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Decision Support System Determines the Best Nutritional Health Study Program at the College of Health Sciences Using the Method TOPSIS (Case Study: Kopertis Region I North Sumatra)

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Abstract

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Nutritional health problems now and in the future mean increasing Indonesia's human development index which is still minimal, nutrition graduates are needed who are able to manage nutrition programs from planning to strong evaluation. The need for nutritional health graduates can be seen from the tendency to increase the number of enthusiasts in the field of nutritional health studies, which is still minimal. So prospective students need the best nutritional health study program to make it easier for prospective students to determine the best nutritional health study program at STIKES to be selected. The number of methods in solving problems in decision making such as AHP, SAW, WP, and others.

Keywords: best health and nutrition study program, decision support system, technique for order preference by similarity to ideal solution (TOPSIS)

1. Introduction

Competition in the world of education is getting faster. This demands special attention from higher education providers to pay attention to the quality of education offered[1] to improve the quality of a university[2]. Higher Education is one of the institutions that contribute to educational activities in Indonesia, of course, must be able to adapt in the face of several developing trends[3]. Quality universities are able to answer the challenges, needs, and desires of the community along with the progress and development of science that continues to advance[4]. Every college has a goal[5]. To achieve this goal, higher education managers must know the causes of interest in entering Higher Education[6]as well as strategies that are right on target for prospective students so that the campus becomes a public favorite, one of which is in great demand today, namely STIKES which has a Nutritional Health Study Program. Right on target is a must so that it can really be useful for those in need[7].

Decision support system is a system that is able to solve problems efficiently, effectively[8], which aims to provide information, guide, predict and direct information users to make better decisions[9]. Decision support systems provide a semi-structured decision, where no one knows for sure how decisions should be made[10]. In the role of decision support systems in the context of the entire information system, it is aimed at improving performance through the application of information

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technology and determining the approach used in the decision-making process, to evaluating interactive selection.[11].

Technique for Others Preference by Similarity to Ideal Solution (TOPSIS) method to help[12] looking for the best alternative from a number of available alternatives[13]in the selection process of selecting the best nutritional health study program in the Kopertis area of North Sumatra region I. The implementation of the TOPSIS method on this problem is applied by making an application-based[14] Microsoft Visual Basic Net 2008.The steps used in the TOPSIS method are the normalization matrix calculation process, the weighted normalization matrix calculation process, the process of determining the positive ideal solution and the negative ideal solution, the process of calculating the distance between each alternative to the ideal solution, and the process of calculating the preference value of each alternative.[15].

2. Method

The stages that must be carried out in this method are:

1. Determine the assessment criteria.
2. Enter data on alternative nutritional health study programs that are assessed.
3. Contents Value for each alternative health and nutrition study program.
4. Create a normalized decision matrix.
5. Determine the yij matrix, namely the positive ideal solution and the negative ideal solution matrix.
6. Determine the distance between the value of each alternative with the positive ideal solution matrix and the negative ideal solution matrix.
7. Produce output in the form of assessment results.

The hardware and software needed are:

1. Hardware (Hardware)
   a. Hard Disk
   b. Ram
   c. Processor
   d. Laptops
2. Software (Software)
   a. Operating system using windows
   b. Microsoft Visual Basic Net 2008

3. Results and Discussion

3.1 TOPSIS Algorithm

The steps for the TOPSIS algorithm are as follows:

1. Ranking Each Alternative

TOPSIS requires a performance ranking of each alternative on each normalized criterion, namely: $A_i C_j$

$$rij = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x^2 ij}} \quad \text{with i=1,2,....m; and j=1,2,.....n;}$$

2. Weighted normalized decision matrix

$$yij = wirij \quad \text{with i=1,2,...,m and j=1,2,...,n}$$

3. Positive and Negative Ideal Solutions

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The positive ideal solution A+ and the negative ideal solution A- can be determined based on the normalized weight ranking (yij) as follows:

$$A+ = (y_1^{+¿¿} , ,);y_2^{+¿ y_n^{+¿¿} ¿}$$

$$A- = (y_1^{-¿¿} , ,);y_2^{-¿ y_n^{-¿¿} ¿}$$

4. Distance With Ideal Solution

Distance is alternative A_i with a positive ideal solution is formulated as follows:

$$= 2D_i^{+¿\sqrt{\sum_{j=1}^{n} ¿¿¿¿}} \quad \text{with i = 1,2,…,m}$$

Distance is alternative Ai with negative ideal solution formulated as follows:

$$=2D_i^{-¿\sqrt{\sum_{j=1}^{n} ¿¿¿¿}} \quad \text{with i = 1,2,…,m}$$

5. Preference Value for Each Alternative

The preference value for each alternative (Vi) is given as:

$$V_i = \frac{D_i^{-¿}}{D_i^{-¿} - D_i^{+¿}¿} ¿ \quad \text{i=1,2,...,m}$$

A larger value indicates that the alternative is preferred.$V_i A_i$

3.2 Current System Analysis

System analysis is the decomposition of a complete information system into its component parts with a view to identifying and evaluating problems, opportunities, obstacles that occur and expected needs so that improvements can be proposed.

