



Identifying Student Interests in the Vocational Field Using the Certainty Factor Method

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Abstract: SMK Negeri 1 Kota Binjai is a vocational high school that has several competency skills majors. This school has an interest in applicants who are quite interested every year, the number of applicants in admitting new students every year continues to increase from year to year. Vocational education is an educational model that focuses on individual skills, skills, work habits, and appreciation of the jobs needed by people in the business/industry world. Lack of information about talent interests and career paths or vocational education greatly affects students in making choices regarding majors. Many students who choose majors are not interested in their talents and other reasons. This can make students wrong in taking a major which causes inadequate competence of students in completing their education and will certainly affect the future of these students. expert system which is a computer program, which is able to store knowledge and rules like an expert. With the existence of an expert system, each student is able to identify and find out what areas of expertise he is interested in. The Certainty Factor method is a method for proving whether a fact is certain or uncertain in the form of a metric which is usually used in expert systems. From the results of trials conducted by the expert system to identify students' interest in the vocational field using the Certainty Factor method, the highest score is majors Online Business and Marketing with a confidence value of 89.67%.

Keywords : Advocacy, Certainty Factor, Department, Expert System.

1. Introduction

SMK Negeri 1 Kota Binjai is a vocational high school that has several competency competency majors, namely accounting and institutional finance, banking and microfinance, office authorization and management, online business and marketing, travel business, Software



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Engineering (RPL) and multimedia. SMK Negeri 1 Binjai has a vision and mission of being competent, competitive, accomplished and of noble character, producing graduates who are skilled and ready to enter IDUKA (Business and Work Industry), improving the quality of educators and professional education staff in producing graduates who are competent in their fields. This school has applicants who are quite interested every year.

Vocational education is an educational model that focuses on individual skills, skills, work habits, and appreciation of the jobs needed by people in the business/industry world. Lack of information about talent interests and career paths or vocational education greatly affects students in making choices regarding majors. Many students who register when choosing a major are not interested in the talent they have, but go along with their friends, choose the wrong major, orders from their parents, and simply choose the major. This of course will make these students wrong in taking a major which causes students not to have sufficient competence when completing education, so this will also affect the vision and mission of SMK Negeri 1 Binjai.

Identifying students' interest in vocational education needs to be done in order to be able to find out the potential of students and not be wrong in choosing a major that suits their interests and talents. So it is necessary to build an expert system to identify student interest in the vocational field. With an expert system, each student is able to identify and find out what areas of expertise he is interested in. So that every SMK graduate is able to develop talent, creativity and ability in facing the world of work. Thus every student who is unable to continue their tertiary studies, it is hoped that students will be able to create jobs for themselves and also for the community.

In analyzing the available information, doctors may disclose information in the form of uncertain statements such as possible, most likely and almost certain. One method that can be used to overcome uncertainty is the certainty factor (CF) method. CF is a method that defines a measure of certainty about facts or rules to describe an expert's belief in the problem at hand. CF shows a measure of certainty about a fact or rule (Parhusip & Pranatawijaya, 2012).

2. Literature

This previous research is one of the references in conducting research so that it can enrich the theory used in reviewing the research conducted. Some of these previous studies were used as references in enriching the study material in this study. One of the researchers who used the course factor method, which was carried out by (Jeremias et al, 2019) in his research, concluded that based on the results of testing the manual calculation process, the course factor value for 6 diseases with 31 symptoms resulted in an error of 0%. So for a comparison of the results of the calculation of the system factor and the manual calculation, the course factor is 100% the same.

The researcher then concluded that the results of his research were in accordance with expert knowledge, based on manual program calculations with the system, the Certainty factor method





was able to provide results based on the weight of the symptoms that had been selected by the user on the system and could provide answers in cases where the truth was uncertain, such as the problem in this study, namely diagnosis of a disease (Maulina, Dina, 2020). Based on his research, it was obtained from the results of 3 system calculation rules, the following results were obtained, rule 1 was declared 96% so that the system could diagnose that the user was positive in rule 1 Covid-19, rule 2 was 36% so that the system could diagnose that the user was in rule 2 negative Covid-19, and rule 3 85% so that the system can diagnose that users in rule 3 are most likely infected with Covid-19 (Fahindra et al., 2019).

Researchers say that this expert system for identifying children's preferences can be further developed into wider applications such as adding the types of children's preferences and behavior in children (Rangkuti et al., 2022). While the results of research conducted based on the results of CF calculations, the highest confidence value is found in type 1 diabetes mellitus with a value of 0.68, a value of 68%. From the results obtained, the drug is the right choice and suitable for use in patients with type 1 diabetes mellitus (Nurazizah & Simanjuntak, 2022).

Based on the results obtained from research on measuring interest and career paths based on expert systems, it can assist students in making decisions in determining majors, especially in the vocational field. The certainty factor method can produce a level of certainty, four personality types Tangible, Thinking, Flexible and Entrepreneur can be used to provide an overview of students' interests and career paths in the vocational field (Novita et al., 2018).

