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RESEARCH ARTICLE

Talent Management Employee Development by Using Certainty Factor Method of Expert System

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Abstract: Talent management is a factor that determines success in the business environment because talent management requires quantitative and qualitative skills. This study aims to implement the certainty factor (CF) method of an expert system for employee development talent management. This research using a certainty factor (CF) method to design an expert system framework. Due to the focus on our research aim, we provide a certainty factor calculation with mathematical modeling for calculating talent management employee development in X Company. The confidence level is 93.55% for a recommendation of not promotion of the job; for 52.38% is a recommendation that can be proposed for promotion, but HRD will evaluate in some time; for 98.73% is a recommendation for promotion of the job. We used CF calculation that can provide the level of confidence (in %). The calculation of the certainty factor (CF) method can be used for recommending job promotion in some companies.

Keywords: Artificial Intelligence, HRD, Mathematical Modeling, Reasoning Technique.

1. Introduction

Talent management is a factor that determines success in the business environment because talent management requires quantitative and qualitative skills. Talent management is closely related to placing the right position or position of a person (employee) in a business organization or company. Talent management is related to recruitment in the field of human resource development (HRD) of a company because to be able to recruit staff according to the criteria will be able to have a fairly influential impact on the success of a company's business (Sjachriatin, 2019).

Talent management will be able to help a company to stay in its position in its business and do not rule out the possibility to be able to increase business prospects further because it is thanks to talented employees. Talent management is one of the strategies in HRD to improve the competence of an organization within the company by improving performance, employee development, and business planning (Sjachriatin, 2019). According to Ron (2020), companies must have superior employees because they are the main ammunition to achieve the goals of a company's success. To achieve a successful company or organization, of course, requires skilled human resources (HR), qualified from all aspects (Rasminto et al., 2020), outstanding talent (Bashori, 2012), able to manage problems (Setyawan et al., 2020) and also good talent (Bashori, 2012; Sjachriatin, 2019).

Many previous studies that used technology for the management or managerial purposes of a company organization have been carried out. Rakasiwi et al. (2020) build a personnel



management information system (SIMPEG) to determine the best employees. Rahayu et al. (2019) using an expert system to assess the performance of a company. Due to the limited research on the use of expert systems for talent management, this study aims to implement the certainty factor (CF) method of an expert system for employee development talent management.

2. Literature Review

Currently, the speed of technology development is very fast in efforts to manage human resources (HR) in an organizational environment, or commonly known as management information systems (Marcel & Faustin, 2019; Rakasiwi et al., 2020). The use of this technology will provide opportunities for companies to manage and manage employees to their business continuity processes with the help of technology that can replace conventional models. On the other hand, with the help of technology like this, it will be able to provide efficiency in terms of managing the best employees based on their abilities or talents (Rakasiwi et al., 2020). In addition to management information system technology, artificial intelligence technology is also known that can replace the role of humans, or commonly called artificial intelligence (AI). AI can replace the role of someone who is an expert in a field by not replacing the main essence of the expert, and its role is replaced with AI, which is an expert system that can replace the role of certain experts (Al Hakim, 2020; Al Hakim et al., 2020; Rahayu et al., 2019). This expert system can already be used as a mobile application (Al Hakim, 2020, 2021; Al Hakim et al., 2020).

Another research about the implementation of certainty factor (CF) gives the confidence level of thyroid disorders. Calculation of CF value can classify cases of some thyroid disorders. There are 99.982% confidence levels of hypothyroid disease, 99.891% of hyperthyroid disease, 92.800% of goiter disease, 86.146% of thyroid nodule disease (thyroid cancer). This confidence level can provide how accurate the expert system is for diagnosing some thyroid disorders (Al Hakim, Prihantini, et al., 2021). Besides, another research by used the CF method is to determine the patient to classify about Covid-19 status. By using the calculation of the CF formula, the system can provide a confidence level higher than 90% to predict the patient is infected with Covid-19 or not (Al Hakim et al., 2020). Furthermore, this CF method also can be used to diagnose 12 fish diseases caused by parasites. The result of the CF value provides a confidence level above 95% (Al Hakim, Pangestu, et al., 2021).