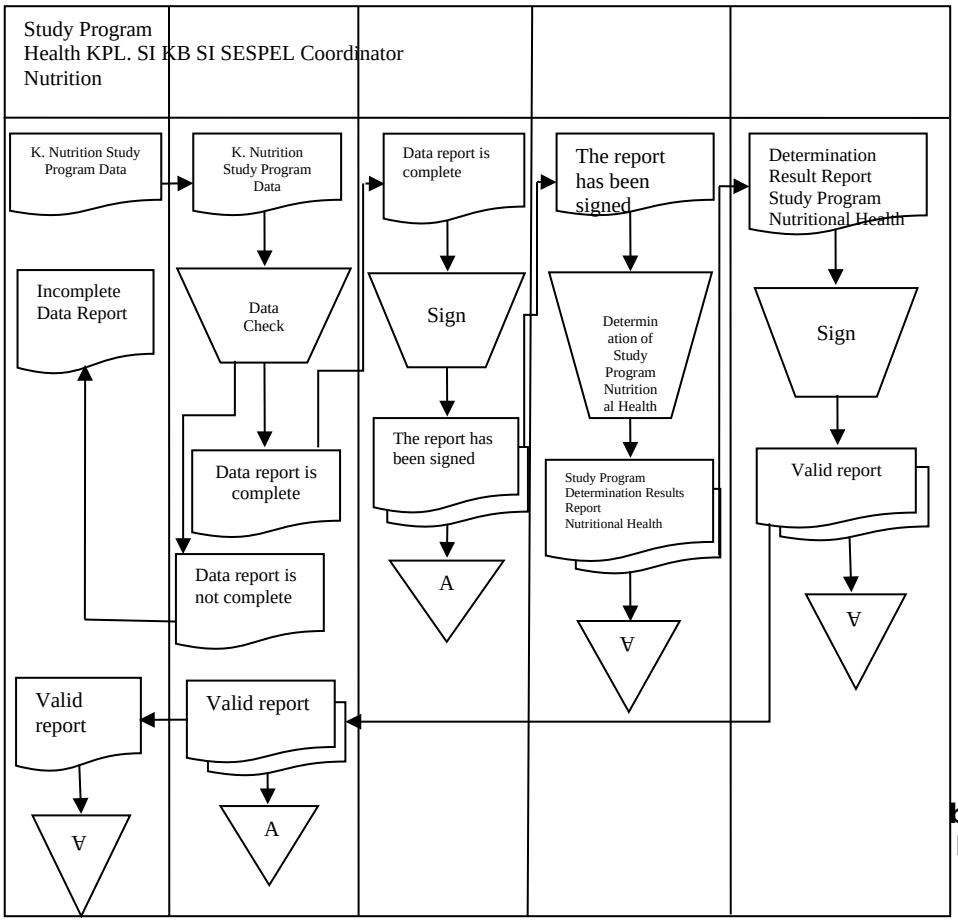

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Figure 1. Current System
source : Kopertis Region I

Table 1. Data of Nutrition Health Study Program

No	Wil	Level	STICK	Study program	No. SK	thn SK	Rating	date Expiration (date-month-yr)	Expired Status
1	01	D-IV	STICK A	NUTRITIONAL HEALTH	180/ SK/ BAN-PT/ Akred/ Dpl-D-IV/ 2014	2014	B	27-06-2019	Still valid
2	01	D-III	STICK B	NUTRITIONAL HEALTH	017	2009	B	17-07-2014	In the process of re-accreditation and has applied for re-accreditation on 11-09-2014
3	01	D-IV	STICK C	NUTRITIONAL HEALTH	012	2009	C	08-13-2014	In the process of re-accreditation and has applied for re-accreditation on 11-09-2014
4	01	D-III	STICK D	NUTRITIONAL HEALTH	015	2014	A	27-06-2019	Still valid
5	01	D-III	STICK E	NUTRITIONAL HEALTH	018	2014	A	08-08-2019	Still valid
6	01	D-IV	STICK F	NUTRITIONAL HEALTH	180/ SK/ BAN-PT/ Akred/ Dpl-	2010	C	07-20-2015	In the process of re-accreditation and has applied for re-accreditation

