UTP Research Recognition Award System: with Decision Support processing

By
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DISSERTATION

Submitted to the Business Information System Programme
in Partial Fulfilment of the Requirements for
the Degree
Bachelor of Technology (Hons)
(Business Information System)

Universiti Teknologi Petronas
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CERTIFICATION OF APPROVAL

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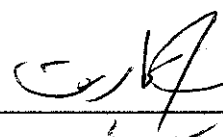
Approved:



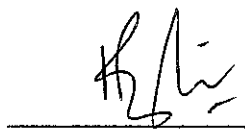
Ms Mazeyanti Mohd Ariffin

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK

April 2007

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



Hazlinda binti Zainudin

ABSTRACT

Based on the main title, the focus of this Final Year Project is on the development of a web-based decision support system. The specific users for this application are the staffs in Research Enterprise Office (REO) of University Technology of Petronas (UTP) and also all the researchers that involve in the research activities. This Decision Support System (DSS) main objective is to help the users in selecting the most suitable candidates to receive several awards available during the 'Employee Recognition & Award' event. Other than that, this project also has the objectives to provide a centralized database system to store all information regarding the research works available in UTP and also to eliminate the paper-based forms usage in order to ensure data consistency and integrity. All those objectives are meant to overcome all the problems that are currently facing by the REO staffs. Among the problems are; the time consuming process to manually review all profiles of all researchers available in UTP, the loss of data consistency, and also the inefficient way to make a decision within a department. The scope of study for this project is initially started by identifying the basic underlying concept to develop a DSS and its relation with a web-based system. It's also covered the issue of developing a centralized database system and also the implementation of production rules by using PHP scripting. The methodology that has been followed for the development process of this project is based on the findings from the journal. It includes several activities such as research, conceptualization, discussion, brainstorming, interview, observation, design, and also testing. This DSS will be a Web-based system in order to ensure its availability to the target users. However, to ensure data confidentiality, it will be published only in the UTP Intranet. It consist all main components of a DSS; a database, a search (inference) engine, production rules, weightage allocation and also user-interface.

ACKNOWLEDGEMENTS

First and foremost, my big thank you goes to my supervisor, Ms Mazeyanti Mohd Ariffin, who has spent some times to help me in selecting my Final Year Project topic. Also thanks for her guidance in helping me to complete this project.

My special thanks also go to Mr Zulkifli, who has helped me to arrange several sessions with people in REO in order to let me know what kind of system needs by their department. Thank you for your time and also your ideas.

Last but not least, my special gratitude for any other persons who have either directly or indirectly involved with this project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

REO Research Enterprise Office

DSS Decision Support System

UTP University Technology of PETRONAS

CHAPTER 1
INTRODUCTION

1.1 Background of Study

'UTP Research Recognition Award System' is a system developed to help the REO personnel in deciding the potential candidates among all the individual researchers and research teams available in UTP to be acknowledged and receive the awards. This application is really useful because it can perform the overall process of choosing the potential candidates to be awarded automatically.

Based on the given scenario, this system is developed in order to provide a tool that can be used to make the decision in a lesser time with a more efficient way. There are several DSS concept applied in the system such as the weightage (value) allocation, the production rules, the search (inference) engine and also the decision support algorithm. Although the application capable to process everything automatically, it will not totally replace the human role in the decision making process. It is only to assist the decision making process done by humans. It's up to the people that involve in the decision making process whether to totally rely on the result provides by the system or use the result only as a supporting fact in making the final decision.

Basically, this system will help the REO personnel in deciding the potential candidates to receive the awards. Before choosing the winners, they must look at the several criteria and external factors that available within each and every potential candidate. The two awards available and the criteria it should adhere to are concluded in the figure in the following page.

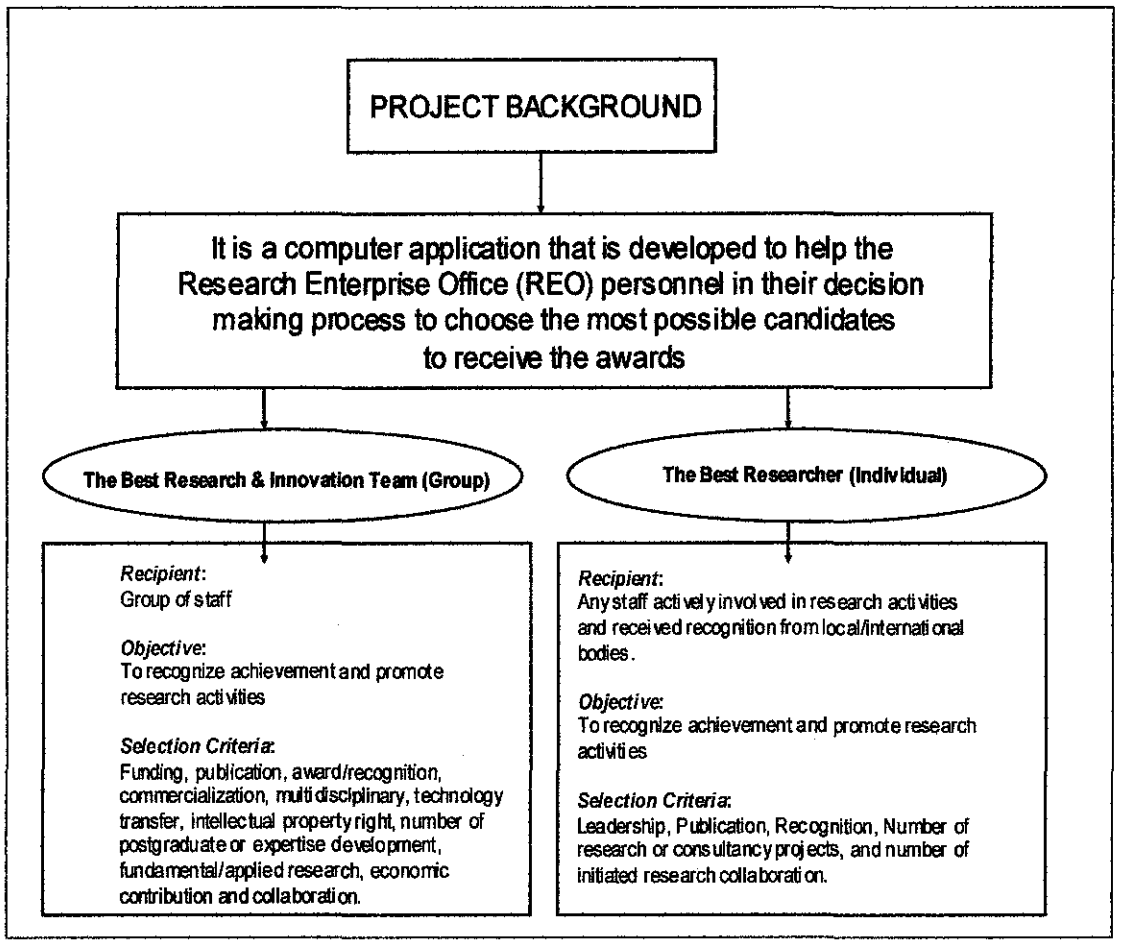


Figure 1 List of Awards

Basically there are three types of users for this system. The first one is the applicants or all the individual researchers and research teams that conduct research activities within UTP. The second user would be all the head programs of UTP. They will need to review and filter all the applications according to their own departments. Upon their approval, then only the applications can proceed to the next level. The third user will be the REO staff themselves. Basically, they are the key users for this system. Based on the data collected from all applicants, this system will suggest the winners for the awards, to the REO staff.

Since there are several types of users for this system, it will be a web-based in order to make it more visible and easy to access by all the users. Therefore, this system will available in UTP intranet later on so that all the users can access it whenever and wherever within the UTP campus.

1.2 Problem Statement

1.2.1 Problem Identification

After an interview session with several REO staff, several problems regarding the process of selecting potential candidates for the awards have been identified. The main problems are:

- The paper-based forms that are currently in used are difficult to store and have the possibilities to be misplaced.
- There is no standard format to fulfil the paper-based forms. Therefore, the applicants tend to fulfil the forms based on their own preferences.
- The decision to choose the research projects or individual researchers that are eligible for the awards is difficult and complicated since the staff in-charge will need to review many profiles because there are hundreds of researchers and research works available in UTP.
- There is no centralized database available in REO that can be used to store information about all researchers and research works that have been conducted in UTP.

1.2.2 Significance of the Project

Upon knowing the problems, a brainstorming session has been conducted with the people involved in the decision making process in order to know the methods or steps that can be taken to overcome the problems they are experiencing at the moment. At the end of the session, it was agreed that a computer application which can automatically handle the overall process should be developed. This application should be able to address all the issues that have been disclosed by the REO staff regarding the problems that they are facing now.

Therefore, the system that is to be developed will solve all the problem statements which will bring benefits to the REO staff. The development of this system will be an advantage to the REO staff as it can provide a good mechanism to collect data from

all researchers and research teams that available in UTP and also provide a centralized database system to store all the information gathered from them. Other than that, the project also important as it can also be a supporting tool in identifying the potential winners for the awards.

At the end, this project will bring significant impact to REO department as it can improve the decision making process done by REO personnel in finding the potential candidates for the awards, by providing a tool that can support that decision making process. It is also beneficial in which it can improve the data collection process from all the researchers and research teams available in UTP by providing a standard form for everyone and later on store the data in a centralized database.

1.3 Objective and Scope of Study

As for this project, the objectives to develop the 'UTP Research Recognition Award System' are:

- To decide on which researcher and research works are deserved to be awarded during the 'Employee Recognition & Award' event.
- To develop a tool that can be used by the REO personnel in helping and supporting their decision making to select potential candidates for the awards.
- To have a centralized database that capable to store all information about individual researchers and research works that has been done in UTP.
- To standardize the form fulfilment process

As for the scope of study, few areas have been identified in order for the project to be well-completed by the end of the two-semester period. They are:

- To do the research on the decision support system concept
- To learn and study the connection between decision support system with online web-based system
- The weightage allocation
- The production rules algorithm
- Data storage within a centralized database system

- Server-side scripting
- User interface

CHAPTER 2
LITERATURE REVIEW/THEORY

Any successful decision making is strongly dependent upon various capabilities which include the effective acquisition, storage, distribution, and sophisticated use of the knowledge of the human experts in the field. In the context of computer-aided systems for monitoring and information processing, these capabilities would be achieved by developing a decision support system (DSS) [1]. DSS is a computer-based system that aids the process of decision making and it should be developed in a way so that it can be interactive, flexible, and adaptable to any kind of information system and also capable for supporting the solution of a non-structured management problem [2].

A DSS attempts to help the decision making process done by humans, mostly by the implementation of certain rules into the system [1]. Based on the rules set within it, a DSS capable to provide one solution or final result which can be used to support the decision making process done by humans in various areas. For this project, a production rule has been set in order for the search engine to find the final result. The production rule in this system is represented in IF-THEN rules that combine the condition and the conclusion for handling a specific situation. The IF part indicates the condition for the rule to be activated and the THEN part shows the action or the conclusion if all IF conditions are satisfied [1]. As for example, this system has a rule to identify the winner for the gold award. The sample rule for this condition is shown in the codes below.

```
IF category = individual, AND main criteria =
funding, AND total funding = more than RM 500,000,
AND total score = more than 85%, THEN the award
received = gold.
```

There are 18 rules altogether included in this system in order to give the precise result that can really help the clients' decision making process.

Another crucial concept within a DSS is that it should have the weightage allocation concept. By having the weightage, then only the rules set in the system can be followed [10]. For this system, the weightage allocation is triggered at the time users fulfil the electronics application forms. The weightage is given according to the level. For example, if the question asking about involvement of the researcher in any exhibition, the e-forms may provide candidates with two different answers. One answer is 'LOCAL EXHIBITION' while another answer is 'INTERNATIONAL EXHIBITION'. Let say if Candidate 'A' answer is 'LOCAL EXHIBITION' for this question where else Candidate 'B' answer is 'INTERNATIONAL EXHIBITION'. Candidate B will gain more points based on the answer given since the weight for his answer is more than the other answer. This weightage for each question will be assigned in the system and the weightage will be higher if the answer is better. Based on the example, International level is of course better than the Local level. That is why score or point to those who have joined exhibition in International level will be higher than those who only join the exhibition up to the local level only.

It is also believed that the most successful application of Artificial Intelligence (AI) in decision making so far is the development of DSS since it can act as a 'consultant' or 'advisor' to decision makers [3]. The usage of DSS is believed to be cheaper compared to the usage of human experts in the long-term scenario. However, DSS are relatively costly to develop even though it is easy and cheap to operate.

DSS has been applied in many ways and various fields which are mean to make human's life simple and even easier. Nowadays, DSS can even be used in fields like Agricultural, Economical, Educational, Corporate, etc in helping the decision making process within that particular fields [4]. It is not denied the usage of DSS capable to increase the profits, to provide efficient in daily work as well as to cut costs for thousands of organizations that have implemented it. As for example, we can see the

application of DSS technology in the domain of environmental management is particularly appropriate in order to preserve and disseminate efficiently valuable and scarce expertise at reasonable costs. The Landfill Restoration Plan Advisor (LRPA) is a DSS designed for the usage in the planning of sanitary landfill restoration [5].

