2018 2nd International Conference on Electrical Engineering & Informatics

PROCEEDINGS

"Toward the Most Efficient Way of Making and Dealing with Future Electrical Power System and Big Data Analysis"

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The 2018 2nd International Conference on Electrical Engineering and Informatics

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Intelligent Decision Support System Using Certainty Factor Method For Selection Student Career

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***Abstract*—This paper explains how intelligent decision-making systems (IDSS) student career selection in accordance with their own potential. Intelligent decision-making systems combine concepts and models from various disciplines. This study describes and explains the normative model of student decision-making in order to know their own potential through interests, ability, knowledge and competencies as well as other factors that support students' self-improvement which are indicators of career selection. This study uses the nature of human decision making, the use of heuristics and knowledge-based decision rules using certainty factor (CF). In the final part of the study, the findings obtained were the student's decision in determining the career choice certainty factor that was in accordance with the chosen workplace.**

Keywords—IDSS, selection Student career, certainty factor

I. INTRODUCTION

The student's background in the information system study program to explore career profiles find the difficult in make career decisions after completing college studies at university. Career decision making is a crucial problem faced by graduates in universities. Where the delay in the process of career guidance and counseling will have an impact on confusion in career decision making later. Even the alumnus will feel the study program taken in advanced education is deemed inappropriate. Career decision making is an important skill that can be used by the students to achieve the future.

This study aims to use the decision support system approach with certainty factor method to help making career selection decisions with counseling knowledge in order to help the students and the lecturers. It is expected that with the development of this research, it can increase the students' knowledge about career potential that is owned and helpedthe students and the lecturers in making decisions about the career that the students want to achieve after completing their studies in college. Whereas higher education as one of the business institutions engaged in education services cannot be separated from globalization.Trend of changes in education and technological movements is one of the important aspects of globalization that will touch the field of education [1]. The students as products can be used as a reference to demonstrate the success of education. College is a provider of student academic education [2].

The success of the students achievement is influenced by several factor, among these factors is the educational background of a student [3]. To determine the level of importance and competence of university academics determine various aspects of activities with the students (communication skills), and thus detect possible training needs [4]. While the results of research by Irwan [5] in the form of a counseling model application to obtain important information about career development of the vocational students and facilitate through the form of services, to connect their plans with their careers according to their talents, interests, abilities, knowledge, personality and other supporting factors .

The research team began a series of steps to investigate and solve the problems in the planning and career selection of the students in college. In this study, student career planning and selection criteria used variables of knowledge ability, skills, competencies, interest and talents obtained in lectures. The criteria are processed by using certainty factor (CF) method. Certaintyfactor model is a method commonly used to manage uncertainty in rule-based systems [6].

This paper presents an intelligent decision support system using the certainty factor method for the students career selection in solving career planning and selection the problems with criteria related to the ability of knowledge, skills, competencies and potential of the students as well as to observe career opportunities and perceptions of the students about what the jobs that show interest for each student specialization. Decision support systems can help humancognitive deficiencies by integrating various sources of information, providing intelligent access to relevant knowledge, and helping decision-making processes.

II. LITERATURE REVIEW

A. Decision Support System (DSS)

To build a decision support system, a database, base model management system and user interface are needed. Database management system (DBMS) is used to process the data. The data is entered and stored in database management system that can be retrieved when needed. Decision Support System (DSS) is considered as computer-based system that can be involed in helping decision-maker to use models data and to solve identified problems. Rauscher [7] DSS is practical for automating various tasks and for facilitating optimal decision making in a given supply chain. DSS is designed in such a way that they provide a source of expertise that acts as a source of knowledge which can be updated by incorporating emerging technologies [7]. In many situations, the quality of decisions can help decision-making for humans where decision making has become a major need for science throughout history. Decision Support System can be used by various fields of science from information science, cognitive psychology, and artificial intelligence which are implemented in the form of computer programs, either as a stand-alone tool or as an integrated computing environment for complex decision making [8]. A study that explores the basic ingredients of a smart approach followed by a rule-based expert system for decision support has succeeded in structured decision situations that are better and well understood from the type of taxonomic classification.