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					D-IV/ 2014				on 11-09-2014
7	01	D-IV	STICK G	NUTRITIONAL HEALTH	013	2015	B	08-15-2020	Still valid
8	01	D-III	STICK H	NUTRITIONAL HEALTH	180/ SK/ BAN-PT/ Akred/ Dpl-D-III/ 2014	2015	B	11-06-2020	Still valid
9	01	D-IV	STICK I	NUTRITIONAL HEALTH	180/ SK/ BAN-PT/ Akred/ Dpl-D-IV/ 2014	2009	C	08-16-2014	In the process of re-accreditation and has applied for re-accreditation on 11-09-2014
10	01	D-III	STICK J	NUTRITIONAL HEALTH	180/ SK/ BAN-PT/ Akred/ Dpl-D-III/ 2014	2014	B	07-08-2019	Still valid

source : Kopertis Region I

To build a Decision Support System to Determine the Best Nutritional Health Study Program with the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method, there is a TOPSIS system flowchart. TOPSIS flowchart can be seen in Figure 4.3 below:

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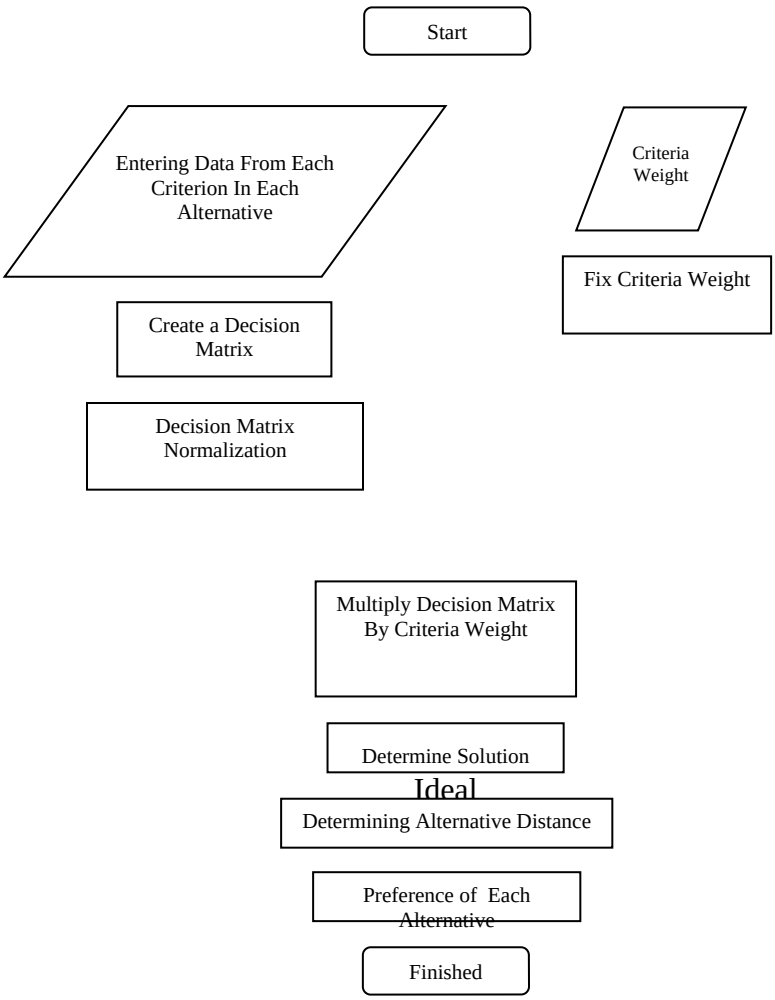

Figure 2. TOPSIS Flowchart

The functionality of the designed application system is described in the form of a use case diagram. As seen in Figure 3 below:

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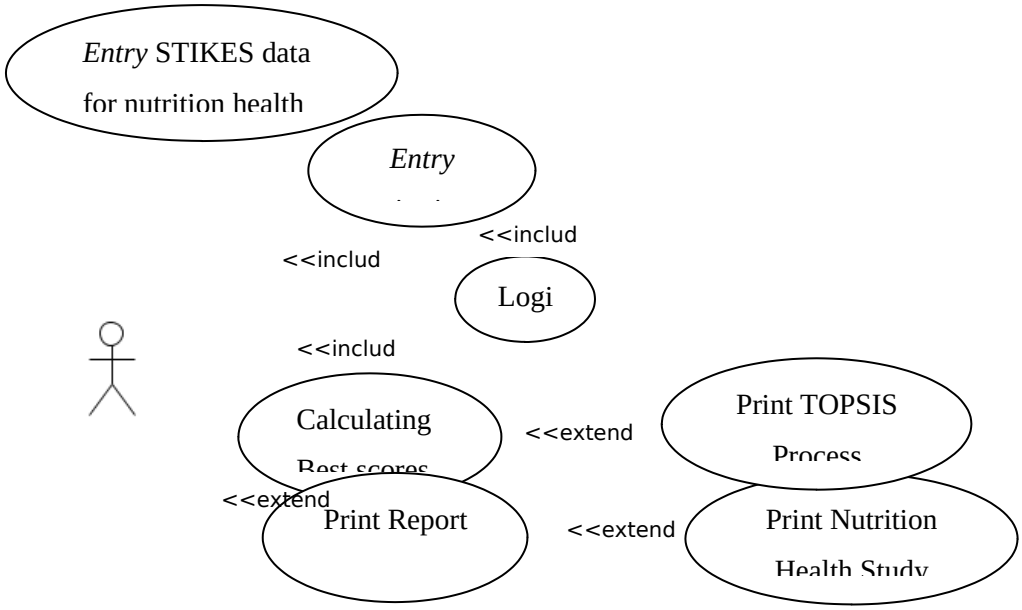