From previous research that has been described above that the certainly factor method can be applied to identify or diagnose with results that are in accordance with expert analysis. With this analysis, this research applies the certainly factor method to identify students' interest in the vocational field using the certainty factor method.

3. Methods

3.1. Types of Research

The Certainty Factor (CF) method is a method for proving whether a fact is certain or uncertain in the form of a metric which is usually used in expert systems. This method is very suitable for expert systems that diagnose something that is not certain. CF was proposed by Shortliffe and Buchanan in 1975 to accommodate the inexact reasoning of an expert.

3.2. Research Supporting Data

In making an expert system, of course, data is needed which will be used as research supporting data. The supporting data for this research will later be used as data analysis using the Certainty Factor method. The data for this research were obtained from the research site and based on information from the teacher in charge of the department or vocational field at SMK Negeri 1 Binjai regarding students' interest in the vocational field. The summary of the





supporting data for this research is as shown in the table below.

Table 1. Data on Interest and Talent Criteria in the Vocational Field

No	Code	Interest Criteria	Department Code							
			J0 1	J0 2	J0 3	J0 4	J0 5	J0 6	J0 7	
1	K01	Do you like designing	√	√						
2	K02	Do you like computers and basic networking	√	√						
3	K03	Do you like programming languages	√	√						
4	K04	Do you like 2d and 3d animation	√							
5	K05	Do you like audio processing	√							
6	K06	Are you a soul that has high creativity	√							
7	K07	Do you like challenges	√	√	√	√	√			√
8	K08	Do you like counting	√	√	√	√	√	√		
9	K09	Do you have good accuracy		√			√	√		
10	K10	Do you like to analyze		√	√	√	√			
11	K11	Do you like solving problems		√						
12	K12	Do you like to play logic		√			√			
13	K13	Do you like doing business			√					
14	K14	Do you have a creative entrepreneurial spirit			√					
15	K15	Are you able to operate the computer			√	√	√	√	√	√
16	K16	Do you like social media			√					√
17	K17	Do you have good communication			√	√	√	√		
18	K18	Do you like to negotiate			√	√	√	√	√	√
19	K19	Do you have a good leadership spirit			√	√				
20	K20	Are you a good stylist			√					
21	K21	Do you like office administration				√				
22	K22	Do you like managing finances?					√	√		
23	K23	Do you have a tenacious and patient attitude					√			
24	K24	Have fun solving problems						√		
25	K25	Are you a diligent and detailed						√		





No	Code	Interest Criteria	Department Code							
			J0 1	J0 2	J0 3	J0 4	J0 5	J0 6	J0 7	
26	K26	Do you like traveling								√
27	K27	Do you have / like foreign languages								√
28	K28	Do you have insight about geography								√

Information :

- J01 : Multimedia
- J02 : Software Engineering
- J03 : Online Business and Marketing
- J04 : Office Automation and Governance
- J05 : Accounting and Financial Institutions
- J06 : Banking and Microfinance
- J07 : Tourism Travel Business

3.3. Application of the Method

The method used in this research is using the Certainty Factor method. The steps of this method are as follows:

1. Calculate the CF value with the following formula:
CF expert * CF user
2. Combine CF 1.1 with CF 1.2 with the following formula:
CF combine (CF1,CF2) = CF[h1,e1] + CF[h1,e2] *(1-CF[h1,e2]) = CF old
Then combine CF old and CF[h1,e3]
3. Confidence percentage = CF combine * 100%

The next step is to determine the value of the expert CF weight on the criteria for majors at SMK Negeri 1 Binjai. This weight is obtained from expert information, while the CF expert weight can be seen in the table below.

Table 2. CF Expert Weight Value

No.	Level of confidence	Weight Value
1.	Very confident	1
2.	Certain	0.8
3.	Sure enough	0.6



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4.	Little Sure	0.4
5.	Don't know	0.2
6.	There isn't any	0

Next is the CF user MD (Measure Disbelief) weight data (Sucipto et al., 2019) as in the table below:

Table 3. Certainty Factor Users

No.	Level of confidence	Weight Value
1.	Very confident	1
2.	Certain	0.8
3.	Sure enough	0.6
4.	Little Sure	0.4
5.	Don't know	0.2
6.	There isn't any	0

Sample case:

A student has the following criteria of interest in talent:

- K01 Do you like designing : Somewhat sure
- K07 Do you like challenges : Somewhat sure
- K08 Do you like counting : Certain
- K10 Do you like to analyze : Sure enough
- K12 Do you like to play logic : Don't know
- K15 Are you able to operate the computer : Sure enough
- K16 Do you like social media : Certain
- K18 Do you like to negotiate : Don't know
- K26 Do you like traveling : Sure enough

From the criteria of student interest above, a calculation or analysis process is carried out using the Certainty Factor method to determine which major is right for students and has the highest confidence value .

Calculating the Certainty Factor value in the J03 major (Online Business and Marketing) by multiplying CFexpert by CFuser becomes as shown in the table below.

