM Login page. The student, faculty and employer have to login to the system. Only registered users i.e. those who have the user ID and password can access the KM for HEIs. The Admin module only can be accessed by the system administrator. In order to get the user ID and password, the user has to register to this system. The administrator will verify the data validity and provide the password to the user. The registration can be done online through login module.

6.2.3 Non-Functional Requirements Analysis

In the area of software requirements, the term non-functional requirements (Yeh, 1984) have been used to refer to concerns not related to the functionality of the software. Figure 6.1 depicts a software quality tree (Boehm, et al., 1978) which aims to address concerns for key types of Non-Functional Requirements and importantly possible correlations among them.

The KM website must ensure certain web application qualities like user-friendliness, correctness, functionality, reliability and efficiency. User interface design is important because it is the only medium which connects the user and computer. So, it is important to ensure that the KM that is developed is user-friendliness. The KM that is developed must operate properly or it provides little value to its users. Correctness is the degree to which the software performs its required function. For an example, the system should be able to analyze the curriculum taught in HEI and what is required in the job market. Reliability is the other important part of the triangle of faith. Software should be able to take the constant pounding of user demand and provide the required

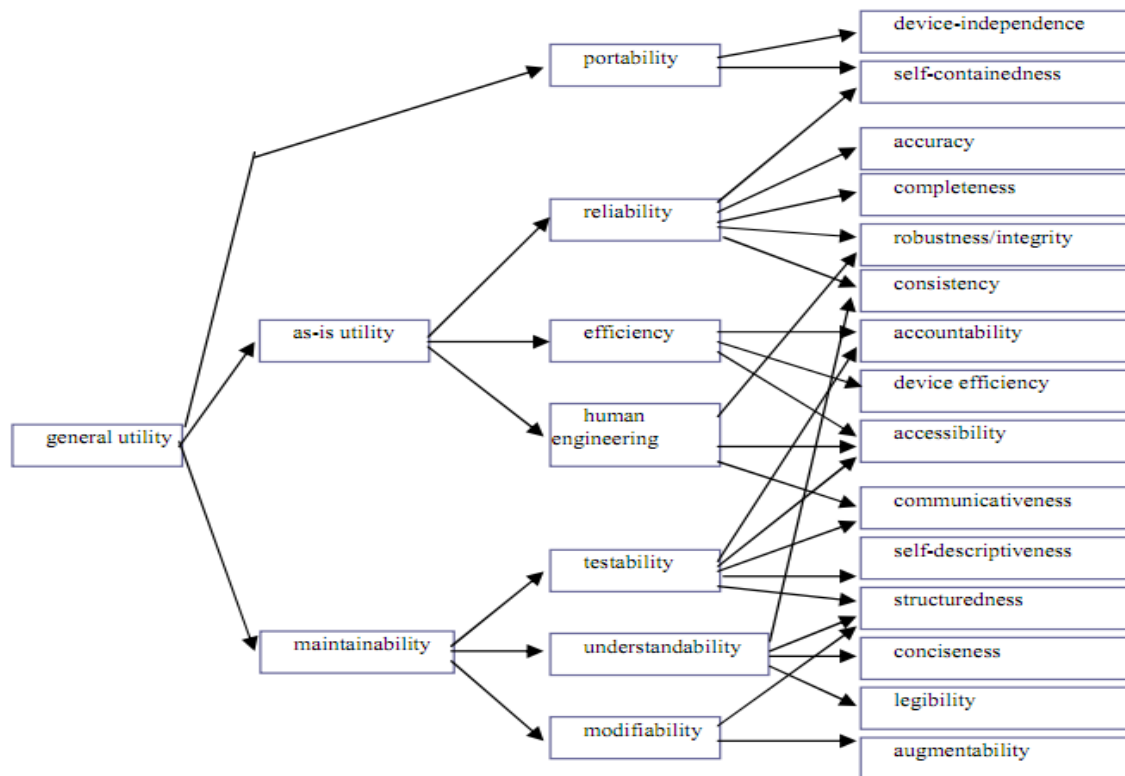


Figure 6.1: Software Quality Tree
(Adopted from Boehm, 1978)

output efficiently no matter what. Good software should give out the proper output every time it is requested to do so. Providing the proper solution for 99.99% of the time is just not good enough, it has to be a 100% when it comes to reliability. Efficiency is the ability of a process procedure to be called or accessed unlimitedly to produce similar outcomes at an acceptable speed. Quick response time performance and faster page generation speed give Scams greater efficiency.

6.2.4 System Design and Development

System Design consists of defining the hardware and software architecture, components, modules, interfaces, and data to satisfy specified requirements. It also defines the security parameters, designing data storage containers and constraints, choosing the IDE and programming language, and indicating strategies to deal with issues such as

exception handling, resource management and interface connectivity. During system design, a clear user interface design is addressed. This includes the issues relating to navigation and accessibility. As discussed in Section 1.6, Figure 6.2 has been developed that depict the work process study design. It illustrates how knowledge could be communicated and managed among the employers, HEIs staff and students to support the curriculum review process. It indicates the communication link build to connect among the employers, HEIs and using KM tool.

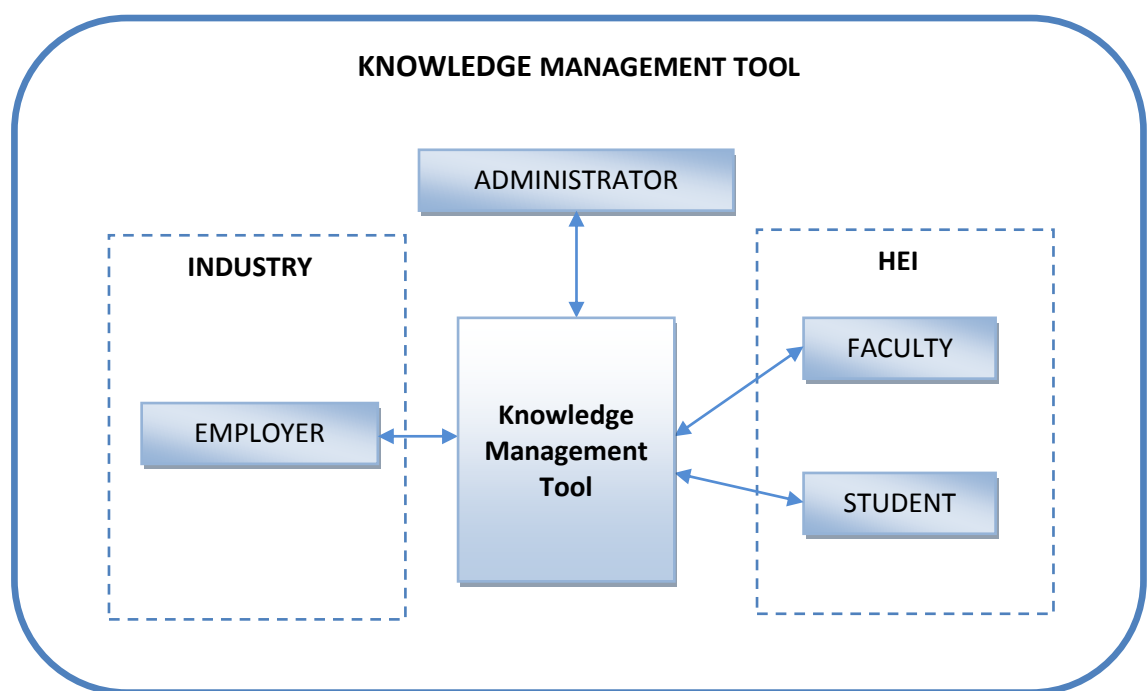


Figure 6.2: Propose study of Work Process design

Based on the proposed study of the Work Process design and the WST conceptual Framework, a KM system is then developed. The first step in the system design is to identify the input-output process of the KM tool. There are four groups of people involve in this case study. They are the employer, HEIs, current students, graduated students and administrator.

The input of the KM tool derived based on layer 1 (participants) and layer 2 (information). The data will be processed in layer 3, which is the KM tool (technology).

During the process stage of KM tool, it includes layer 4, which is the process and activities. Once the proposed KM tool completes its processing, it needs to produce the results as an output. The output stage consists of layer 5 (product and services), layer 6 (customers), layer 7 (outcomes) and layer 8 (ultimate goal).

Prior to the system development, a number of tasks were taken into account. Firstly, a detail research was done on the current curriculum in FCSIT. Here, the study focused on the subjects or courses taught for each major in FCSIT. Then, there were an in-depth study on the skills taught for the selected courses. After identifying the skills taught, weightage were given for each course based on the documentation review and interviewing. Weightage was assigned based on the total credit hours for each subject and the skill or skills taught for the subject. At the end of each skill, a total of credit hours spent are shown. The percentage is calculated based on the credit hour spend for each skill divided by the total credit hours for the subject. After analyzing the curriculum for all the major programmes in FCSIT, the researcher need to know the skills required in the job market. This information is important to compare the skills taught in the HEIs and the skills required in the job market. This was carried out by identifying the different types of jobs available in the market and the skills required which is related to the Computer Science and Information Technology programmes. More than 1000 jobs were analyzed in order to identify the different types of jobs available in the job market for all the six programmes. Later on, the jobs were logically grouped into seven categories as shown in Figure 6.3. They are Software, Hardware, Web Developing, Networking, Database, IT/IS and Internship for Students. In order to avoid hard coding, a logical job category title was created for a group of similar job skills. For each job category title, a group of job position title was assigned. The overview of the process is shown in Figure 6.4. Appendix I shows the details of job table in the KM system.

