

Online Students Scholarship Application With Decision Support System Using Decision Tree Algorithm

Ronald B. Rivera, Joe G. Lagarteja

Abstract: This study aimed to develop a Decision Support System (DSS) applying Decision Tree Algorithm for Scholarship Board of Santiago City, Isabela. The developed system's primary purpose is to help the Scholarship Board of Santiago City in assessing and evaluating students' pre-application requirements and determine whether they are qualified or disqualified to avail the scholarship grants. The system was developed using PHP programming language. Its users' acceptability was evaluated and measured using the ISO 9126 and four-point Likert Scale based on Functionality, Usability, Reliability, Efficiency and Portability. The overall evaluation of the developed system with a grand mean of 3.58 was an indicative of its high acceptability. Scholarship Board of Santiago City expedited up its assessment process of pre-application requirement with the aid of the developed system from 40% to 90% compared from the typical manual system using paper-based processing. As a general result, previously identified problems in the scholarship application were all addressed.

Index Terms: Artificial Intelligence, Android, Classification, Convolutional Neural Network

1 INTRODUCTION

One of the government ways of supporting students of higher learning is through granting scholarships. It is stated in the Republic Act (R.A.) 10687 an act of providing comprehensive unified student financial assistance for tertiary education. Scholarship as defined by Oxford Dictionary is a grant or payment made to support a student's education, awarded on the basis of academic or other achievement. Meanwhile, Santiago City Scholarship Board has this so called BESPREN Scholarship. This program mandates a City-wide College Scholarship Program to help indigent families on their financial problems. However, issues arise in current scholarship program of the City Hall. Currently, the procedures for applying for scholarships are done manually using paper-based processing. Applicants have to fill out their application forms and submit them manually to the office. If there is any problem with their applications while they are processed, it will also take an extra time for the reviewing committee as well as the applicant to communicate and correct the errors. Therefore, it causes a delay in the entire procedure. This informed the development of a decision support system for online scholarship application which can facilitate the processes of various scholarship applications. The decision support system is a web-based system designed to assist the process of scholarship granting. The system's primary purpose is to assess student's pre-application requirements through the use of Decision Tree Algorithm. Decision Tree Algorithm will be used to assess student's grade, residence and income.

Through the use of the decision support system, the team in-charge for LGU Santiago's Scholarship Application will have lesser time in evaluating students' pre-application requirements. Moreover, students (applicants) won't flock their way to the city hall because transactions regarding scholarship application will be processed online.

2 MATERIALS AND METHODS

2.1 Requirement Modelling

This section provides the details of the steps or procedures of the development of "Online Students Scholarship Application with Decision Support System using Decision Tree Algorithm." It also presents the models, processes, risks analysis, design, development and acceptance testing undergone by the researchers during the conduct of the study.

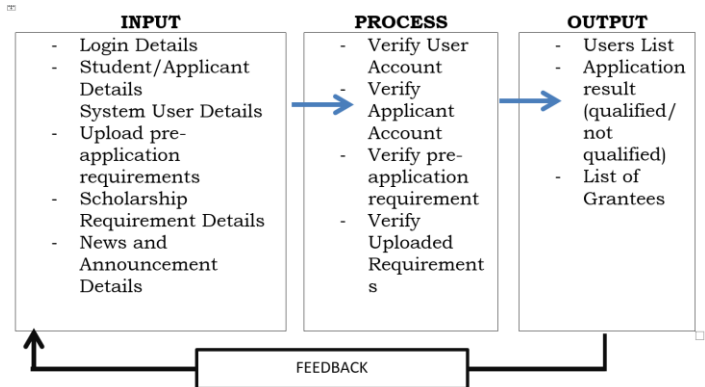


Fig. 1. Input Process Output of the System.

Figure 1 shows the Input-Process-Output of the System. Before an applicant can log-in to the system, the application signs up and will be verified by the system administrator. After which, the applicant fills up the pre-application requirement to be validated by the system using a decision tree algorithm whether qualified or not. Once an applicant passed the pre-application validation, applicant can now upload secondary requirements for further processing. On the other hand, the

- Ronald B. Rivera is from Callang National High School, San Manuel Isabela
- Joe G. Lagarteja is from Isabela State University, Echague Isabela

scholarship in-charge verifies and approves scholarship application and print the list of grantees.

