

## Decision Support System for Scholarship Scheme Grant (Dermaiswazah Pelajar)

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**Abstract:** Scholarships are normally offered to students with excellent academic achievements. Majlis Agama Islam Negeri Johor (MAINJ) is one of the organizations providing scholarships for students living in Johor who would like to pursue their studies at the mentioned university. This scholarship is specifically for student from Asnaf families who want to further their studies, the student scholarship scheme grant is an assistance that has been introduced. The purpose of developing this system is to facilitate the MAINJ to manage and handle scholarship scheme applications. It can also keep all application and applicant records systematically reducing the risk of physical data loss and also facilitating data retrieval. In addition, the system can increase the level of decision-making efficiency previously made by the manager to decide whether or not the applicant is eligible for this scholarship scheme grant. This system can directly assess whether the applicant is eligible or otherwise by using the Tree Decision method. The development of this system is guided by the Prototype model. Meanwhile, PHP programming language and MySQL database is used for system production. The web application system consists of five modules in total, namely login, data management, applications, reports, and evaluations. Users for this system consists decision maker (a person who will decide to approve or reject the application), administrator and applicant (user). It is expected that this system will not only make it easier for MAINJ to manage application information and make decisions but also make it easier for applicants to apply and review the results.

**Keywords:** Decision Support System, Decision Tree, Scholarship Scheme Grant, Structured Approach, Web-based system

### 1. Introduction

Scholarships are grants or payments made to support the education of students, given on the basis of academic achievement or other achievements. Sometimes a scholarship is a one-time check [1]. MAINJ is one of the organizations which offers scholarship for students who lives in Johor and would like to further their studies at the university listed. The student scholarship scheme grant is an aid that has been introduced for students from Asnaf families who want to further their studies.

Currently, the application is done with the applicant filling out the application form, and then sending the completed application form to the office or via email. The application form can be found at MAINJ or from the MAINJ website. The implementation of current application evaluation methods raises a number of issues such as systematic handling, search, and analysis, as well as application evaluation. Based on the observations conducted at MAINJ, it was found that the method of implementation of scholarship application and processing of this application is done manually, namely filling in the softcopy form and sending the electronic document via email. The problems encountered are the record of the application and the applicant is not stored systematically. At present they only use the folder in the computer to keep the application form. In addition, it is also difficult to store data manually as it can cause damaged forms and dumping of paper. Before the interview session will be carried out, the officer will print out all the selected application that they want to interview. The use of paper nowadays is not so conventional because it can be changed with the use of information technology that is growing nowadays. The evaluation application form process not in systematic way that can cause delay to determine the eligibility or result.

Therefore, a support system for student scholarship scheme applications was developed to help both parties manage scholarship application information online. This project involves of public user (applicant), administrator (manager) and decision maker (officer). The web application system consists of five modules in total, namely login and registration, data management, application, reports and evaluation. The main importance of this project is to save time for the applicant eligibility process. Also, applicants can easily check their eligibility through the internet. In addition, the function of this system can also produce reports and data analysis can be done.

This chapter contains six main sections. Section 1 describes the background of the project, while Section 2 provides the results of the literature review. Section 3 shows the research methodology and Section 4 explains the findings from the analysis and design of the system. Section 5 demonstrates the result from system's implementation and testing. Conclusion is provided in the last section.

## **2. Literature Review**

Scholarship Scheme Grant is a scheme that can help students from the asnaf family to further their studies for diplomas and degrees. This scholarship is an aid that has been introduced for students from the asnaf family who want to further their studies to the two main universities on the list, namely Al-Azhar University, Egypt, and universities in Jordan. There are only certain courses offered for each university. For Al-Azhar University, the courses offered are sya'riah and law courses, usuluddin, dakwah, Arabic language studies, Islamic knowledge, Arabic language courses, and tahfiz Al-Quran and Al-Qiraat courses. For the University of Jordan, the courses offered are Islamic studies courses of sya'riah usuluddin, tahfiz, Islamic economics, and Arabic.

Currently, the process of handling this scholarship application is done manually and also via email. As usual, applicants need to download the form on MAINJ's official website, and they need to fill out the form. Then, the applicant needs to return the completed form with all the required documents that have been listed by MAINJ via email. Once the application is closed, MAINJ has to go through one application at a time and needs to select the applicant who meets all the conditions that have been listed by MAINJ and send an email to the applicant to continue the next process which is the interview session. Interview sessions were conducted for the officers to ask them why they wanted to apply for scholarships and more. So, the applicant needs to attend the interview session. If the applicant does not attend the interview session, automatically the applicant will not be listed. Upon completion of the interview session, the office will need to review all selected applications and decide one by one whether the selected applicants are eligible or not to obtain a scholarship or not. Then, MAINJ needs to send an email to the eligible applicants to let them know that their application has been accepted. If the applicant does not receive an email from MAINJ after 3 months from the date of the interview, the applicant should consider their application unsuccessful.