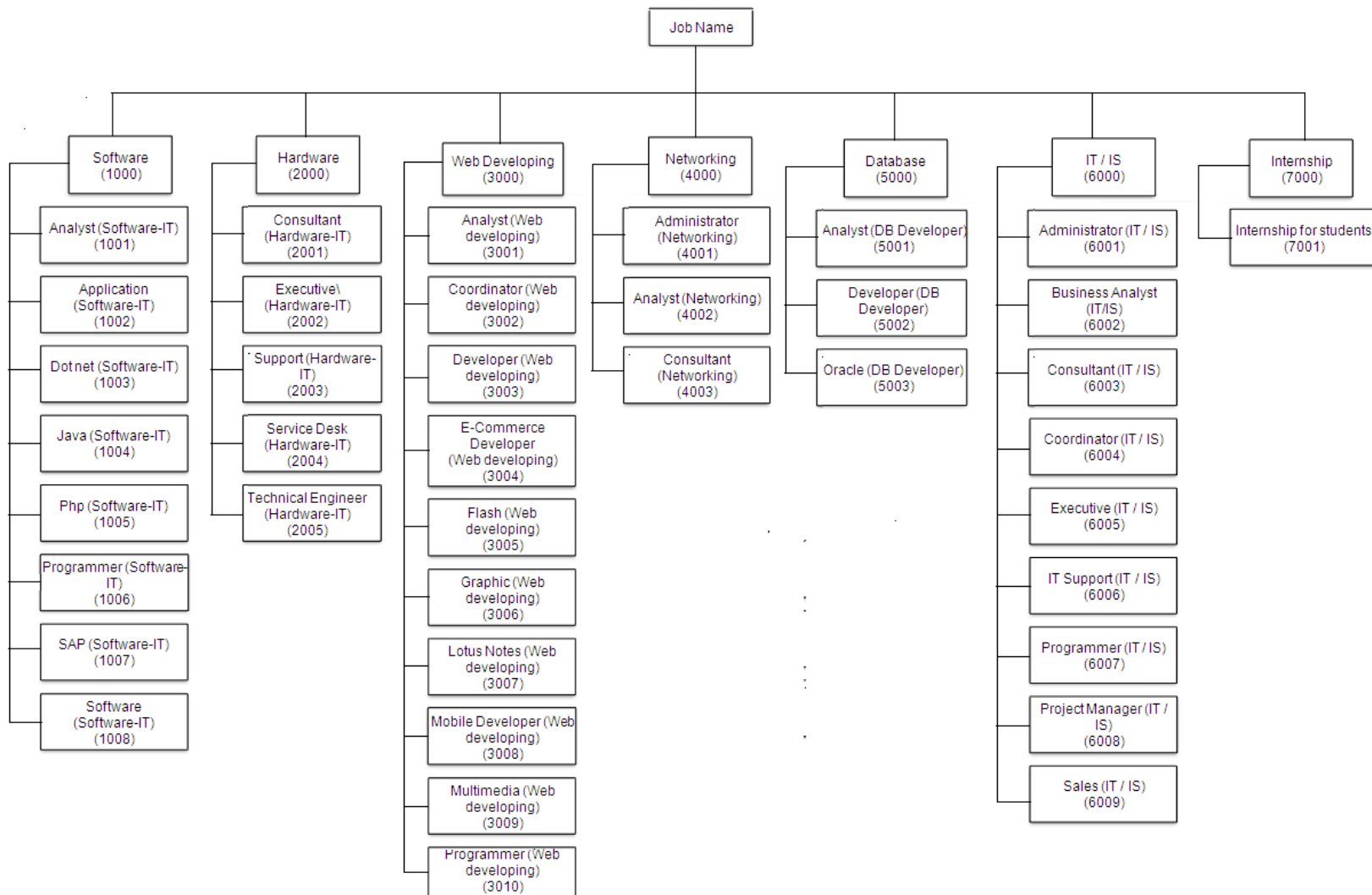


Figure 6.3: Hierarchy on job categories

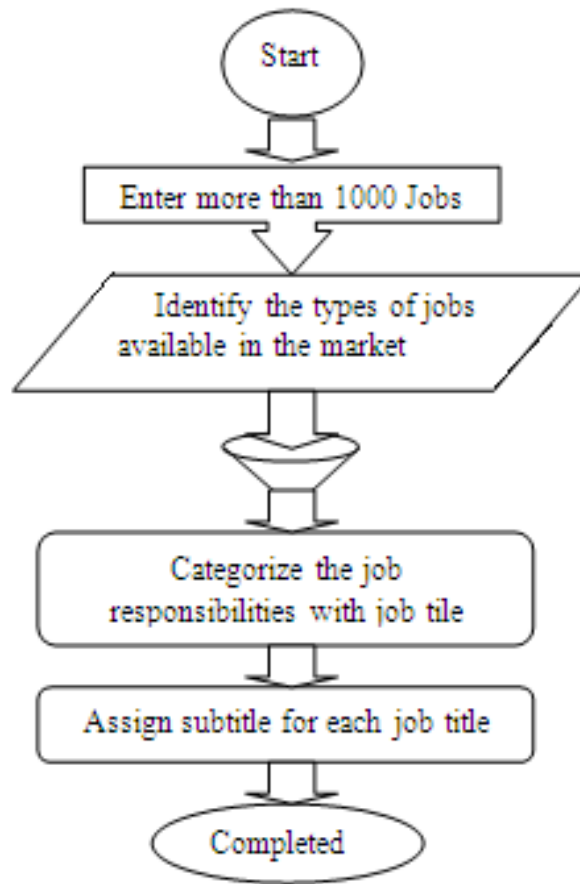


Figure 6.4: Overview of the Job Categorization Process

6.2.5 Tools Used in System Development

6.2.5.1 ASP.net

ASP.NET is used to create web pages and web technologies. ASP.NET is an extremely valuable tool for programmers and developers as it allows them to build dynamic, rich web sites and web applications using compiled languages like VB and C#. ASP.net is mainly chosen by the programmers because the web application exists in compiled form on the server. So the execution speed is faster compared to the interpreted scripts. Besides that,

ASP.NET makes development simpler and easier to maintain with an event-driven, server-side programming model. Apart from that, the content and program logic are separated. This will reduce the inconveniences of program maintenance. Besides that, since the configuration information is built-in ASP.NET, there is no need to register the components. An addition to that, ASP.NET offers built-in security features through windows authentication. Besides that it also includes built-in caching features.

6.2.5.2 Adobe Photoshop

Adobe Photoshop is a graphics editing program. It is developed and published by Adobe Systems Incorporated. The study chooses this tool because it is very easy to edit the photos. In this project, a number of images were edited with Adobe Photoshop to include in the KM webpage.

6.2.5.3 Crystal Report basic 10.0 bundles

Crystal Reports provides broad data connectivity options making it easy to access enterprise data and satisfy end user information requirements. It provides an easy way to incorporate reporting into the application. Crystal Reports provide the flexibility and control over how data is presented and formatted. In this study, Crystal Reports is used for charting. It increase the graphical impact of the reports by choosing from a wide variety chart types including bar, 3D bar, pie, line, Gantt, gauge, funnel, XY scatter, ranged map, dot density map, and more. In this study, pie chart has been used. Crystal Reports provides flexible options that let end users view and interact with information in familiar formats and via familiar environments.

6.2.5.4 SQL server 2008 R2 Express

The Microsoft SQL Server 2008 R2 Express is a reliable data management system. It delivers a well set of features, data protection, and performance for embedded applications, lightweight Web Sites and applications; and local data stores. It is designed for easy deployment and rapid prototyping. SQL Server Express with Management Tools is an easy-to-use version of the SQL Server Express data platform. It includes the graphical management tool such as the SQL Server Management Studio (SMSS) Express.

6.2.5.5 System requirements

Supported Operating Systems are Windows 7, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Vista, Windows XP. It includes 32-bit systems: Computer with Intel or compatible 1GHz or faster processor (2 GHz or faster is recommended.). 64-bit systems: 1.4 GHz or faster processor. The minimum of 512 MB of RAM (2 GB or more is recommended). Besides that, 2.2 GB of available hard disk space is required.

6.3 Analysis and Design of Proposed KM

During the system analysis phase, the user requirements that were obtained through the questionnaires were thoroughly analyzed. Next, the relevant diagrams were designed which explains the interactions between the users and the proposed KM. The physical system design process is defined as those tasks which focus on the specification of detailed computer-based solutions. While the scope, functionality, development tools, functional and non-functional requirements of the proposed system were emphasized in the previous section, the system design will focus and highlight on the technical or implementation concerns of the system.

6.3.1 System Design Technology

A hierarchy chart is used to depict and identify the major modules, which act on the data in a high-level picture of the system. The major function of KM is divided into four parts and these parts can be further decomposed into smaller, sub-components depending on the different use roles and the type of situation.

6.3.2 System Module Architecture

There are four types of users involve in the KM namely Employers, HEI Members, Students and Administrator as shown in Figure 6.5.

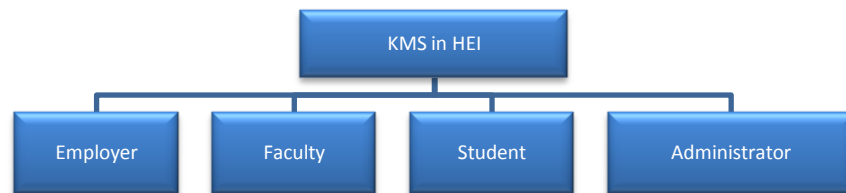


Figure 6.5: Main Users of KM

6.3.2.1 Employer Module

The Employer Module has two main sub-modules as shown in Figure 6.6. It includes of uploading the job vacancy and View Students resume.

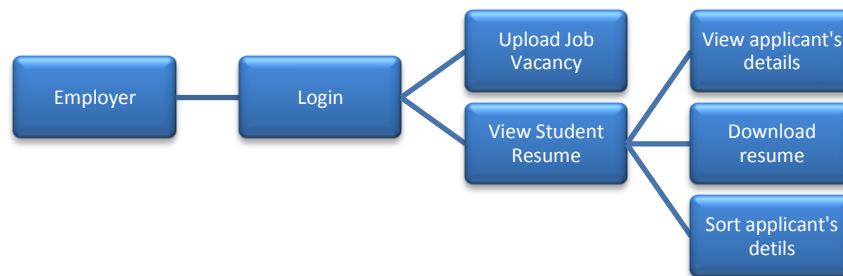


Figure 6.6: Employer Module

6.3.2.2 Faculty Module

The Faculty Module has four main sub-modules as shown in Figure 6.7. It includes of View Current Curriculum, View Statistics of curriculum weightage for each programme and view theory application and system application for courses, compare the current curriculum weightage with employer's needs and to view the variance between employer requirements and faculty offer.

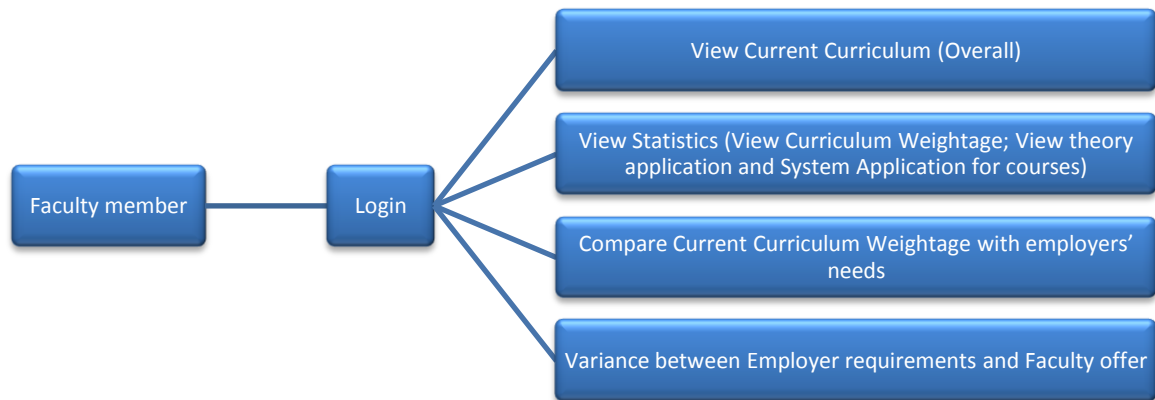


Figure 6.7: Faculty Module

6.3.2.3 Student Module

The Student Module has four main sub-modules as shown in Figure 6.8. It includes of View Overall Current Curriculum, View Statistics of curriculum weightage for each programme and view theory application and system application for courses, Upload Resume and View Job vacancy.

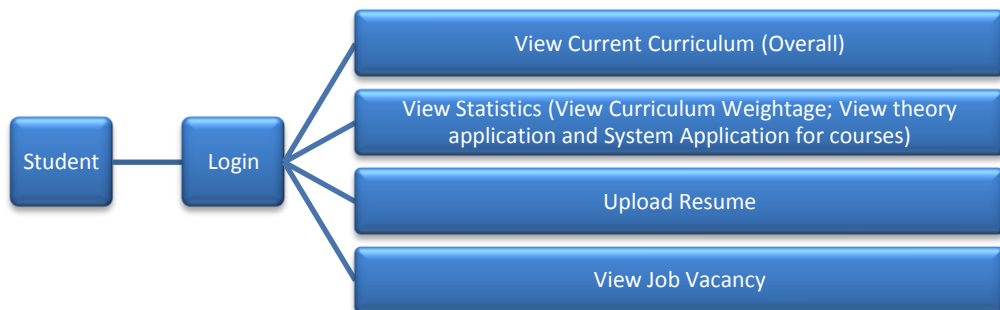


Figure 6.8: Student Module

6.3.2.4 Administrator Module

The Administrator Module has two main sub-modules as shown in Figure 6.9. It includes of system maintenance and user maintenance. System maintenance comprise of job maintenance, job category maintenance, job position maintenance, course maintenance, subject maintenance, skill maintenance, course subject maintenance, subject skill maintenance, course skill maintenance, course category maintenance, programme course category maintenance. On the other hand, user maintenance comprise of faculty member details maintenance, student details maintenance and employer details maintenance.

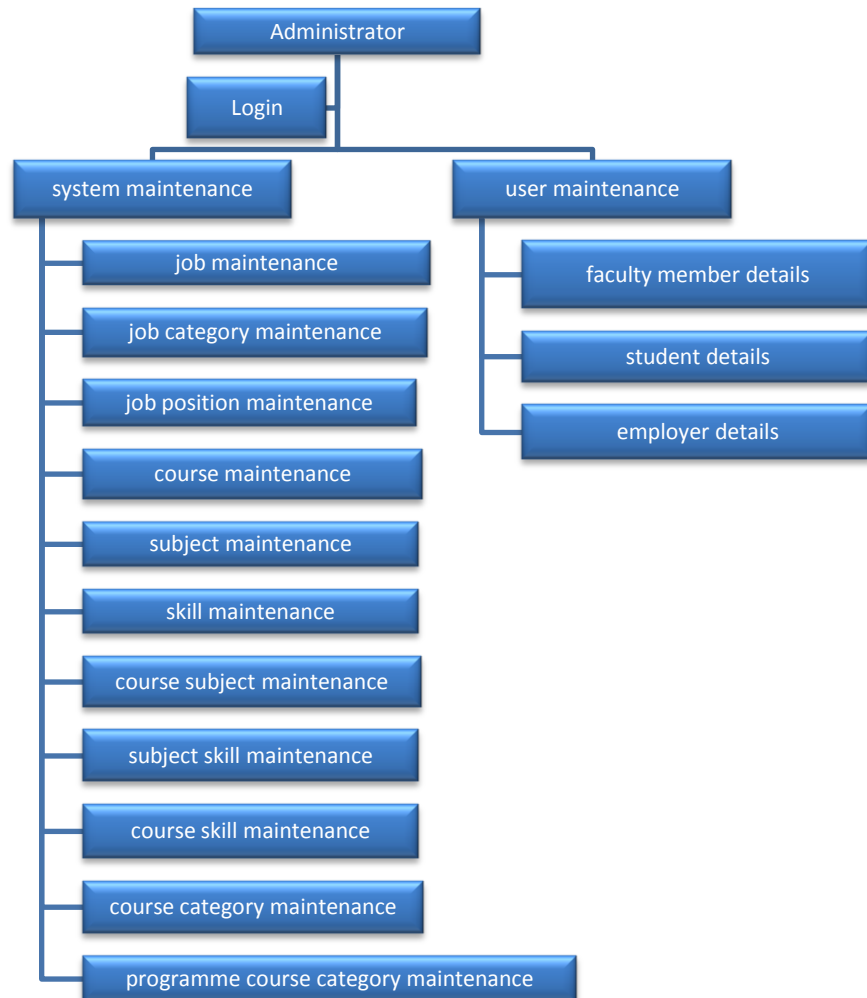


Figure 6.9: Administrator Module

Figure 6.10 shows the Overall ER Diagram. It consist of subject , skill, job, employer, student, faculty, course, CGPA, subject skills, course skill, course subject, student resume skill, job vacancy skill, job vacancy, job position, job category, job category course, student resume, faculty member, programme course category and course category.