Hence, this study examined the following hypotheses:

- H1: With the calculation of certainty factor (CF) method cannot be used for recommending job promotion in some companies.
- H2: With the calculation of certainty factor (CF) method can be used for recommending job promotion in some companies.

3. Research Method

This research method refers to (Al Hakim, Pangestu, et al., 2021; Al Hakim, Prihantini, et al., 2021) for using a certainty factor (CF) method for design an expert system. Due to the focus on our research aim, we provide a certainty factor calculation with mathematical modeling for calculating talent management employee development in X Company. The following research flowchart can be seen in Figure 1.

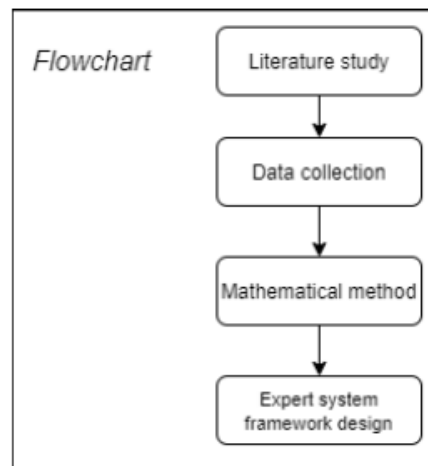


Figure 1. Research flowchart. Source: (Al Hakim, Prihantini, et al., 2021).

Based on Figure 1, this research flow begins with a literature study from several scientific publications. After that, we collect the data from interviews with HRD staff in X Company. After that, we calculate the MYCIN mathematical equation of each criterion (similar to symptoms for medical cases). For the end step, we design an expert system framework with draw.io. The following Table 1 explain completed data collection from X Company.

Table 1: Talent Data and Criteria

Criteria Code	Criteria	Selection	Selection Answer	Selection Answer Code (SAC)
T1	Bad Potential	Analysis Ability	Not Enough	K1
		Problem Solving	Not Enough	K2
		Communication	Not Enough	K3
		Target Oriented	Not Enough	K4
		Leadership	Not Enough	K5
		Careless	Yes*	K16
		Easy to Forget	Yes*	K17
		Procrastinating Work	Yes*	K18
T2	Standard Potential	Analysis Ability	Enough	K6
		Problem Solving	Enough	K7
		Communication	Enough	K8
		Target Oriented	Enough	K9
		Leadership	Enough	K10
		Easy to Forget	Yes*	K17
		Can Work Multitasking	Yes*	K19
T3	High Potential	Analysis Ability	Good	K11
		Problem Solving	Good	K12
		Communication	Good	K13
		Target Oriented	Good	K14
		Leadership	Good	K15
		Agile, Move Quickly Procedurally	Yes*	K20

Note: * indicate optional (additional) selection answer if not included, the calculation of MYCIN equation also completely successful.

Based on Table 1, each criterion has a list of questions (selection answer code; SAC) which is included as a selection, and each selection answer must be answered whether the answer is "Not Enough" or "Enough" and "Good". Each selection is the same on each criterion, with the addition of several selections that have the selection answer "Yes" to add a weight value to the CF. Calculation of CF based on the data in Table 1 can be seen in Table 2 in the next chapter.

4. Results and Discussion

Table 2, each SAC is given a weight based on the opinion of the company's Human Resource Development (CF_{rule}) or H value, while the weight based on the researcher's opinion is determined based on the possible influence of SAC on the relevant criteria (CF_{user}) or E value. multiplied to get $CF(H,E)$. the value of $CF(H,E)$ will be calculated by equation (1):

$$CF(H,E)_n + CF(H,E)_{n+1} \times (1 - CF(H,E)_n) \tag{1}$$

The $CF_{combine}$ value is a predetermined criterion (there are three criteria: “Bad Potential”, “Standard Potential”, and “High Potential”).