B. Intelligent Decision Support System (IDSS)

DSS is defined as an interactive computer-based information system that is intended to assist humans in making decisions by analyzing, retrieving, and summarizing data relevant to decisions [9-11]. The main component of a decision support system consists of a database management system, model base management system and user interface. To provide intelligence to the three components of the decision support system, it can be added that an optional fourth component can be included, namely a Knowledge-based ManagementSystem (KMS) [12]. Decision support system with Knowledge Management System is referred to as Intelligent Decision Support System (IDSS) [13].

Expert system (ES) basically captures and regulates specific task knowledge that comes from experts (expertise) into computer programs. The users can find a specific suggestion to solve the problem by using expert knowledge contained in the system. To provide specific conclusions, it is used to give decisions that are similar to an expert [14-15]. The IDSS expected for this study has a KMS that combines model-based features into the ES [16].

C. Certainty Factor Method

The use of Certainty Factor (CF) models on a problem can be explained in detail in the original paper by Shortliffe and Buchanan.The use of a rule-based system developed requires a modular approach to uncertainty decisions where the difficulty to assess subjective probability of experts consistently. Furthermore, initial interactions withexperts make them believe that the numbers given by experts who work with them differ in the likelihood of character. Therefore, a certainty factor model is created for the MYCIN domain as a practical approach to uncertainty management in rule-based systems [17-18]. In addition, Heckerman [19] shows recent research, where diagnostic systems built using certainty factors can be applied practically in clinical settings in the real world. All three researchers have discovered the certainty factor model as a practical use for consultation so that the authors are interested in using this CF model in career planning and selection research.

Some implementation of rule-based representations of knowledge displays basic rules in the form of engine inference networks using real criteria or facts illustrated in Fig. 1. Each arc in the engine inference network is a rule; name above the arc in the form of CF for rules.

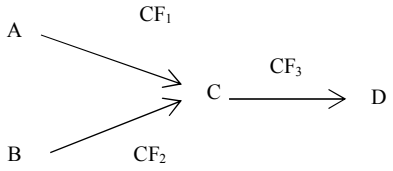

Fig 1. Jaringan inferensi untuk situasi

R1: If A Then B, CF_1
R2: If C Then B, CF_2
R3: If B Then D, CF_3

The certainty factor model can calculate changes in belief in each hypothesis in data tracing or observed variables by applying a simple combination function to CF that lies between the evidence and the intended hypothesis. CF is combined in two steps. The first step iscombining CF_1, CF_2 and CF_3 for CF rules R_1, R_2 and R_3, then for giving CF_4 for R_4 composite rules as illustrated below.

R_4: If A And C Then B, CF_4

$$CF_4 \begin{cases} CF_1 + CF_2 - CF_1CF_2CF_1CF_2 \geq 0 \\ CF_1 + CF_2 + CF_1CF_2CF_1CF_2 < 0 \\ \frac{CF_1 + CF_2}{1-\min(|CF_1|,|CF_2|)} \text{otherwise} \end{cases} \quad (1)$$

To combine CF_1 and CF_2 can use functions:

$$CF_4 = (CF_1)(CF_2)$$

The second step is combine with CF_3 and CF_4, is to look for CF_5 in the R_5 rule created.

R_5: If A And C Then D, CF_5

Where the combination function used is:

$$CF_5 = \begin{cases} CF_3CF_4CF_3 > 0 \\ 0 \qquad\qquad CF_4 \leq 0 \end{cases} \quad (2)$$

Then $CF_5 = (CF_4)(CF_3)$

The second step can be called a combination function. In the certainty factor (CF) model can set the merging function of two rules in which the hypothesis in the first rule is proof in the second rule.