6.3.3 Overall Entity relationship Diagram (ERD) Diagram

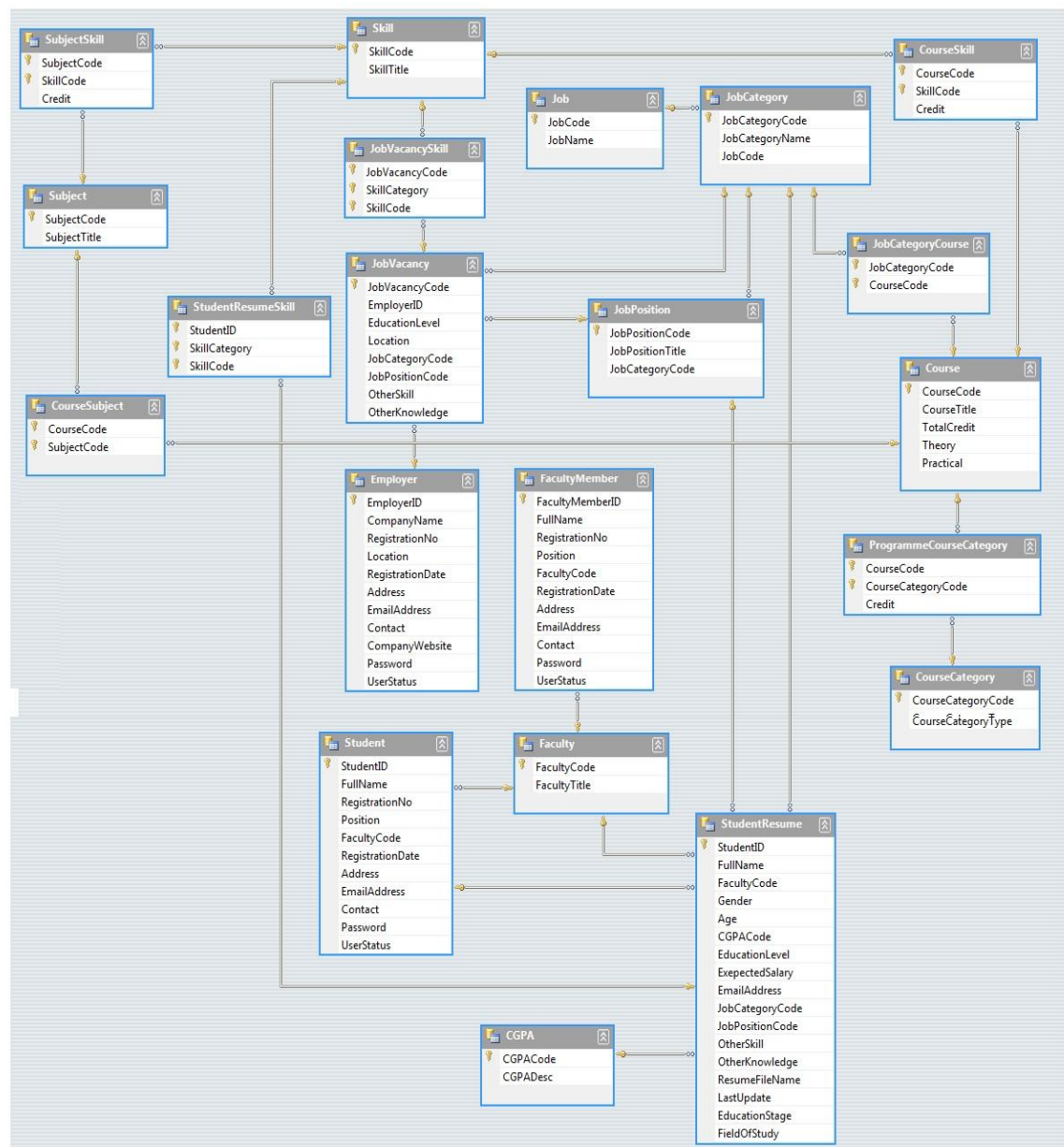


Figure 6.10: Overall ER Diagram

6.4 Unified Modeling Language (UML)

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the software systems, as well as for business modeling and other non-software systems. The UML is very important parts of developing object oriented software and the software development process. It describes the boundary of the system, the structure of the system, and the behavior of the system. Mostly, UML uses graphical notations to express the design of software projects. The UML helps project teams to communicate, explore potential designs, and validate the architectural design of the software. This study used Microsoft Visio to draw the UML diagrams which include of class diagram, use case and activity diagram. Figure 6.11 shows the users in KM system.

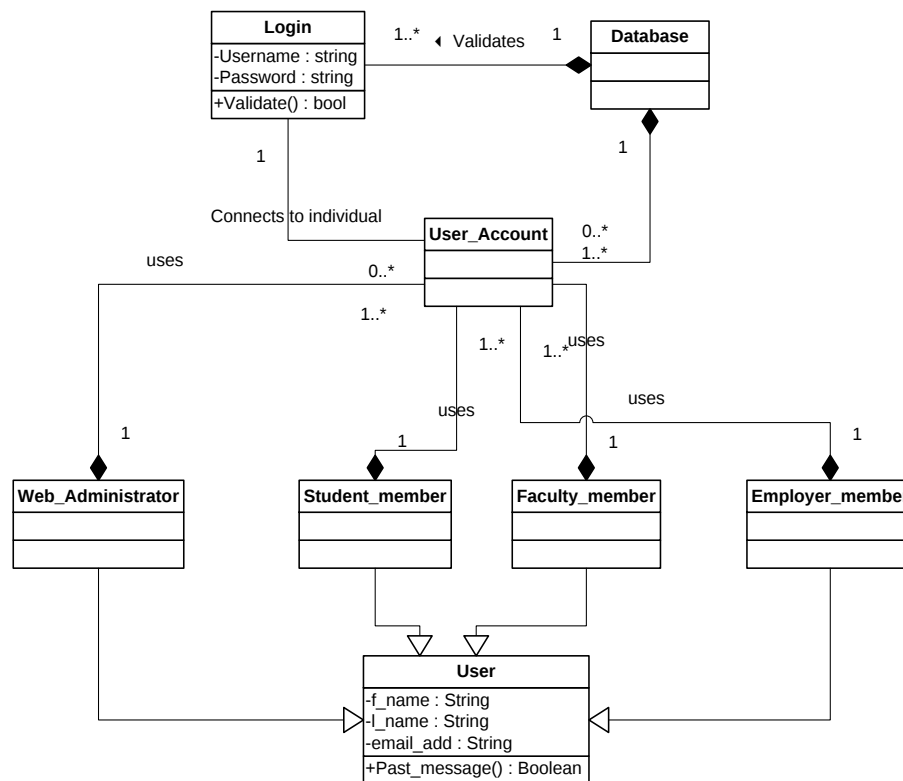


Figure 6.11: Class diagram for Users in KMS

Figure 6.12 shows the administrator login page. It illustrates the overview and the activities in each web page. For the administrator KM's webpage, once the user had login as an administrator, the user will be looking at the administrator welcome page. On this page, the administrator has two options, viz system maintenance and user maintenance.

Under the system maintenance, there are twelve options viz job maintenance, job category maintenance, job position maintenance, course maintenance, subject maintenance, skill maintenance, course subject maintenance, subject skill maintenance, course skill maintenance, course category maintenance, job category course maintenance and programme course category maintenance. For the job maintenance, the administrator could edit or delete job code and job name. For the job category maintenance page, the administrator could edit or delete job category code and job category name job details. For the job position maintenance page, the administrator could edit or delete job position code, job position title and job category.

For the course maintenance page, the administrator could edit or delete job code, course title, total credit, theory percentage and practical percentage. The total credit is assigned using document review method based on the FCSIT, UM for each course in the faculty. For the subject maintenance page, the administrator could edit or delete subject code and subject title. For the skill maintenance page, the administrator could edit or delete the skill code and skill title.

For the course subject maintenance page, the administrator could edit or delete course and subject details. For the subject skill maintenance page, the administrator could edit or delete the subject, skill and credit information details. For the course skill maintenance page, the administrator could edit or delete the course, skill and credit details. The administrator could edit or delete the course category code and course category type

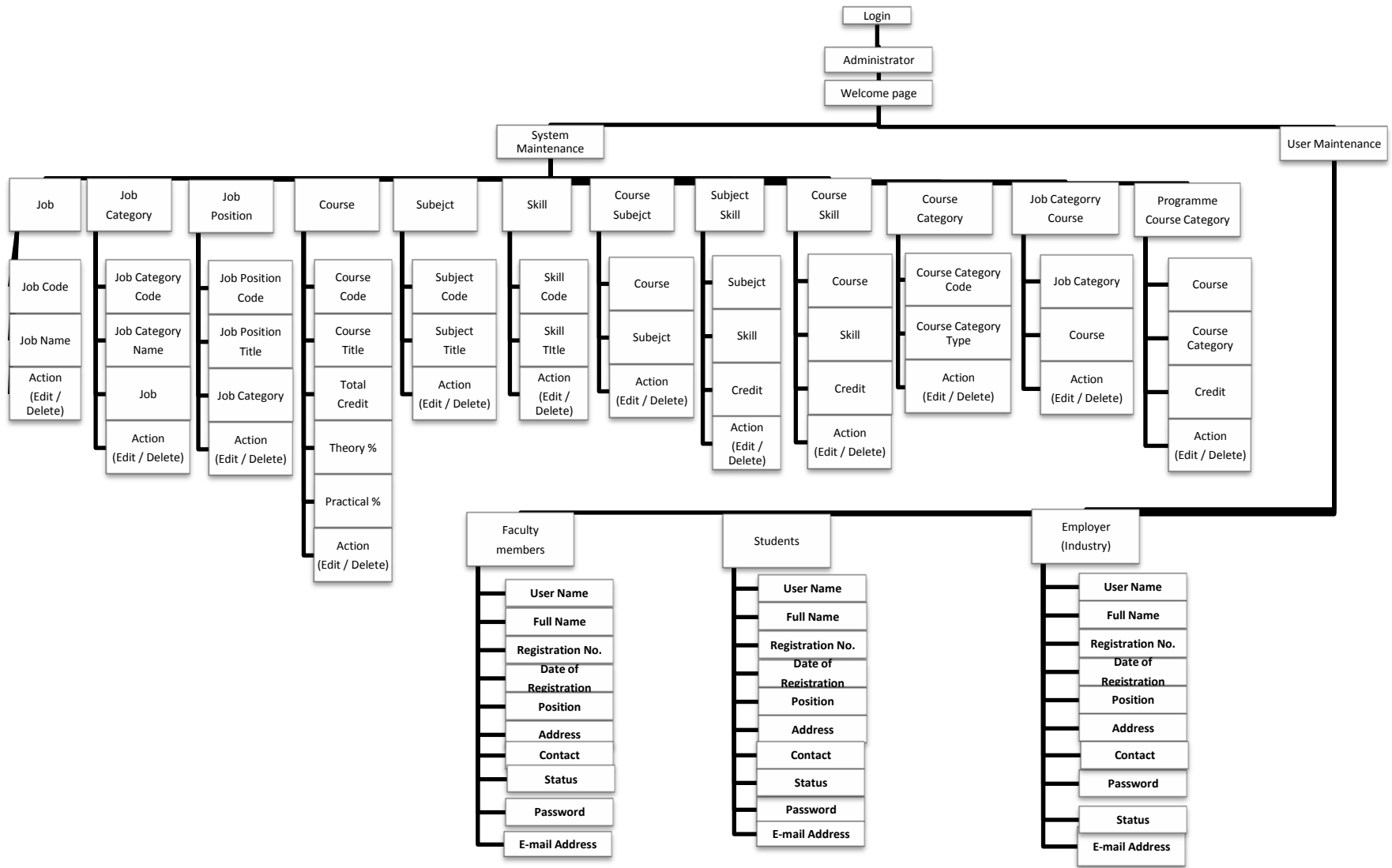


Figure 6.12: Administrator login page

details below the course category maintenance page. For the job category course maintenance page, the administrator could edit or delete the job category and course details. Lastly, for the programme course category maintenance page, the administrator could edit or delete the course, course category and credit details.