Table 2: Calculation of certainty factor (CF) on Employee Talent Management for Each Criteria

SAC	CF_{rule} (H)	CF_{user} (E)	$CF(H,E)_n$	$CF(H,E)_n + CF(H,E)_{n+1} * (1 - CF(H,E)_n)$	$Cf_{combine}(T_x)$	Level of Confidence (%)
K1	0.5	0.7	0.35	0.643	T1	93.55
K2	0.5	0.9	0.45	0.757		
K3	0.4	0.8	0.32	0.888		
K4	0.6	0.9	0.54	0.924		
K5	0.4	0.8	0.32	0.929		
K16	0.3	0.2	0.06	0.931		
K17	0.2	0.2	0.04	0.935		
K18	0.3	0.2	0.06	0.935		
K6	0.4	0.3	0.12	0.226	T2	52.38
K7	0.4	0.3	0.12	0.319		
K8	0.4	0.3	0.12	0.400		
K9	0.4	0.3	0.12	0.472		
K10	0.4	0.3	0.12	0.493		
K17	0.2	0.2	0.04	0.524		
K19	0.3	0.2	0.06	0.524		
K11	0.7	0.8	0.56	0.837		
K12	0.7	0.9	0.63	0.917		
K13	0.7	0.7	0.49	0.969		
K14	0.7	0.9	0.63	0.986		
K15	0.7	0.8	0.56	0.987		
K20	0.3	0.2	0.06	0.987		

Tables 1 and 2 provide the results of the calculation of the certainty factor (CF) which will be used as the basis for determining the conclusion (inference) using the forward chaining inference engine. The inference engine will provide recommendations based on the level of confidence obtained from the results of the CF calculations in Table 2. An explanation of the proposed job recommendations can be seen in Table 3.

Table 3: Job Recommendation Scheme Based on Level of Confidence

Level of Confidence (%)	Recommendation
93.55	Not Promotion
52.38	Can be proposed for promotion, but needs evaluation in some time
98.73	Proposed for Promotion

Based on Table 3, the confidence level is 93.55% for a recommendation of not promotion of the job; for 52.38% is a recommendation that can be proposed for promotion, but HRD will evaluate in some time; for 98.73% is a recommendation for promotion of the job. We used CF calculation that can provide the level of confidence (in %). The following Figure 2 explained about design between system and user due to the process of talent management assessment.

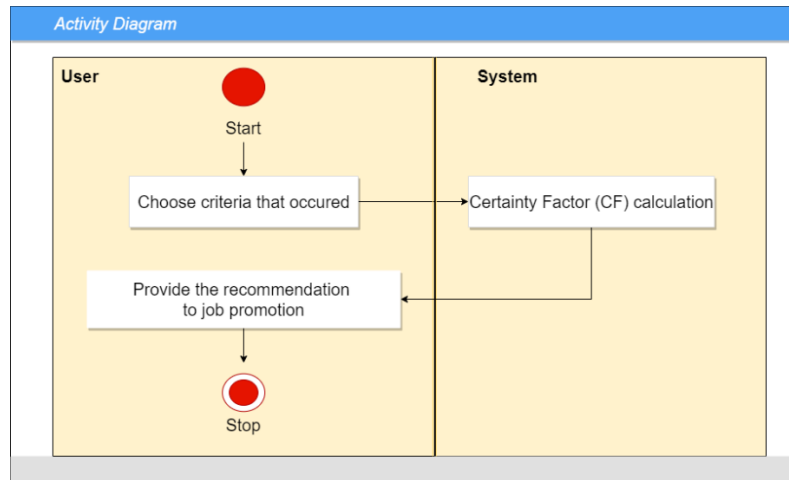


Figure 2. Design of activity diagram of the expert system.

With this confidence level based on a calculation of CF value, HRD can determine the employee due to recommendation of promotion (by the process explained in Figure 3, that user is an HRD staff). According to (Bashori, 2012), talent management is urgent for any company to aiming the big goals of their companies. A successful company is based on superior talent. Talented by HRD needs to be managed correctly, to detect, develop, and used the talents of achieving personal also to achieve the company’s goal.