Figure 3. Use Case Diagram

Data on nutritional health study programs along with other information based on certain criteria can be seen in Figure 4 below:

Laporan Data Prodi Kesehatan Gizi

KOPERTIS WILAYAH I SUMUT

Jl. Setia Budi Gg. Sempurna

No	No Reg	Nama	Alamat	Tahun Berdiri	No Telp
1	P001	STIKES A	Medan Patumbak	9/29/1970	0615674356
2	P002	STIKES B	Medan Tembung	3/16/1989	0615328452
3	P003	STIKES C	Medan Kota	5/23/2001	0615345277
4	P004	STIKES D	Tanjung Sari	11/25/1965	0615784594
5	P005	STIKES E	Medan Maimun	11/13/1972	0615153822
6	P006	STIKES F	Medan Aksara	6/3/1983	0615448712
7	P007	STIKES G	Medan Petisah	11/13/1989	0615385261
8	P008	STIKES H	Deli Serdang	5/14/1964	0615782391
9	P009	STIKES I	Medan Brayan	12/14/1979	0615274585
10	P010	STIKES J	Pakam	7/5/1984	0615976485

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Figure 4. Data Report of Nutrition Health Study Program

3.3 Decision Result of Health Nutrition Study Program Determination

The report from this decision support system is to display the final calculation results from processing the data obtained on the assessment form with the aim of getting the best nutritional health study program for prospective students who can have PTS quantity and quality values.

Laporan Data Prodi Kesehatan Gizi

KOPERTIS WILAYAH I SUMUT

Jl. Setia Budi Gg. Sempurna

No.	No Reg	Nama	Alamat	Hasil	Keterangan
1	P001	STIKES A	Medan Patumbak	0,4140818	--
2	P002	STIKES B	Medan Tembung	0,3812486	--
3	P003	STIKES C	Medan Kota	0,5935119	--
4	P004	STIKES D	Tanjung Sari	0,7073061	--
5	P005	STIKES E	Medan Maimun	0,4064881	--
6	P006	STIKES F	Medan Aksara	0,2926039	--
7	P007	STIKES G	Medan Petisah	0,6187514	--
8	P008	STIKES H	Deli Serdang	0,5859182	--
9	P009	STIKES I	Medan Brayan	0,5935119	--
10	P010	STIKES J	Pakam	0,7185348	Prodi Kesehatan Gizi Terbaik

Figure 4. Decision Result Report

Hierarchical arrangement by setting goals that the overall system targets at a limited level.

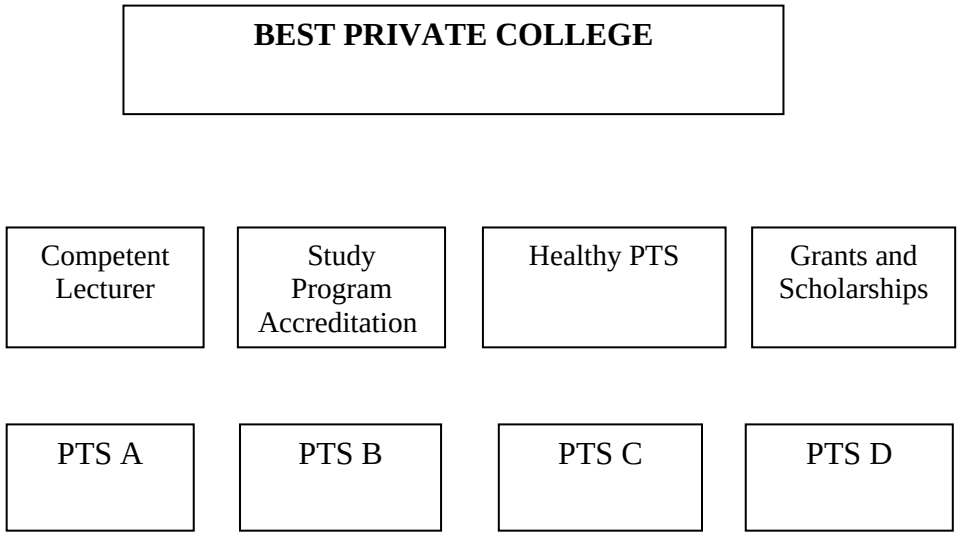

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Figure 1. AHP Hierarchical Structure

The following data are needed to support this research in determining the best private universities in the Kopertis Area I.