On the other hand, for the user maintenance page, the administrator could edit or delete the faculty member details such as the user name, full name, registration number, date of registration, position, address, password, e-mail address, status (active or inactive) and contact details. When the users (faculty members, students or employers) complete their registration, they do not have the privilege to assign their password. They are only allowed to fill-up and assign their personal details and the username. Once they submit their registration form, the administrator will verify the validity of the data sent by the user. If the data sent are valid, the administrator will assign a temporary password and e-mail them to the user.

Besides sending the password, the administrator needs to change the current status of the user from inactive to active. If the administrator do not change the status from inactive to active, the user will fail to login to the KM page. Besides editing or deleting the faculty member details, the administrator also could edit or delete the students details such as user name, full name, registration number, date of registration, position, address, password, e-mail address, status (active or inactive) and contact details. Finally, the administrator also could edit or delete the employer information such as the user name, full name, company registration number, date of registration, position, address, password, e-mail address, status (active or inactive) and contact details.

For the employer's KM tool page, the user needs to register their details. During registration process, the employers are allowed to fill in all their personal details and

company details. However, they are not allowed to assign a password. Once they complete and submit the registration form, it will be viewed by the administrator to verify that all the information is accurate. Once they verify its data validity, the administrator will assign a password and e-mail it to the employer.

Besides that, the administrator also will activate the user to exploit the system. With the given password, the user is allowed to change to a new password. Once they login into the employer KM webpage using their valid username and password, it will direct them to the welcome page. Here, the employer may either upload job vacancy or view student application and resume or both as shown in Figure 6.13. While uploading the job vacancy, the employer need to select the level of education, location, detail job title, skill(s) required, other knowledge, soft skills required and others.

On the other hand, for the view student application or resume, firstly the employer could view the student application and download their resume. The employer could also sort the education stage, field of studies or CGPA. This will display the entire selected applicant's information. The employer also could sort the information by last active date in ascending or descending order. Finally, if the employer is interested with the student's information, the employer could invite the students for interview session through electronic mail. This KM will improve the relationship between industry and students.

For the student's KM page, the user needs to register their details. During registration process, the students are allowed to fill in all their personal details. However, they are not allowed to assign a password. Once they complete and submit the registration form, it will be viewed by the administrator to verify that all the information is accurate.

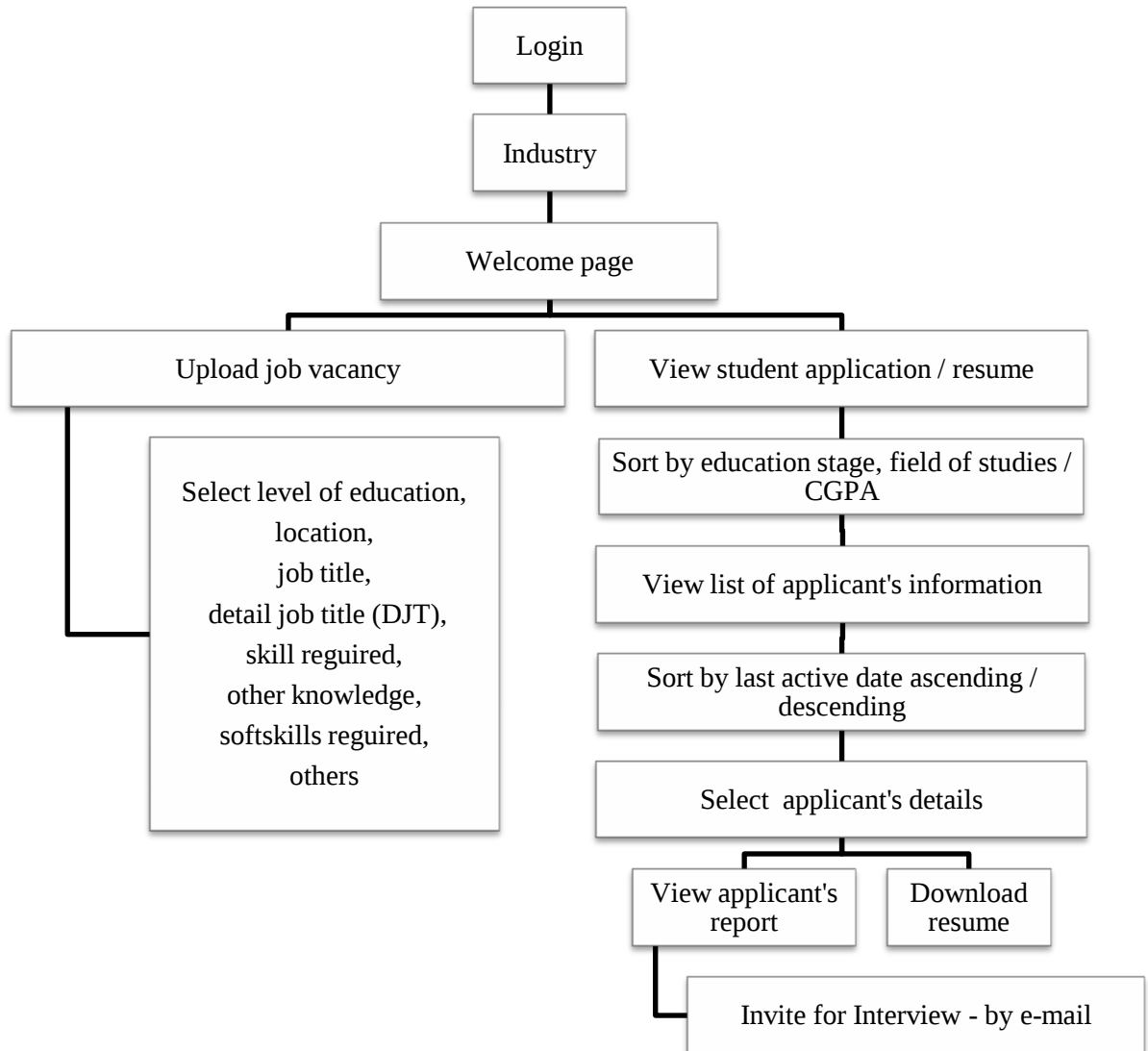
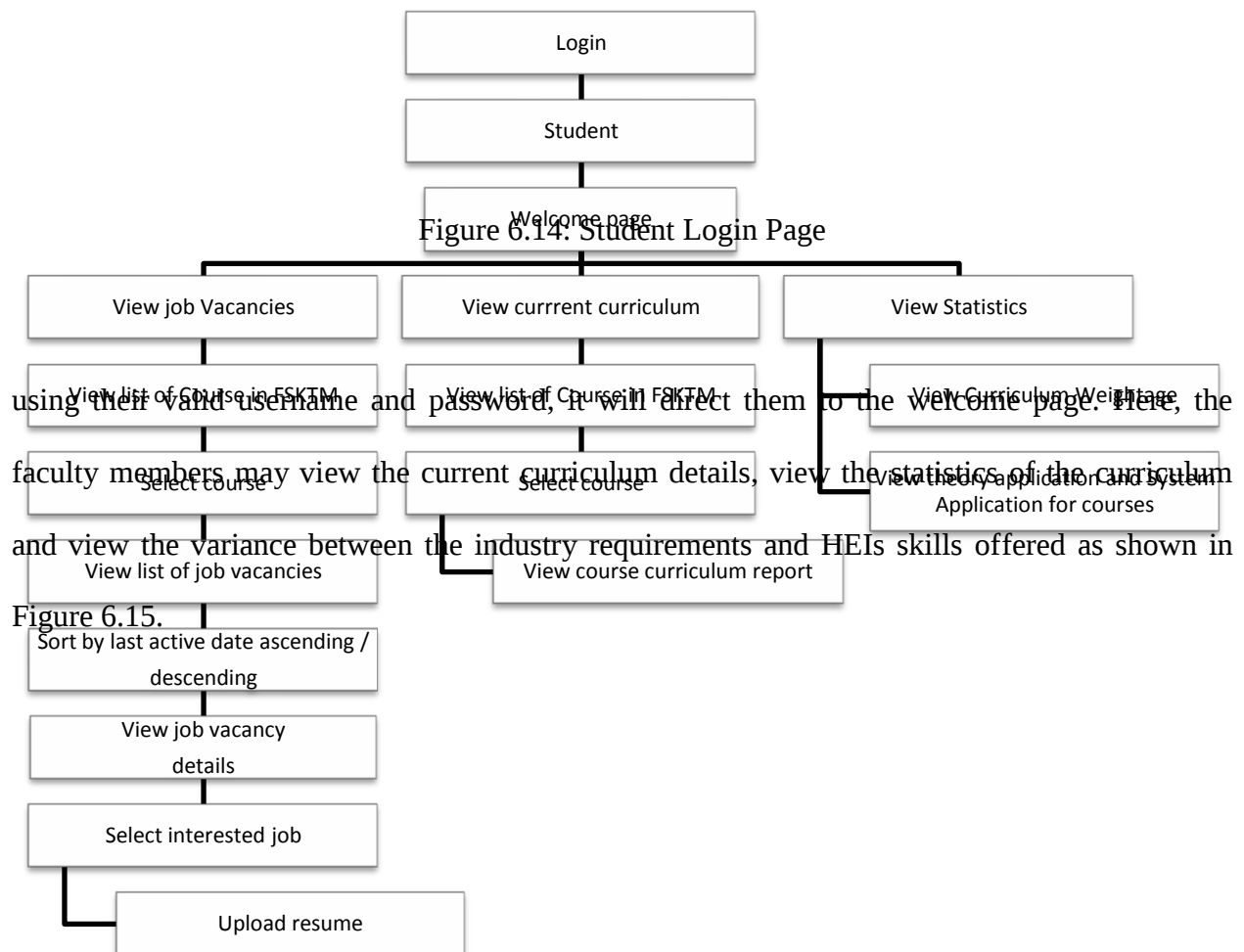


Figure 6.13: Employer Login Page

Once they verify its data validity, the administrator will assign a password and e-mail it to the student. Besides that, the administrator also will activate the user to exploit the system. With the given password, the user is allowed to change to a new password. Once they login into the student KM webpage using their valid username and password, it will direct them to the welcome page. Here, the student may view the job vacancies, view the current curriculum or view statistics or perform all the activities as shown in Figure 6.14.

In order for them to view the job vacancies, firstly a list of courses in FCSIT, UM will be displayed. Then, the user may select they course and view the list of job vacancies. They may sort the results by last active date ascending or descending. Lastly, they may select a job relevant for their qualifications and upload their resume. Besides viewing the job vacancies, the student may also view the current curriculum details. Here, the students may also view the current curriculum report and the statistics which present the curriculum weightage on theory application and system application. In this case, the KM will encourage the current students to apply for part-time job and internship course. Besides that, the students also could evaluate their strength in the job market.

Finally, for the faculty's KM page, the user needs to register their details. During registration process, the faculty members are allowed to fill in all their personal details and HEIs details. However, they are not allowed to assign a password. Once they complete and submit the registration form, it will be viewed by the administrator to verify that all the information is accurate. Once they verify its data validity, the administrator will assign a password and e-mail it to the faculty members. Besides that, the administrator also will activate the user to exploit the system. With the given password, the user is allowed to change to a new password. Once the user login into the faculty member's KM webpage



While viewing the current curriculum, the user may select the course from the list of courses offered in FCSIT and view the course curriculum report. The report shows both the hard skills, soft skills and the weightage given for each course. The weightage is assigned based on the document review study. For the view statistics, the user may view the curriculum weightage on both theoretical and practical spend for the course. This will guide the HEIs whether the weightage given for the course is proper.