If all the evidence and hypotheses in the rule base are simple propositions, we only need to use series and parallel combination rules to combine CF_n [18]. Certainty Factor (CF) models that combine combination functions toaccommodate rules that contain conjunctions anddisjunctions illustrated as follows:

R_6: If E and F then G, CF_6

If a rule has rules that reflect indirect evidence as illustrated in the rules below:

R_7: If H then E, CF_7

R_8: If I then F, CF_8

Then CF_6, CF_7 and CF_8 are combined to produce a new composite rule for CF R_9 rules:

R_9: If H And I Then G, CF_9

The combination function is

$$CF_9 = CF_6 \min (CF_7, CF_8) \quad (3)$$

Calculate the combination of CF_6, CF_7 and CF_8 using the minimum value of CF_7 and CF_8, where R_6, contains a combination of E and F. So the CF model uses a CF_8 minimum for evidence in relation, and a maximum of CF_8 for evidence in disjunction. There are many variations between the implementation of the CF model used. The original CF models used in MYCIN treat CF_8 less than 0.2 as if they were 0 in a series combination, to avoid unnecessary questions arising from users under goal-directed reasoning schemes. For the sake of brevity, we will not describe other variations, but everything is explained in full [17].

III. METHODOLOGY

In this section, this study discusses how comprehensive and easy information methods for the students' career selection are through career planning and selection. The completeness of this document uses an integrated approach to utilize information sources identified through tracking from expert knowledge in relation to a number of quantitative information. The purpose of this research is to develop Intellegent Decision Support System (IDSS) that integrates the types of information notificationson career planning and selection to the students with the aim of increasing the level of the students adoption about the ability of knowledge, skills and competencies that the students must possess to be able to work in the world of work. In paper [20] proposed competency validation as a bridge of learning forms and tools to strengthen and expand access to the formal qualification system.

Model specifications to further test the mechanisms underlying the relationship with career selection and career competency can use a theoretical framework, namely Career Construction Theory (CCT). Career Construction Theory (CCT) states careers as a process in which individuals apply their own choices to vocational choices, future desires and the transition of their work [21]. In Dumulescu's research [22] finding, the meaning in work can develop career competencies needed for professional success, gaining increased self-potential. In this paper examines the relationship between career selection and career competencies of the students followed by knowledge and skills.

The results of the study [23] states to address the needs of counselors in measuring career adaptation responses that can be used for career construction tasks in research needs. In measuring the dimensions of the career adaptation model it is necessary to develop a Student Career Construction Inventory (SCCI). In measuring career adaptation responses consisting of thoughts and behavior work involved in building career opportunities [23].

To achieve this goal, the process is structured involves solving objectives into working methods and rules illustrated in Fig. 1. where stated in the figure there is identification of key components of IDSS that are made, and developed rules for knowledge of career counseling experts that are relevant to be used in knowledge-based systems of proposed IDSS and expand them for decision making in student career selection using Intellegent Decision Support System (IDSS) based applications. Where the expert knowledge component is combined with quantitative information and is used in the development of Intellegent Decision Support System (IDSS) [24].

The knowledge base from the expert can be identified as having a key component for the design of the IDSS created. The results of this design, it is important to identify expert counseling knowledge for career planning and selection in accordance with the study program taken with the world of work in accordance with the knowledge, skills and competencies possessed.

The success of a DSS depends on the quality of expertise or heuristics used. It is important to ensure that competent professional knowledge is chosen for elicitation in developing IDSS by investigating the determinants of experts' knowledge in planning and career selection at universities. Armstrong argues that differences between expert and novice performance cannot be reduced to experience but must include qualitative defferences. Cognitive psychology literature distinguishes the performance of experts from beginners using a number of elements.

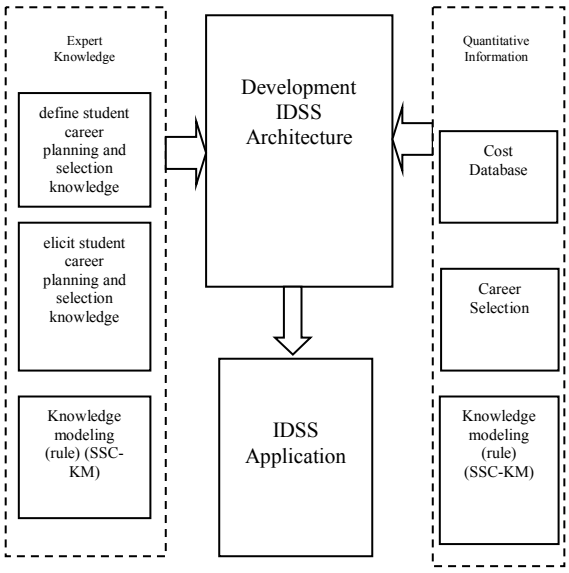

Fig. 2 Research Methodology

Attributes to the determinants of the students' career selection skills are using the criteria of knowledge ability, skills, competence and self-potential (interests, talents).