By doing an observation of the current evaluation process, Decision Support System for Scholarship Scheme Grant has been proposed to help MAINJ handles the applicant's information and the evaluation of scholarship applications. The system can collect the application information, can determine the eligibility of applicants automatically and can produce the status of the application result. The system database also stores the data in an integrated manner, so, it was able to manage the data, generate the application results and generate reports. All of these features are important to make the process become quicker and more comprehensive.

Decision Supports Systems (DSS) are computer-based information systems designed in such a way that help managers to select one of the many alternative solutions to a problem [2]. It is possible to automate several decision-making processes in large and sophisticated computer-based DSS and analyse large amounts of information quickly. DSS is an interactive computer-based information system with a well-organized collection of models, people, procedures, software, databases, telecommunications, and devices, helping decision makers to solve unstructured or semi-structured business problems. DSS evolved early in the era of distributed computing. The history of such systems begins in about 1965 and it is important to start formalizing a record of the ideas, people, systems and technologies involved in this important area of applied information technology [3].

**Table 1: System's comparison**

Features/System	Kifayah Calculator (MAIWP)	Fakir/Poor Eligibility Calculator (MAIWP)	Income Zakat (MAIS)	Decision Support System for Scholarship Scheme Grant
System Type	Web-based	Web-based	Web-based	Web-based
Login and registration module	No	No	No	Yes
Application Module	No	No	No	Yes
Evaluation Module	Yes	Yes	Yes	Yes
Data Management Module	Unknown	Unknown	Unknown	Yes
Report Module	Unknown	Unknown	Unknown	Yes
Decision Making	Yes	Yes	Yes	Yes
Database	Unknown	Unknown	Unknown	mySQL

Three existing systems are studied and analysed to get more information to develop the Decision Support System for Scholarship Scheme Grant. The existing system studied included Kifayah Calculator (MAIWP), Asnaf Fakir Miskin Eligibility Calculator (MAIS) and Income Zakat (MAIS). Table 1 summarized the comparison. From a summary of the comparison between existing and proposed system, the proposed has all the features of the three existing systems. Proposed system had an additional module which is login and application module, but the rest are same. The main function of the proposed system is same with three existing systems which is generate the decision making or eligibility.

### 3. Methodology

The methodology chosen to develop this system was prototype. As shown in Table 2, each phase has its own assignment and output that need to produce during the entire project development. Besides that, the output had been completed within the specific days that have been given.

**Table 2: Software development activities**

Phase	Task	Output
Planning	<input type="checkbox"/> Proposed the project	<input type="checkbox"/> Project proposal
	<input type="checkbox"/> Determine the project schedule, activities and output	<input type="checkbox"/> Develop Gantt chart
Analysis	<input type="checkbox"/> Determine the flow of the project	<input type="checkbox"/> Data flow diagram (DFD)
	<input type="checkbox"/> Determine the process that involves in a system	<input type="checkbox"/> Entity relationship diagram (ERD)
	<input type="checkbox"/> Identify literature reviews	
	<input type="checkbox"/> Determine the database design	
Design	<input type="checkbox"/> Design the interface of the system	
	<input type="checkbox"/> Designing the interface	<input type="checkbox"/> System flowchart
Implementation and Testing	<input type="checkbox"/> Designing the database	<input type="checkbox"/> Relational schema and data dictionary
	<input type="checkbox"/> Build a database	<input type="checkbox"/> User interface design
	<input type="checkbox"/> Write program code for each module in the system	<input type="checkbox"/> Database
	<input type="checkbox"/> System testing	<input type="checkbox"/> Program code
		<input type="checkbox"/> System interface and prototype
		<input type="checkbox"/> Test cases

#### 4. Analysis and Design

This part discusses the results of the analysis and design process to develop a Scholarship Scheme Decision Support System. Discussions in this chapter include system requirements analysis, system analysis, and system design. Table 3 and 4 show the functional requirement and non-functional requirement for this system.

**Table 3: Functional requirements**

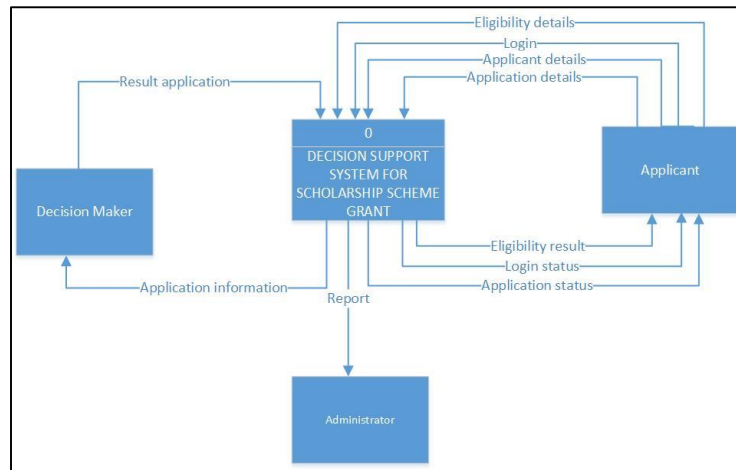
Module	Requirements
Login and registration	<ul style="list-style-type: none"> <li>• The system should allow the users to login the system using identification number.</li> <li>• The system should allow the administrator to login into the system using admin ID and password</li> <li>• The system should allow the user to input the valid identification number to logged in as a user.</li> <li>• The system should allow the user to input the valid admin ID and password to logged in as an admin.</li> <li>• The system should alert the user and administer for any invalid input.</li> <li>• The system should redirect user to dashboard once successful login.</li> <li>• The system should allow the user to register before login.</li> </ul>