Table 1. PTS data

No. Reg	PTS name	Address	Year	PTS type	phone
001	PTS A	Jl. Krakatoa Medan	12 -04-1976	University	0617772111
002	PTS B	Jl. BC. King of Medan	07-06-1961	University	0617800006
003	PTS C	Jl. Field Fishing	31-11-1957	University	0617833330
004	PTS D	Jl. BC. King of Medan	04-01-1965	University	0617666990

PTS Determination Procedures include:

Table 2. PTS Penilaian Assessment Data

PTS name	Competent Lecturer	Study Program Accreditation	Healthy PTS	Grants and Scholarships
PTS A	25 lecturers	A	Healthy	There is
PTS B	15 lecturers	B	Healthy	There is
PTS C	18 lecturers	B	Not healthy	There is
PTS D	15 lecturers	C	Not healthy	There is

To build a Decision Support System in Determining the Best Private Universities with the AHP (Analytical Hierarchy Process) method, there is a flowchart of the AHP system.

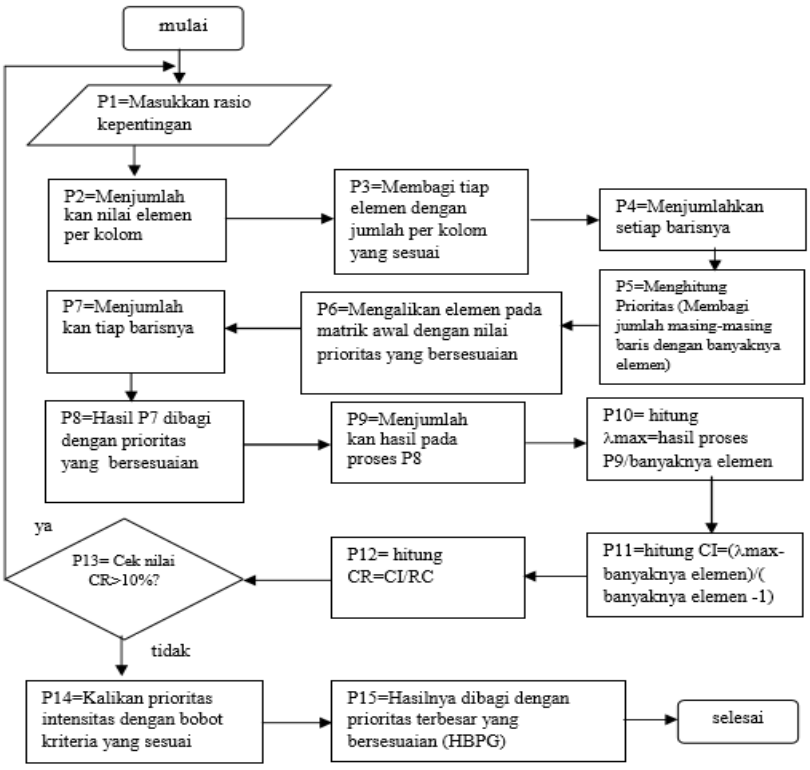

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Figure 2. AHP Flowchart

The functionality of the designed application system will be described in the form of a use case diagram.