Good knowledge of decision-making systems in domains that can be included in the Intellegent Decision Support System (IDSS) is using the form of if-then-else rules. So that it can help the students' career selection, career decision making for academics by proving and increasing existing knowledge. The initial application obtained by knowledge using Boolean logic is shown [25]. The main use of combining expert knowledge in the Intelligent Decision Support System (IDSS) platform involves developing into a format that is used. Knowledge gained from experts needs to be modeled by developing knowledge-based rules that can be used in Intellegent Decision Support System (IDSS).

IV. Result And Analysis

To carry out the IDSS process in accordance with career planning and selection, the framework is based on determining the IDSS Implementation required. An engineering planning and career selection is designed on a computer based on a Decision Support System (DSS). The configuration model is presented in Fig. 3.

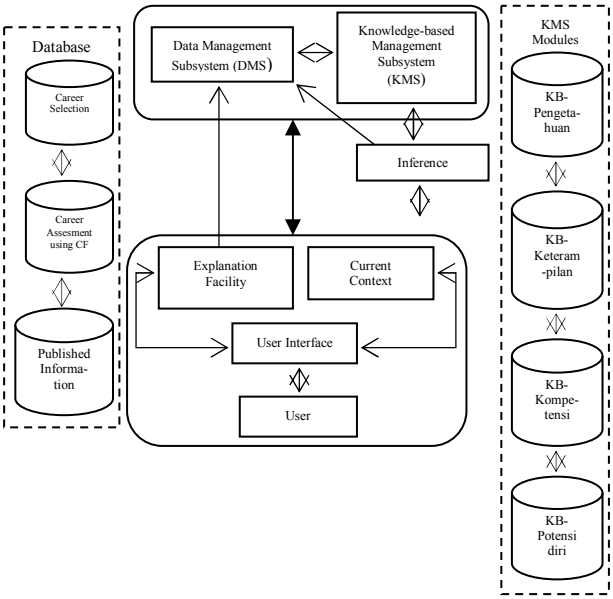

Fig.3 Student Career Intelligent Decision Support System

A. Knowledge base Management Subsystem (KMS)

This model consists of three main parts: (1) identifying student career choices, (2) short lists and prioritizing actions, and (3) providing expert advice on careers that are appropriate to the field of science. The factors that determine expert knowledge about career selection in knowledge-based modules in the Knowledge Management System for Intelligence Decision Support System (IDSS) are designed: (1) career planning and selection measurements based on the KB Knowledge module, (2) knowledge-based skills, conditioning skills in career suitability measurement modules (KB-Skills), (3) knowledge-based competency module (competency-KB), (4) self potentialmodule consisting of knowledge-based talents (self-potential KB), (5) suggestions for knowledge-based experts on planning and selecting career the students according to the field.

B. Data Management Subsystem (DMS)

IDSS database is intended to store appropriate career planning and selection data and that support knowledge-basedmodules. In the Data Management System, it is configured into three database sections: (1) Selection of career assessment software from career planning and selection, (2) career assessment database using Certainty Factor (CF), and (3) Information about careers of interest according to the field science or study program. The three parts of the database can be used in sequences and periods based on the information that will be processed and the logic generated from one module individually or together with the KMS module. Data in the third database block (published career information) and expert advice on KMS blocks in data management systems can be edited individually without requiring comprehensive data records. Data is used in career assessments in software and career selection sections which can also be edited based on master edits from database system administrators.

C. User Interface System (UIS)

User interface subsystem of IDSS combines the functions of the desicion support system user interface: (1) users, (2) interactions using the user interface, (3) providing explanatory facilities, and (4) the current or necessary condition. The system gives direction or explanation for career selection decisions to users. IDSS is designed for the needs of counseling students and lecturers on career selection. In the user interface design has 2 usability functions, namely to view or get information and can translate into a system in the form of a system information to the user in a form that is easily understood in the form of images, text or video, where the explanation facility function is responsible for explaining the output logic in the form of a Knowledge Management System (KMS) rule.