**Table 3: (cont)**

Module	Requirements
	<ul style="list-style-type: none"> <li>• The system should show error when empty field is found.</li> <li>• The system should show error when user input invalid information.</li> </ul>
Application module	<ul style="list-style-type: none"> <li>• The system should display the form for the user to fill in their information.</li> <li>• The system should allow the user to fill in the form.</li> <li>• The system should allow user to upload the documents.</li> <li>• The system should allow the user to submit the form.</li> <li>• The system should show error when empty field is found.</li> <li>• The system should show error when user input invalid information.</li> </ul>
Evaluation module	<ul style="list-style-type: none"> <li>• The system should show the result of application.</li> </ul>
Data management module	<ul style="list-style-type: none"> <li>• The system should allow administrator to insert the information of the applicants in the form.</li> <li>• The system should allow administrator to update the information of the applications in the form.</li> <li>• The system should allow administrator to delete the information of the applications in the form.</li> <li>• The system should allow the user to manage the applicant's data.</li> <li>• The system should allow the user to manage the applications data.</li> <li>• The system should display the applicant's information.</li> <li>• The system should display the application information.</li> </ul>
Report module	<ul style="list-style-type: none"> <li>• The system should allow the administrator to generate a report.</li> <li>• The system should allow the administrator to print a report.</li> </ul>

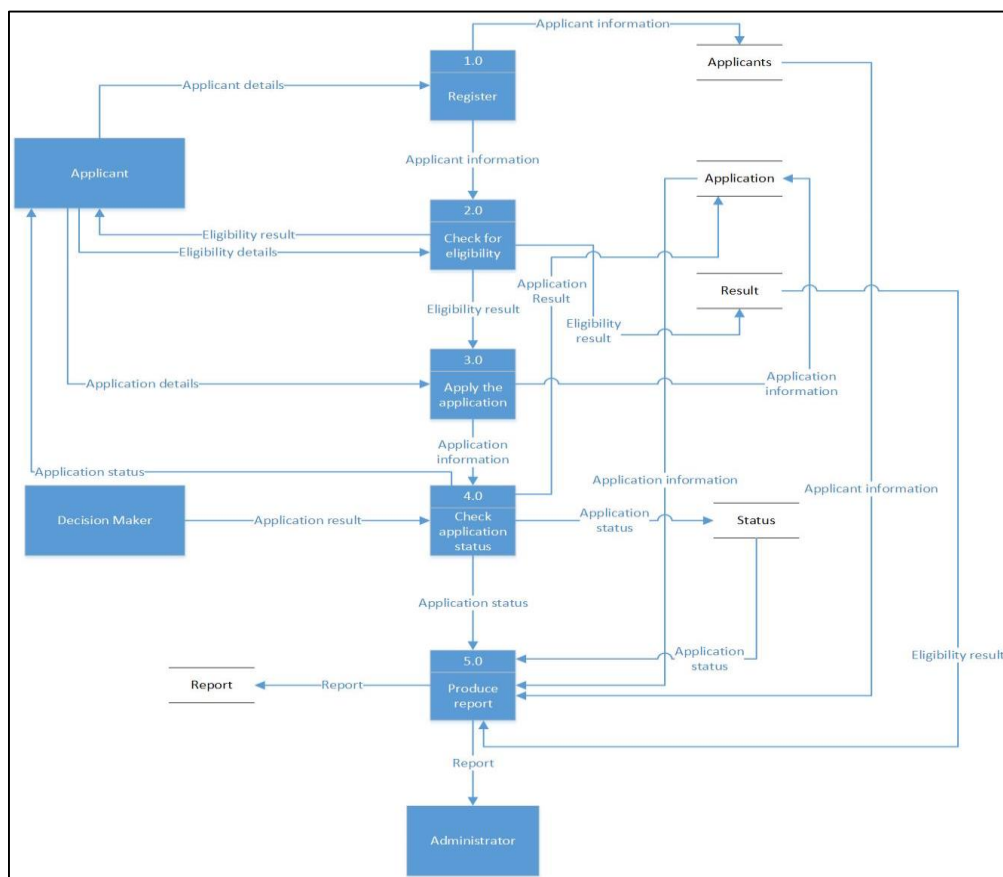
**Table 4: Non-functional requirements**

