

# Decision-Making System for Selection of Majors in Higher Education Using the Certainty Factor (CF) Method for Web-Based High School Students

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**Abstract:** Various information about college majors has been widely available in print media and on the internet so as to make it easier to get that information. However, the information provided only provides a general description, such as profile, costs, location, and other general information. This information has not fully helped provide input on majors that match the abilities, interests, and preferences of prospective students. The objectives of this research are; to determine the Decision-Making System for Selection of Departments in Higher Education Using the Certainty Factor (CF) Method for Web-Based High School Students, and design a prototype of the Decision-Making System for Selection of Departments in Higher Education Using the Certainty Factor (CF) Method which runs on various operating systems. Based on the results of research and testing on the design of the Decision-Making System for the Selection of Departments in Higher Education using the Certainty Factor (CF) Method for Web-based High School Students that has been carried out by the author, several conclusions can be drawn, namely; This study succeeded in making an expert system design for the selection of majors in higher education for high school students using the Certainty Factor (CF) method and this study succeeded in analyzing the results of the IF THEN ELSE calculation using Certainty Factor (CF).

**Keywords:** Decision-Making System; Selection of Majors; College; Certainty Factor (CF) method; High school student; Web-based.

## 1. Introduction

Every year there is an increase in the number of high school graduates who continue their education in tertiary institutions [1,2]. This is shown by data from the National Socio-Economic Survey (SUSENAS) of the Central Statistics Agency which shows the total net enrollment rate for higher education in 2011 was recorded at 10.30 which then increased in 2012 by 13.28. Meanwhile, at the end of 2013 its development increased by 17.92 [3]. This shows that awareness of education continues to increase, including awareness to continue education to higher education [4,5]. The higher the awareness of high school graduates to continue their education has an impact on fierce competition to be accepted in a university [6,7]. However, there are still prospective students who choose the department incorrectly [8]. The discrepancy in the selection of majors will cause prospective students not to have the enthusiasm to learn, and can even lose motivation to continue their education in Higher Education. Many students fail in higher education only because they choose majors based on reputation or follow the choices of their friends, so the majors chosen are not in accordance with their abilities and talents. In addition, there are several opinions that can influence the decisions of prospective students, namely the opinions of parents, friends, or idolized figures. Based on these opinions and without examining their abilities, prospective students can make decisions that are very contrary to their interests and talents. Various information about college majors has been widely available in print media and on the internet so as to make it easier to get that information. However, the information provided only provides a general description, such as: profile, costs, location, and other general information. This information has not fully helped provide input on majors that match the abilities, interests, and preferences of prospective students.

From the above problems, it is hoped that it can be solved by an expert system on problems in the selection of majors using the Certainty Factor method. The certainty factor method is used to accommodate inexact reasoning and express the degree of expert confidence in diagnosing problems [9,10,11]. In order for the expert system built to be easily accessible, it is implemented web-based, thus expert system users can use it at any time. From the description above, the research objectives are; 1) To find out the Decision-Making System for Selection of Majors in Higher Education Using

the Certainty Factor (CF) Method for Web-Based High School Students, and 2) The design that will be built later is a prototype of the Decision-Making System for Selection of Departments in Higher Education Using the Certainty Factor (CF) Method which runs on various operating systems.

## 2. Background and Analysis

In this study, the author uses several Field Research methods, namely by obtaining data directly from the research site, namely the Academic Bureau of Abulyatama University so that the data needed in this thesis are data that were actually obtained when the research was carried out. At this planning stage the researcher will collect data and information through some literature regarding the methods used, the applications used to build applications, and look for the data needed to build this application. The author conducted a direct survey to the Abulyatama University Academic and references to previous research to obtain data on criteria and alternative data for majors. The criteria and weight values that are the material for calculations or considerations are described in table 1.

Table 1. Certainty Factor

Uncertain Term	CF
Definitely No	-1.0
Almost Definitely Not	-0.8
Most Likely No	-0.6
Probably not	-0.4
Do not know	-0.2 to 0.2
Possible	0.4
Most likely	0.6
Almost Sure	0.8
Certainly	1.0

There are two ways to get the confidence level (CF) of a rule, namely:

$$CF(Rule) = MB(H,E) - MD(H,E) \dots (1)$$

$$MB(H, E) \begin{cases} P(H) = 1 \\ \max[P(H|E), P(H)] - P(H) \end{cases} \dots (2)$$

$$MD(H, E) \begin{cases} \max[1,0] - P(H) \\ P(H) = 0 \\ \min[P(H|E), P(H)] - P(H) \end{cases} \dots (3)$$

Where:

- (CF) Rule = certainty factor
- MB(H,E) = Measure of belief (measure of belief) against hypothesis H, if given evidence (between 0 and 1)
- MD(H,E) = Measure of disbelief, (a measure of disbelief) against evidence H, if given evidence E (between 0 and 1)
- P(H) = Probability of the truth of the hypothesis H
- P(H|E) = The probability that H is true because of the fact E

The analysis is carried out to obtain information about what is currently going on where the information collected is mainly about criteria and alternative majors so that later it can produce new information that is effective and efficient. At this stage, several procedures or stages in carrying out information are also described, accompanied by a flowmap of what is currently running and suggestions for selecting majors. Flowmap is a flow chart that shows the general structure of an information, which displays a general description of the data processing sequence in a general form and shows the overall work flow. Process design is the beginning of making the system to be made, where it can be seen what processes will be needed in the manufacture of a system. While the design of the proposed procedure is a stage to improve or increase work efficiency. The system design stage is described as a design for building a system and configuring software and hardware components so as to produce a good system, the designed system becomes one component. Database design is a collection of information stored in a computer systematically so that it can be checked using a computer program to obtain information from the database. The database design starts from creating databases, tables, fields to form an Entity Relationship Diagram (ERD).

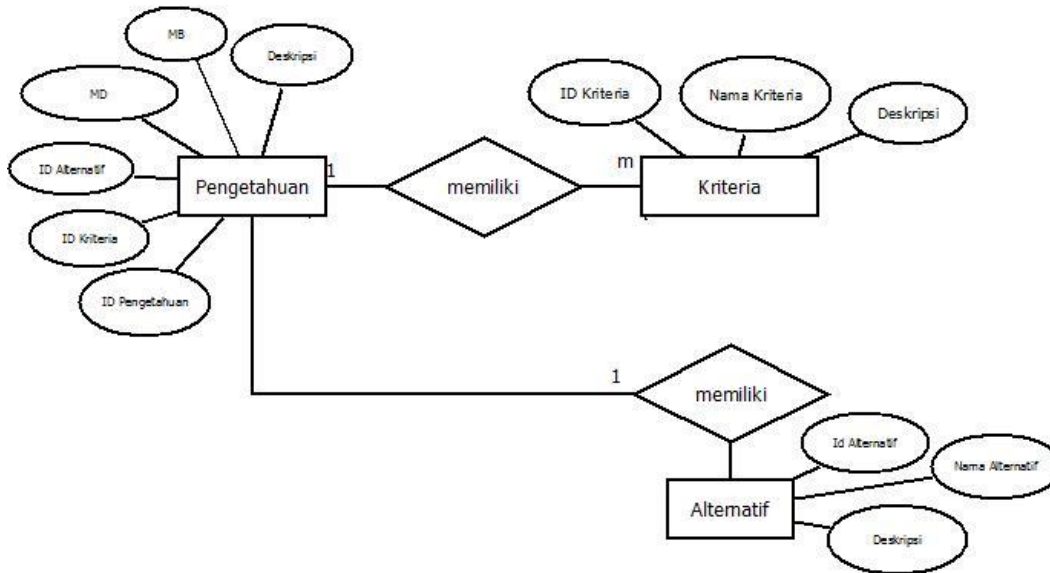


Fig 1. ERD (Entity Relationship Diagram)

Software testing in this study was carried out by the user, while the testing method used was black box testing. Black box testing is testing the fundamental aspects of the system without paying attention to the internal logical structure of the software. This method is used to find out if the software is working properly. Black box testing is a test data design method based on the software specifications made. The things that will be tested using the black box method are as follows:

Table 2. Test Plan

Requirement	Test Items
Login	Login
Admin Data	Adding User or User Data
Criteria Data	Adding criteria data
Alternative Data	Add alternative data / majors
Consulting Data	Analysis Process and Consultation Results with Certainty Factor (CF) Method

### 3. Result and Discussion

The design of the decision-making system for selecting majors in higher education uses the Certainty Factor (CF) method for web-based high school students which the author designed consists of several stages, namely input design, output design, process design, control design, labor design, and cost design. This design later the author hopes to make it easier for every user, especially the Academic High School (SMA) and Universities. This input design consists of several program files, namely; 1) Officer/Admin Data Entry Program, 2) Alternative Data Entry Program, 3) Criteria Data Entry Program, 4) Knowledge Data Entry Program (rule), and 5) Consultation Data Entry Program. The output design of the decision-making system for selecting majors in universities using the Certainty Factor (CF) method for web-based high school students consists of several program outputs, namely; 1) Consultation Result Analysis, 2) Alternative Report, 3) Criteria Report, 4) Knowledge Report, and 5) User List. The use of the decision-making system for selecting majors in higher education uses the Certainty Factor (CF) method for web-based high school students, seen from the design of the application into the form of an application display. The results of the application begin with a login form and continue with the main menu form which contains an alternative master display, criteria, knowledge, graphs, analysis, reports, and users. Computer users just click on the desired menu icon to see what is in the file as shown in the following image.