Taking another example which is closely related to this project is the development of a DSS at the Pennsylvania Department of Labour and Industry. Within this particular department, the consultants and department staff implemented a Web-based, Knowledge-driven DSS. The Expert Assistance System for Examiners (EASE) is a web-based application designed to assist in resolving unemployment insurance claims [6]. The system was built beginning in 1998 by using the EXSYS system and Internet technologies on a Microsoft Windows NT platform. The EASE project is within the same area with this project, which is under human resource area. However, both projects are totally different because EASE is used to assist in the matter of unemployment insurance claims where else this project is to choose best candidates to be awarded.

Another example of previously developed DSS is used as the supporting tool in the evaluation process. This DSS called Web-based Employee Performance Appraisal Decision Support System. This particular DSS is actually an e-Government integrated solution that used for evaluating the performance of individual employee. Its usage generally can automate the employee performance review and also manage the evaluation process so that it became consistent, has integrity, and also precise [7]. Basically, this particular DSS has the same objective with this project – to evaluate and review the performance of individual employee (but this project evaluates individual researchers and research teams).

However, this project has different kind of criteria that will be the main concerns for the evaluation process. Based on [8], it is clearly shown that the judging criteria used for that particular organization is somehow a bit different from those criteria used in the REO [9]. The criteria used for the evaluation can be varies since different organization

will have different major concerns from one another.

As a general condition, a DSS consists of a database, a model base and also a user interface [10]. Depending on the system, each of these components may be very simple or highly elaborate. The database, or in advanced systems, a database management system (DBMS) or a data warehouse, consists of structured, real-life information, such as customer account records, product sales history, employee schedules, or manufacturing process statistics [1]. The model base, or model base management system (MBMS), contains one or more models for the kind of analysis the system will perform. For example, if the purpose of the system is to supply sales projections under different conditions, one model might be a linear regression formula derived from past sales and other factors. The user interface integrates the two into a coherent system and provides the decision maker with controls for—and possibly feedback about—managing the data and the models. For this project, those entire basic elements will be included to ensure this DSS can be fully used as a supporting tool.

A DSS can be either a stand-alone or a web-based system. This project will be a web-based DSS in order to make it available and accessible for all users. There are lots of advantages to develop a web-based DSS rather than developing a stand-alone system [11]. The web increased access to DSS and it is also increase the use of a well-designed DSS in an organization. Using a Web infrastructure for building DSS improves the rapid dissemination of best practices analysis and decision-making frameworks. The web also provides a way to manage a company's knowledge repository and to bring knowledge resources into the decision making process. One can hope that Web-based delivery of DSS capabilities will promote and encourage ongoing improvements in decision making processes [12]. For this specific project, it is crucial to make the system as a web-based since the system should always be visible and transparent to key users in order to fully utilize the functionalities it has. That is why it is a web-based and will be published in the UTP intranet.

Besides that, some surveys have also been conducted to identify the many reasons why companies should developed and used DSS in their organizations. The reasons include; companies work in an unstable or rapidly changing economy, companies want to implement electronic commerce, the need for new , timely and accurate information, the high demand for high-quality of decision making, the need to improve communication within organizations and the most important factor is to reduce the cost of decision making process [1], [7]. Based on those advantages, this project should capable to provide some (if not all) the advantages listed to the organization that involved for this project. However, it is believed that this project will benefit REO at least in ensuring their decision making process becomes more efficient and faster. This DSS will be a supporting tool in order to improve the decision making process and also to enhance the quality of the decision done.

CHAPTER 3
METHODOLOGY/PROJECT WORK

In order to ensure the smoothness of the project completion work, all steps and procedures to be taken have to be thoroughly clarified. This methodology section will briefly show the pre-determined track.

3.1 Procedure Identification

Figure below shows the main flow chart of project works to be followed.

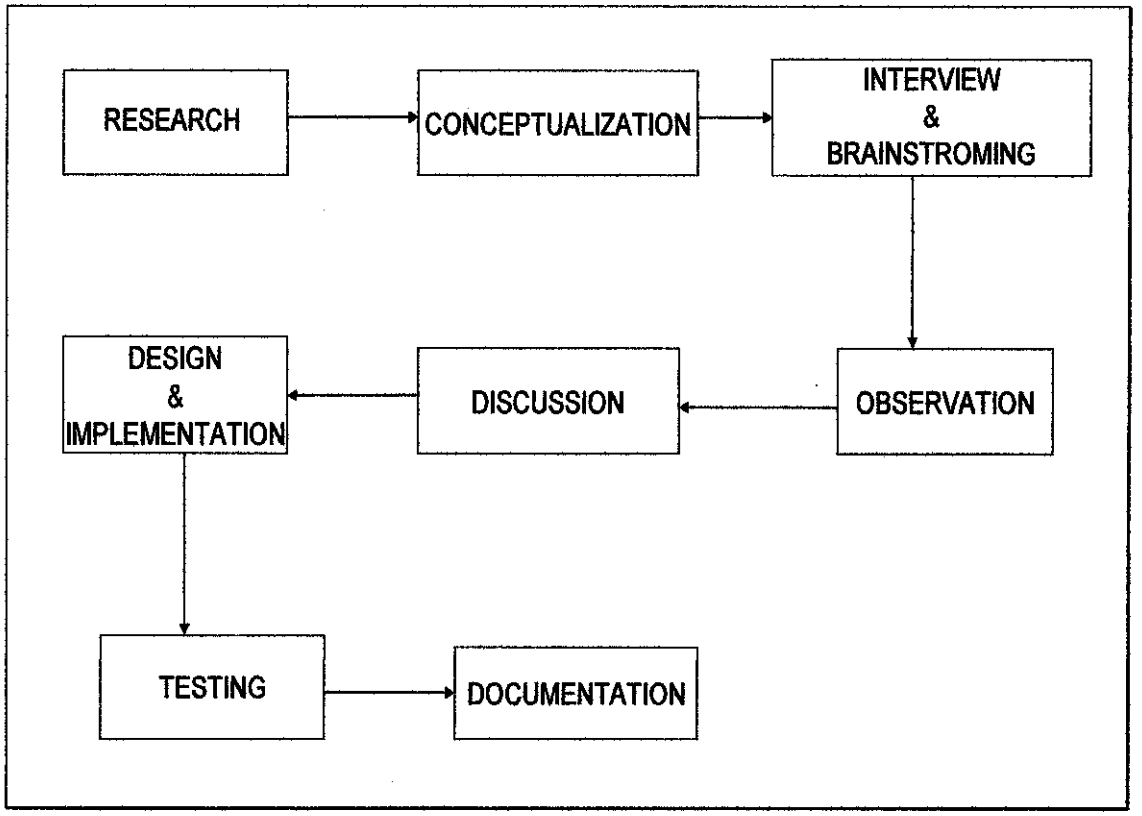


Figure 2 Main Methodology Flow Chart

3.1.1 Research

Before coming out with the idea of developing this system, some research has been done regarding the previous and current technology of DSS itself. The research has gone into reviewing the literature of underlying concepts behind the development of several applications of DSS. Student learned how DSS performs in their ability of assisting and helping humans in making decision. The result of researches and reviews that have been conducted help much in giving the idea and insight to student on the existing application of DSS, to be implemented in this system. Basically the research has been done by reading out the online journal that describing the previous works of several successful DSS and also by reading sample DSS projects from reference book [1].

3.1.2 Conceptualization

After reviewing on the outcomes of the research, the fundamental and basic concept of DSS has been identified in order to guide the brainstorming for determination of decision making domain. Once the decision domain is determined, it will be used and set to be the title of the system development. Besides that, through the researches done, all the underlying concept of the DSS development was recognized which include the critical elements involve in the development, the technologies needed, compatible software and hardware as well as the issues of human's social life and system's reliability. Later in this phase, student applied the concept into real life situation in order to find area in which this kind of system can be implemented (within the university campus itself).

3.1.3 Interview & Brainstorming

For this project, student went to the REO and interviewed the staff on the scenario or situation that might need them to make a decision. A brainstorming session also conducted during the interview in order to identify the several alternatives available for the DSS to be implemented by REO. Based on the scenario given, student came out

with the idea to build a DSS for the Employee Research Recognition Award System. From this activity too, the problem statements have been identified. Several questions have been asked regarding the problems that they are facing right now.

3.1.4 Observation

Later on this stage, student has observed the current system that available in REO. It has been identified that they are still using the paper-based form to gather and store information on individual researcher as well as all the research works available in UTP. There is also no computer application available in REO currently that can help them to do the decision making process. However, there is one official website of REO available and has been published in the Internet in order to let people know about their existence and also their roles in UTP.

3.1.5 Discussion

For this particular DSS, the criteria of evaluation for each category can be considered as the heart of the system since based on those criteria, only then the decision can be made. Therefore, in order to find the most suitable and appropriate criteria of selection the best candidate, several steps will need to be done.

- Discussion with REO personnel (Mr Zulkifli) about some basic and brief criteria that could be applied into the system
- Discussion with the experts (Dr Ibrahim and Mr Zamri) about the specific criteria that are going to be used when evaluating the best research and researcher.
- Research on Internet by accessing any available information regarding the criteria used to choose and select best employee, best research or even best researcher.

Those criteria are very important since only based on that, the questions could be developed and the weight also could be assigned to all possible answers for each question.

3.1.6 Design & Implementation

After the criteria that are going to be applied in the decision making process has been identified, the design and implementation process started. After all of the elements have been designed, the development phase was started for both programming and the construction of the user interfaces.

Designing phase is also considered as the phase of prototype development. In this project case, the final product itself is actually a prototype. That means in the design phase, the partial prototype was built which represented the initial part of the full prototype decision support system. The partial prototype was built for the purpose of providing a deeper insight and better understanding of the criteria of selection and system's ability to help in decision making. In fact, system's design is inherently an iterative process where findings from system testing are used to refine the system's ability and functionality as well as its structure.

3.1.7 Testing

The integration of every part of this DSS will then test to ensure that the prototype works properly, according to the requirements and basic concept of so called decision support system. The testing was done by a verified person or the target user in the first place as to get a verified result. When errors identify, then correction will be made in any of the phases where necessary before moving into the design and implementation phase. Besides the programming structure, the interface of the system was also taken into account within the testing phase. This is to make sure that the system can be easily used and understand by the user. During this testing phase, we will use dummy (or sample data) since the real data is still confidential.

3.1.8 Documentation

At the end of the development of this project, a document report will be produced which consist the whole process of the system development, as well as the elements involve. As to ensure that the system is working as it is programmed and to make a quick

recovery from any errors that may evolve, it is wise to make documentation, so that it is easier to make any adjustment or correction on the system, or maybe as a reference for future development. The documentation contains all the project's information and the documents are following the requirements of both user and developer. Among others, the documentation contains of explanations on how to operate the system as well as the programming source code, perhaps for future references. It is also planned to create a user manual so that users of this system will find it is even easier to use this DSS rather than using the paper-based forms.

3.2 Tools

3.2.1 Macromedia Dreamweaver MX 2004

Since the system is a web-based, all the design has been created by using Macromedia Dreamweaver. Other than that, it is also easy to integrate the HTML with PHP by using this software. Its unique feature to edit system that combines both the productivity of 'What You See Is What You Get' design with the control of HTML code editing mode is also another advantage to use this in designing the overall system.

3.2.2 PHP

This server-side scripting is used to process data passed from HTML forms to the database. It is also compatible with MySQL database and Apache Web Server. Other than that, PHP also needed to ensure this system can perform the decision support processing. The entire decision support algorithm has been implemented in the system by using PHP (following the Production rules). PHP also embedded within tags, so it can reduce the amounts of code since it can moves between HTML and PHP.

3.2.3 MySQL

MySQL is used in the project to store all the data collected from the researchers and research team into a centralized database. It is also extremely fast since it stores data in separate tables rather than putting all the data in one big area. It is also used because it is easy to customize and runs on most platforms, but particularly well suited to working with Apache and PHP.

3.2.4 Apache Web Server

It is used because the system is a web-based and need to be online. Other than that, it also provides a full range of Web server features, including CGI, SSL, and virtual domains. Apache also supports plug-in modules for extensibility. Apache is also easy to configure and compatible with PHP and MySQL database.

3.3 Project timeline

The Gantt chart below shows the overall process and important milestones for this project. The 'X' indicates the process that need to be done while the 'O' indicates the milestone submission.

No	Detail /Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Work Continue	X	X	X											
2	Submission of Progress Report 1				O										
3	Project Work Continue				X	X	X	X							
4	Submission of Progress Report 2								O						
5	Seminar (compulsory)									X					
6	Project work continue								X	X	X	X			
7	Poster Exhibition										O				

8	Submission of Dissertation (soft bound)												O		
9	Oral Presentation													O	
10	Submission of Project Dissertation (Hard Bound)														O

Figure 3 Gantt Chart of the project

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Target Users

After the discussion session with the REO staff, it was identified that there will be three key users for this system. These different users will have different roles in the system. The main users of this system are as follows.

4.1.1 Researchers / Candidates

- They do not have to log-in when entering the system. Thus, they cannot perform the administrator roles. They can only view the system.
- Their main role in the system is to fulfil the application forms and system will submit the forms into the database.

4.1.2 REO Personnel

- They need to login into the system in order to use certain functions that available for them
- They can search the winners of the awards by using this system
- Besides that, they can also specify the type of winners that they would like to have by entering the limitation at the screen (within the search function page) available in the system.
- They can also search for the contact person of every research clusters for all departments. This function is important when a new project is available and they need to find out who are the best parties to take the project.

Therefore, they can use this system to find out the person that they can contact regarding that particular new project.

4.1.3 Head of Departments

- The head of departments also need to login into the system before they can perform specific function available for them
- They can view all applications (according to the departments) and can make the approval whether the application is qualified to compete or not by using this system. Upon their approval, then only the applications can proceed to another stage

4.2 System Flow

The general system flow is shown in figure below.