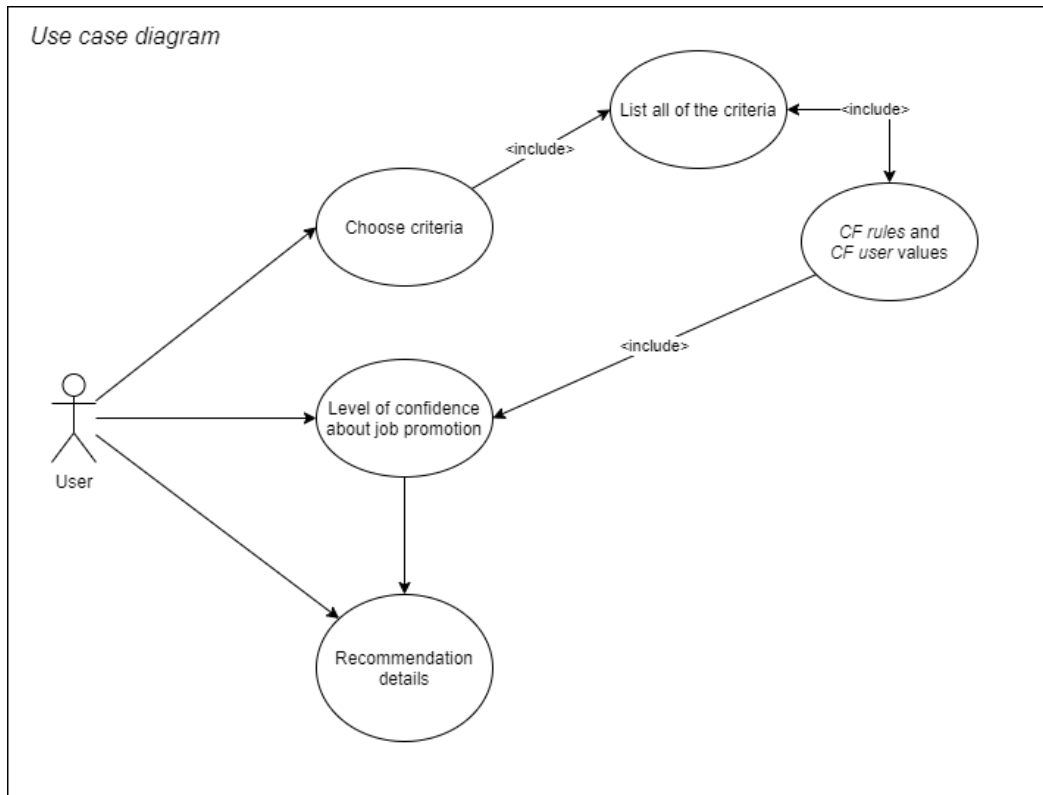


Figure 3. Design of use case diagram about the expert system.

According to (Rahayu et al., 2019), talent management has some system characteristics, because it needs to perform some pieces of information. By using this CF method, we can provide a new system characteristic, based on the expert system method (CF is the branch of expert system, stated by (Al Hakim et al., 2020)), so with the calculation of certainty factor (CF) method can be used for recommending job promotion in some companies (H1

accepted). For some reason, including some error of assessment of the talent, they must pick some chances for study better in their position, so it can be considered in the future by HRD (Rahayu et al., 2019) and can be implemented to the mobile device such as Android-mobile (Figure 4).