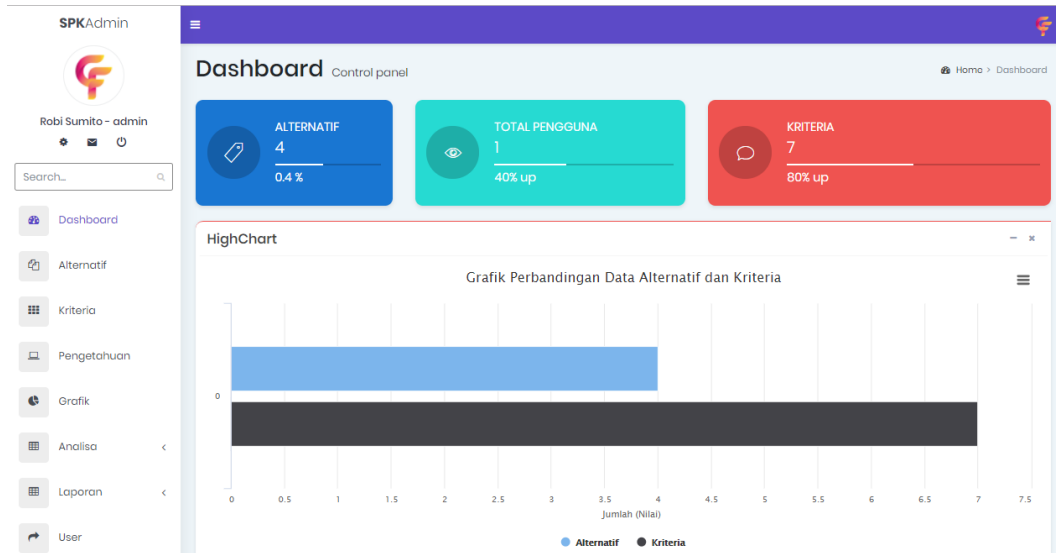


Fig 2. Main Menu Display

The consultation form menu is dynamic data where the data is filling from student consultations with the use of this system. The form contains information on questions about the rules that have been regulated with various criteria and alternatives which will later produce information containing the choice of majors for students later.

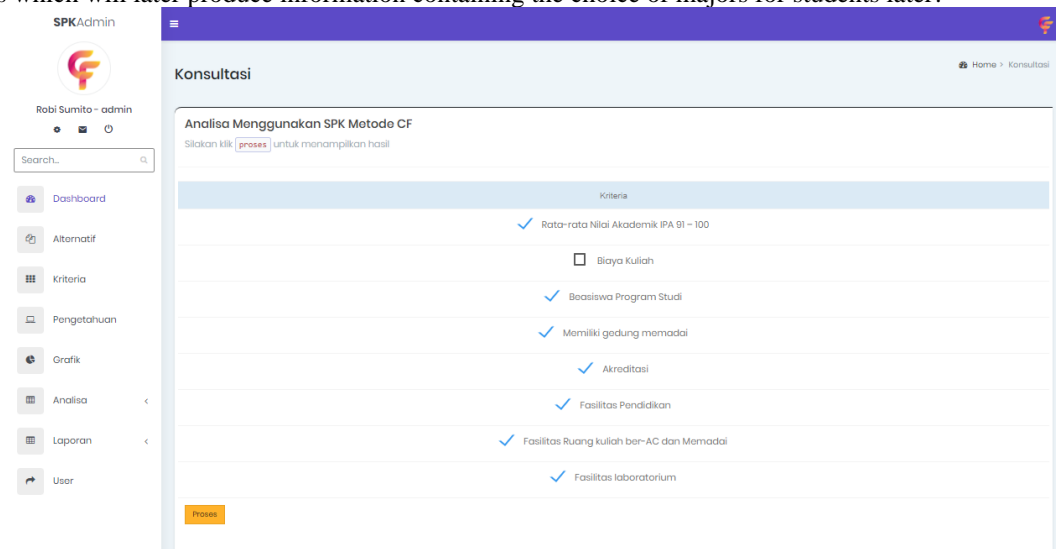


Fig 3. Consultation Form

This result will contain information about the choice of diagnosis and student symptoms. In this analysis using the Certainty Factor (CF) method so that the analysis in question is the result of filling out the consultation as shown in the following figure.