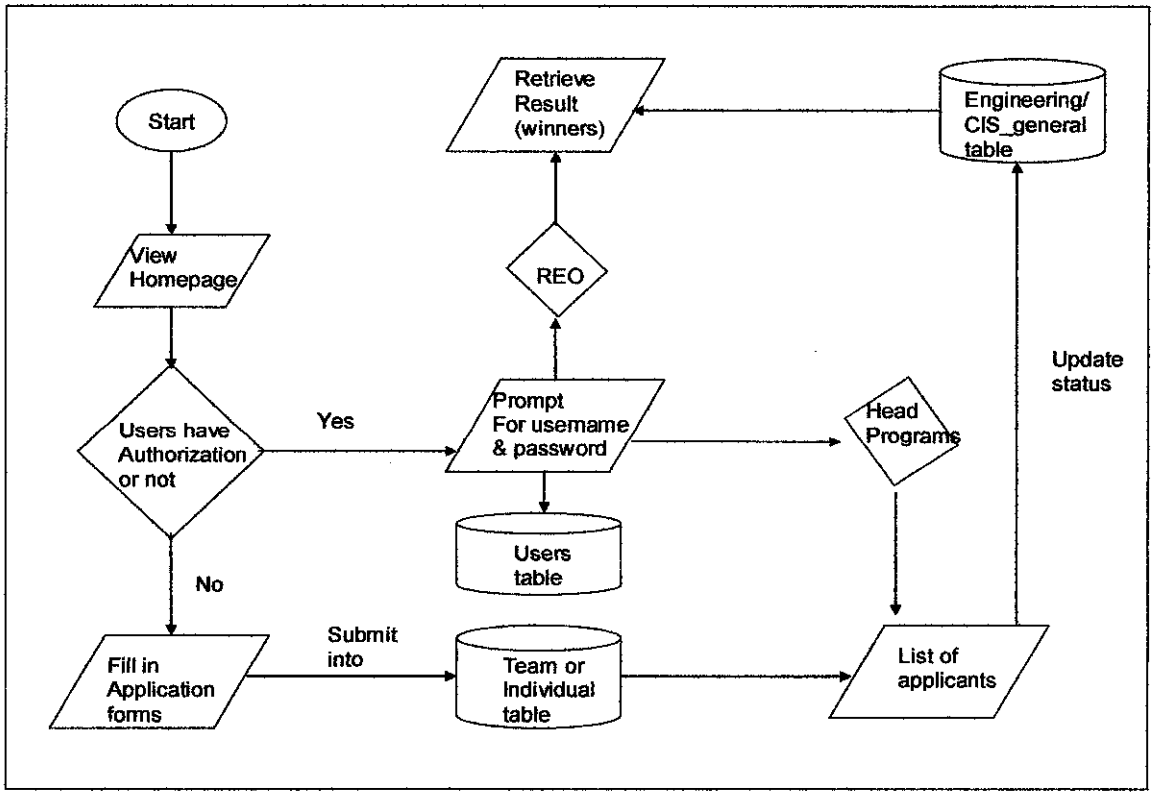


Figure 4 General System Flow

The system starts when the first user (the researchers or research teams) access the system and fill in the application forms available in the system. After the forms have been filled completely, system will submit them into the database. This process is shown in Figure 5.

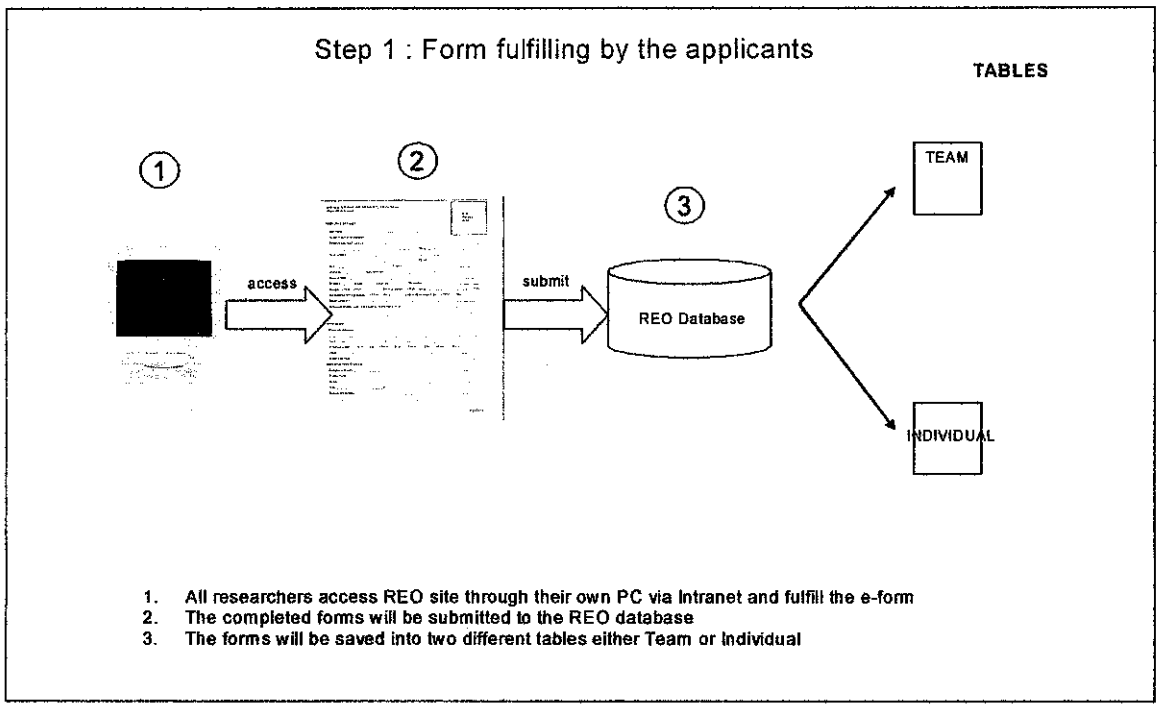


Figure 5 System Flow

Later on, the head programs will login into the system and retrieve back all the applications in order to review it and determine which applications qualify to compete. Once the applications have been reviewed and approved by the head programs, they will be saved into different tables and system will classify whether the application should be put into the 'ICT/BIS & General Studies' table or into the 'Engineering' table. This is shown in the Figure 6. The last step is when the REO personnel login into the system and perform the search function in order to know the winners. Within this step, the system will retrieve the data from database and find the winners based on the criteria selection stated by the users as shown in Figure 7.

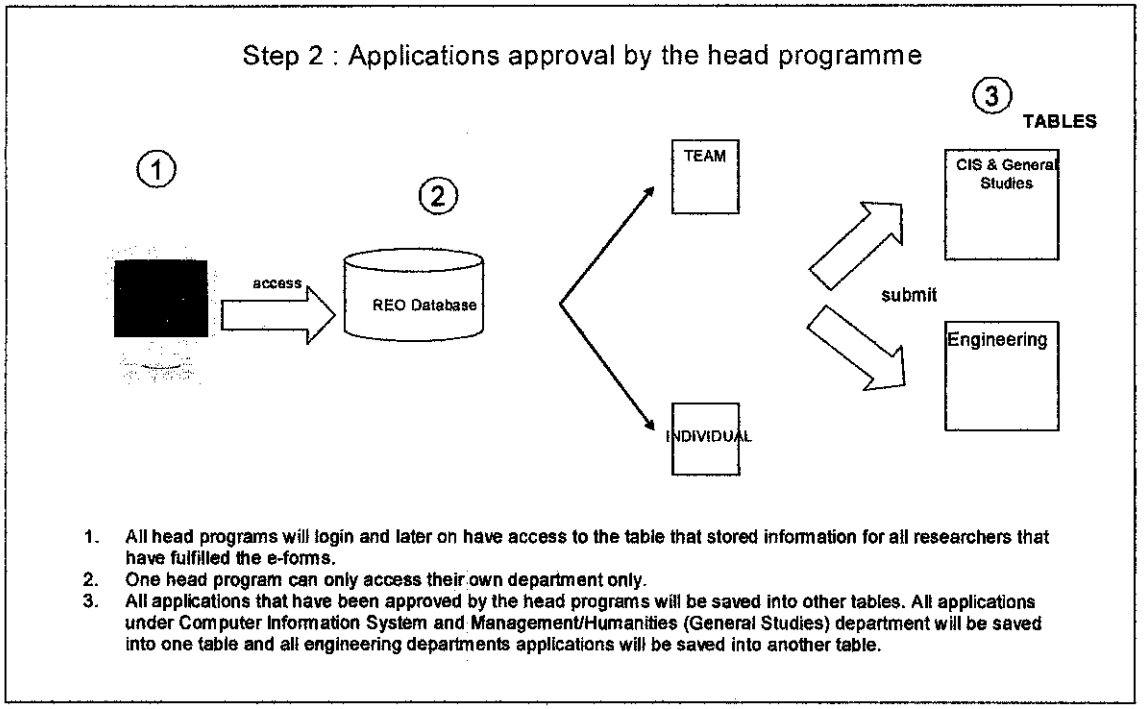


Figure 6 System Flow

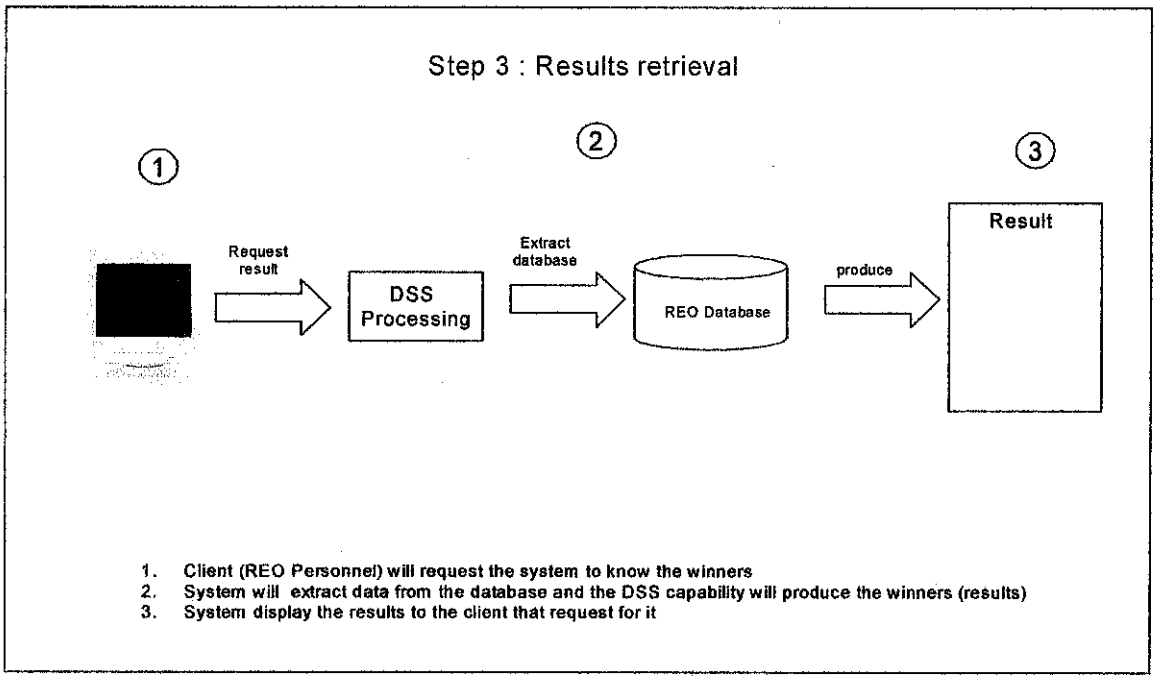


Figure 7 System Flow

4.3 Data Flow

The dataflow diagram below shows how the data and also meaningful information flow within this system.

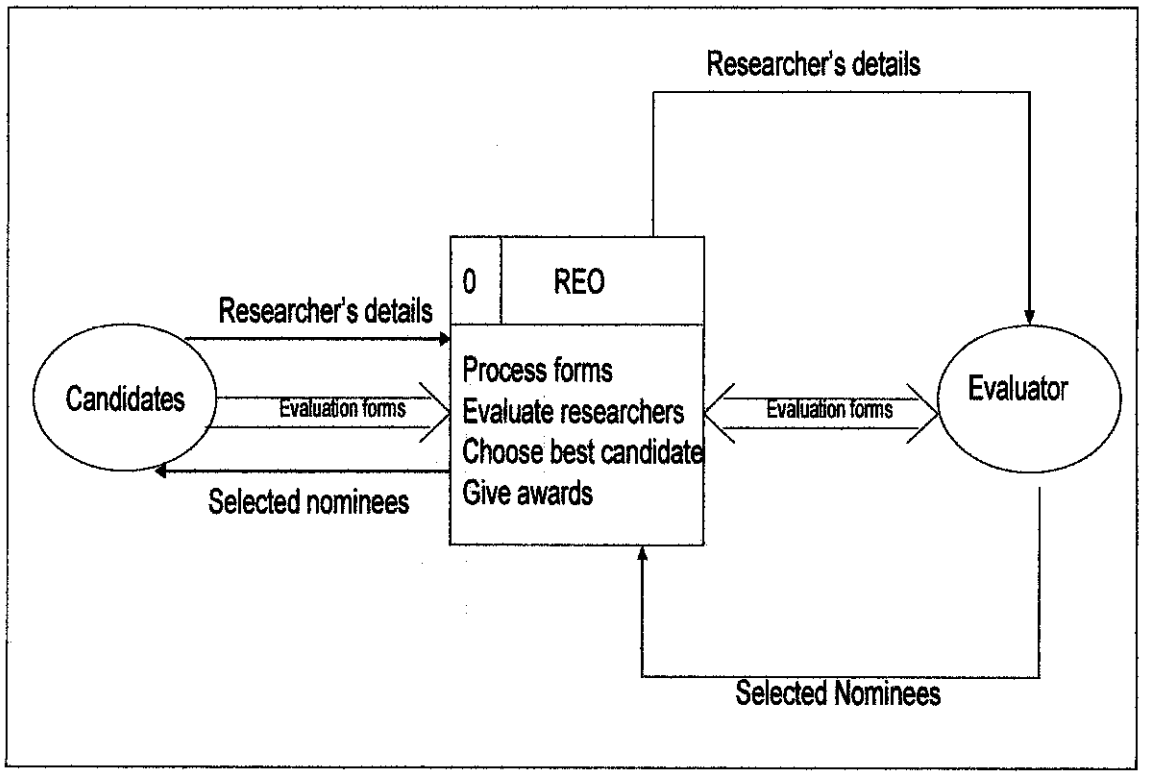


Figure 8 Data Flow Diagram

4.4 System Architecture

This DSS is a web-based system that will be published only in *UTP Intranet* due to the security and confidentiality issue. However, this will need permission and further discussion with IT unit of UTP and this task will be handled together with the REO personnel.