No	Requirements	Descriptions
1.	Performance	<ul style="list-style-type: none"> <li>• The interaction between the user and the system should not be more than 10 minutes.</li> <li>• The system should be able for use anytime.</li> </ul>
2.	Operational	<ul style="list-style-type: none"> <li>• The system should be user friendly.</li> <li>• The system should be easily maintained and updated.</li> <li>• The system should be able to work on any web browser.</li> </ul>
3.	Security	<ul style="list-style-type: none"> <li>• Only administrator can generate a report.</li> <li>• Users can only access their own account with identification number.</li> </ul>



**Figure 4.1: Context diagram**

Figure 4.1 shows the context diagram for the system. There are 3 entities involved namely applicant, administrator and decision maker. Figure 4.2 shows the level 0 of data flow for the system. There are 5 process which is registration or login, check for eligibility, apply the application, check application status, produce report. For the first process it is for applicant to login or register to the system.



**Figure 4.2: Level 0 diagram**

Figure 4.3 shows the entity relationship diagram for this system. It contains ten tables including applicant, application, application document and so forth.

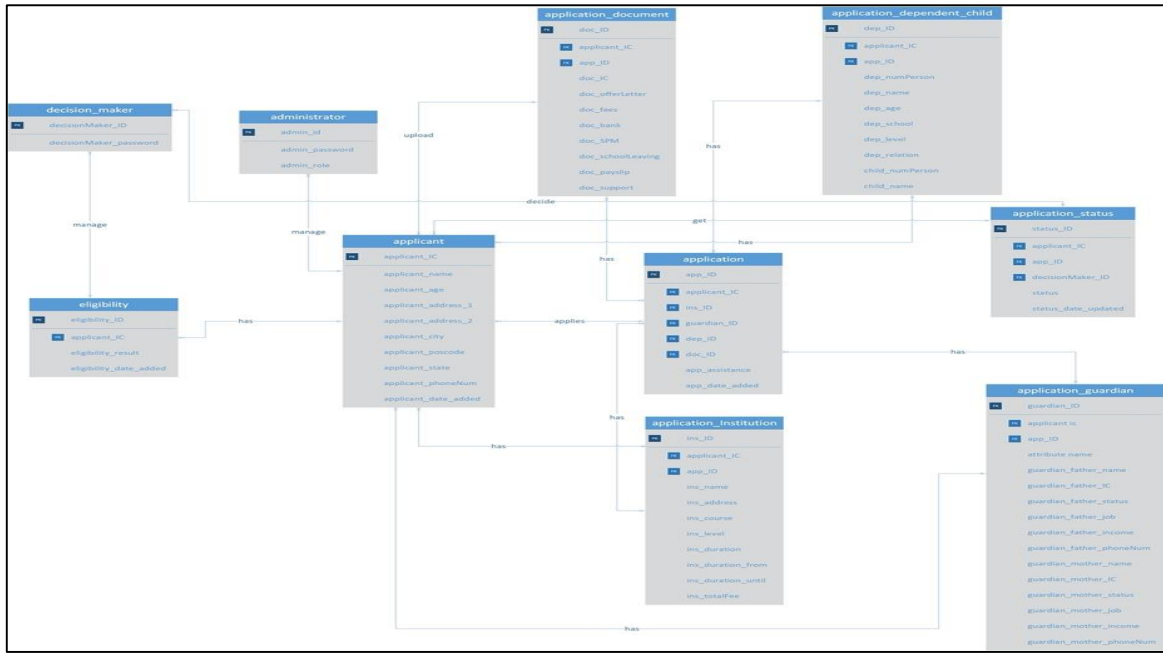


Figure 4.3: Entity Relationship Diagram

Figure 4.4 (a), (b) and (c) shows the applicant flow chart for Decision Support System for Scholarship Scheme Grant.