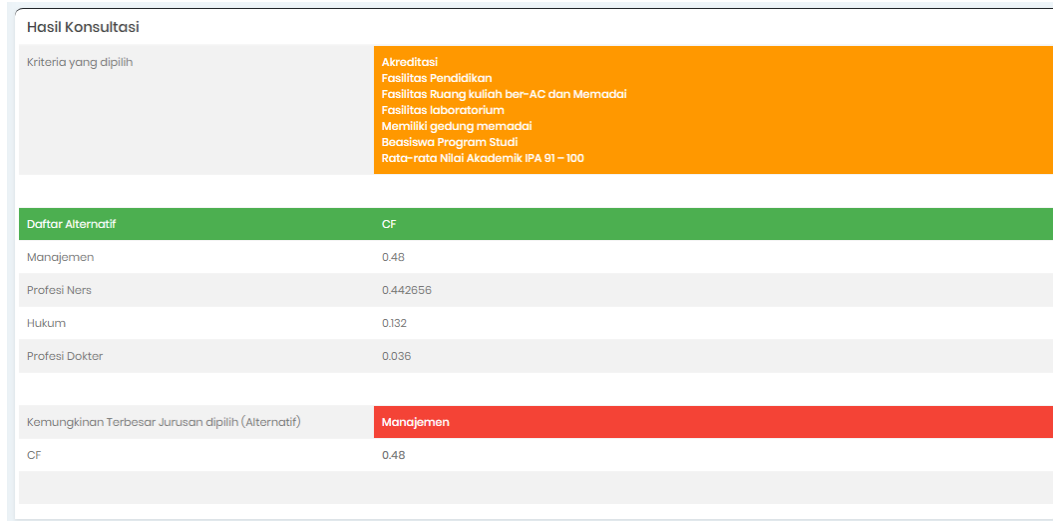


Fig 4. Certainty Factor (CF) Model Assessment Results

In addition to being displayed in list form, tables and reports are also displayed in graphical form to make it easier for application users to easily view information graphically, as shown in the image below..

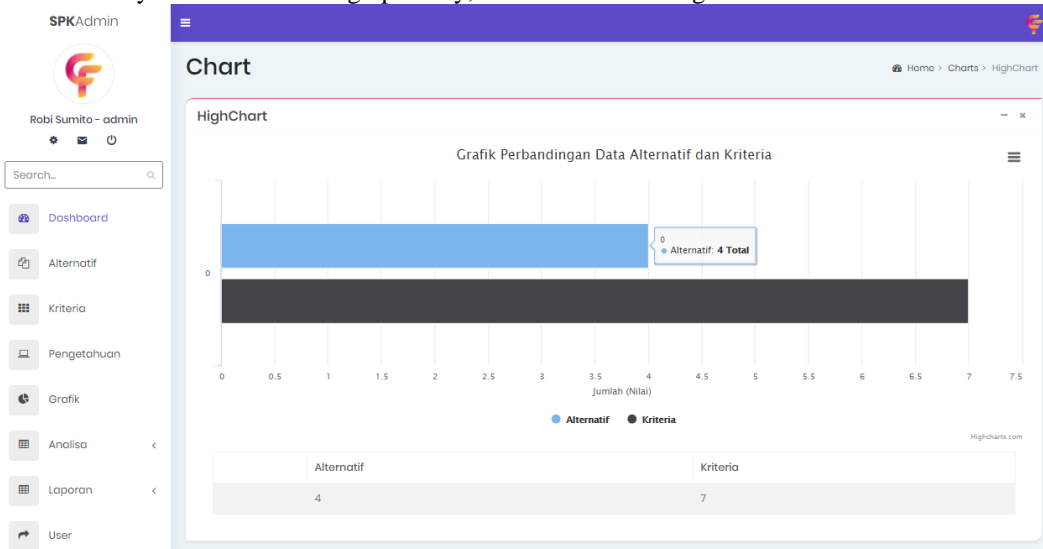


Fig 5. Data Graph

## 5. Conclusion

Based on the results of research and testing on the design of the Decision-Making System for the Selection of Departments in Higher Education using the Certainty Factor (CF) Method for Web-based High School Students that has been carried out by the author, several conclusions can be drawn, namely:

- 1) The Expert System created is successful in processing data and providing recommendations for majors in Higher Education using the Certainty Factor (CF) Method.
- 2) The design of the Decision-Making System for the Selection of Departments in Higher Education with the Certainty Factor (CF) Method for Web-Based High School Students was built using the PHP programming language and supported by visualization languages such as HTML, CSS, JQuery and MySQL as a database.
- 3) The Expert System application that was built can make it easier for students to determine the selection of majors in Higher Education by using the Certainty Factor (CF) Method, especially in the selection of Majors at Abuyatama University.

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