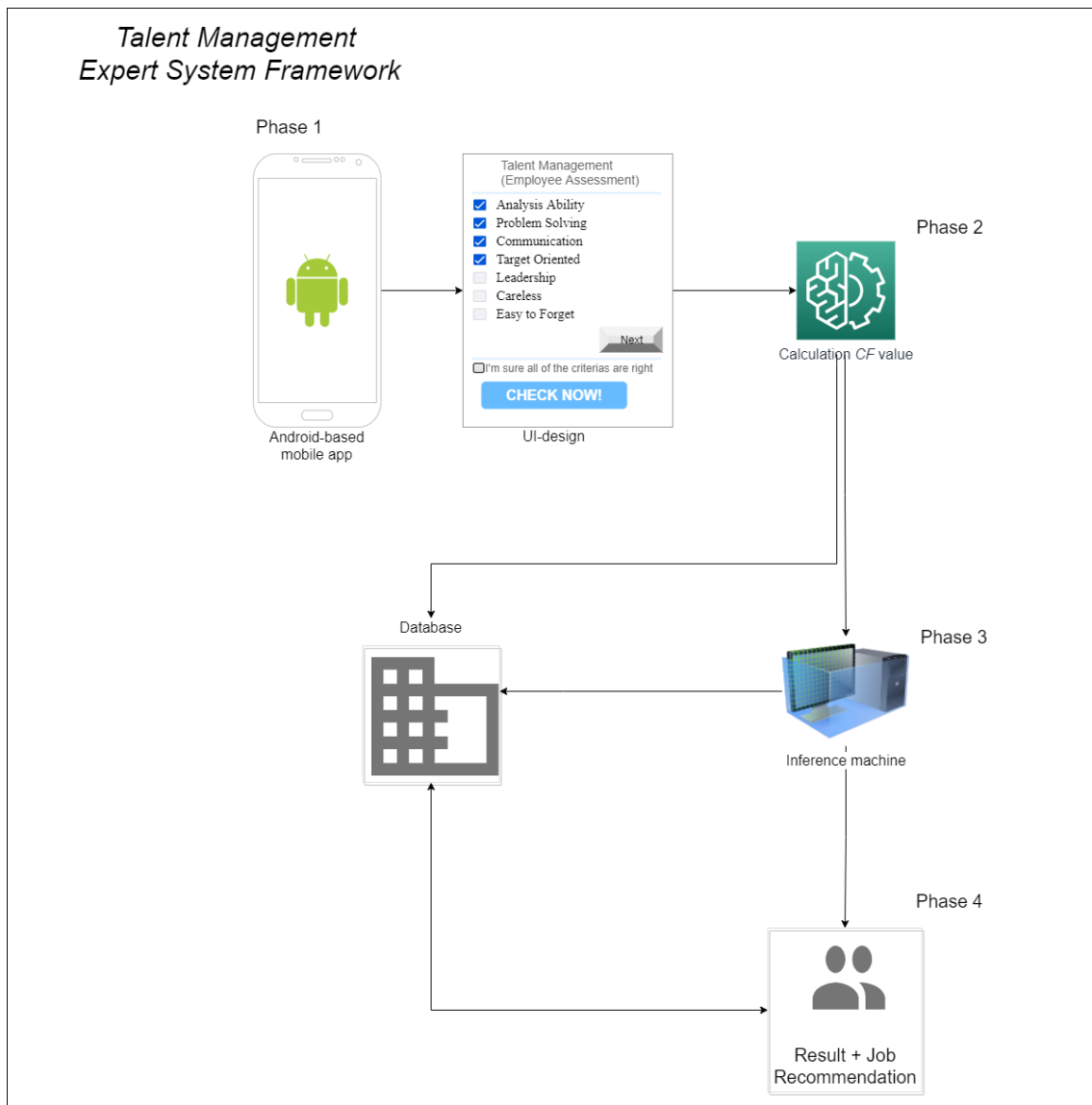


Figure 4. Design of Android mobile app of talent management expert system. Modified from (Al Hakim, Prihantini, et al., 2021).

Based on Figure 4, we can know the process of talent management assessment in four (4) phases. There are Phase 1 (about collecting the criteria), Phase 2 (calculation of certainty factor (CF) value based on criteria that have been chosen before), Phase 3 (inference machine that process the system to provide the inference in the next phase), and Phase 4 (about the result with the level of confidence (in %) also provide the job promoting recommendation).

5. Conclusion

Based on results and discussion, we can conclude that the talent management of employees can be implemented by using the calculation of certainty factor (CF) method with the level of confidence about 93.55% for the recommendation of not promoting, 52.38% for the recommendation of potential promotion but need more evaluation first, and 98.73% for

the recommendation of proposed promotion, so it can be used to develop of expert system in the future.

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