2.2 Data Process Modelling

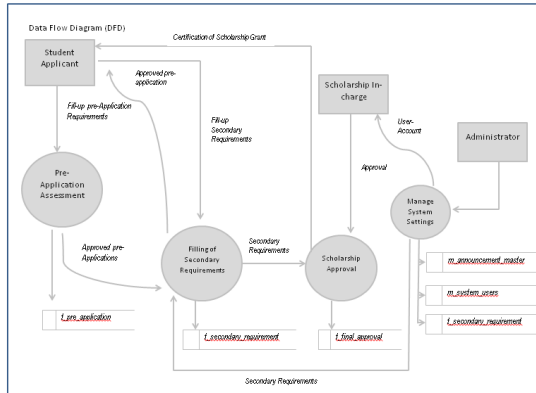


Fig. 2. Context Diagram

Figure 2 shows the context level 0 diagram of the system. The application starts with the students (applicants) filing the pre-application requirements. Pre-application requirements include grade, residence, and average monthly income. These requirements are the basis of applicant's qualification or disqualification. If qualified, the student (applicant) uploads the secondary requirements. These requirements are then checked by the scholarship in-charge as basis of issuance of the certification of scholarship grants.

2.3 Classification of Applicant using Decision Tree Algorithm

A decision tree is a map of the possible outcomes of a series of related choices [1]. It allows an individual or organization to weigh possible actions against one another based on their costs, probabilities, and benefits. They can be used either to drive informal discussion or to map out an algorithm that predicts the best choice mathematically [2][3]. A decision tree typically starts with a single node, which branches into possible outcomes. Each of those outcomes leads to additional nodes, which branch off into other possibilities. This gives it a treelike shape. There are three different types of nodes: chance nodes, decision nodes, and end nodes. A chance node, represented by a circle, shows the probabilities of certain results. A decision node, represented by a square, shows a decision to be made, and an end node shows the final outcome of a decision path [4][5]. Decision trees can also be drawn with flowchart symbols, which some people find easier to read and understand.

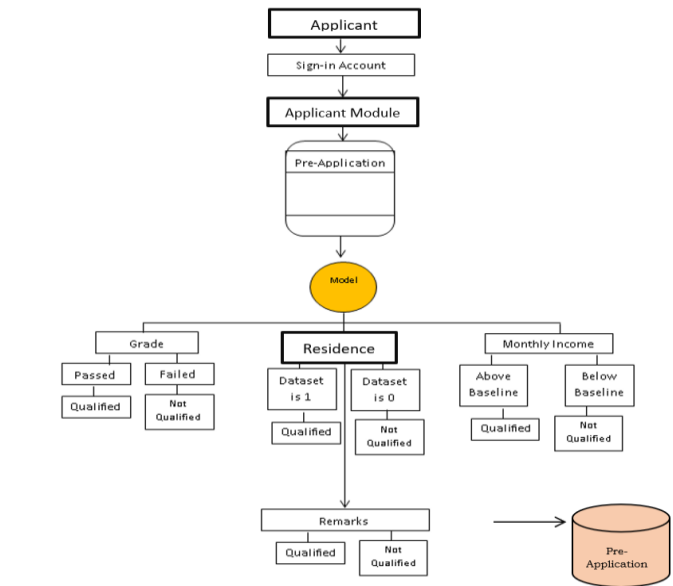


Fig. 3. Classification Algorithm Representation using Decision

Figure 3 shows the classification process of the of the system using Decision Tree Algorithm. It shows the process how an applicant can be classified as qualified and not-qualified.

2.4 User Design

In this stage, the researcher systematically designed the layout that would meet the needs of the system.

1. Login Form - it is where the authorized user will enter his/her username and password. Once a user enters a correct username and password he/she is redirected to the user's panel.
2. Dashboard – it is where the system administrator can view updates and status of scholarship grants, gender distribution board and Residence counter.
3. Pre-application Module – it where the student pre-applies for scholarship. The pre-application is pre-processed using a Decision Tree Algorithm based on Grades, Residence, and Monthly Income to determine whether the applicant is qualified or disqualified for scholarship grants.
4. Upload Secondary Requirement – once the pre-application is approved, secondary requirements module is enabled for an applicant to upload secondary requirements.