In IDSS, a solution or decision is relevant to quantitative information and expert knowledge. With the existence of this IDSS, users not only get knowledge about the wishes or needs of the students they want to achieve, but it also provides specific information into the system. Thus, the function of IDSS that is designed can develop solutions or decisions based on available information. Data from the Database Management System (DMS) are interconnected with the knowledge of the Knowledge Management System that provides information in helping the users make decision systems. Meanwhile the IDSS inference engine can proceed reasoning by combining new decision-making options based on expert knowledge. The system is enriched by providing the ability to deduce new knowledge in response to information needs for users in different situations. The data in the Data Management System (DMS) and the knowledge in the Knowledge Management System (KMS) are useful for running an inference engine.

D. Demonstrasi Aplikasi IDSS

During the IDSS application demonstration, the steps involved in the IDSS application demonstration are explained using the DSS Framework Fig.4. The most important aspects of IDSS-based system design are decentralized architectures that allow connect applications with different users as support tools. IDSS can be used via Internet and can be accessed smoothly by users in the designed IDSS application. IDSS can be distributed which is

illustrated in Fig. 4 made by the main component of the system:

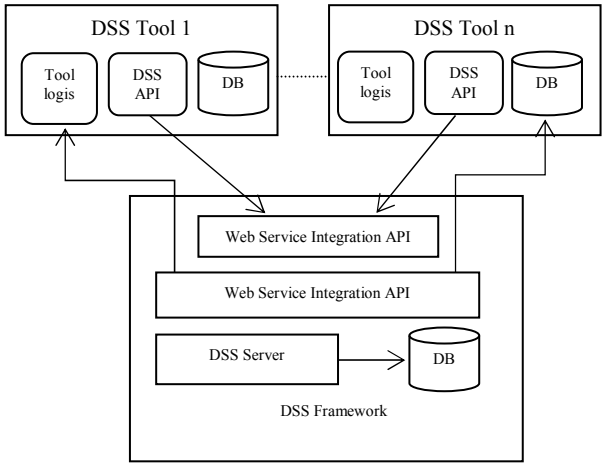

Fig. 4 Desicion Support System (DSS) Frame Work

For the purpose of demonstrating the ability of IDSS using purposive sampling technique, it has the main objective of directing researchers to use certain variables or criteria from the population used by expert knowledge in answering research questions. Since the non-probability sampling technique is used, there are various criteria that can be used to enter certain samples in purposive sampling.

The logic of decision making by the process described in the form of if-then-rules, which can describe the process of decision making rules. So that complex systems can be built by combining many rules that involve identifying the right variables.

The use of IDSS variables is to solve the problems into rational parts, can be represented as variables, where variables can be used to develop the rules used in IDSS. The system starts by asking users to answer questions and provide specific responses. The answers and the responses are used to assign values to variables, which are derived from the values of internal rules or other external (database) sources used. In the logic of decision making to identify career choices, the students must include the ability of knowledge, skills, potential, and competencies that can be appropriate variables. Based on expert knowledge obtained and relevant quantitative information, appropriate values can be given to users.

V. CONCLUSION

Based on understanding career information as a need for planning and career selection using criteria of knowledgeability, skills and competencies well as self potential (interests-talents), which utilize the relevance of Intelligent Decision Support System (IDSS) in supporting career selection planning and decisions for college students the information system program described in this paper. This paper identifies a comprehensive format that can be used to represent the knowledge of counseling experts at the university so that they can be used effectively later on the platform of the Intelligent Decision Support System (IDSS).

IDSS uses the certainty factor (CF) model by combining the planning and career selection knowledge model using the rules of if-then-else which is developed by representing expert knowledge based on the rules so that the rules are designed to produce the students' career decisions. The system design IDSS provides facilities for users with the right information to assist decision making in the students career domain stated in the development of IDSS using components from DSS namely Knowledge-based Management System (KMS), data management subsystems, and user interface subsystems. Finally, the IDSS application uses the DSS platform in an effort to break information barriers to adoption of career selection. IDSS can be useful in helping counseling practitioners with evidence that strengthens the knowledge base and information they provide to the students.

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