The actual architecture that is going to be implemented is quite simple. Most Web-based DSS are built using 3-tier or 4-tier architecture. So for this particular DSS, it will be 3-tier architecture. A user using a Web browser sends a request using the hypertext transfer protocol (HTTP) to a Web server. The Web server processes the request, using a program. The program will then process the request and produce result. The results are returned to the user's Web browser for displaying purpose. The architecture of this DSS is shown in Figure 9 below.

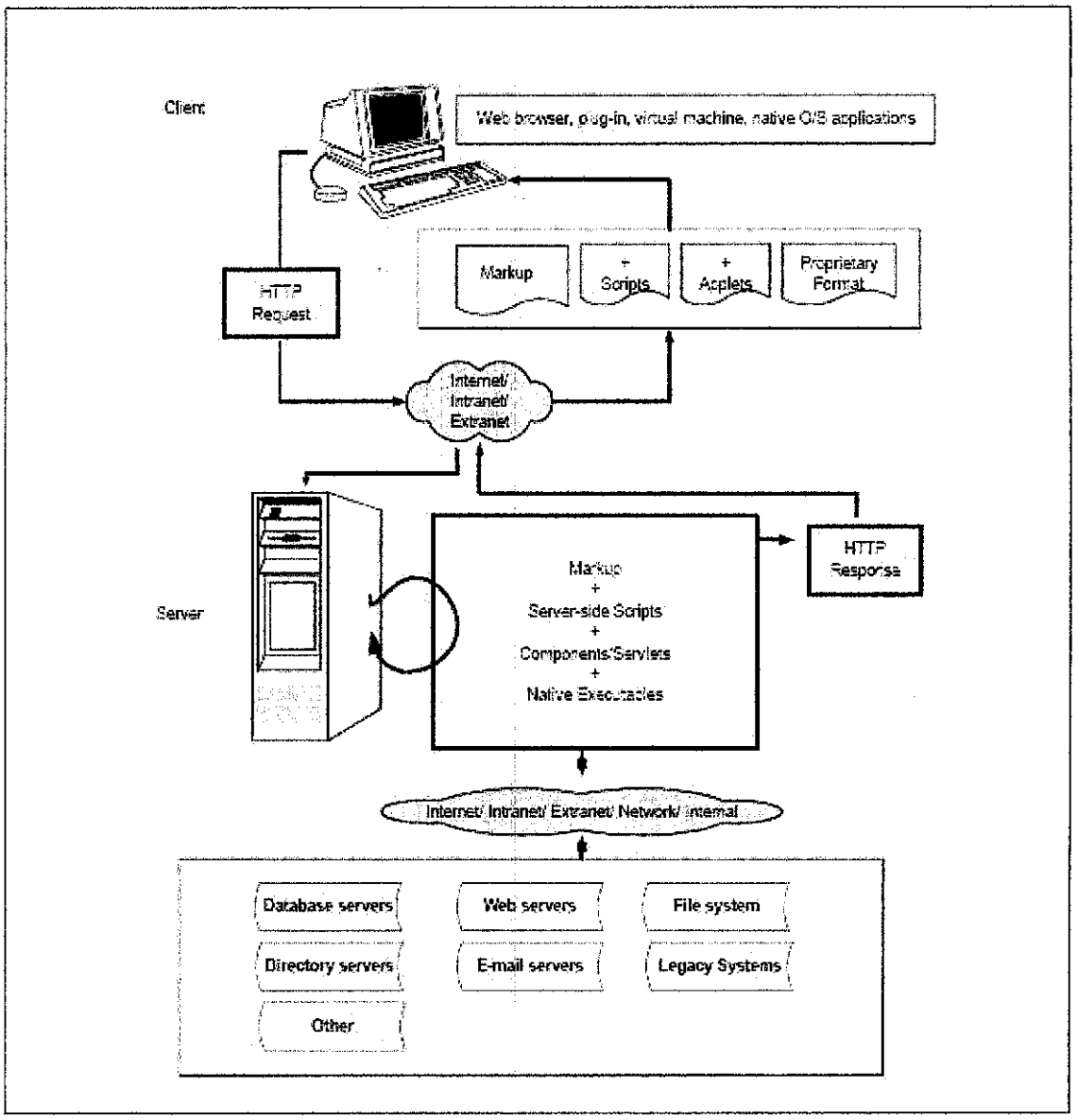


Figure 9 General System Architecture Diagram

4.5 System Framework

Based on the discussions with REO, this system framework should be able to address the following aspects as shown in Figure 10.

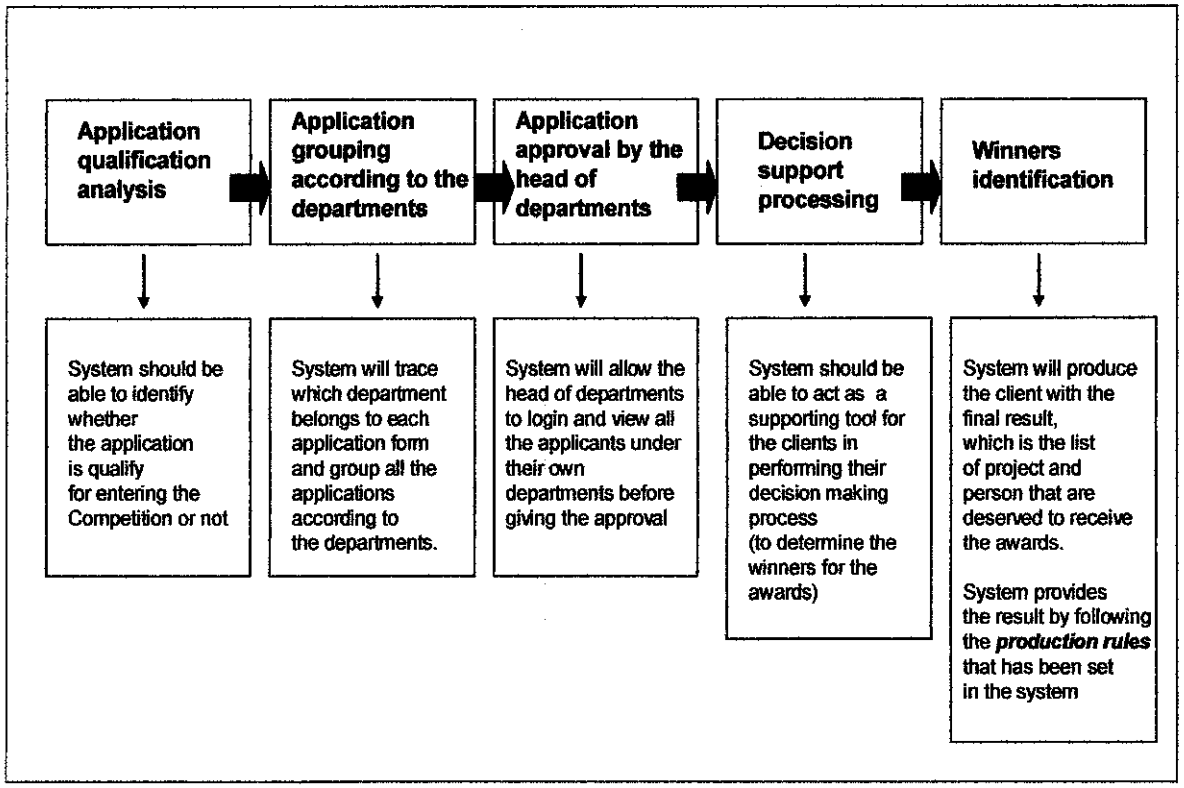


Figure 10 System Framework

4.6 System Model Implementation

This system model is implemented based on the framework that has been identified earlier. There are six main mechanisms altogether. Each and every of them will be discussed in more details within this section.

4.6.1 Information gathering by the e-forms

All information about the applicants is collected through the electronic forms available in the system. The e-form is simple and easy to fill and all the questions require users to choose and tick the answer only. (The answers are all provided in the radio buttons or checkboxes format). This enforces a standard way to fulfil the e-form. All the information will be saved into the database. The tables will be according to the departments.

4.6.2 Information checking by the head programs

The Qualifying Criteria are completion of research project, period of evaluation, and benchmark. If the program head determines that the application is qualified for the awards, then he or she will submit the form into another table (in the database). Otherwise, the applications cannot proceed to the next stage and the system will not process them in the decision support processing stage.

4.6.3 Database storing & Field mapping

All the qualified applications will be submitted into two different tables. One table stored the qualified applications under the CIS and General Studies departments and another table is to store all qualified applications under the engineering departments. Each answer in the application form will be mapped into the matching fields in those tables.

4.6.4 Weightage allocation

System should be able to assign weightage to each and every answer provided by the user in the application form. This is crucial since the weightage is required for the system to perform its decision support capability. For this task, system will retrieve the data from the database and assign different weightage to all fields accordingly.

4.6.5 Result identification (based on the Production Rules)

At the end, system sums up all the accumulated points gained by each and every application. Another system capability is the search engine, which can find the applications with certain limit of scores, to be nominated as the winners. For example, system should be able to short list all the applications with the total point of 90% and above and those short-listed applications will be considered as the winners. The result will be requested by the REO personnel and system should be able to display the result in the html file form. System can produce the result by following the ***production rules*** that has been set within the system [Table 2].

4.6.6 Extra functionalities

One search function is available within the system in order to allow the applicants to know their application status. By key-in their names or project's title, the search engine will display the result of the application whether it is approved by the Head Program, not approved or in process. Another extra function available for REO personnel is that they can group all the researchers available in UTP according to the Research Clusters. This function is useful when a new project is available and the REO staff would like to know the list of people that may be interested with that project's topic or at least to identify the people that perform research on the related topic.

4.7 System Functionalities

Table 1 System Functionalities

Functionality	Action / Result
View • Information about REO • Objectives • Awards	This system will display brief information about REO, the awards available and also the objectives of the competition to let the users know about the competition and why it would be held in UTP.

Login mechanism	This system has the login mechanism in order to determine the functions that can be performed by each user that use the system. It is also to enforce security and confidentiality.
Application form submission	There will be two different electronic forms (e-forms) available in the system. Possible candidates will fill in the forms according to the category of awards that they would like to apply, either Best Research Team or Best Individual Researcher.
Application form approval	If users login as head of the departments, they can view all the applications under their own department. If they approve the application, the form will be submitted into another table in the database.
Display result	The decision algorithm available in the system will retrieve data from the database and perform the decision support processing on the data. Each answer in the application form will be stored in different single field. Based on the data stored in the field, system will assign weightage according to the selection criteria. This system will have the ability to add or sum up the accumulate points gain by each application. This system consist one search engine in order to search which researchers and which projects have

	gained the highest score before displaying the results to the user. At the end, the final result (the winners) will be displayed based on the production rules and also the total scores gained.
Application status search	This system has the search function that allows users to know the status of their application. If the application has been approved by the head programs, then the status will be 'approved'. Otherwise, system will inform user that their form haven't been approved or processed yet.
Researchers search (according to Research Clusters)	Another extra functionality available within the system is the search function that can be performed by the REO personnel in order to find a complete list of researchers' name according to the Research Cluster. This function is useful for determining the researchers that may be interested in a new project offered by certain parties.

4.8 System Prototype & Interface Design

This system prototype is constructed following the framework and also based on the functionalities that it should have. Upon time, the system prototype is enhanced and later on it evolved into the real working system. Within this section, each and every interface will be described in details.

The homepage of this system is as shown in Figure 11. Basically this page will direct users to the other pages that available in this system. Besides that, it is also consists basic information about Research Enterprise Office of UTP.