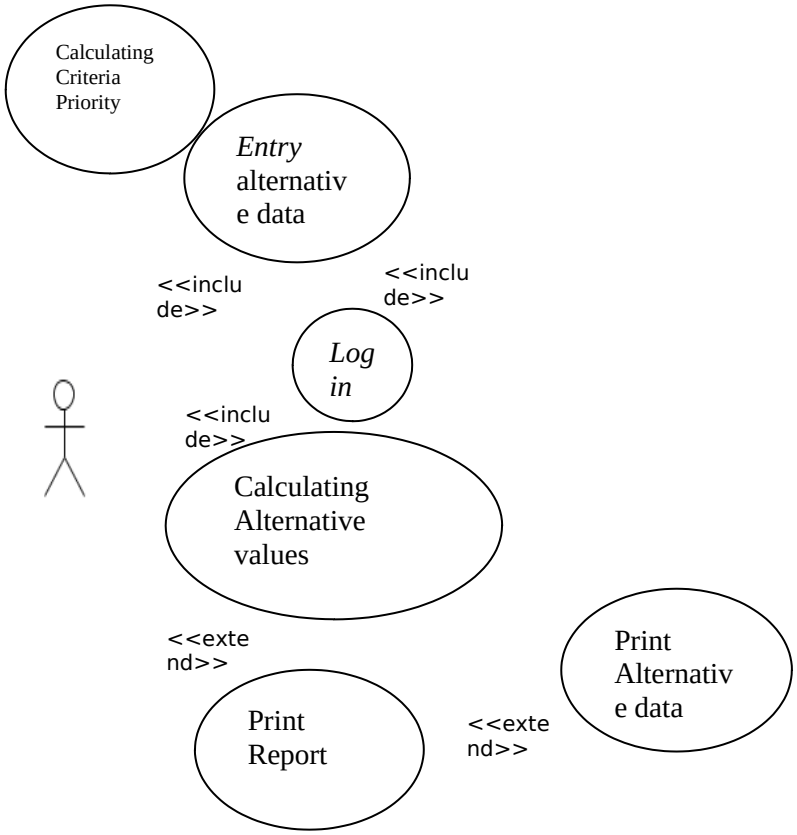

Figure 3. Use Case Diagram

This interface design is the main form that connects with other forms and is the interface to start the process.

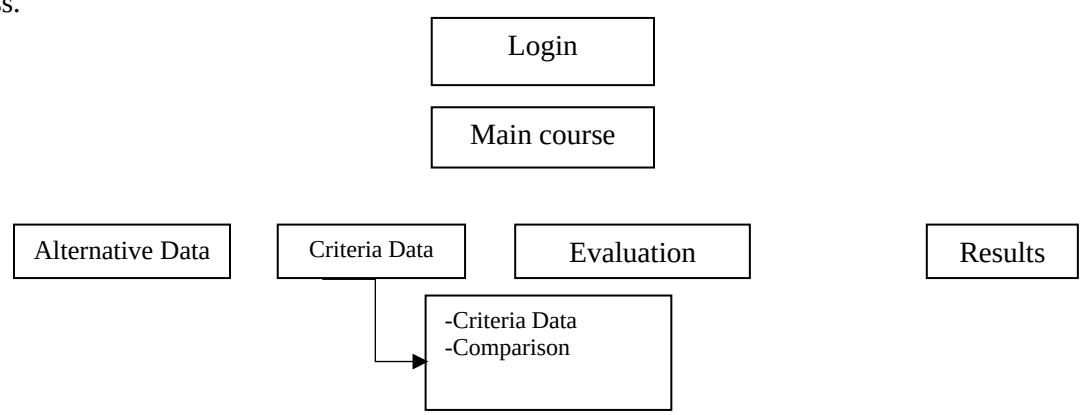

Figure 4. Main Menu Interface Design

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Caption :

1. AHP assessment criteria
   There are 4 stages that must be analyzed in the AHP section of this assessment criteria:
   a. Input assessment criteria and set of pairwise comparison matrices
   b. Calculate the value of the criteria matrix
   c. Calculate the total value per line
   d. Calculate Consistency Ratio
2. Calculate Priority Subcriteria
   In this section, because there are 4 criteria used to select the best technician, the priority calculation of the existing sub-criteria is carried out, namely: Competent Lecturer Sub-criteria, Study Program Accreditation sub-criteria, Healthy PTS sub-criteria and Grants and Scholarships sub-criteria. From these 4 criteria, the AHP assessment criteria will be calculated, namely:
   a. Calculating the priority of sub-criteria from criteria
   b. Create a criterion value matrix
   c. Determine the sum matrix of each row
   d. Consistency ratio calculation
3. Calculate the priority of PTS data results, namely: inputting PTS data and entering predicate values (good, sufficient and less) for all sub-criteria then calculating the matrix of results obtained from calculating the priority value of the criteria multiplied by the priority value of the sub-criteria, to get the results of the technician's assessment. Furthermore, from the results of the assessment, PTS will be obtained which have the opportunity to become the best PTS in the city of Medan.

File used as a place to store data that has been inputted, so that the data stored in the file will be collected into a single file that makes it easier to search and retrieve information. The following files will be used in making decisions to determine the best PTS.