Finally, the faculty members may also view the variance between the industry requirements and HEIs skills offered. Here, the user may select the course from the list of courses offered in FCSIT, UM. Here, the report will compare the list of knowledge, skills, abilities, and other characteristics (KSAO) that an applicant must have compared with the KSAO required in the job market. KSAOs typically fall into two major categories viz technical and behavioral.

Technical KSAOs measure acquired knowledge and “hard” technical skills. On the other hand, behavioral KSAOs measure “soft” skills, the attitudes and approaches applicants take to their work, such as the ability to collaborate on team projects or the ability to communicate orally with a broad range of individuals. Both types of KSAOs are important for successful job performance (Fine & Cronshaw (1999). The basic Class diagram, Use Case diagram and Activity diagram are shown in Appendix J.

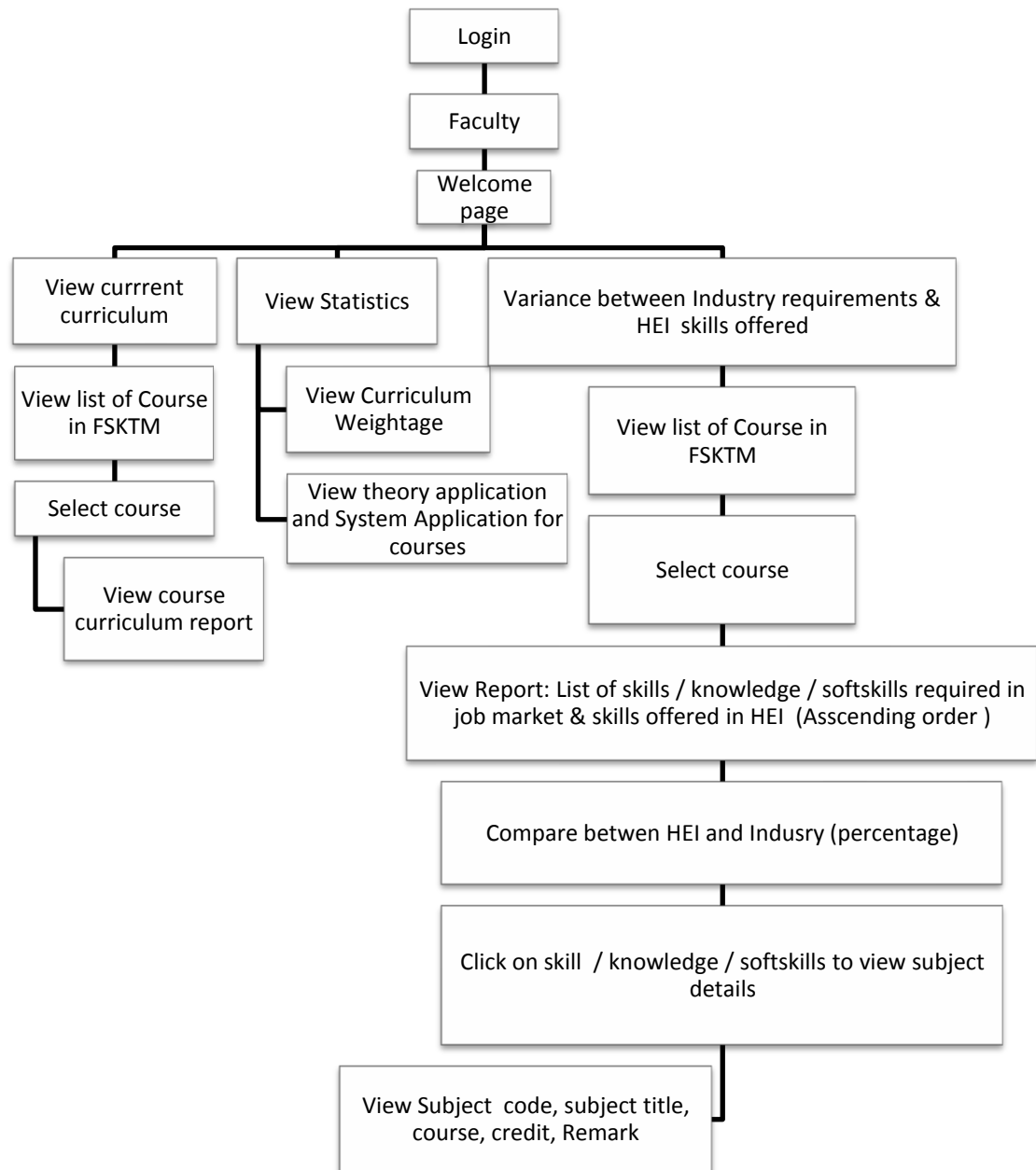


Figure 6.15: Faculty Login Page

6.5 Discussion on Knowledge Management Application

This section provides technical details on the KM application in the curriculum review process. The significant of KM can be seen in the development of the database and while the data of job specification are captured, stored, and reuse that is then applied and analyzed on the existing HEIs curriculum. The curriculum that fails to meet the need of the employer (knowledge and skill) will be highlighted by the KM system for updating the course. This system provides a real-time employment based curriculum. Appendix K shows the class diagram for faculty registration system, employer registration system, student registration system, the use case diagram for the overall KM in HEI and case diagram for the administrator. Figure 6.16 shows the main page of Knowledge Management System webpage of Faculty of Computer Science and Information Technology.



Figure 6.16: Main Page

Figure 6.17 shows the Employer Login Page. The system will pop-up a message box “Invalid Login Information” if either the username or password or both are not valid. Once the employer fill-in the valid username and password, the employer will enter to the Employer page as shown in Figure 6.18.

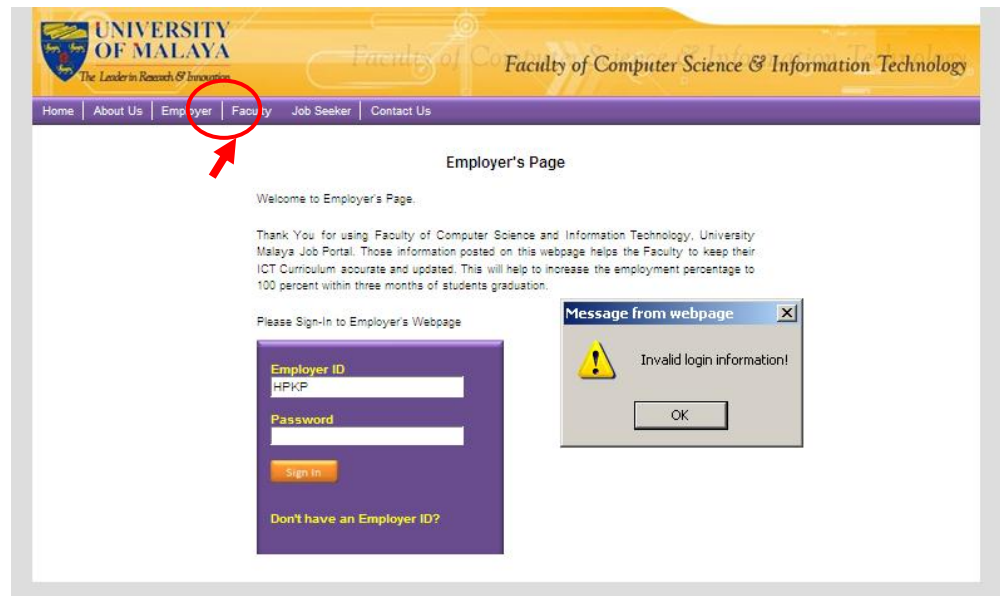


Figure 6.17: Employer Login page



Figure 6.18: Employer Main Menu page

Once the employer select upload job vacancy, the employer need to fill-up the level of education, location job title, detail job title and skills required as shown in Figure 6.19. The detail job title is shown in Figure 6.20. Besides uploading the job vacancy, the employer may also view the application's resume. Here, the employer may sort the applicant's information by education stages, field of studies and the applicant's CGPA. Besides that, the employer also could download the complete resume. Besides that, the user also could sort the information based on the last active date ascending or descending as shown in Figure 6.21.

The screenshot displays the 'Employer's Page' of the University of Malaya's system. The page has a header with the university's logo and name, and a navigation bar with links to Home, About Us, Employer, and Contact Us. The main content area is titled 'Employer's Page' and contains a section for 'Upload Job Vacancy(s)'. This section includes several dropdown menus for 'Level of Education' (Certificate, Diploma, Degree, Masters, PHD), 'Location' (Johor), 'Job Title' (Analyst (Software - IT)), and 'Detail Job Title' (Analyst (Software - IT)). Below these are checkboxes for 'Skill Required (Programming)' such as AI, CASE tool, Cisco, Expert System, Fuzzy Logic, IP addressing, IPv6, JAVA, LAN, MATLAB, Mobile Computing, Network Mgt, Network Security, Networking, Neural Network, Object Oriented Programming / Models, OBJEE, Operating System, OSI layers & TCP/IP layers, Project Mgt, Prolog, Protocols - network Mgt (SNMP, NTP), Real world activities, Robotics, Router / Switch, Software Quality, VHDL, VLSM, WAN, and Wireless network. There is also a text input field for 'Other, Pls Specify'. Below the skills section are checkboxes for 'Database Skill' (DB2, MySql, Oracle, SQL) and 'Other Knowledge' (.NET, ASP.NET, XHTML, XML, XML Web Services, AWT (Animation), C, C#, C++ sound program, COBOL, COBRA, 3D object Modeling, COM+, CSS, CSS, DB2, DHTML, Digital video / images, Domino 8).

Figure 6.19: Job Vacancy page

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Faculty of Computer Science & Information Technology

Welcome, hpkp | Logout

Home | About Us | Employer | Contact Us

Employer's Page

Upload Job Vacancy(s)

Level of Education: ☐ Certificate ☐ Diploma ☐ Degree ☐ Masters ☐ PHD

Location:

Job Title:

Detail Job Title:

Skill Required (Programming):

- ☐ Expert System
- ☐ JAVA
- ☐ Network Mgt
- ☐ Object Oriented Programming / Models
- ☐ Project Mgt
- ☐ Robotics
- ☐ VLSM

Database Skill: ☐ DB2 ☐ MySqi ☐ Oracle ☐ SQL

Other Knowledge:

- ☐ .NET
- ☐ ASP.NET
- ☐ XHTML
- ☐ XML
- ☐ XML Web Services
- ☐ AWT (Animation)
- ☐ C
- ☐ C#
- ☐ C sound program
- ☐ C++
- ☐ COBOL
- ☐ COBRA
- ☐ 3D object Modeling
- ☐ COM+
- ☐ CSS
- ☐ CSS
- ☐ DB2
- ☐ DHTML
- ☐ Digital video / images
- ☐ Domino 8

Figure 6.20: Detail Job Title

UNIVERSITY OF MALAYA
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Faculty of Computer Science & Information Technology

Welcome, hpkp | Logout

Home | About Us | Employer | Contact Us

Employer's Page

View Resume

University Malaya CAMPUS Resume / Internship Search

Education Stage: ☐ Fresh Graduates ☐ Final Year Only ☐ Other Current Students ☐ Internship Posting ☒ All

Field of Studies: ☐ Engineering ☐ IT ☐ Science ☐ Business/Finance ☐ Art/Other ☒ All

CGPA: ☐ >=3.5 ☐ >=3.0 & <=3.5 ☐ <3.0 ☒ All

SEARCH

Figure 6.21: Job sort page

Once the employer sort the applicant's details as shown in Figure 6.21, it will display the results as shown in Figure 6.22 and 6.23.

The screenshot shows the 'Employer's Page' with a 'View Resume' button. Below it, a table titled 'CAMPUS Resume / Internship Search RESULTS' displays search results. The table has columns for Date Last Active, Level of Education, Grade / Result, Expected Salary, Particulars, and Action. Two results are shown for August 15, 2011, and August 19, 2011.

Date Last Active	Level of Education	Grade / Result	Expected Salary	Particulars	Action
15 Aug 2011	Degree	>=3.0 & <=3.5	\$3,000.00	25 Female	View Resume
19 Aug 2011	Diploma	>=3.0 & <=3.5	\$5,000.00	25 Male	View Resume

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Figure 6.22: View student application

The screenshot shows the 'View Student Resume's Page' with a 'Student Resume' button. Below it, a form displays the student's resume details for Chan Fatt Lai, including faculty, gender, education stage, field of studies, CGPA, level of education, age, expected salary, email address, job title, detail job title, skill required, database skill, and other knowledge.