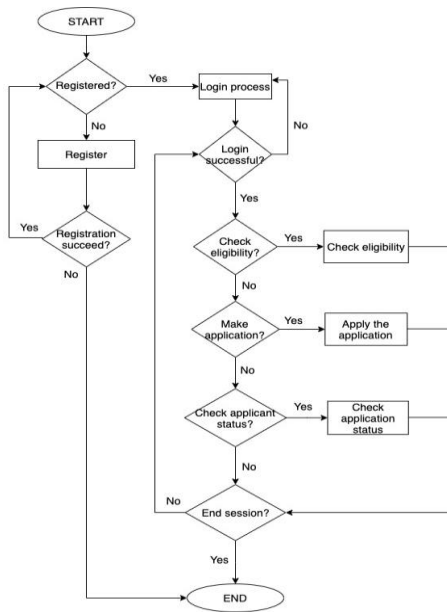


Figure 4.4(a) : Flowchart applicant

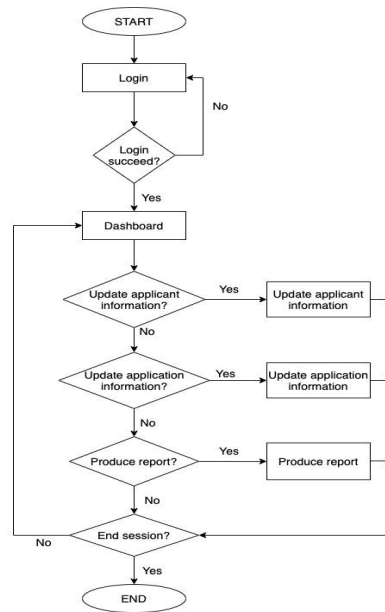
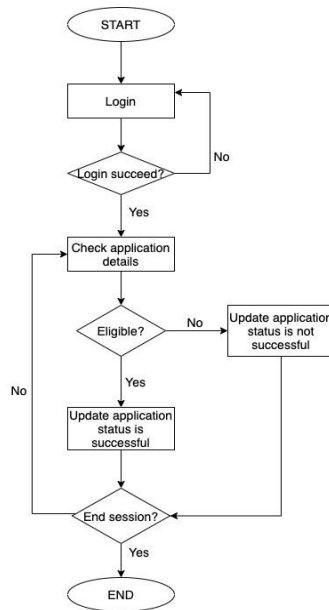
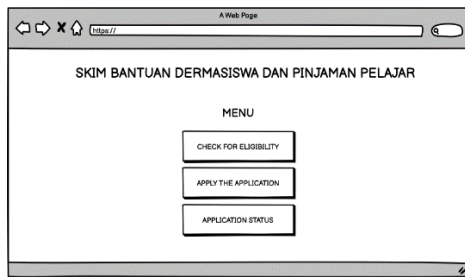


Figure 4.4(b) : Flowchart administrator

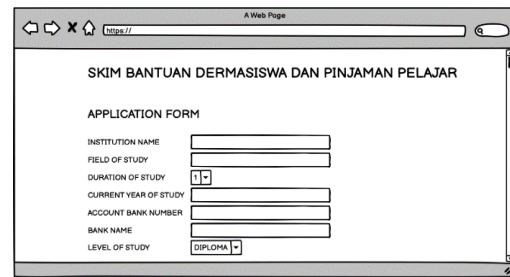


**Figure 4.4(c): Flowchart decision maker**

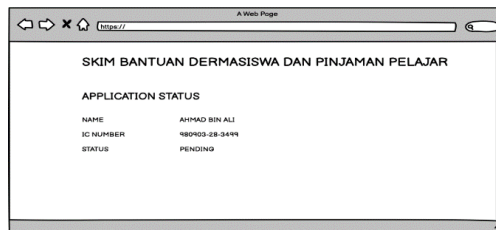
Figure 4.5(a), (b) and (c) shows a few of user interface for Decision Support System for Scholarship Scheme Grant.



**Figure 4.5(a) : Menu user interface**



**Figure 4.5(b) : Application form user interface**



**Figure 4.5(c): Application status user interface**

#### 4.1 Decision Tree for eligibility and list of rules

The following rules is used to determine the eligibility for the offered courses namely as University Al-Azhar, Mesir for courses Syariah and Law, Usuluddin, Dakwah, Studies and Arabic, Islamic Science and Arabic, University Al-Azhar, Mesir for courses Tahfiz Al-Quran and Al-Qiraat and University in Jordan for courses Syariah Islamic Studies, Usuluddin, Tahfiz, Islamic Economy and Arabic. Table 5 lists the rules.

**Rule 1:**  
 IF religion = Islam  
 AND citizen = Malaysia  
 AND residential = >5year  
 AND received other assistance = No



AND guardian income = <kifayah limit  
 AND education = Passed STAM with at least jiyjad rank OR SPM at least 5A (Ulum Islamiah)  
 AND entrance examination = Passed OR was in Year One  
 AND Pejabat Atase Pendidikan Johor AND MTPAJM = Registered  
 THEN qualification = "Al-Azhar, Syariah and Law, Usuluddin, Dakwah, Studies and Arabic, Islamic Science and Arabic"

**Rule 2:**

IF religion = Islam  
 AND citizen = Malaysia  
 AND residential = >5year  
 AND received other assistance = No  
 AND guardian income = <kifayah limit  
 AND education = Have a diploma in Tahfiz Al-Quran and Al-Qiraat from MARSAH OR Darul Quran Jakim  
 AND registered with = Pejabat Atase Pendidikan Johor AND MTPAJM  
 THEN qualification = "Al-Azhar, Tahfiz Al-Quran and Al-Qiraat"

**Rule 3:**

IF religion = Islam  
 AND citizen = Malaysia  
 AND residential = >5year  
 AND received other assistance = No  
 AND guardian income = <kifayah limit  
 AND education = Passed SPM at least 5A OR passed STAM at least jayyid rank  
 AND entrance examination = Was in fourth year of study  
 AND registered with = Office of Education Malaysia Jordan through Agency Johor Jordan Student Welfare (BKPJJ)  
 THEN qualification = "Jordan, Syariah Islamic Studies, Usuluddin, Tahfiz, Islamic Economy and Arabic"