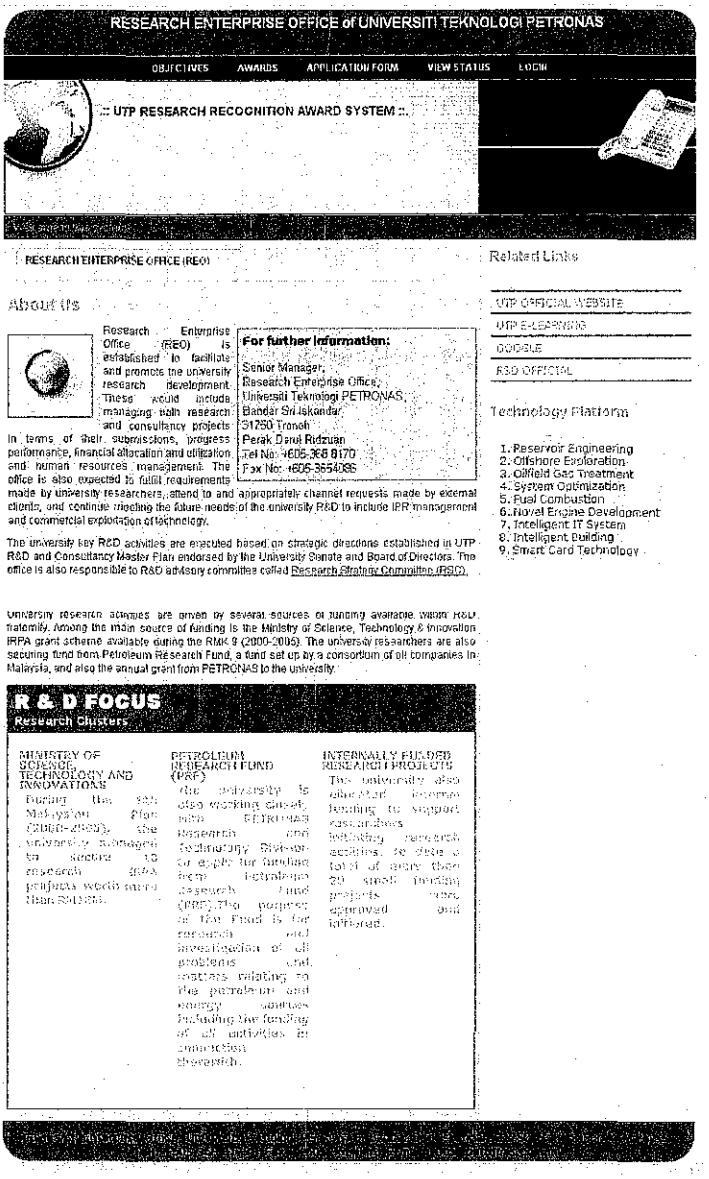


Figure 11 System Homepage

The 'Objective' page of this system is as shown in Figure 12. It is basically to tell users about the objectives of the awards.

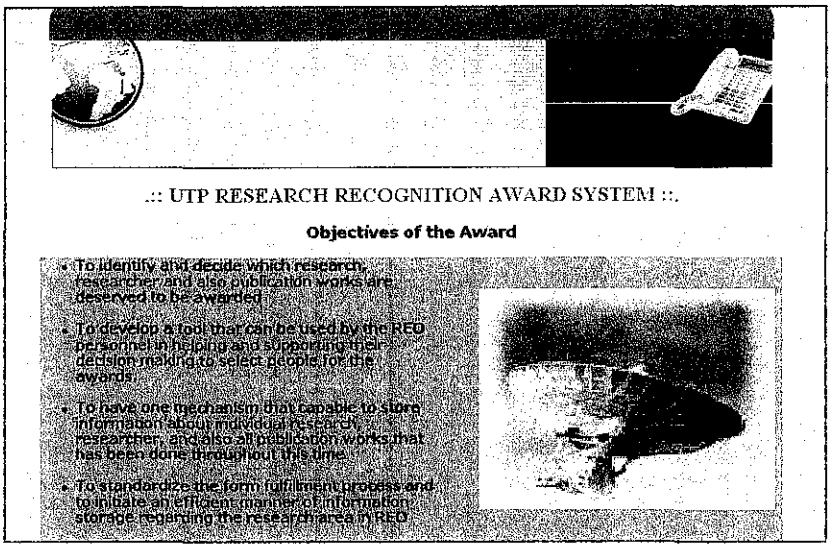


Figure 12 Objective page

Another page is the 'Award' page as shown in Figure 13. This page is just to list down the two awards available for all individual researchers and research teams.

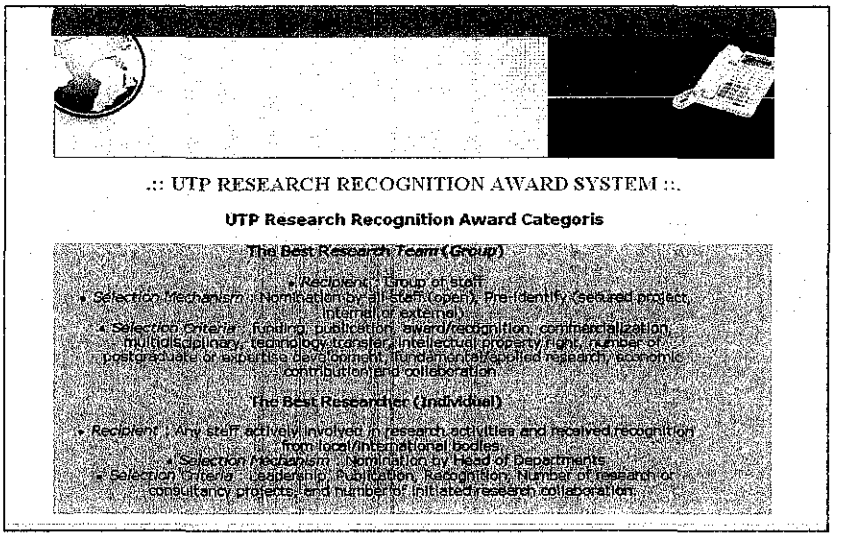


Figure 13 Award page

The 'Application Form' page is where the research teams or individual researchers can access the e-forms and fulfil the forms before the system submit the forms into the database. The application will be divided into two categories which are 'The Best Research Team' or 'The Best Individual Researcher'.

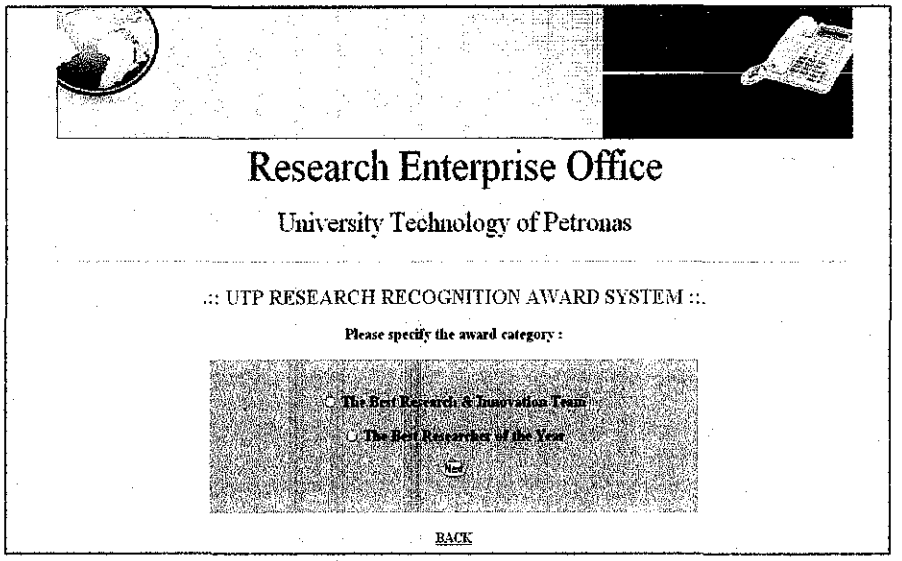
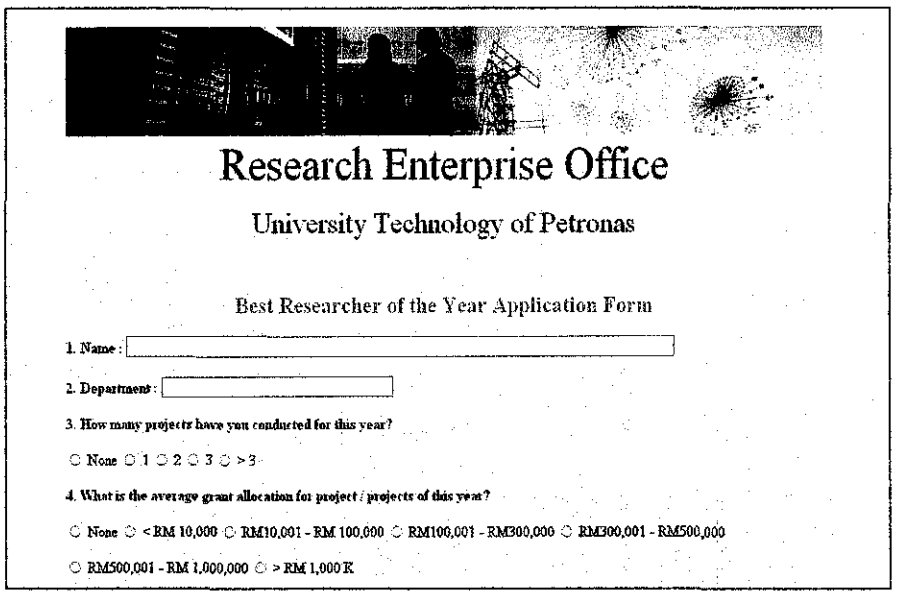


Figure 14 Application page

Once the category has been specified, this system will direct users to the specific application forms. Both forms will be different based on the category of award that the user has chosen (either for individual or team). The sample application form is shown in the Figure 15 and Figure 16. When the form is filled in completely, this system will submit the form into the database once the users click the 'Submit' button.



Research Enterprise Office

University Technology of Petronas

Best Researcher of the Year Application Form

1. Name :

2. Department :

3. How many projects have you conducted for this year?

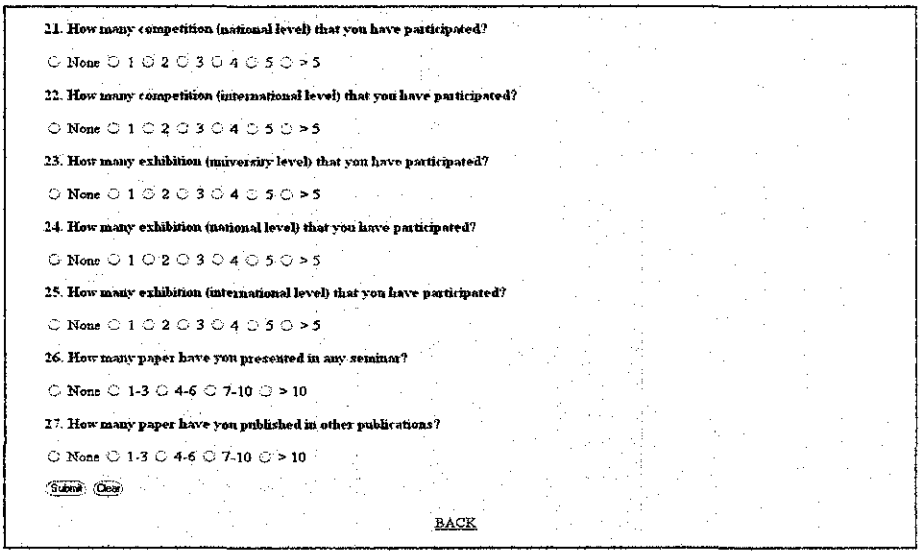
○ None ○ 1 ○ 2 ○ 3 ○ > 3

4. What is the average grant allocation for project / projects of this year?

○ None ○ < RM 10,000 ○ RM10,001 - RM 100,000 ○ RM100,001 - RM300,000 ○ RM300,001 - RM500,000

○ RM500,001 - RM 1,000,000 ○ > RM 1,000 K

Figure 15 Application form



21. How many competition (national level) that you have participated?

○ None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ > 5

22. How many competition (international level) that you have participated?

○ None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ > 5

23. How many exhibition (university level) that you have participated?

○ None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ > 5

24. How many exhibition (national level) that you have participated?

○ None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ > 5

25. How many exhibition (international level) that you have participated?

○ None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ > 5

26. How many paper have you presented in any seminar?

○ None ○ 1-3 ○ 4-6 ○ 7-10 ○ > 10

27. How many paper have you published in other publications?

○ None ○ 1-3 ○ 4-6 ○ 7-10 ○ > 10

Submit Clear

BACK

Figure 16 Application form (cont)

The system will submit the form into the database accordingly. If the form is for 'The Best Research & Innovation Team' award, then it will be saved into the 'TEAM' table. If the form is for 'The Best Individual Researcher' award, then the form will be saved into the 'INDIVIDUAL' table. Both 'TEAM' and 'INDIVIDUAL' tables are stored in

the 'REO' database. Once the form has successfully submitted into the database, system will inform users about it by showing the page as shown in Figure 17.