Full Name	Chan Fatt Lai
Faculty	Faculty of Engineering
Gender	Female
Education Stage	Fresh Graduates
Field of Studies	IT
CGPA	>=3.0 & <=3.5
Level of Education	Degree
Age	25
Expected Salary (RM)	\$3,000.00
E-mail Address	fattlai@yahoo.com
Job Title	Analyst (Software – IT)
Detail Job Title	Analyst (Dot Net) (Software – IT)
Skill Required (Programming)	- Object Oriented Programming / Models - Software Quality
Database Skill	- MySql - Oracle
Other Knowledge	.NET - ASP.NET - XML - XML Web Services

[Download Resume](#)

Figure 6.23: View applicant's Resume

Next, we are looking at the Faculty main page as shown in Figure 6.24. There are four main activities found in Faculty main page. It includes of View Current Curriculum, View Statistics of curriculum weightage for each programme and view theory application and system application for courses, compare the current curriculum weightage with employer's needs and to view the variance between employer requirements and faculty offer. In the view current curriculum, the faculty member need to choose the course that they are interested to view (Bachelor of Computer Science (Artificial Intelligence), Bachelor of Computer Science (Computing System & Networking), Bachelor of Computer Science (Management Information System), Bachelor of Computer Science (Software Engineering), Bachelor of Information Technology (Management) or Bachelor of Information Technology (Multimedia) as shown in Figure 6.25.

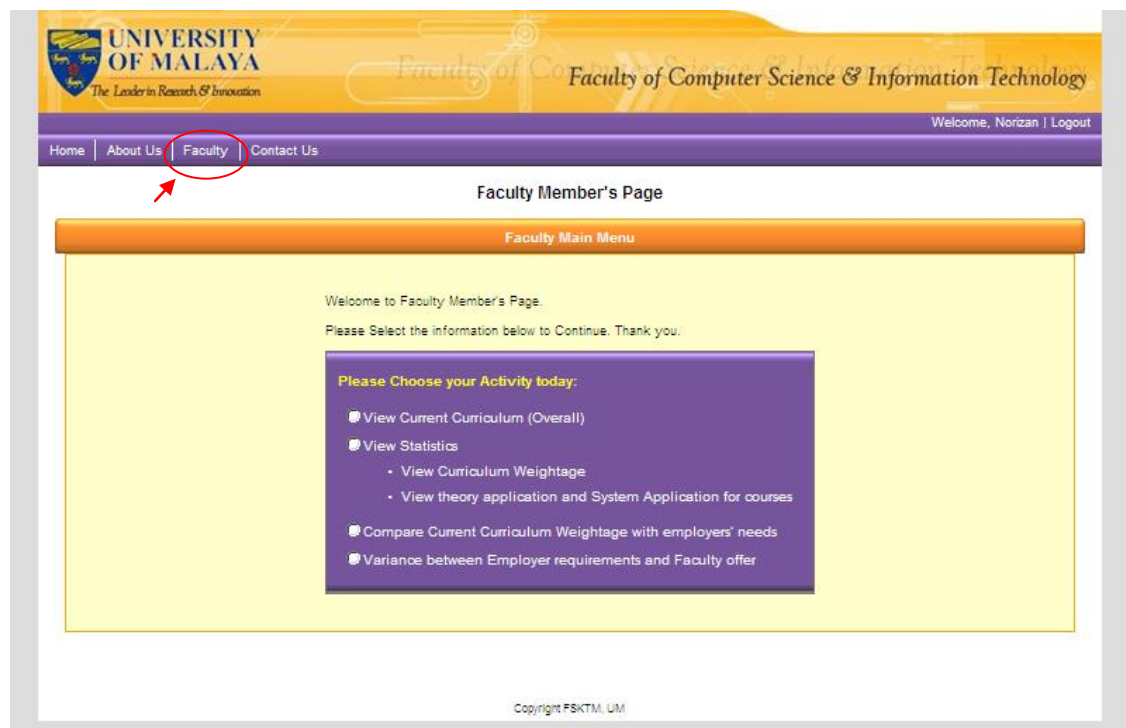


Figure 6.24: Faculty Main Menu

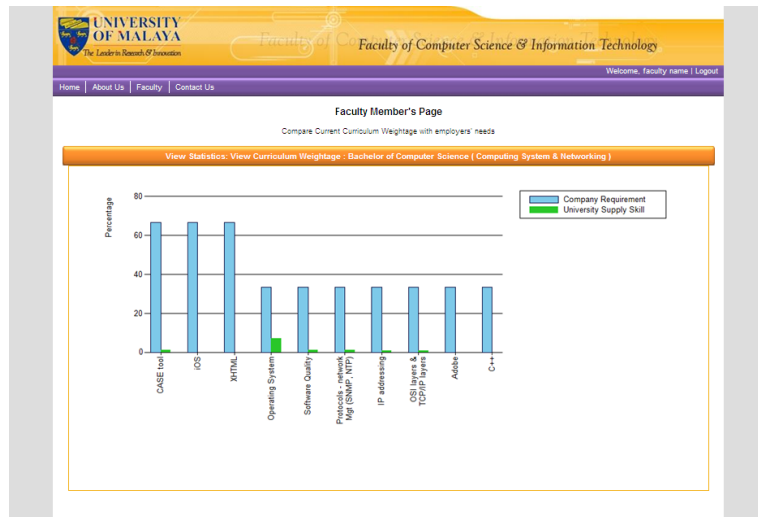


Figure 6.27: View top 10 skills required in Bar chart.

Once the user selects the View Statistics of curriculum weightage for each programme, it will display the theory application chart and system application chart for all the listed courses as shown in Figure 6.28. The percentage is calculated based on the weightage spend on theoretical and practical for each subject in the course.

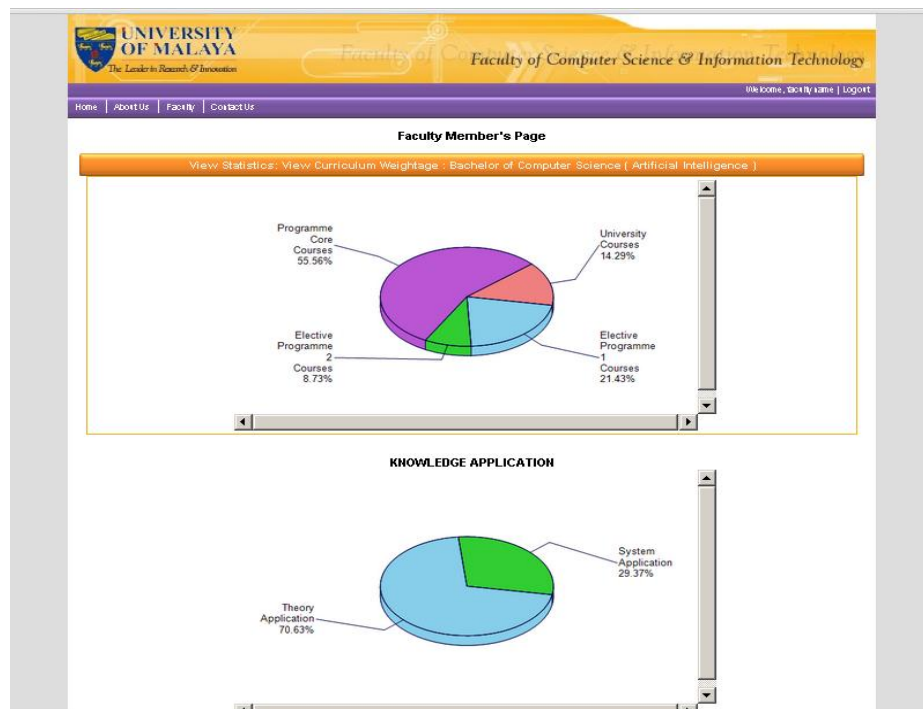


Figure 6.28: View Curriculum Weightage and View Theory application and System application for courses

The user also may click on the variance between employer requirements skills and the faculty offer skills option. This link shows the percentage comparison between the employer and the faculty skills. The employer percentage derived based on the skills that the employer select from the job vacancy page. On the other hand, the employer percentage derived from the percentage that the HEIs assign for each skill in a subject in a course. There is a column labeled variance. The purpose of this column is to display the difference in percentage between the demand of the employer and the supply of HEIs. It is arranged based on descending order as shown in Figure 6.29.

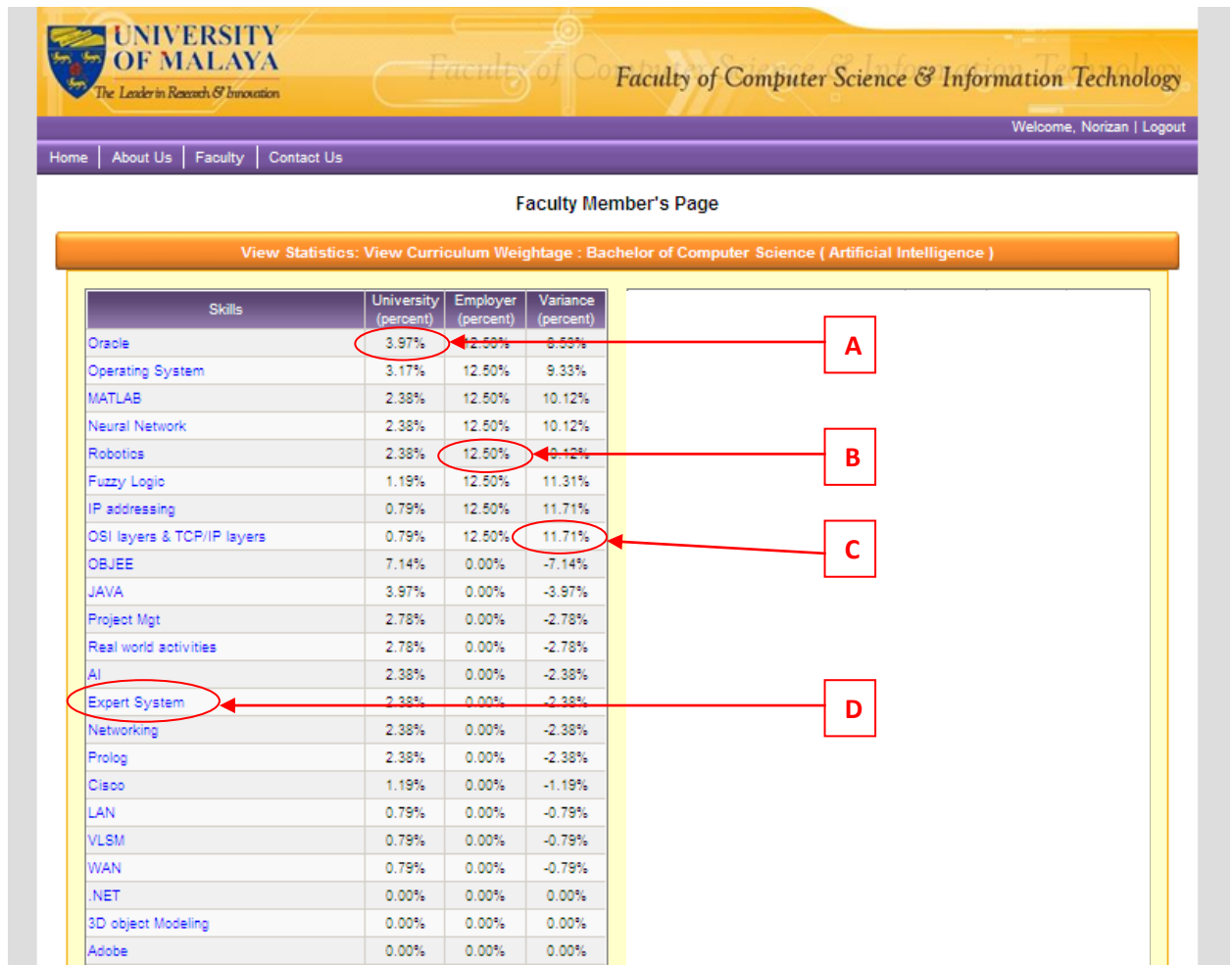


Figure 6.29: Variance between employer skill demand and Faculty skill supply

The formula of the variance was derived upon consultation with a mathematician.

Label “A” in Figure 6.29 shows the percentage of skill required in the faculty. It is calculated as below:

$$\text{Faculty Skill Percentage} = \frac{\text{Credit spend for the skill}}{\text{Total Credit for the Course for graduation}} \times 100$$

Label “B” in Figure 6.29 shows the percentage of skills required by the employer. It is calculated as below:

$$\text{Employer Skill Percentage} = \frac{\text{No. of vacancy(s) available for the specific skill}}{\text{Total vacancies available by employers}} \times 100$$

Label “C” in Figure 6.29 shows the percentage of Variance between the percentage of skills requested by the employer and the percentage of skills supply by faculty. It is calculated as below:

$$\text{Variance (\%)} = \text{Employer Skill Percentage} - \text{Faculty Skill Percentage}$$

The user may also click on each skill to know the subject taught for this skill and the credit hour spend as shown in Figure 6.29 (Label D in Figure 6.29).