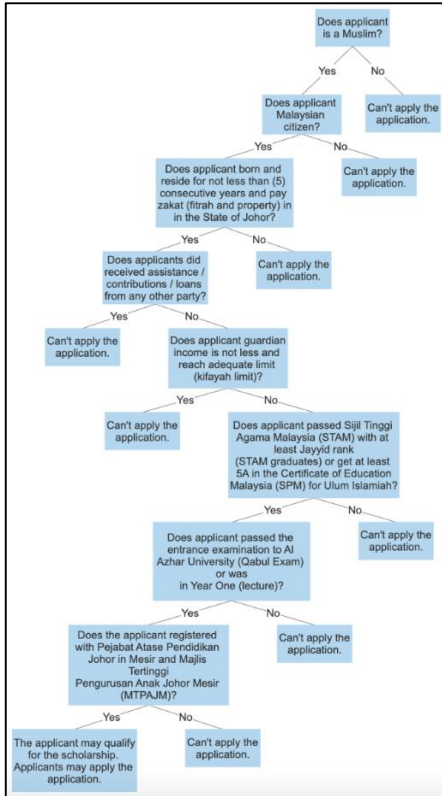
**Table 5: Rules**

Rules	University Al-Azhar, Mesir for courses Syariah and Law, Usuluddin, Dakwah, Studies and Arabic, Islamic Science and Arabic	University Al-Azhar, Mesir for courses Tahfiz Al-Quran and Al-Qiraat	University in Jordan for courses Syariah Islamic Studies, Usuluddin, Tahfiz, Islamic Economy and Arabic
Islam	/	/	/
Malaysian Citizen	/	/	/
Born and reside for not less than (5) consecutive years and pay zakat (fitrah and property) in the state Johor	/	/	/
Did not receive assistance / contributions / loans from any other party	/	/	/
Student guardian income is less and reach adequate limit (kifayah limit)	/	/	/

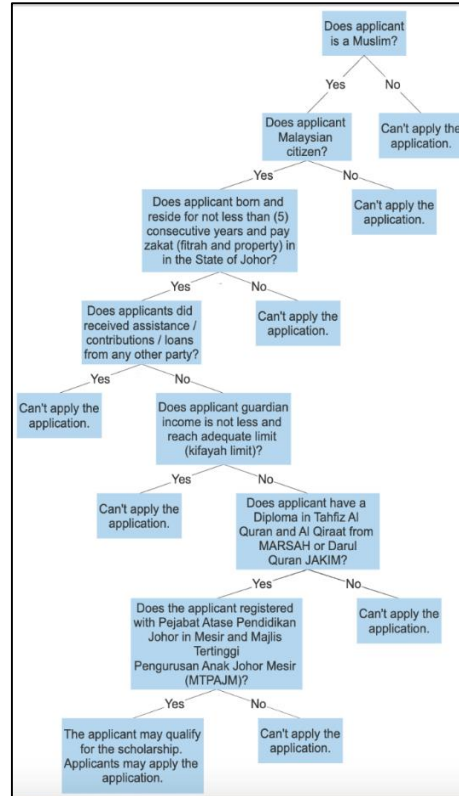
**Table 5: (cont)**

Rules	University Al-Azhar, Mesir for courses Syariah and Law, Usuluddin, Dakwah, Studies and Arabic, Islamic Science and Arabic	University Al-Azhar, Mesir for courses Tahfiz Al-Quran and Al-Qiraat	University in Jordan for courses Syariah Islamic Studies, Usuluddin, Tahfiz, Islamic Economy and Arabic
Passed Sijil Tinggi Agama Malaysia (STAM) with at least Jayyid rank (STAM graduates) or get at least 5A in the Certificate of Education Malaysia (SPM) for Ulum Islamiah	/		
Passed the entrance examination to Al Azhar University (Qabul Exam) or was in Year One (lecture)	/		
Registered with Pejabat Atase Pendidikan Johor in Mesir and Majlis Tertinggi Pengurusan Anak Johor Mesir (MTPAJM)	/	/	
Have a Diploma in Tahfiz Al Quran and Al Qiraat from MARSAAH or Darul Quran JAKIM		/	
Passed SPM with at least 5A or pass STAM with at least Jayyid rank			/
Student have been in the fourth (4) year of study			/
Registered with the Office of Education Malaysia Jordan through the Agency Johor Jordan Student Welfare			/