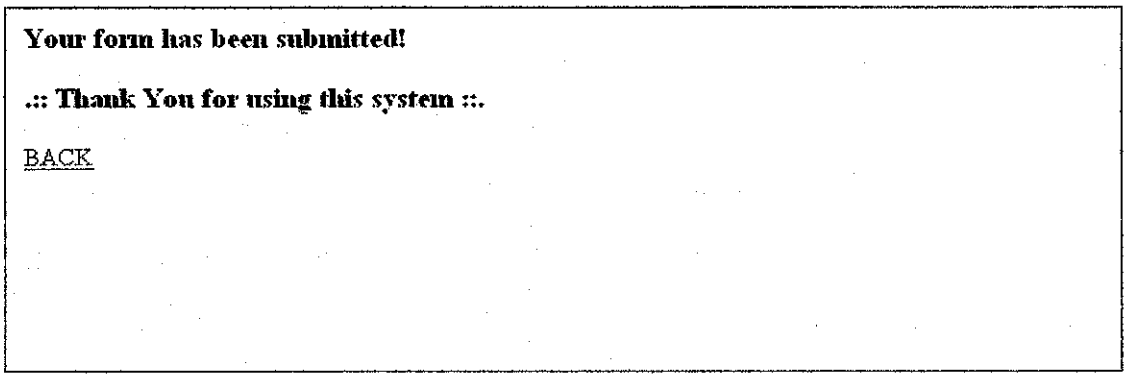


Figure 17 Information page (form submitted into database)

The decision support processing is actually embedded within this application form. For each answer provided for every question, different value (or weightage) has been assigned accordingly.

Other than that, this system also has the capability to add or sum up the accumulate points gain by each candidate. After candidates finish answering all the questions in the e-forms, system will ask whether they want to update or to insert their newly entered details. At this point of time, system will save the data into the database and each answer will be assigned with the different weightage accordingly. This is the stage where the main functionality of this system will be triggered, in which the different weightage are assigned to each answer choose by the candidate. This weightage will be saved into the database for later usage. The development of the **production rules** (as shown in Table 2) to determine the winners also based on the data that has been stored within this stage.

The 'View Status' page is where the applicants can perform the search function in order to know the status of their applications. All applications submitted into the database will be reviewed by the head programs. Not all applications are qualified to compete for the awards. That is why the head programs need to review the forms first and later on decide whether the applications qualify to compete or not. The Qualifying Criteria to compete for the awards are the completion of research project, period of evaluation, and benchmark. The search function will give the users the result whether their application is approved, not approved or hasn't been processed yet. The search page is shown in Figure 18.

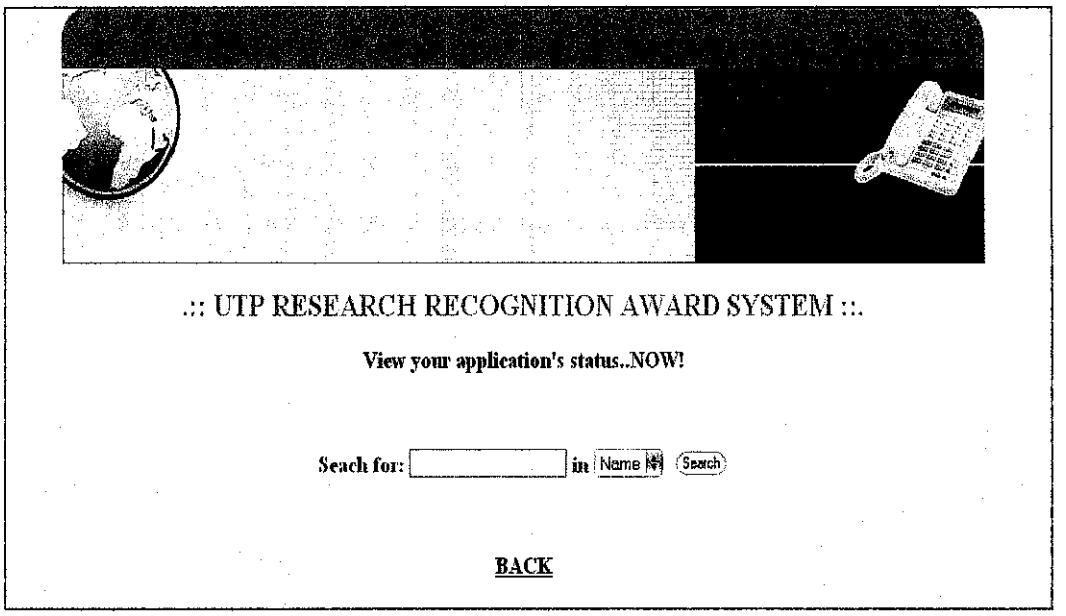


Figure 18 Application Status search page

Within any system, the login mechanism is usually a must. Instead of addressing the security and confidentiality issue, the login mechanism also can be used to determine the functions that can be performed by each and every user that access the system. The 'Login' page for this system is as shown in figure 19.

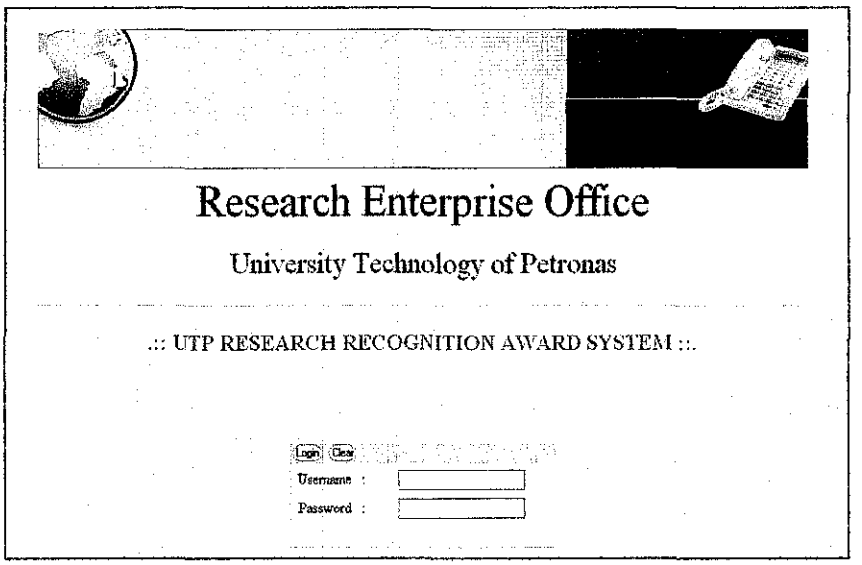


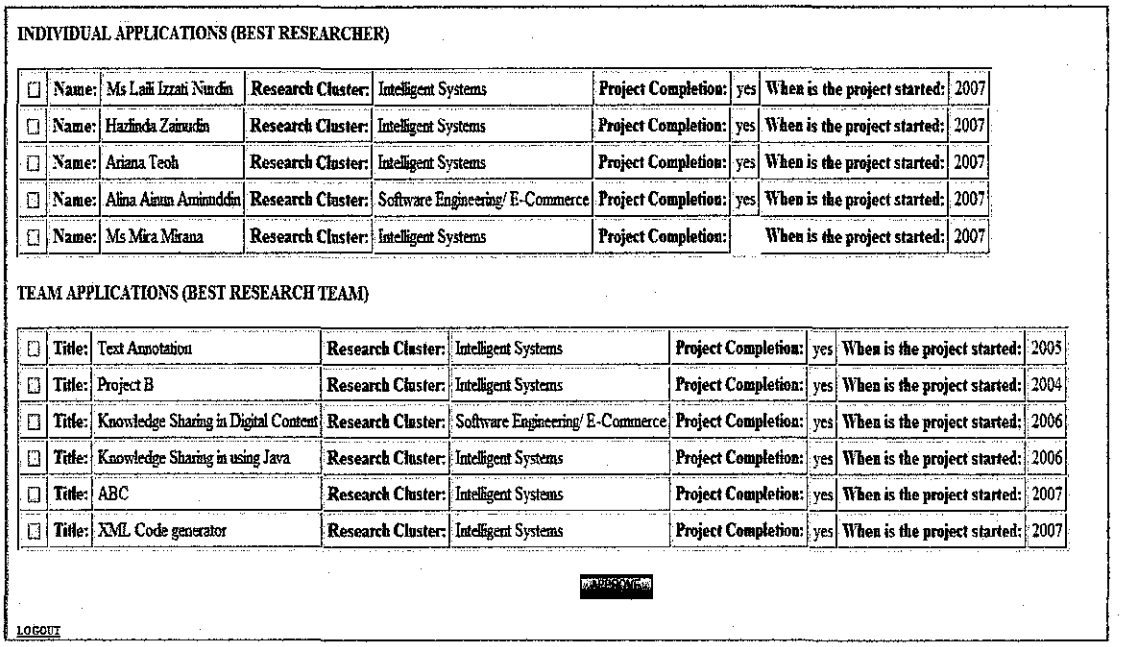
Figure 19 Login page

If users login as the Head Programs, they can view all the applications (both for individual or team) under their own department. However, this still has the restrictions in which they can only view the applications within their own department only. They cannot view applications under other departments. Once they login as the Head Programs, they will get the list of applications that need to be reviewed as shown in Figure 20.

Based on the list, the head programs will review each and every applications and determine whether it is qualify to compete or not (based on the qualifying criteria). They can tick on the applications that they have approved and leave the checkboxes uncheck on the applications that they do not approved. Once they are done with the reviewing process, they can click on the 'Approved' button.

Upon clicking this button, the system will process all the applications again. If the application is approved, then it will be saved into a new table in the database. Otherwise, the applications will not be saved into another table. The approved applications will be sent into two different tables accordingly. The system will group

those applications according to two groups; the first group is the 'Computer Information System & General Studies' group and the second group is the 'Engineering' group.



INDIVIDUAL APPLICATIONS (BEST RESEARCHER)

☐	Name:	Ms Laili Izzati Nurdin	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2007
☐	Name:	Hazlinda Zainudin	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2007
☐	Name:	Ariana Teoh	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2007
☐	Name:	Alina Ainun Aminuddin	Research Cluster:	Software Engineering/ E-Commerce	Project Completion:	yes	When is the project started:	2007
☐	Name:	Ms Mira Mirana	Research Cluster:	Intelligent Systems	Project Completion:		When is the project started:	2007

TEAM APPLICATIONS (BEST RESEARCH TEAM)

☐	Title:	Text Annotation	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2005
☐	Title:	Project B	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2004
☐	Title:	Knowledge Sharing in Digital Content	Research Cluster:	Software Engineering/ E-Commerce	Project Completion:	yes	When is the project started:	2006
☐	Title:	Knowledge Sharing in using Java	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2006
☐	Title:	ABC	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2007
☐	Title:	XML Code generator	Research Cluster:	Intelligent Systems	Project Completion:	yes	When is the project started:	2007

LOGOUT

Figure 20 List of Applicants

However, if user login as the REO staff, they will gain different functions from the system. First of all, they will be directed into the page shown in Figure 21.

Figure 21 REO page

If users click on the 'View Results' link, they will be directed into the search engine page. They can specify the winners' criteria within the search page as shown in the figure below.

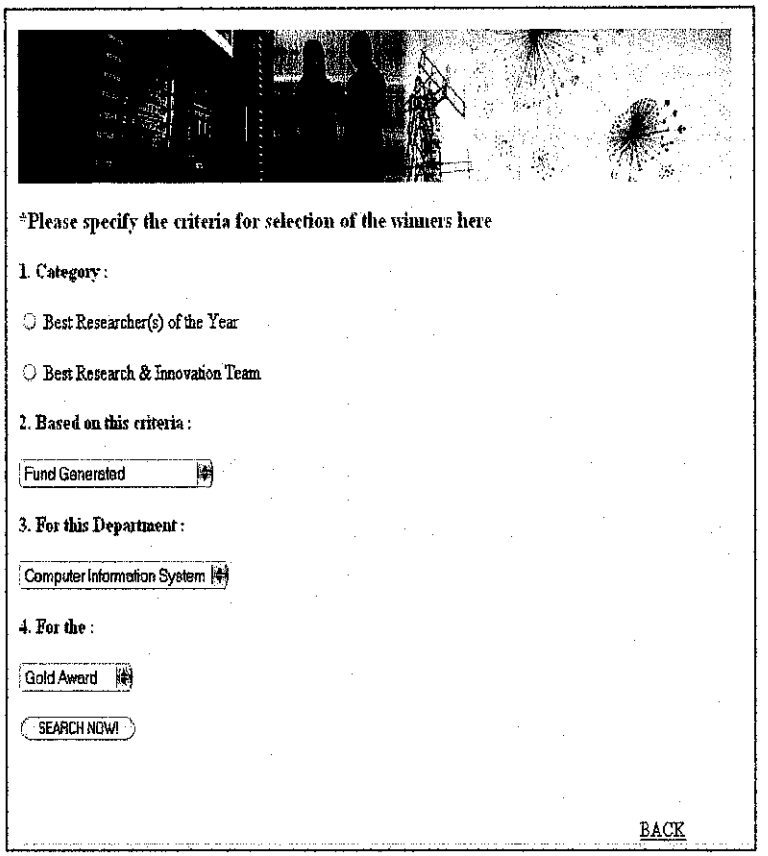


Figure 22 Search Winners page

Based on the criteria that has been specified, the search function will retrieve the database (the CIS_General or Engineering tables) and extract the data from the tables based on the specified criteria.

After the search function has successfully determine the winners (based on the score of individual candidates store in database), this system will view the result to the users. The result displayed by the system following the IF-THEN rules that combine the condition and conclusion for handling specific scenario. This rule is also known as the production rules as shown in Table 2. If there is a suitable candidates that fulfil all the selection criteria that has been specified in the search engine, system will display it so that users can see the result as shown in Figure 23.