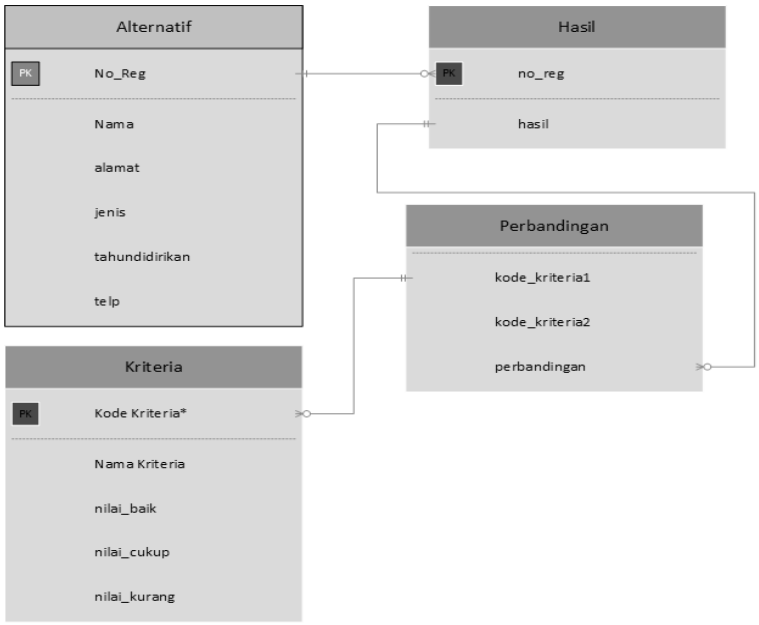

Figure 5. Table Relation

The Alternative Data Input menu is a display that is useful for inputting alternative data.

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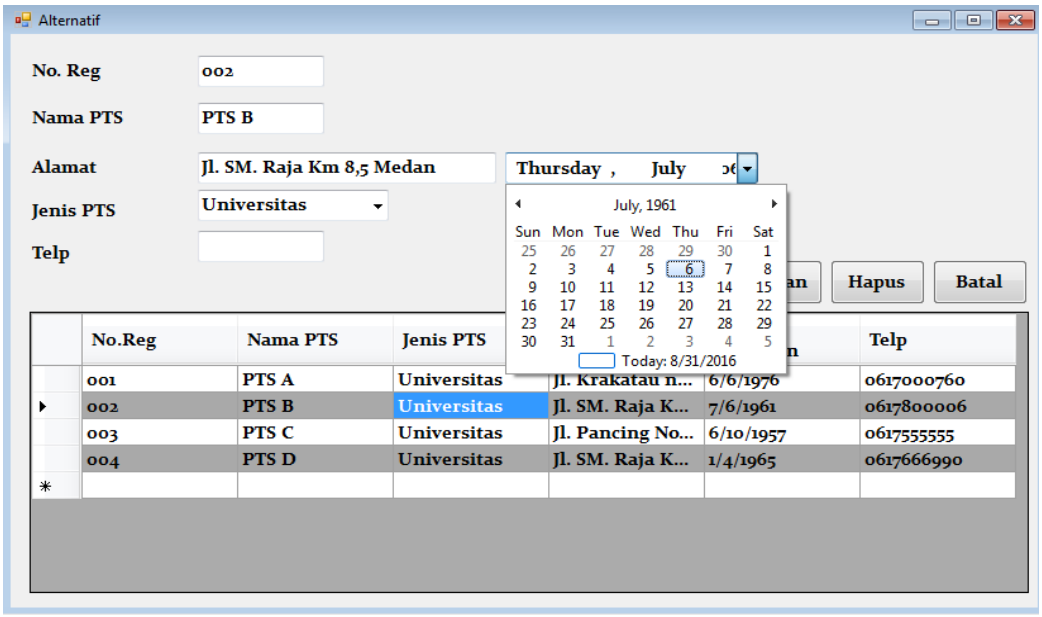

Figure 6. Alternative Data Input Menu

On the Alternative Data Input menu there is a menu:

1. Save, which serves to store the data that has been inputted.
2. Delete is to perform the process of deleting incorrect or unimportant data.
3. Cancel is to cancel the process to be carried out.

The Criterion Value Data Input menu is useful for inputting PTS Criteria value data.

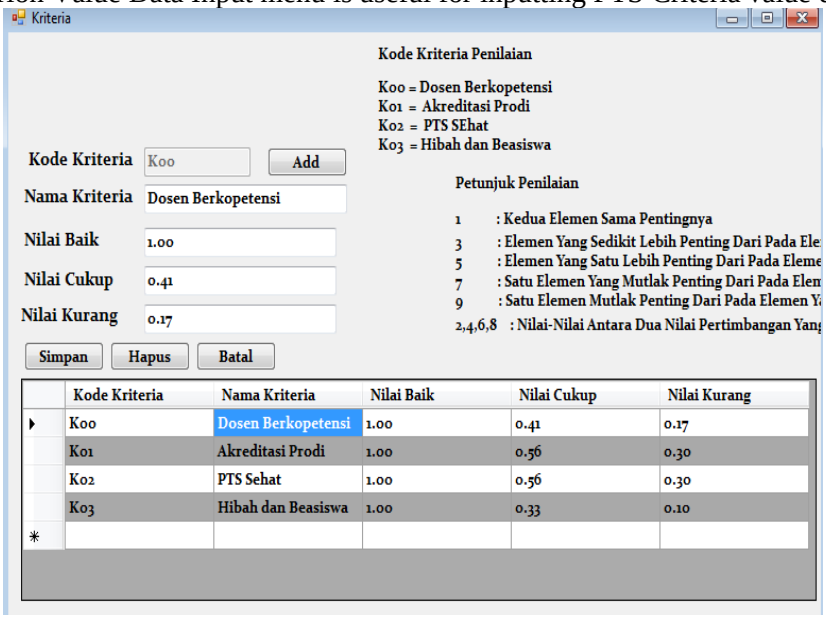

Figure 7. Data Input Menu PTS Criteria Values

On the PTS Criteria Value Data Input Menu there is a menu:

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1. Save, which serves to store the data that has been inputted.
2. Delete is to perform the process of deleting incorrect or unimportant data.
3. Cancel is to cancel the data that has been inputted.

The Comparison Value Input menu is useful for inputting criteria comparison values.

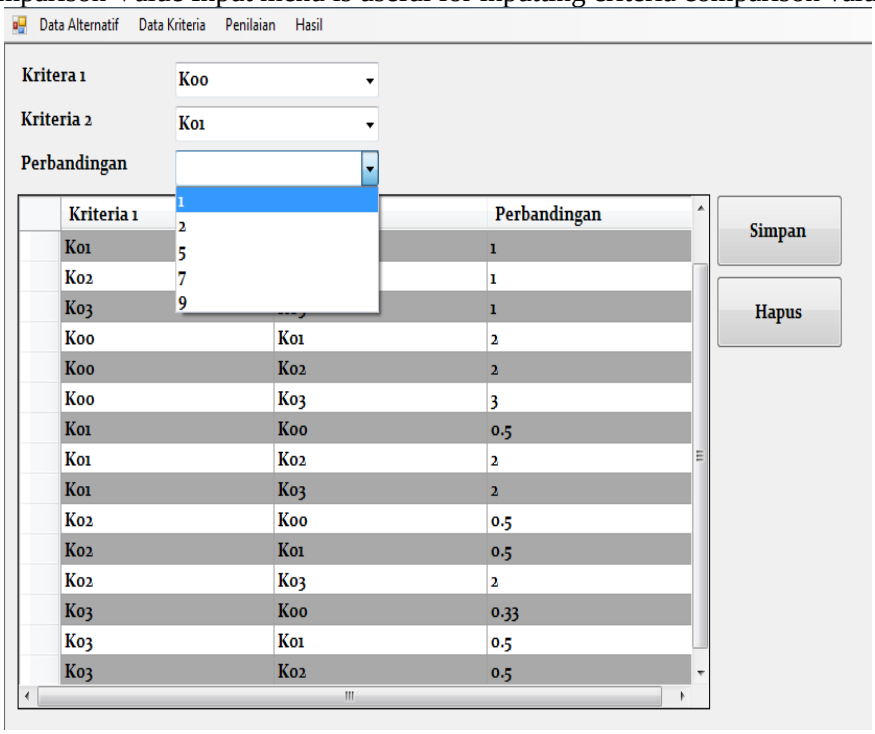

Figure 8. Input Menu Value Comparison Criteria

In this Criteria Comparison Value Input Menu there is a menu:

1. Save function to perform the input data storage.
2. Cancel function to cancel the process of storing the input data.

The report on the results of the decision from this decision support system is to display the final calculation results from processing the data obtained on the assessment form with the aim of getting PTS that can have quantity and quality values in working conditions.

LAPORAN ALTERNATIF PEMILIHAN PTS

No. Reg	Nama PTS	Jenis PTS	Alamat	Tahun didirikan	Telp	Hasil
001	PTS A	Universitas	Jl. Krakatau no 09 Mec	06/06/1976	0617000760	1.00
002	PTS B	Universitas	Jl. SM. Raja Km 8,5 Mi	07/06/1961	0617800006	0.75
004	PTS D	Universitas	Jl. SM. Raja Km 9,1 Mi	01/04/1965	0617666990	0.44
003	PTS C	Universitas	Jl. Pancing No. 30 Mec	06/10/1957	0617555555	0.41

Figure 9. Decision Result Report

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4. Conclusions

Based on the chapter description and the results of research in the field, the following conclusions can be drawn:

1. Determine the criteria in determining the best nutritional health study program with the provisions of the relevant and predetermined criteria.
2. Applying the TOPSIS method in determining the best nutritional health study program, which is basically a method that accumulates decisions based on the fulfillment of certain criteria. Assessment provisions are made quantitative to facilitate calculations.
3. The decision support system for determining the best nutritional health study program at STIKES is expected to support the process of determining a higher quality, faster nutritional health study program and the availability of a database for the North Sumatra Regional I Kopertis Agency.

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