Figure 6.30: Skill details on subject taught in HEIs

Besides that, there is also another column labeled Remarks (recommendation) as shown in Figure 6.30. The purpose of this remark column is to advise the faculty member on the action to be taken based on the variance percentage. If the difference is between 1 and 49 percent, then it will be shown as “Remain unchanged” in the remark column. If the variance percentage is more than or equal to 50 percent and lesser than 80 percent, then there will be a remark as “Recommended to increase the Credit hour or time spend”. If the difference is more or equal to 80 percent, then “Immediate action on subject taught; need quick increase in credit hour” will be displayed. If the variance is lesser than 0 percent, then it will display, “need to introduce this skill in curriculum”.

For an example, assume that Oracle skill is covered in four different courses in that programme in semester 1, 2, 3 and 5. The total credit for the course that offers Oracle is 3 credit each x 4 subjects, which are equal to 12 credits. However, for the calculation of the Oracle skill covered in the course, the weightage is calculated based on the hour(s) spend for the Oracle skill. For this purpose, a study need to be done on the course structure and

further information on the skill could be gathered through interviewing the lecturers. In this case, assume that the Oracle credit is spent as shown in Table 6.1.

Table 6.1: Oracle credit spent

	Credit Spend on Oracle	Total course Credit	Total Credit for graduation
Subject 1	1.5	3	115
Subject 2	1.5	3	
Subject 3	2	3	
Subject 4	2	3	
Total Credit spend	7	12	

So, the formula for the “Faculty Skill Percentage” is calculated as below:

$$\begin{aligned}
 \text{Faculty Skill Percentage (for Oracle)} &= \frac{1.5 + 1.5 + 2 + 2}{115 \text{ (Total Credit)}} \times 100 \\
 &= \mathbf{6.1 \%}
 \end{aligned}$$

Table 6.2 shows the total job vacancies available for each skill by the employers.

Table 6.2: Total job vacancies available for each skill by the employers

Employer	Total vacancies available				Total Vacancies
	Skill A (Oracle)	Skill B	Skill C	Skill D	
Employer A	10 (50%)	5 (25%)	2 (10%)	3 (15%)	20
Employer B	20 (40%)	20 (40%)	5 (10%)	5 (10%)	50
Employer C	10 (20%)	10 (20%)	10 (20%)	20 (40%)	50
Employer D	1 (20%)	1 (20%)	2 (40%)	1 20(%)	5
Total vacancy(s) for each skill	41	36	19	29	
Percentage for each skill	41/125*100 = 33%	36/125*100 = 29%	19/125*100 = 15%	29/125*100 = 23%	125

In calculating the employer skill percentage for Oracle skill, 41 vacancies out of the total of 125 vacancies who contributed in the proposed KMS are requesting for Oracle in their requirements. So, the below formula will be used to calculate the employer skill percentage.

$$\begin{aligned} \text{Employer Skill Percentage} &= \frac{41}{125} \times 100 \\ \text{(for Oracle)} & \\ &= \mathbf{32.8\%} \end{aligned}$$

Based on the employer skill percentage and faculty skill percentage, the variance percentage for these two could be calculated. The purpose of the variance percentage is to determine the discrepancy between what is required in the job market and what is being offered in the faculty. So, the variance of skill percentage for the Faculty and Employer are calculated as below:

$$\begin{aligned} \text{Variance \%} &= \text{Employer Skill Percentage } \mathbf{(32.8\%)} - \text{Faculty Skill Percentage } \mathbf{(6.1\%)} \\ &= \mathbf{26.7\%} \end{aligned}$$

So, based on the variance (26.7%), the remark column in the proposed KMS will be shown as “Remain unchanged”.

Figure 6.31 illustrate the student main menu. It includes of View Overall Current Curriculum, View Statistics of curriculum weightage for each programme and view theory application and system application for courses, Upload Resume and View Job vacancy. Once the user select “view current curriculum”, the faculty member need to choose the

course that they are interested to view (Bachelor of Computer Science (Artificial Intelligence), Bachelor of Computer Science (Computing System & Networking), Bachelor of Computer Science (Management Information System), Bachelor of Computer Science (Software Engineering), Bachelor of Information Technology (Management) or Bachelor of Information Technology (Multimedia). Once they choose the course, it will display the overall skills and the weightage spend on that course. The students may also upload their resume page for the employer's view (Figure 6.32) and upload their resume file (Figure 6.33). Besides that, the student also may view the job vacancies available and they could apply job online as shown in Figure 6.34.



Figure 6.31: Student Main Menu



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Faculty of Computer Science & Information Technology

Welcome, hari | Logout

[Home](#)
[About Us](#)
[Job Seeker](#)
[Contact Us](#)

Student's Page

Upload Resume

Full Name

Faculty

Gender

Education Stage

Field of Studies

CGPA

Level of Education

Age

Expected Salary (RM)

E-mail Address

Job Title

Detail Job Title

Skill Required (Programming)

☐ AI
☐ CASE tool
☐ Cisco
☐ Expert System

☐ Fuzzy Logic
☐ IP addressing
☐ IPv6
☐ JAVA

☐ LAN
☐ MATLAB
☐ Mobile Computing
☐ Network Mgt

☐ Network Security
☐ Networking
☐ Neural Network
☐ Object Oriented Programming / Models

☐ OBUJEE
☐ Operating System
☐ OSI layers & TCP/IP layers
☐ Project Mgt

☐ Prolog
☐ Protocols - network Mgt (SNMP, NTP)
☐ Real world activities
☐ Robotics

Figure 6.32: Upload Resume

☐ Prolog
☐ Protocols - network Mgt (SNMP, NTP)
☐ Real world activities
☐ Robotics

☐ Router / Switch
☐ Software Quality
☐ VHDL
☐ VLSM

☐ WAN
☐ Wireless network

Other, Pls Specify

Database Skill
☐ DB2
☐ MySQL
☐ Oracle
☐ SQL

Other Knowledge
☐ .NET
☐ ASP.NET
☐ XHTML
☐ XML

☐ XML Web Services
☐ AWT (Animation)
☐ C
☐ C#

☐ C sound program
☐ C++
☐ COBOL
☐ COBRA

☐ 3D object Modeling
☐ COM+
☐ CSS
☐ CSS

☐ DB2
☐ DHTML
☐ Digital video / images
☐ Domino 8

☐ Dreamweaver
☐ EJB
☐ ERP
☐ Adobe

☐ ESSBASE
☐ Front Page
☐ Game Programming
☐ HTML

☐ Information Accuracy
☐ iOS
☐ Adobe Photoshop Premiere
☐ IT Infrastructure

☐ J2EE
☐ Java 2D
☐ JAVA SCRIPT
☐ JBOSS

☐ JDBC
☐ JMF
☐ JSP
☐ AFX

☐ Linux
☐ Lotus Notes
☐ Ms Project
☐ My SQL

☐ MySQL
☐ OLAP
☐ Open GL
☐ OSM

☐ OSS
☐ Android
☐ PHP
☐ PHP

☐ RDBMS
☐ Apache
☐ Software Testing
☐ SQL

☐ Sunolaria
☐ Troubleshoot Hardware
☐ Troubleshoot Linux
☐ Troubleshoot Macintosh

☐ Troubleshoot Network
☐ Troubleshoot PC
☐ Troubleshoot Windows
☐ Unix

☐ API Programming
☐ Visio
☐ Visual Basic
☐ Visual C#

☐ VRML
☐ Web Design
☐ Weblogic
☐ Windows

Other, Pls Specify

UPLOAD RESUME

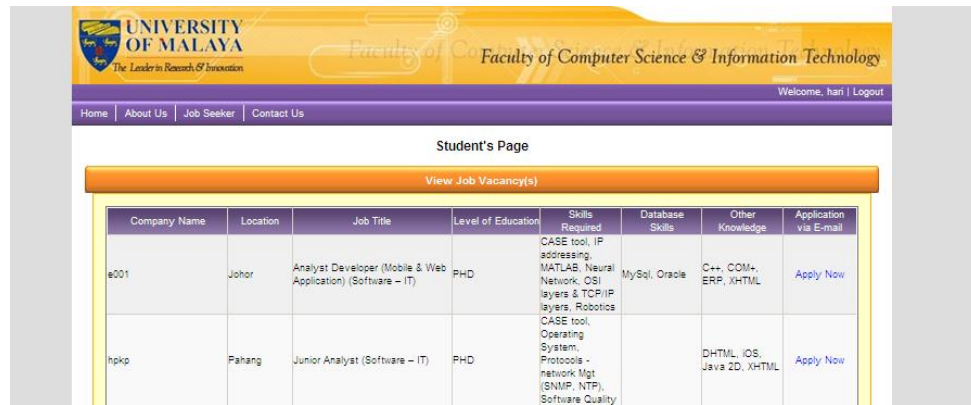
Browse...

SUBMIT

RESET

Upload resume file through browsing

Figure 6.33: Upload Resume File through Browsing



The screenshot shows the 'Student's Page' with a 'View Job Vacancy(s)' button. Below it is a table with two rows of job vacancies. The table has columns for Company Name, Location, Job Title, Level of Education, Skills Required, Database Skills, Other Knowledge, and Application via E-mail.

Company Name	Location	Job Title	Level of Education	Skills Required	Database Skills	Other Knowledge	Application via E-mail
is001	Johor	Analyst Developer (Mobile & Web Application) (Software – IT)	PHD	CASE tool, IP addressing, MATLAB, Neural Network, OSI layers & TCP/IP layers, Robotics	MySQL, Oracle	C++, COM+, ERP, XHTML	Apply Now
hpkg	Pahang	Junior Analyst (Software – IT)	PHD	CASE tool, Operating System, Protocols - network Mgt (SNMP, NTP), Software Quality		DHTML, iOS, Java 2D, XHTML	Apply Now

Figure 6.34: Student View Job Vacancies

Figure 6.35 shows the Administrator's main page. It consists of two main menu viz, the system maintenance and user maintenance. System maintenance comprise of job maintenance, job category maintenance, job position maintenance, course maintenance, subject maintenance, skill maintenance, course subject maintenance, subject skill maintenance, course skill maintenance, course category maintenance, programme course category maintenance (Figure 6.36). On the other hand, user maintenance comprise of faculty member details maintenance, student details maintenance and employer details maintenance (Figure 6.37).



Figure 6.35: Administrator Main Menu

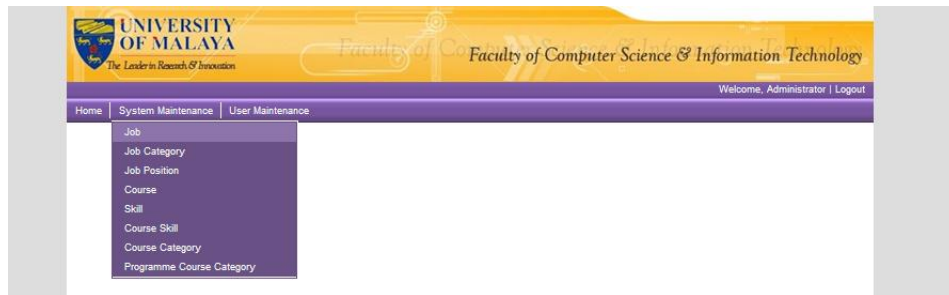


Figure 6.36: System Maintenance



Figure 6.37: User Maintenance list

Figure 6.38 and Figure 6.39 show the User Maintenance page.

