Decision Support System for Selecting University in Pekanbaru Based on Android

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Abstract — Nowadays development of technology is growing fast, especially Android Operating System (OS). Android is a technology that can help humans to improve their works, both quality and quantity, e.g., making decisions. This study discusses the application of decision support systems to select a university. Many students are still confused to select the best university for them. Hence, this application aims to assist students in making decisions using a weighted product (WP) method. It exploits some criteria, namely, Distance, university accreditation, and a number of lecturers. The research methodology is used, namely problem analysis, analysis of both hardware and software requirements, design system, implementation, and testing. Ultimately, the application can be utilized. This application is built on Android Studio and Java Development Kit. It is implemented in Universities in Riau. This application can help students to choose the best university quickly and accurately.

Keywords—Decision Support System, Weighted Product, Selection of Universities, Android

1. Introduction

Currently, many universities offer majors by comparing their strengths to each other. Therefore, it makes students confusing to choose. Hence, it needs a system to make it easier to select a university by comparing the quality of universities that can be utilized on the Android Operating System (OS). Android is a Linux kernel-based used on smartphones and tablet computers. Android is a complete platform consisting of an operating system, application, and development tools. It is supported by various open source communities in the world. Consequently, it makes Android growing fast and able to develop in terms of devices and technology [1]. Android Studio is an Integrated Development Environment (IDE), an official software to make Android applications. It is based on IntelliJ IDEA. The development of IntelliJ is located in a code editor and providing more features. Ultimately, it can increase making Android applications [2].

The concept of Decision Support Systems (DSS) is needed in supporting stages for making a decision. It starts with identifying problems, data selection, approach selection, and evaluating such an approach [3]. The main objective is to help in making decisions, both structured and semi-structured issues [4]. Characteristic of DSS consists of five [5], namely, divide problems into semi-structured or unstructured; combine analytical methods, conventional data, data search, and information integration; use an interactive model (user friendly) and flexible and able to adapt in any environments. Another strengths of DSS [5] are to extend user capabilities, save time for solving problems, especially for complex issues; problem solution is more reliable; produce another alternative solution and can find additional evidence to increase justification.

Fig. 1. Framework of DSS

There are four stages in DSS [6] as shown in Figure 1. Firstly, search (intelligence), a process of searching and detecting elements that cause problems. Secondly, design is a process to make several methods that can be a problem solution. Thirdly, selection (choice) is selection of an alternative model that can solve a problem. Fourthly, implementation is to apply the chosen method into a system using a computer. Fifthly, monitoring is a process to know
the function as expected.

After students complete high school education level, the student wants to proceed to the university that is in accordance with the student's ideas and expertise. To determine the best university, students need a decision. This research makes a selection process to choose the university using Weighted Product (WP) method. The selection of WP because it's easy to calculate compared to other methods. The research problem is how to make a decision to choose the right university using WP method.

This paper is arranged as follows: Section 2 describes the literature review. Section 3, explains the research methodology. Result can be seen in Section 4. Finally, Section 5 draws a conclusion from DSS for selecting a university.

II. LITERATURE REVIEW

The system is a collection of interrelated elements that are responsible for processing input so as to produce output. The system is a network of interrelated procedures, gathered together to complete a particular goal [7]. Android is a Linux-based mobile operating system that includes operating systems, middleware and applications. Andro...
accreditation is still on-going process.

**TABLE I. WEIGHT VALUE OF EACH CRITERION**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Name Criteria</th>
<th>Weight Value (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Distance</td>
<td>2</td>
</tr>
<tr>
<td>C2</td>
<td>Accreditation</td>
<td>4</td>
</tr>
<tr>
<td>C3</td>
<td>Number of lecturers</td>
<td>4</td>
</tr>
</tbody>
</table>

**TABLE II. ACCREDITATION OF UNIVERSITIES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Accreditation Criteria</th>
<th>Weight Value (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accreditation</td>
<td>NB</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3 represents range number of lecturers in university. It comprises 5 groups namely, 0-10 people, 11-20 people, 21-30 people, 30-40 people and more than 40 people.

**TABLE III. NUMBER OFLECTURERS AT UNIVERSITIES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Criteria Range Number of Lecturers</th>
<th>Weight Value (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Lecturers</td>
<td>0 – 10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>11 – 20</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>21 – 30</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>30 – 40</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>&gt; 40</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 4 indicates that there are 5 universities as an alternative choice that wants to be enrolled as input into the system.

**TABLE IV. ALTERNATIVES USED**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Name of Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>ST Manajemen Ilmu Komputer AMIK Riau</td>
</tr>
<tr>
<td>A2</td>
<td>ST Ilmu Farmasi Riau</td>
</tr>
<tr>
<td>A3</td>
<td>ST Ilmu Ekonomi Riau</td>
</tr>
</tbody>
</table>

Furthermore, a data search can be conducted for the above universities with a starting point at Jl. Jendral Sudirman, in Pekanbaru, Riau (Back of Awal Bros Hospital).

a. ST Manajemen Ilmu Komputer AMIK Riau
The Distance from residence to the university is 13 km, university accreditation is B, and a number of lecturers are 38 people.

b. ST Ilmu Farmasi Riau
The Distance from residence to the university is 14 km, and university accreditation is B, and a number of lecturers are 20 people.

c. ST Ilmu Ekonomi Riau
The Distance from residence to the university is 12 km, university accreditation is C, and a number of lecturers are 44 people.