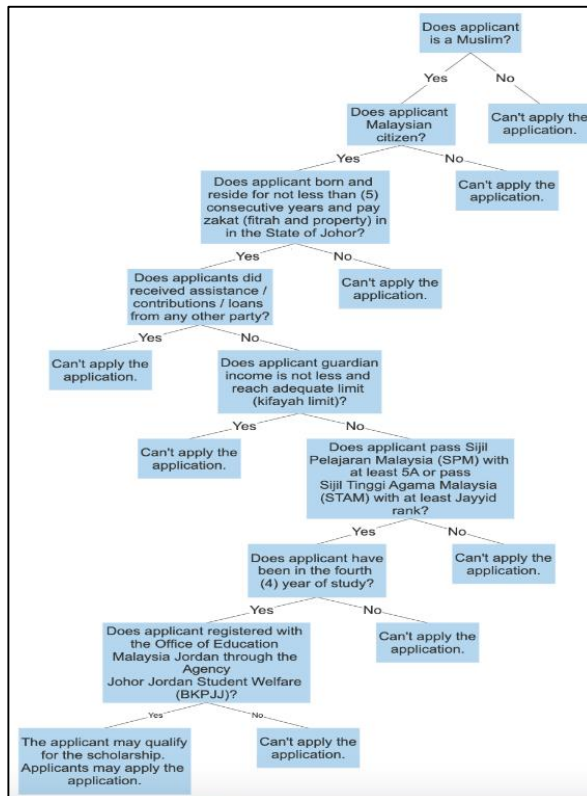
Figure 4.6(a), (b) and (c) shows a decision tree for 3 applicant eligibility for Decision Support System for Scholarship Scheme Grant.



**Figure 4.6(a) : Decision Tree University Al-Azhar for courses Syariah and Law, Usuluddin, Dakwah, Studies and Arabic, Islamic Science and Arabic**



**Figure 4.6(b) : Decision Tree for student University Al-Azhar, Mesir for courses Tahfiz Al-Quran and Al-Qiraat**



**Figure 4.6(c) : Decision Tree for student University in Jordan for courses Syariah Islamic Studies, Usuluddin, Tahfiz, Islamic Economy and Arabic**

## 5. System's Implementation and Testing

This section focuses on descriptions to demonstrate findings from system implementation and testing. This system can only be accessed by systems with registered accounts. Applicants need to register before entering the system. The information required to enter the system is the IC number. Applicants need to fill in their identity card number to access the system. Applicants can apply for scholarships if they are eligible to apply. There is some information required by the system such as the name of the institution, the level of the institution, the duration of the institution of study, etc. to generate results of applicant's eligibility based on the rules that have been set.

Figure 5.1 (a) is an interface for checking the eligibility of the applicant. Applicants need to fill in their name and IC number and select the university and course they want and mark their requirements. Figure 5.1 (b) is the interface if the applicant is eligible to apply, the system will bring up the message box "You can apply" and go directly to the application page for the applicant to apply while if the applicant is not eligible, it will show "You are not eligible to apply". Figure 5.1 (c) and Figure 5.1 (d) show the source code for the qualification page.

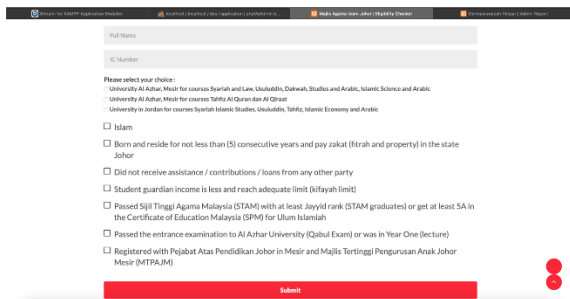


Figure 5.1(a) : Eligibility Interface

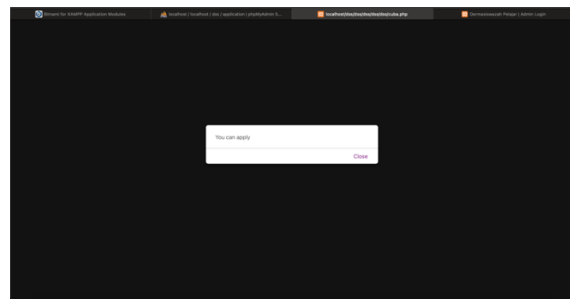


Figure 5.1(b) : Eligibility Interface

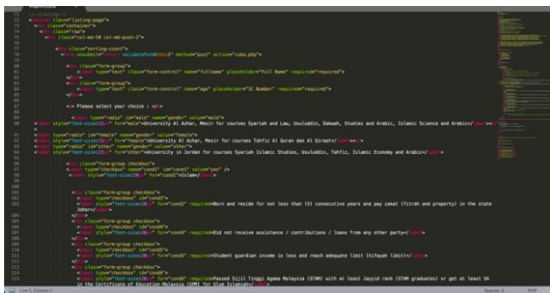


Figure 5.1(c) : Eligibility source code part 1

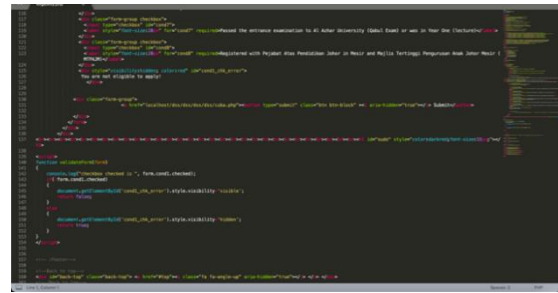


Figure 5.1(d) : Eligibility source code part 2

If the user is eligible to apply, they can proceed with the application. The information required by the system is such as the name of the institution, the level of the institution, the duration of study of the institution, and more. Figure 5.2(a) and 5.2(b) show the code segment for the application page and its interface.