Faculty Member						
User Name	Full Name	Date of Registration	Position	E-mail Address	Status	Action
f001	Faculty 001	20 Aug 2011	unknown	F001@gmail.com	Active	Edit Delete
f002	Faculty 002	22 Aug 2011	unknown	f002@gmail.com	Inactive	Edit Delete
faculty	faculty name	18 Aug 2011	position	email@mail.com	Active	Edit Delete

Figure 6.38: User Maintenance

Faculty Member	
User Name	f001
Full Name	Faculty 001
Registration No.	1234567
Date of Registration	20 Aug 2011
Position	unknown
Address	1 2 3
Password	123
E-mail Address	F001@gmail.com
Contact	0123456789
Status	Active
Save Cancel	

Figure 6.39: User Details Maintenance

6.6 How well does the KM tool support HEIs to support the curriculum review process?

Finally, the study focuses on how well the KM tool could support the HEIs to support the curriculum review process. Questionnaires were the primary source used in this study. There questionnaires were divided into two parts. Part A represents the satisfaction and functionality of the proposed KM Tool and part B represents the general comments about the proposed KM tool with four open-ended questions in order to gain in-depth understanding of KM tool to support the HEI curriculum review process. Therefore, an evaluation of the KMS prototype was conducted on March 2011. Ten graduated students, twenty current students, ten employers, ten academic staff and five non-academic staff involved in the system evaluation. Due to the difficulty to gather all participants at the same time for the prototype evaluation, the evaluation was conducted at the time convenient to the participant. As a result, the prototype evaluation took three (3) weeks to complete. It was arranged in such a way that one examiner evaluate the prototype at one time. For the graduated students, the evaluation was carried out in open areas that are convenience for them. For the current students, the evaluation was carried out outside their classroom. For the non-academic staff, the evaluation took place in their office and finally for the academic staff, the evaluation was carried out in the respective educators' rooms or in a discussion room with personal computer installed. A notebook computer with the preinstalled software was used in the evaluation to avoid the occurrence of the network reliability problem. The evaluation procedure consisted of fifteen minutes' briefing on the purpose of the prototype, fifteen minutes' demonstration on the functionality of the system modules, and twenty minutes for the respondents to answer the evaluation questionnaire. A questionnaire (Appendix M) was completed at the end of the session. The questionnaires

were then checked for completeness (i.e. that all questions had been answered). A total of twenty six questions were included in the evaluation form. The questions are:

1. Do you agree the KMS is easy for new users to learn to perform the task?
(Learnability)
2. Do you agree the KMS is easy to accomplish the task? (Intuitiveness)
3. Is the content easy to understand and internalize? (Ease of Comprehension)
4. Are fonts big enough? (Legibility)
5. Is there enough contrast between the text and its background? (Legibility)
6. Is the information accurate, of high quality and well-written? (Reading
Enjoyment)
7. Is the KMS webpage categorized and organized well? (Information Architecture)
8. Do you feel satisfied after interacting with the website? (Fulfillment)
9. Do you feel that you have obtained value from using the website? (Usefulness)
10. Is the experience of being on the website fun and not burdensome? (Enjoyment)
11. Do you feel happy, excited, pleased, etc. when you interact with the site?
(Positive Emotions)
12. The system improves the user's knowledge on the skills required by employers
for the field of study or the course offered.
13. The proposed KMS allow users to view the overall current curriculum
14. The statistics which shows the curriculum weightage; theory application and
system application for a course is very useful for users
15. The upload resume function is very simple to use
16. It is very easy to view the job vacancies

17. The variance between employer requirements and faculty offer is very helpful in curriculum review process in the future.
18. The table that shows the variance is very clear
19. The bar chart that shows the top ten skills required by the employers are very helpful for curriculum review process
20. I'm satisfied with the remarks (the action to be taken based on the percentage of variance shown)
21. The skills shown in the upload job vacancy page is satisfactory and up-to-date
22. The job vacancy page is very easy to understand & user friendly
23. It is very convenient to view the applicant's details
24. It is very fast to download the student's resume
25. The sort function in applicant's details are very helpful in filtering the interested candidates
26. Overall, I'm satisfied with the proposed KM tool and it could be helpful in curriculum review process

Table 6.3 shows the evaluation of the respondents on the proposed KM tool. In calculating the mean and standard deviation for items in Table 6-3, the following scores were used: 'Strongly Disagree' = 1, 'Disagree' = 2, 'Somewhat Agree'=3, 'Agree'=4 and 'Strongly Agree' = 3. Based on the evaluation, almost all the respondents were satisfied with the proposed KM tool as the mean was between 3.80 and 4.90. The respondents were agreed that KMS is easy for new users to learn to perform the task with a mean of 4.30 for graduated students, 4.25 for current students, 4.40 for employers, 4.00 for academic staff and 4.20 for non-academic staff. This majority all the respondents agree or strongly agreed.

Table 6.3: Evaluation of the respondents on the proposed KM tool

	Graduated Student (n=10)		Current Student (n=20)			Employer (n=10)			Academic Staff (n=10)			Non-Academic Staff (n=5)	
	Mean	Std. Deviation	Mean	Std. Deviation		Mean	Std. Deviation		Mean	Std. Deviation		Mean	Std. Deviation
Q1	4.30	0.82	4.25	0.64	Q1	4.40	0.70	Q1	4.00	0.47		4.20	0.83
Q2	4.40	0.53	4.20	0.65	Q2	3.90	0.32	Q2	4.10	0.74		4.40	0.55
Q3	3.90	0.84	4.00	0.52	Q3	4.00	0.47	Q3	4.30	0.67		4.00	0.71
Q4	4.10	0.57	4.00	0.46	Q4	4.10	0.57	Q4	4.00	0.67		4.40	0.55
Q5	4.20	0.74	4.20	0.56	Q5	3.80	0.42	Q5	4.30	0.67		4.40	0.55
Q6	4.40	0.79	4.10	0.41	Q6	3.90	0.32	Q6	4.30	0.67		3.80	0.84
Q7	4.50	0.84	4.10	0.55	Q7	3.90	0.32	Q7	4.20	0.79		4.20	0.84
Q8	4.40	0.53	4.10	0.31	Q8	3.90	0.32	Q8	4.10	0.74		4.20	0.45
Q9	4.50	0.70	4.05	0.45	Q9	3.90	0.32	Q9	4.40	0.52		4.20	0.84
Q10	4.30	0.53	4.20	0.60	Q10	3.90	0.32	Q10	4.30	0.67		4.00	0.71
Q11	4.50	0.67	4.00	0.52	Q11	3.90	0.32	Q11	4.30	0.67		4.40	0.55
Q12	4.20	0.53	4.15	0.46	Q12	3.80	0.42	Q12	4.40	0.52		4.40	0.55
Q13	4.60	0.63	4.20	0.49	Q13	3.80	0.42	Q13	4.10	0.74		4.00	0.71
Q14	4.80	0.70	4.10	0.52	Q14	3.90	0.32	Q14	3.80	0.63		4.40	0.55
Q15	4.10	0.42	4.20	0.45	Q15	3.90	0.32	Q15	4.20	0.92		4.60	0.55
Q16	4.30	0.57	4.20	0.41	Q16	3.90	0.32	Q16	4.50	0.71		4.40	0.55
Q26	4.70	0.48	4.35	0.59	Q26	4.40	0.70	Q26	4.20	0.63		4.60	0.55
					Q21	4.2	0.63	Q17	4.80	0.42		4.20	0.84
					Q22	4.1	0.57	Q18	4.40	0.51		4.80	0.45
					Q23	4.2	0.63	Q19	4.40	0.69		4.00	0.71
					Q24	4.4	0.52	Q20	4.50	0.85		4.40	0.55
					Q25	4.2	0.42						

The respondents agreed that the contents in the KM tool were easy to understand and internalize. This was supported with a mean between 3.90 and 4.30. The respondents were also asked if the information on the KM tool were accurate, of high quality and well-written. Based on the analysis, the mean was between 3.80 and 4.40. This shows majority of the respondents were satisfied. When the respondents asked whether they obtained value from using the website, the mean was between 3.90 and 4.50. This shows the positive satisfaction of the respondents.

Followed by that, the respondents were asked on the overall functionality of the Modules in the KM tool. Majority of the respondents agreed that the system improves the user's knowledge on the skills required by employers for the field of study or the course offered. This is supported by the graduated student with a mean of 4.20 and standard deviation of 0.53, current student with a mean of 4.15 and standard deviation of 0.46, employer with a mean of 3.80 and standard deviation of 0.42, academic staff with a mean

of 4.40 and standard deviation of 0.52 and non-academic staff with a mean of 4.40 and standard deviation of 0.55.

Based on the analysis, majority of the respondents also agreed that the proposed KMS allow users to view the overall current curriculum. This is supported by the graduated student with a mean of 4.60 and standard deviation of 0.63, current student with a mean of 4.20 and standard deviation of 0.49, employer with a mean of 3.80 and standard deviation of 0.42, academic staff with a mean of 4.10 and standard deviation of 0.74 and non-academic staff with a mean of 4.00 and standard deviation of 0.71.

When the respondents were asked on the statistics which shows the curriculum weightage; theory application and system application for a course is very useful for users, most of the respondents gave positive feedback. This is supported by the graduated student with a mean of 4.80 and standard deviation of 0.70, current student with a mean of 4.10 and standard deviation of 0.52, employer with a mean of 3.90 and standard deviation of 0.32, academic staff with a mean of 3.80 and standard deviation of 0.63 and non-academic staff with a mean of 4.40 and standard deviation of 0.55.

Based on the analysis, most of the respondents were satisfied with the upload resume function as it very simple to use and they also agreed that it was very easy to view the job vacancies. This is supported by the mean between 3.90 and 4.60 with a standard deviation between 0.32 and 0.71.

Based on the academic and non-academic evaluation on the system, it was highlighted that, the variance shown in the KM tool between employer requirements and faculty offer was very helpful in curriculum review process. This is supported by the academic staff with a mean of 4.80 and standard deviation of 0.42. This is further supported by the non- academic staff with a mean of 4.20 and standard deviation of 0.84.

They also added that the table that shows the variance is very clear. This is supported by the academic staff with a mean of 4.20 and standard deviation of 0.84. This is further supported by the non- academic staff with a mean of 4.80 and standard deviation of 0.45.

During the evaluation, both the academic and non-academic staff agreed that the bar chart which shows the top ten skills required by the employers in the KM tool are very helpful for curriculum review process. This is supported by the academic staff with a mean of 4.40 and standard deviation of 0.69. This is further supported by the non- academic staff with a mean of 4.00 and standard deviation of 0.71. The respondents were also satisfied with the remarks column in the KM tool, which propose the action to be taken based on the percentage of variance shown. This is supported by the academic staff with a mean of 4.50 and standard deviation of 0.85. This is further supported by the non- academic staff with a mean of 4.40 and standard deviation of 0.55.

Based on the evaluation, the employers agreed that the skills shown in the upload job vacancy page are satisfactory and up-to-date. This is supported by the employers' feedback on questionnaire with a mean of 4.20 and standard deviation of 0.63. The employers also agreed that the job vacancy page is very easy to understand and it is user friendly. This is supported with a mean of 4.10 and standard deviation of 0.63. The employers were also satisfied with the system as the KM tool was very convenient to view the applicant's details and it was very fast to download the student's resume. This was supported by the mean of 4.4 and 4.2 respectively, supported by the standard deviation of 0.52 and 0.42. Based on the four open-ended questions that were asked in the questionnaire, the respondents were filled with valuable comments (see Appendix N).

A current student, Norma (TCS1) commented that,

'... It is a good idea to connect the HEI, industry and students together'.

Another graduated student, Suzan (TGS1) said,

‘... those information provided by industry to HEI will help to enhance the curriculum review process’.

Letchu (TCS2) commented that,

‘... The students will definitely gain benefits of the KM ‘.

Another graduated student Rosli (TGS2) added that,

‘... the proposed system should improve the curriculum which increase the satisfaction of the employer’s need’

A current student, Kamal (TCS3) mentioned that,

‘.... no doubt the system is a good system which will be helpful for this faculty and any other HEI’.

One of the faculty members, Dr.Vani (THEIA1) said,

‘ ... satisfied with the overall system’.

Dr.SitiNor (THEIA2) mentioned,

‘...will be very helpful for the curriculum review committee members while reviewing the curriculum processes. It gives the justification for changes in the curriculum as all the skills required in the job market are listed carefully’.

A non academic staff, MsLilian (THEINA1) commented that,

‘The students should take this opportunity to look for part time job which provides them hands-on experience’.

Ms.Payee (THEINA2) added that,

‘If the KM used accordingly, it will provide benefits from many aspects to the HEI’.

An employer, Ms.Salwah (TE1) commented that,

‘... it is a good idea to propose KM in curriculum review process. If the Industry and HEI work together, it will definitely help HEI in the curriculum review processes’.

In addition to that, Ms.Mizah (TE2) stressed that,

‘... If both HEI and industry are active in sharing information, it will help HEI to produce graduates with most demanded competencies by the industry in the job market’.

Ms.Lili (TE3) added that

‘...happy with your proposed KM system. It should help HEI’.

6.7 Summary

This chapter presented the website development that would serve their participants. In designing the prototype system, the WST conceptual framework was used as discussed in this chapter. UML diagrams were used to express the design of software projects. This chapter concludes that, KM tool could support HEIs to support the curriculum review process to produce competent graduates as discussed. Chapter 7 summarizes the research by answering the all research questions, future research, conclusions and contribution.