After the data has been obtained, input such data into a table to be exploited as a reference. Table 5 shows Alternative Matches. It consists of 3 criteria, namely, C1, C2, and C3. C1 defines Distance, C2 indicates university accreditation, and C3 indicates a number of lecturers. Meanwhile, it comprises 3 universities, which are A1, A2, and A3. A1 describes ST Manajemen Ilmu Komputer AMIK Riau, A2 represents ST Ilmu Farmasi Riau, and A3 shows ST Ilmu Ekonomi Riau.

**TABLE V. ALTERNATIVE MATCHES**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
</tr>
<tr>
<td>A1</td>
<td>13 km</td>
</tr>
<tr>
<td>A2</td>
<td>14 km</td>
</tr>
<tr>
<td>A3</td>
<td>12 km</td>
</tr>
</tbody>
</table>

After matching the values of each criterion. Then, the next step is repair of weight first, where the initial weight $W = (2,4,4)$ to be fixed to $W_j = \frac{W_j}{\sum W_j}$, where:

$$W_j = \text{Weight value}$$

$$\sum W_j = \text{Number of weight values}$$

and obtained values of $W1, W2, W3$ as follows:

a) $W_1 = \frac{2}{2+4+4} = 0,2$

b) $W_2 = \frac{4}{2+4+4} = 0,4$

c) $W_3 = \frac{4}{2+4+4} = 0,4$

After making improvements, the next step is to calculate the S vector value, using multiplication to link the attribute rank. Rating attributes must be increased first with the weight of these attributes. The formula of vector S is:

$$S_i = \prod_{j=1}^{\#} X_{ij}^{W_j}$$  \hspace{1cm} (2)$$

with $i = 1, 2, 3, \ldots, n$, where $j = 1, W_j$ is rank positive for benefit attribute (C2 and C3) and negative value (C1) for cost attribute.

a) $S1 = (13^{0,2})(3^{0,4})(4^{0,4}) = 1,62$

b) $S2 = (14^{0,2})(3^{0,4})(3^{0,4}) = 1,42$

c) $S3 = (12^{0,2})(2^{0,4})(5^{0,4}) = 1,53$

After obtaining the S vector value in each of the next alternatives is to rank to determine the best alternative choice. This ranking uses the value $V$ where the formula of V is:

$$V_i = \frac{\prod_{j=1}^{\#} X_{ij}^{W_j}}{\prod_{j=1}^{\#} (X_{ij}^{\ast W_j})}$$ \hspace{1cm} (3)$$

where:

$I$ = 1, 2, 3, ..., n
$V$ = Alternative preferences are analogous to vectors
$V_x$ = Criteria value
$W$ = Weight of criteria / sub criteria
$i$ = Alternative
$j$ = Criteria
$n$ = Number of criteria
$\ast$ = The number of criteria that have been assessed in vector S

Or more simply as:

$$V_i = \frac{X_i}{\sum X_i}$$  \hspace{1cm} (4)$$

where:

$I$ = 1, 2, 3, ..., n
$V$ = Alternative preferences are analogous to vectors
\[ S_i = \text{Vector } S \]
\[ \sum S_i = \text{Number of Vector } S \]

Then, calculate values of \( V_1, V_2 \) and \( V_3 \) as follow:

a) \[ V_1 = \frac{1.617591+1.4205283+1.52825952}{4.5663788} = 0.35 \]

b) \[ V_2 = \frac{1.4205283}{4.5663788} = 0.31 \]

c) \[ V_3 = \frac{1.5282595}{4.5663788} = 0.33 \]

Based on the calculation, \( V_1 \) has a higher value than the values \( V_2 \) and \( V_3 \).

**B. Implementation**

Figure 3 shows the user guide to use the application. This page is displayed once the application is operated. It describes weighting criteria consisting of Distance, accreditation, and number of lecturers. Button “NEXT” is used to go to the next page.

The second input page is the same way as the input page 1. Figure 5 shows the input page 2.

The third input page has the same input method as the previous page. Figure 6 shows the input page 3.
Figure 7 shows the best alternative result using WP method as DSS. The system chooses the appropriate university to user. From three (3) universities namely, STMIK AMIK Riau, ST Ilmu Farmasi Riau and ST Ilmu Ekonomi Riau. The recommendation university is STMIK AMIK RIAU with ranking value 0.35.

V. CONCLUSION

Based on experimental results, there are some conclusions that can be described. First, the application uses WP method as calculation process so it is more accurate. However, decision making is depend on users. Secondly, it can help users making decision to select appropriate university. Thirdly, the application is utilized in Pekanbaru area. Finally, the application is based on Android OS and it can be exploited in everywhere and offline (without internet connection).

REFERENCES