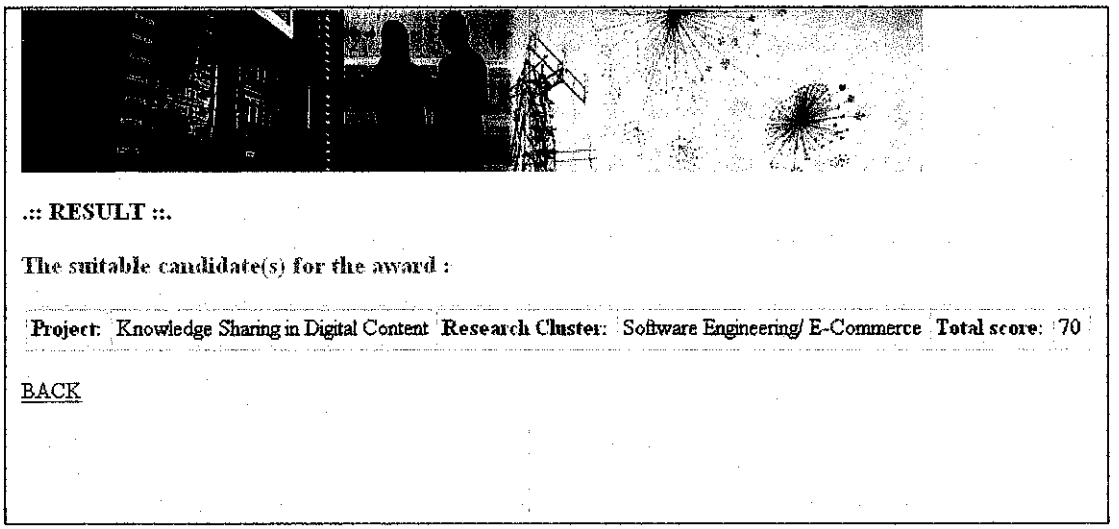


Figure 23 The Result page

Another extra function that REO staff can perform is to find the contact persons for every research clusters available in every department. What they need to do is to key in the departments name and later on click the 'search' button (Figure 24). System will retrieve the data from the database and provide the contacts details to the users (Figure 25).

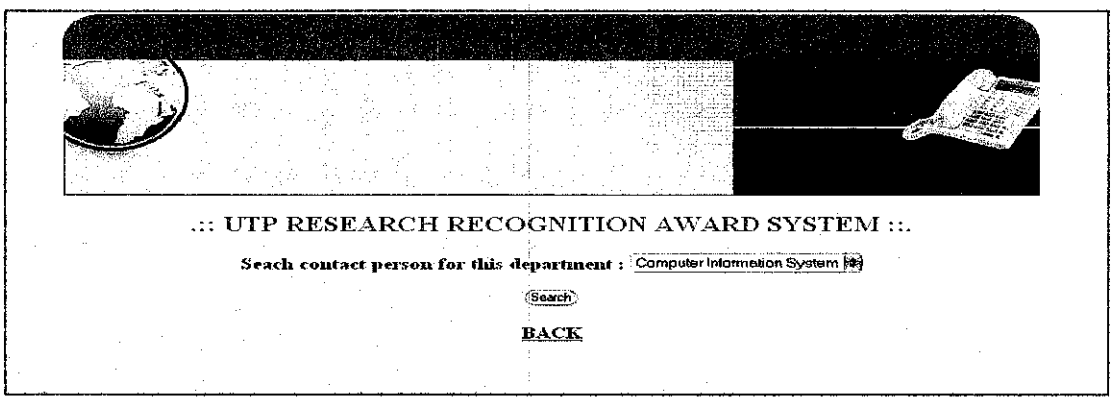


Figure 24 The search Research Cluster page

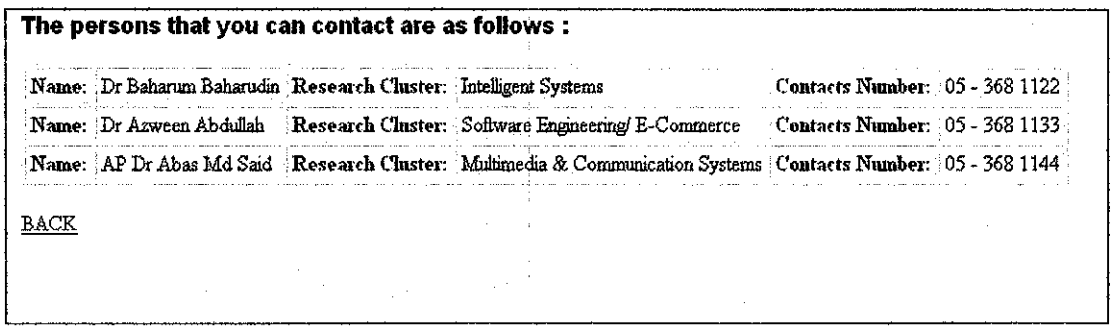


Figure 25 The Result page

4.9 Production Rules

The production rules for this system are shown in Table 2. All these rules have been embedded within the PHP scripting and have been used when the system wants to find the final result (winners for the awards).

Table 2 Production Rules

```
Rule 1:
IF category = individual
AND main_criteria = funding
AND funding >= RM 250 - 300K
AND total_point >= 85%
THEN result = gold

Rule 2:
IF category = individual
AND main_criteria = award_winning
AND  total_award >= 8
AND total_point >= 85%
THEN result = gold

Rule 3:
IF category = individual
AND main_criteria = revenue_generation
AND total_revenue >= RM 50 - 100K
AND total_point >= 85%
THEN result = gold

Rule 4:
IF category = individual
AND main_criteria = funding
AND funding >= RM 250 - 300K
AND total_point >= 80%
AND total_point < 85%
THEN result = silver
```

Rule 5:

IF category = individual
AND main_criteria = award_winning
AND total_award >= 8
AND total_point >= 80%
AND total_point < 85%
THEN result = silver

Rule 6:

IF category = individual
AND main_criteria = revenue_generation
AND total_revenue >= RM 50 - 100K
AND total_point >= 80%
AND total_point < 85%
THEN result = silver

Rule 7:

IF category = individual
AND main_criteria = funding
AND funding >= RM 250 - 300K
AND total_point >=75%
AND total_point < 80%
THEN result = bronze

Rule 8:

IF category = individual
AND main_criteria = award_winning
AND total_award >= 8
AND total_point >= 75%
AND total_point < 80%
THEN result = bronze

Rule 9:

IF category = individual
AND main_criteria = revenue_generation
AND total_revenue >= RM 50 - 100K
AND total_point >= 75%
AND total_point < 80%
THEN result = bronze

Rule 10:

IF category = team
AND main_criteria = funding
AND funding >= RM 250 - 300K
AND total_point >= 75%
THEN result = gold

Rule 11:

IF category = team
AND main_criteria = award_winning
AND total_award >= 8
AND total_point >= 75%
THEN result = gold

Rule 12:

IF category = team
AND main_criteria = revenue_generation
AND total_revenue >= RM 50 - 100K
AND total_point >= 75%
THEN result = gold

Rule 13:

IF category = team
AND main_criteria = funding
AND funding >= RM 250 - 300K
AND total_point >= 70%

AND total_point < 75%

THEN result = silver

Rule 14:

IF category = team

AND main_criteria = award_winning

AND total_award >= 8

AND total_point >= 70%

AND total_point < 75%

THEN result = silver

Rule 15:

IF category = team

AND main_criteria = revenue_generation

AND total_revenue >= RM 50 - 100K

AND total_point >= 70%

AND total_point < 75%

THEN result = silver

Rule 16:

IF category = team

AND main_criteria = funding

AND funding >= RM 250 - 300K

AND total_point >=65%

AND total_point < 70%

THEN result = bronze

Rule 17:

IF category = team

AND main_criteria = award_winning

AND total_award >= 8

AND total_point >= 65%

AND total_point < 70%

THEN result = bronze

```
Rule 18:
IF category = team
AND main_criteria = revenue_generation
AND total_revenue >= RM 50 - 100K
AND total_point >= 65%
AND total_point < 70%
THEN result = bronze
```

4.10 Data Storage

It has been mentioned earlier that this project will use MySQL database as the storage mechanism. This is due to the fact that MySQL is the most common and most comprehensive database and is used by a majority of PHP applications. For this project, the database name is 'REO'. Within the REO database, there are 5 tables altogether. The tables and their descriptions are as follows.

Table 3 List of Tables in REO database

Table name	Descriptions
1. USERS	It stores the ***username and password*** for all the authenticate users. This table is used by the login function.
2. TEAM	Stores the details of all the ***research teams*** that have been submitted through the application forms (in HTML).
3. INDIVIDUAL	Stores the details of all the ***individual researchers*** that have been submitted through the application forms (in HTML).
4. CIS_GENERAL	Stores the details of all the ***approved applications*** for the Computer Information System or General Studies department

5. ENGINEERING	Stores the details of all the ***approved applications*** for the all 5 Engineering departments
6. RESEARCH_CLUSTERS	Stores the details of all contact persons according to the research clusters for every department.

4.11 Discussion

4.11.1 DSS concept within the system

It has been mentioned earlier that this system should be able to process the collected data and produce the final result to the key users. The result provides by the system will then use by the users in order to determine the winners of the awards. In other words, this system should be able to support the decision making process done by REO. Therefore, there are several features that available in the system that made it slightly different from a normal web-based system, in which it has the decision support system concept. The concept of decision support has been applied as follows.

1. Weightage(value) allocation
    - The weightage given for each answer for all the questions available in the application form will be different according to the level.
    - The better the answer, the more value (or weightage) assigned to it.

2. Production rules in determining the winners (final result)
    - System capable to solve several different scenarios, following the production rules that has been specified.
    - User can choose what main criteria that they are going to use in performing the evaluation. For example, user might want to evaluate those to be awarded based on the main criteria like performance (in term of how many awards that have been received), total revenue generated, total fund gained from responsible party, etc.

- Therefore, different main criteria chosen will generate different output. As for example, if the main concern of the evaluation process is to choose the best researcher based on the benefit he has brought to community as a whole, Researcher A might win BUT if the main concern of the evaluation is to award the researcher who has received the most fund either from government or non-government organization, then the Researcher B might win.
- The result is actually retrieved by following the Production Rules (in Table 2). All the rules that the system should adhere to has been coded in the PHP scripting and the final results produce by the system are all based on those rules.

3. Comparison mechanism
    - This system will have another capability which is to make comparison between the results retrieved by the search function.
    - After user has selected the category of the evaluation process, system will be able to provide user with the output which in this case is the research teams or individual researchers that have gained highest point. Eventually, those with the highest point will be the best candidate to be awarded.
    - However, this system should also capable to give result of the next best candidates. It means, other than showing the candidate with the highest score only, system should also be able to show other candidates who have also gained high marks (for example, the top 5).
    - So in other words, this system also can be a tool to shortlist several names of candidates that may deserve the awards. Although the winners that the system suggested may be not logical, users still can use the result to assist in their decision making process. Development of a decision support system is to help or to support the decision that the human need to do. It should be clear by now that the development of this system is not to totally replace the human roles in making the decision.

4.11.2 Comparison of this system with the others

There are several other DSS that have the same functionality with this DSS. Though the objectives and the functionality of those DSS may be almost the same with this project, there are still plenty differences between those DSS with this one.

- different criteria used for the evaluation process thus producing the different production rules to follow
- different style in finding the result (weightage assign upon entering data or weightage assign once the manager choose the type of evaluation that they prefer)
- different user interface and tools used

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Relevancy to the Objectives

Based on the objectives stated in the early part of this report, it is clear that the development process of this system is parallel with its objectives. All the researches that have been done were in the area of evaluation process for employee/researcher/research work. Those researches also covered the issues of developing a Web-based decision support system such as

- Web-based decision support system methodology
- Web-based decision support system architecture
- Web-based decision support system interface
- Web-based decision support system storage mechanism/database
- Web-based decision support system functionalities
- Tools that can be used in developing a Web-based decision support system

Besides that, this system also has the functionality to identify who are eligible to be awarded based on the scores/points gained by individual researchers or publication and research works. Since the main objective of this system is to help the decision making process done by REO in selecting the best candidates which is currently time-consuming and prone-to-inconsistency process, it is clear enough that the main functionality which includes within the system can cater and overcome that problem.

Other than that, this system also capable to improve the information storage issue within the department since its development will also include a development of a

centralized database that will store all information and related details of all researchers and research/publication works available in UTP.

Lastly, its development also enforce a standardize method in fulfilling the forms since everyone will use the same e-forms during the evaluation process. Therefore, by using this DSS, the decision process will be more efficient and consistent.

5.2 Suggested future work for expansion & continuation

There are several recommendations for future work of this system. These recommended future works are basically to enhance the functionality of this system and also to make it more attractive and convenient to the users.

Firstly, the language uses for the development of this system can also be changed. Currently, this project uses HTML and PHP scripting and for recommendation, someone may want to convert it to other language such as C++ or Java. It has been learned that the development of the decision support system is actually more appropriate by using the second generation language like C++. However, due to the limited skills and also less familiarization of the developer to those particular programming languages, it has been decided that HTML and PHP is used instead.

Second recommendation for future work is in the issue of system's availability. Currently, due to the security and confidentiality issues, this system will only be published in UTP Intranet. Therefore, in the future, there is a hope that this system can be enforced with any kind of security tools in order to ensure its security and integrity. With that, this system should be able to be published in Internet instead of in UTP Intranet only. When it is already available in Internet, the availability of it to the target users will be increasing and this means it is can fully utilize at any time and from anywhere, as long as there is Internet connection.

Thirdly, the user interface should also be enhanced in order to really accommodate individual users' preferences. In other word, the system should allow different users to personalize the interface so that it suits with their preferences. Up to this point of time, the development of this system interface is just based on several people

preferences (the developer, the focal person of this project, and also the supervisor). However in the future, it is hoped that someone can really go into details about the user interface so that he/she will develop a user interface that really according to the target users' preferences. Surveys may need to be conducted in order to know what kind of interface that user likes and studies may need to be performed in order to know the connection between the good user interface with the users' performance and system's usability.