2.5 Programming Environment

In computer program and software product development, the development environment is the set of processes and programming tools used to create the program or software product. The programming environment used by the researchers to develop the Decision Support System for Scholarship Application is as follows:

Frontend:

- Hypertext Pre-processor (PHP)
- Javascript
- AJAX
- Bootstrap CSS

Backend:

- MySQL

2.6 System Evaluation

To evaluate the system researchers used the ISO/IEC 9126 standard in evaluating the user's perception. The four-point Likert scale was used and as follows:

FORMULA:

$$X = x/n$$

WHERE:

X – Mean, x – Value of items, n – number of items

ASSUMPTIONS:

- 4 –Highly Acceptable 3 –Very Acceptable
2 –Acceptable 1 – Not Acceptable

RANGES:

- 3.26 – 4.00 Highly Acceptable
2.51 – 3.25 Very Acceptable
1.76 – 2.50 Acceptable
1.00 – 1.75 Not Acceptable

3 RESULTS AND DISCUSSIONS**3.1 Users Acceptability of the System****TABLE 1****USER ACCEPTABILITY OF THE SYSTEM BASED ON FUNCTIONALITY**

Characteristics	Range Value	Qualitative Rating
The system records applicant's information	3.72	Highly Acceptable
The system assesses pre-application requirements as basis of approval	3.58	Highly Acceptable
The system generates scholarship grants dashboard	3.82	Highly Acceptable
The generates announcements	3.85	Highly Acceptable
Mean	3.75	Highly Acceptable

The degree to which the functionality of the developed system was found out to be 3.57 and it was Highly Acceptable.

TABLE 2**USER ACCEPTABILITY OF THE SYSTEM BASED ON USABILITY**

Characteristics	Range Value	Qualitative Rating
The system is equipped with message box/notification boxes	3.56	Highly Acceptable
The system operates with minimal effort	3.61	Highly Acceptable
The system's interface is appealing	3.40	Very Acceptable
The system uses icons in every menu	3.53	Highly Acceptable
Compared to other software, the system is easy to learn	3.60	Highly Acceptable
Mean	3.54	Highly Acceptable

The degree to which the usability of the developed system was found out to be 3.54 and it was Highly Acceptable.

TABLE 3**USER ACCEPTABILITY OF THE SYSTEM BASED ON RELIABILITY**

Characteristics	Range Value	Qualitative Rating
The system uses trapping scripts to secure proper data is stored	3.42	Very Acceptable
The system is capable of restoring deleted data	3.60	Highly Acceptable
The system tracks creation and modification of data	3.60	Highly Acceptable
Mean	3.54	Highly Acceptable

The degree to which the efficiency of the developed system was found out to be 3.51 and it was Highly Acceptable.

TABLE 4**USER ACCEPTABILITY OF THE SYSTEM BASED ON EFFICIENCY**

Characteristics	Range Value	Qualitative Rating
The system responds promptly	3.42	Very Acceptable
The system accomplishes task quickly	3.50	Highly Acceptable
The system obtains more current and timely information	3.56	Highly Acceptable
The system has more concise and summarized information	3.67	Highly Acceptable
	3.43	Very Acceptable
Mean	3.51	Highly Acceptable

degree to which the portability of the developed system was found out to be 3.57 and it was Highly Acceptable.

TABLE 5
USER ACCEPTABILITY OF THE SYSTEM BASED ON PORTABILITY

Characteristics	Range Value	Qualitative Rating
The system is capable of changing/managing user roles	3.52	Highly Acceptable
Installation of the system is done effortlessly	3.61	Highly Acceptable
The system can be accessed anywhere through internet connection	3.60	Highly Acceptable
<i>Mean</i>	3.57	Highly Acceptable

The degree to which the Functionality, Usability, Reliability, Efficiency, and Portability of the developed system was found out to be 3.58 and it was Highly Acceptable.

TABLE 6
Grand Mean

Parameter	Grand Mean	Qualitative Rating
Functionality	3.75	Highly Acceptable
Usability	3.54	Highly Acceptable
Reliability	3.54	Highly Acceptable
Efficiency	3.51	Highly Acceptable
Portability	3.57	Highly Acceptable

4 CONCLUSION

Based on the results of the acceptability evaluation of the system, problems identified were all addressed. The system can determine qualified and disqualified applicants through pre-application. It also lessens the work of scholarship in-charge through its automated facilities. The cooperating agency can also ensure their data security through database integration and login privileges. Lastly, the system provides timely generation of scholarship reports.

5 ACKNOWLEDGMENT

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