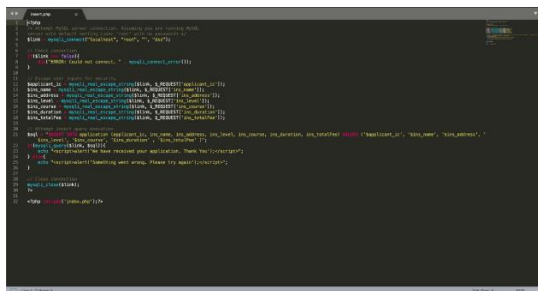


Figure 5.2(a) : Code segment for application page

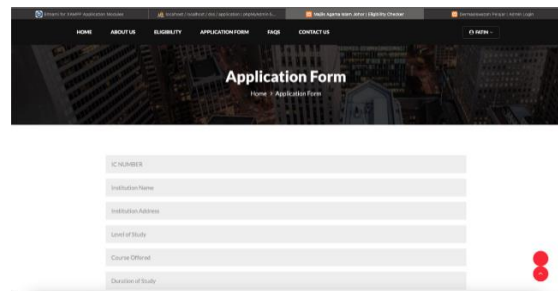


Figure 5.2(b) : Application page

The system also able to show the result of application for that applicant are eligible to apply. Figure 5.3(a) and Figure 5.3(b) show the code segment for result evaluation of application and the interface.

Figure 5.3(a) : Code Segment for Application’s Result

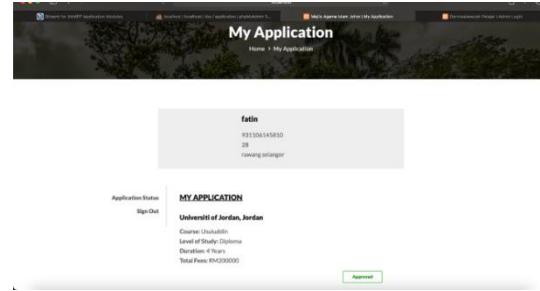


Figure 5.3(b): Result of Application Page

### 5.1 Testing

All five modules are tested, including the login and registration module, application module, evaluation module, data management module and report module.

Table 5: System Functional Testing

Testing Modules	Testing	Expected Results	Actual Results
Registration and Login Module	<ul style="list-style-type: none"> <li>• Input correct username and password for administrator and decision maker</li> <li>• Input correct information for applicant registration</li> <li>• Input correct IC number for applicant login</li> </ul>	<ul style="list-style-type: none"> <li>• Displays the main page of the system for administration and decision maker</li> <li>• Displays registration successfully for applicant</li> <li>• Display main page of the system for applicant</li> </ul>	<ul style="list-style-type: none"> <li>• Login successfully</li> <li>• Registered successfully</li> </ul>
Application Module	<ul style="list-style-type: none"> <li>• Input all the information in the text boxes</li> </ul>	<ul style="list-style-type: none"> <li>• Display the application is successfully submitted</li> </ul>	<ul style="list-style-type: none"> <li>• Successfully submitted the application</li> </ul>
Evaluation Module	<ul style="list-style-type: none"> <li>• Applicants check eligibility by using checkbox and radio button</li> <li>• Decision maker can decide whether to approve or reject the evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• The eligibility are showing the result based on applicants input</li> <li>• The result of application are displayed</li> </ul>	<ul style="list-style-type: none"> <li>• Successfully give the answer for eligibility and application</li> </ul>
Data Management Module	<ul style="list-style-type: none"> <li>• Administrator can manage data of applicants and applications</li> </ul>	<ul style="list-style-type: none"> <li>• Display the updated data</li> </ul>	<ul style="list-style-type: none"> <li>• Successfully displayed the data</li> </ul>
Report Module	<ul style="list-style-type: none"> <li>• Administrator can view the report of applicants and applications</li> </ul>	<ul style="list-style-type: none"> <li>• Display the applicants and applications report</li> </ul>	<ul style="list-style-type: none"> <li>• Successfully generated and viewed the report</li> </ul>

## 6. Summary

For this system, saving time for the applicant eligibility process is the main importance of this project. Applicants can also verify their eligibility conveniently through the internet. If it is apparent from the results of this eligibility analysis that the applicant is eligible, the applicant can continue to apply via the system website. Otherwise, there is no need to apply the application. MAIJ also conveniently manages all applications that fulfil the criteria for eligibility. In fact, the purpose of this system that can also generate reports and data analysis can be performed.

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