Lastly, the criteria and weightage given to all answers available in the e-forms should also be reviewed from time to time. These criteria may be change after some time since the evaluation process may be done according to different style or even the evaluators may also be a different group of persons from one time to another. Therefore, the weightage assigned to those criteria should be able to change from time to time in order to accommodate those changes.

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APPENDICES

Appendix A: Proposed scoring table for Selection Criteria

Appendix B: The Production Rules code

Appendix C: The Form Submission code

Appendix D: The Users Authentication code

Appendix E : The Search Status code

Appendix F : The Search Research Cluster code

Appendix G: The List of Applicants (for head programs to approve) code

APPENDIX A

UTP RESEARCH RECOGNITION AWARD
Proposed Scoring Table for Selection Criteria (90%)

No	Criteria	Marking Scheme									
1	**Funding**	1	2	3	4	5	6	7	8	9	10
a	Based on Funding Amount	< 20K	20K-40K	40K-60K	60K-100K	100-150K	150-200K	200-250K	250-300K	300-500K	500K-1M
		2	4	6	8	10					
b	Number of Funded Projects	1	2	3	4	5 or more					
2	**Publication**	2	4	6	8	10					
	Based on Points System 1 for each Local Publication 2 for each Int'l Publication	< 2 points	2 - 4 pnts	5 - 7 pnts	8 - 10 pnts	more than 10 points lump the points together before marking					

3	**Award/Recognition**	2	4	6	8	10
	Based on Points System 1 for each Local Award 3 for each Int'l Award	< 2 points	2 - 4 pnts	5 - 7 pnts	8 - 10 pnts	more than 10 points
		lump the points together before marking				

4	**Multidisciplinary**	2	4	6	8	10
	Based on Multidiscplinary Team Composition	2 disc	3 disc	4 disc	5 disc	more than 5 discp

5	**Capability Development**	2	4	6	8	10
	Based on Number of Junior Researcher/PG Students involved in the Project	2	3	4	5	>5
6	**Revenue Generation**	2	4	6	8	10
	Revenue Generated from the Consultancy, TT & other Commercialization Projects	< 5K	5-20K	20-50K	50K-100K	> 100K

UTP RESEARCH RECOGNITION AWARD

Proposed Scoring Table for Selection Criteria (90%)

No	Criteria	Marking Scheme									
6	**Infrastructural Contribution**	1	2	3	4	5	6	7	8	9	10
	Purchase of Equipment by utilising the External Funding	< 20K	20K-40K	40K-60K	60K-100K	100-150K	150-200K	200-250K	250-300K	300-500K	500K-1M

UTP RESEARCH RECOGNITION AWARD

Proposed Scoring Table for Special Selection Criteria (10%)

No	Criteria	Marking Scheme				
1	**Collaboration**	2	4	6	8	10
	Number of Initiated Research Collaboration Projects	1	2	3	4	5 or more

2	**Intellectual Property Rights**	0	5
	Based on Patenting Initiative	No Patent Initiative	Embark into Patenting Process

APPENDIX B

The Production Rules code

```
<?php

// Connects to your Database
mysql_connect("localhost", "evilynda", "linda123") or die(mysql_error());
mysql_select_db("reo") or die(mysql_error());

//first IF
if ($category == "individual")
{

//second IF
if ($criteria == "fund")
{

if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 90
                                        AND funding >= 8" );
//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 85
                                        AND score < 90
                                        AND funding >= 8" );
//end silver
}

elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 80
                                        AND score < 85
                                        AND funding >= 8" );
//end bronze
}
```

```
//end of second IF criteria = fund
}

//start of second IF criteria = revenue
elseif ($criteria == "revenue")
{
if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 90
                                        AND revenue >= 8" );

//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 85
                                        AND score < 90
                                        AND revenue >= 8" );

//end silver
}

elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 80
                                        AND score < 85
                                        AND revenue >= 8" );

//end bronze
}
//end of second IF criteria = revenue
}


//start of second IF criteria = award
elseif ($criteria == "award")
{
if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 90
                                        AND award >= 8" );
```

```
//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 85
                                        AND score < 90
                                        AND award >= 8" );
//end silver
}

elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                        FROM individual
                                        WHERE department='".$dept."'
                                        AND score >= 80
                                        AND score < 85
                                        AND award >= 8" );
//end bronze
}
//end of second IF criteria = award
}

//code to print the result
Print "<table border cellpadding=3>";
while($info = mysql_fetch_array( $data ))
{

Print "<tr>";
Print "<th>Name:</th> <td>".$info['name'] . "</td> ";
Print "<th>Research Cluster:</th> <td>".$info['research_cluster'] . " </td>";
Print "<th>Total score:</th> <td>".$info['score'] . " </td>";

}
Print "</table>";
//end of code to print the result

//*************************************************************************
$query = "UPDATE individual SET status = 'PROCESSED'";
mysql_query($query);
//*************************************************************************

//end of first IF category = individual
}
```

```
elseif ($category == "team")
{

//second IF
if ($criteria == "fund")
{

if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 70
                                        AND funding >= 8" );
//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 65
                                        AND score < 70
                                        AND funding >= 8" );
//end silver
}

elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 60
                                        AND score < 65
                                        AND funding >= 8" );
//end bronze
}
//end of second IF criteria = fund
}

//start of second IF criteria = revenue
elseif ($criteria == "revenue")
{
if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 70
                                        AND revenue >= 8" );
```

```
//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 65
                                        AND score < 70
                                        AND revenue >= 8" );

//end silver
}

elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 60
                                        AND score < 65
                                        AND revenue >= 8" );

//end bronze
}
//end of second IF criteria = revenue
}


//start of second IF criteria = award
elseif ($criteria == "award")
{
if ($type == "gold")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 70
                                        AND award >= 8" );

//end gold
}

elseif ($type == "silver")
{
$data = mysql_query("SELECT *
                                        FROM team
                                        WHERE department='".$dept."'
                                        AND score >= 65
                                        AND score < 70
                                        AND award >= 8" );

//end silver
}
```

```
elseif ($type == "bronze")
{
$data = mysql_query("SELECT *
                                                    FROM team
                                                    WHERE department='".$dept."'
                                                    AND score >= 60
                                                    AND score < 65
                                                    AND award >= 8" );
//end bronze
}
//end of second IF criteria = award
}

//code to print the result
Print "<table border cellpadding=3>";
while($info = mysql_fetch_array( $data ))
{

Print "<tr>";
Print "<th>Project:</th> <td>".$info['title'] . "</td> ";
Print "<th>Research Cluster:</th> <td>".$info['research_cluster'] . " </td>";
Print "<th>Total score:</th> <td>".$info['score'] . " </td>";

}
Print "</table>";
//end of code to print the result


//*****************************************************************************
$query = "UPDATE team SET status = 'PROCESSED'";
mysql_query($query);
//*****************************************************************************
//end of first IF category = team
}

//code to tell users theres no match result
$anymatches=mysql_num_rows($data);
if ($anymatches == 0)
{
echo "There's no suitable candidates that matched with all the criteria<br><br>";
}
//end of code to tell users that no match found


?>
```

APPENDIX C

The Form Submission code

```
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<title>Insert data from Individual applications</title>
<style type="text/css">
<!--
.style1 {color: #CC0000}
-->
</style>
</head>

<body>

<?php
$score=$funding+$no_proj+$publish+$award+$disc+$revenue+$capa+$infra+$collaborate+$patent;

$status="Not Process Yet";

$connect=mysql_connect("localhost", "evilynda", "linda123")
or die ("Could not connect to database in localhost!");

$result=mysql_select_db("reo")
or die ("Could not select reo database !");

$sqlquery = "INSERT INTO individual VALUES ('". $name ."', '". $department . "', '". $research_cluster . "', '". $complete . "',
'". $year . "', '". $funding . "', '". $no_proj . "', '". $publish . "', '". $award . "', '". $disc . "', '". $capa . "', '". $revenue . "', '".
$infra. "', '". $collaborate . "', '". $patent. "', '". $score. "','". $status . "')";
$queryresult = mysql_query($sqlquery)
or die ("Could not execute mysql query !");

?>

<h3 class="style1">Your form has been submitted!</h3>
<h3>.:: Thank You for using this system ::. </h3>
<p><a href="application.htm">BACK</a></p>
</body>
</html>
```

APPENDIX D

The Users Authentication code

```
<?php
$host="localhost"; // Host name
$username="evilynda"; // Mysql username
$password="linda123"; // Mysql password
$db_name="reo"; // Database name
$tbl_name="users"; // Table name

// Connect to server and select databse.
mysql_connect("$host", "$username", "$password")or die("cannot connect");
mysql_select_db("$db_name")or die("cannot select DB");

// username and password sent from signup form
$myusername=$_POST['myusername'];
$mypassword=$_POST['mypassword'];

$sql="SELECT * FROM $tbl_name WHERE username='$myusername' and password='$mypassword'";
$result=mysql_query($sql);

// Mysql_num_row is counting table row
$count=mysql_num_rows($result);

// If result matched $myusername and $mypassword, table row must be 1 row
if($count==1){
// Register $myusername, $mypassword and redirect to file "login_success.php"
session_register("myusername");
session_register("mypassword");
session_start();
if(!session_is_registered(myusername))
{
header("location:main_login.htm");
}

//my code starts here
if ($myusername == "ictbis")
{
header("location:cis_head.php");
}

elseif ($myusername == "general")
{
header("location:general_head.php");
}

elseif ($myusername == "meche")
{
header("location:meche_head.php");
}
```

```
elseif ($myusername == "ee")
{
header("location:ee_head.php");
}

elseif ($myusername == "chemy")
{
header("location:che_head.php");
}

elseif ($myusername == "cve")
{
header("location:civil_head.php");
}

elseif ($myusername == "geo")
{
header("location:che_head.php");
}

elseif ($myusername == "reo")
{
header("location:login_REO.php");
}


}

else
{
echo "Wrong Username or Password";
}
?>
```

APPENDIX E

The Search Status code

```
<?
//This is only displayed if they have submitted the form
if ($searching =="yes")
{
//If they did not enter a search term we give them an error
if ($find == "")
{
echo "<p>You forgot to enter a search term";
exit;
}
// Otherwise we connect to our Database
mysql_connect("localhost", "evilynda", "linda123") or die(mysql_error());
mysql_select_db("reo") or die(mysql_error());
// We preform a bit of filtering
$find = strtoupper($find);
$find = strip_tags($find);
$find = trim ($find);

if ($field == "name")
{
$data = mysql_query("SELECT * FROM individual WHERE upper($field) LIKE'%$find%'");
}
else
{
$data = mysql_query("SELECT * FROM team WHERE upper($field) LIKE'%$find%'");
}
//And we display the results
while($result = mysql_fetch_array( $data ))
{
echo "<h2>Your Application is :</h2><p>";
echo $result['status'];
echo "<br>";
echo "<br>";
}
//This counts the number or results - and if there wasn't any it gives them a little message explaining that
$anymatches=mysql_num_rows($data);
if ($anymatches == 0)
{
echo "Sorry, but we can not find an entry to match your query<br><br>";
}
//And we remind them what they searched for
echo "<b>Searched For:</b> " .$find;
}
?>
```

APPENDIX F

The Search Research Cluster code

```
<?php

// Connects to your Database
mysql_connect("localhost", "evilynda", "linda123") or die(mysql_error());
mysql_select_db("reo") or die(mysql_error());

//start of if else

if ($rc == "cis")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Computer Information System'");
}

elseif ($rc == "general")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Management and Humanities'");
}

elseif ($rc == "ce")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Chemical Engineering'");
}

elseif ($rc == "cve")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Civil Engineering'");
}

elseif ($rc == "ee")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Electrical Engineering'");
}

elseif ($rc == "me")
{
$data = mysql_query("SELECT * FROM research_cluster where department='Mechanical Engineering'");
}
//end of if else
Print "<table border cellpadding=3>";
while($info = mysql_fetch_array( $data ))
{
Print "<tr>";
//my code
Print "<th>Name:</th> <td>".$info['name'] . "</td> ";
Print "<th>Research Cluster:</th> <td>".$info['research'] . " </td>";
Print "<th>Contacts Number:</th> <td>".$info['contact'] . " </td>";
}
Print "</table>";
?>
```

APPENDIX G

The List of Applicants (for head programs to approve) code

```
<?php

// Connects to your Database
mysql_connect("localhost", "evilynda", "linda123") or die(mysql_error());
mysql_select_db("reo") or die(mysql_error());

$data = mysql_query("SELECT * FROM individual where department='Chemical Engineering'")
//$data = mysql_query("SELECT * FROM individual")
or die(mysql_error());

Print "<table border cellpadding=3>";
while($info = mysql_fetch_array( $data ))
{

Print "<tr>";
//my code
Print "<th>Name:</th> <td>".$info['name'] . "</td> ";
Print "<th>Research Cluster:</th> <td>".$info['research_cluster'] . " </td>";
Print "<th>Project Completion:</th> <td>".$info['complete'] . " </td>";
Print "<th>When is the project started:</th> <td>".$info['year'] . " </td>";

}
Print "</table>";
?>

</p>
</div>


<div align="center">
 <p align="left"><span class="style1">TEAM APPLICATIONS (BEST RESEARCH TEAM)</span>
 </p>
 <p align="left">

<?php
```