Table 4. Calculating the Value of Online Business and Marketing Criteria

Criteria	CF Users	CF Expert	Results (CF Expert * CF User)
CF[H ₃ , E ₁]	0.2	0	0
CF[H ₃ , E ₇]	0.4	0.6	0.24





Criteria	CF Users	CF Expert	Results (CF Expert * CF User)
CF[H ₃ , E ₈]	0.6	0.6	0.36
CF[H ₃ , E ₁₀]	0.6	0.4	0.24
CF[H ₃ , E ₁₂]	0.2	0	0
CF[H ₃ , E ₁₅]	0.6	0.6	0.36
CF[H ₃ , E ₁₆]	0.8	0.6	0.48
CF[H ₃ , E ₁₈]	0.2	0.8	0.16
CF[H ₃ , E ₂₀]	0.6	0	0

From the table above, that is, combining the Certainty Factor values:

$$\begin{aligned} \text{CFcombine CF[H3,E]1,7} &= \text{CF[H3,E1]} + \text{CF[H3,E7]} * (1 - \text{CF[H3,E1]}) \\ &= 0 + 0.24 * (1 - 0) \\ &= 0.24 \text{ old1} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old2} &= \text{CF[H,E]old1} + \text{CF[H3,E8]} * (1 - \text{CF[H,E]old1}) \\ &= 0.24 + 0.36 * (1 - 0.24) \\ &= 0.5136 \text{ old2} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old3} &= \text{CF[H,E]old2} + \text{CF[H3,E10]} * (1 - \text{CF[H,E]old2}) \\ &= 0.5136 + 0.24 * (1 - 0.5136) \\ &= 0.6303 \text{ old3} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old4} &= \text{CF[H,E]old3} + \text{CF[H3,E12]} * (1 - \text{CF[H,E]old3}) \\ &= 0.6303 + 0 * (1 - 0.6303) \\ &= 0.6303 \text{ old 4} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old5} &= \text{CF[H,E]old4} + \text{CF[H3,E15]} * (1 - \text{CF[H,E]old4}) \\ &= 0.6303 + 0.36 * (1 - 0.6303) \\ &= 0.7634 \text{ old5} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old6} &= \text{CF[H,E]old5} + \text{CF[H3,E16]} * (1 - \text{CF[H,E]old5}) \\ &= 0.7634 + 0.48 * (1 - 0.7634) \\ &= 0.8770 \text{ old6} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old4} &= \text{CF[H,E]old6} + \text{CF[H3,E18]} * (1 - \text{CF[H,E]old6}) \\ &= 0.8770 + 0.16 * (1 - 0.8770) \\ &= 0.8967 \text{ old7} \end{aligned}$$

$$\begin{aligned} \text{CFcombine CF[H3,E]old8} &= \text{CF[H,E]old7} + \text{CF[H3,E26]} * (1 - \text{CF[H,E]old7}) \\ &= 0.8967 + 0 * (1 - 0.8967) \\ &= 0.8967 \text{ old8} \end{aligned}$$

The results of the CF value from the calculation above are:





$$\begin{aligned}
 CF_{\text{combine}} CF[H3,E]_{\text{old}8} &= CF[H,E]_{\text{old}7} + CF[H3,E26] * (1 - CF[H,E]_{\text{old}7}) \\
 &= 0.8967 + 0 * (1 - 0.8967) \\
 &= 0.8967_{\text{old}8} \\
 &= 0.8967 * 100 = 89.67 \%
 \end{aligned}$$

4. Results And Discussion

Based on the CF calculation results above, the results are obtained as in the table below.

Table 5. CF Calculation Results

No.	Department Code	Vocational Field	Confidence Percentage
1.	J01	Multimedia	54.84%
2.	J02	Software Engineering	77.80%
3.	J03	Online Business and Marketing	89.67%
4.	J04	Automation and office governance	72.67%
5.	J05	Accounting and Financial Institutions	87.11%
6.	J06	Banking and Microfinance	63.64%
7.	J06	Travel agent	80.74%

From the table above, it is obtained that the vocational field or major recommended to students is the Online Business and Marketing major with a confidence value of 89.67%. The scope of work for graduates of the BDP program is a profession that is relevant to these competencies. The related business world includes service companies, trade, manufacturing, as well as government or private agencies. While the concentration of the BDP department is in shops, supermarkets, dealers and retail. Includes sales staff, marketing, purchasing, cashiers, sales and purchasing administration, warehouse managers, and online marketing intermediaries. In addition, it can also be within the scope of factories such as warehousing, finance, and distribution of goods. If you enter the scope of the cooperative as a manager, marketing, or bookkeeping. While the scope of insurance work is to become staff, customer seekers, or *debt collectors* .

5. Conclusion

in this research, with an expert system to identify students' interest in the vocational field using the certainty factor method, it can help SMK Negeri 1 Binjai realize its vision and mission, namely to produce graduates who are skilled and ready to enter IDUKA (Business and Work Industry), improve the quality of educators and professional education staff. This system can also assist students in making choices regarding their majors based on criteria that suit





students' interests so that students have adequate competence when completing education. This system can also assist educational staff in providing appropriate learning methods for students and facilitate educational staff in teaching activities.

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