Expert System in Career Exploration Based on Business and Industrial Needs

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Abstract

Era Society 5.0 is the development of technology-based human activities. Rapid technological developments have an impact on human life, one of which can eliminate jobs and can also create new jobs. The Business and Industrial World (DUDI) is one sector that has an impact on technological developments with the hope that the human resources who will work later are superior human resources so that they can innovate well. This study aims to measure the entrepreneurial personality of SMK students using an expert system application. The methodology used in this research is Research and Development (R&D). There are four stages to do: Definition, Design, Development and Dissemination. The instrument used to measure entrepreneurial personality is inventory (non-test) with four indicators of entrepreneurial personality, namely Extroverted, Leader, Moderate Risk Taker, Ambisious, which have undergone a fit test using Confirmatory Factor Analysis. The result of this research is an expert system application that can recommend jobs based on six career-oriented personality types. Based on the results of data analysis, the Entrepreneurship Personality-based career development application was declared valid, practical and effective in measuring the entrepreneurial personality of vocational students in percentage (0.89) and very practical (91.11) and the results of product effectiveness were 82.47 (effective).

Keywords: Expert System, R&D, Entrepreneurial Personality, Four-D, Society 5.0.

1. Introduction

The purpose of vocational education at Vocational High Schools (SMK) is to prepare students' abilities to continue to higher education levels and prepare students to enter the workforce and develop professional attitudes as described in the Decree of the Minister of Education and Culture No. 049074u1990[1][2]. However, the Central Statistics Agency (BPS) noted that Vocational High Schools are still the highest contributor to the unemployment rate from the Open Unemployment Rate (TPT) in Indonesia[3].

The obstacle faced by vocational students after they graduate is their ignorance of their abilities[4]. This results in their ignorance of determining career and education plans[5][6]. One way that the school does is by conducting career guidance. Career guidance carried out by Guidance and Counseling (BK) teachers as psychologists can determine results in accordance with the abilities of students' interests through a series of tests carried out[7]. Not being implemented evenly and consistently is an obstacle because the number of comparisons between students and BK teachers is not appropriate[8][9]. So we need an Expert System that can provide convenience for students[10].

The artificial intelligence technique that will be applied in the form of an Expert System can imitate the human reasoning process[11] and offer more specific results to be utilized[8][12][13], because the Expert System functions consistently like a human expert who will provide advice to the user and find solutions to specific problems[14][15][16].

One of the programs developed in finding talented entrepreneurs is to measure the entrepreneurial potential that exists within the individual through his personality[17][18]. One way that can be done to find out the entrepreneurial potential that exists within an individual is to measure the entrepreneurial personality by using the right instrument or measuring instrument[18][19].

Through collaboration between expert systems and psychology, it will produce more valid, practical and effective personality tests and inventories in measuring personality, especially entrepreneurial personality[14][20]. Therefore, a career development expert system application was designed using an entrepreneurial personality inventory in order to measure the entrepreneurial potential in an individual[21][22][23], especially vocational high school students[15]. Then direct the right career program with their personality.

2. Research Methodology

The type of research used is Research and Development (R&D). Research and development is a type of research that is used to produce certain

products and test the effectiveness of these products[24]. In research and development methods there are several types of models. The model used is the development of a 4-D model. The 4-D development model (Four D) is a development model developed by S. Thiagarajan, Dorothy S. Semmel, and Melvyn I[14]. The 4D development model consists of 4 main stages: Define, Design, and Disseminate[20]. This method and model was chosen because it aims to produce a product in the form of an expert system-based entrepreneurship personality inventory software, the product developed is then tested for validity with product validity and testing to determine the extent of the effectiveness of the product in career development using entrepreneurial personality. The 4D research stages used are presented in in Figure 1 [18] [25][9].
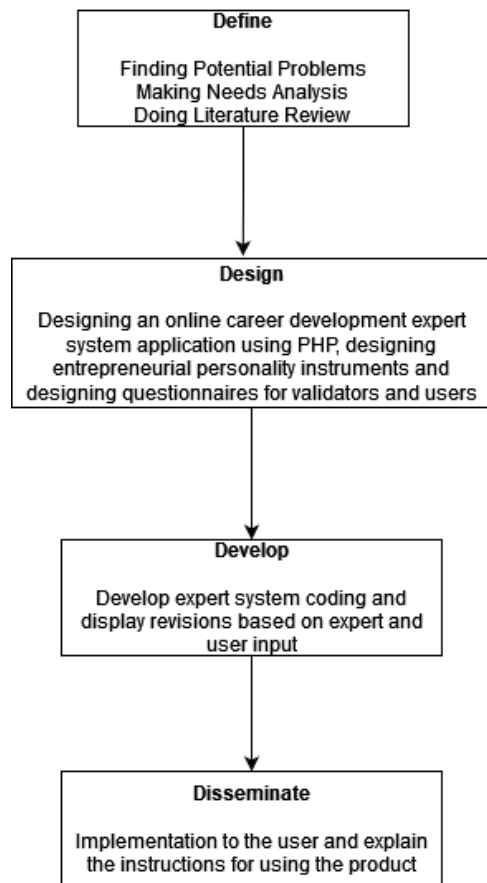

Figure 1. Stages of Career Expert System Application Development

From Figure 1, it can be explained that the Stages of Development of Career Expert System Applications are as follows:

a. Define

In the define stage, a needs analysis was carried out using a lift, which was distributed to class XI students of SMK Penerbangan SPAN Padang, , and BK teachers, then a literature review was

carried out to see the relevant literature that could support this research.

b. Design

The design stage is the most important stage to do[1], where at this stage the process of designing an entrepreneurial personality inventory instrument is carried out, where to design this instrument it involves entrepreneurship experts, psychology experts and language experts. This is what is transferred to the expert system application so that the expertise of some of these experts can be implemented and documented so that it can be used in the next few years. The process carried out in designing the entrepreneurial personality inventory instrument is depicted in Figure 2.
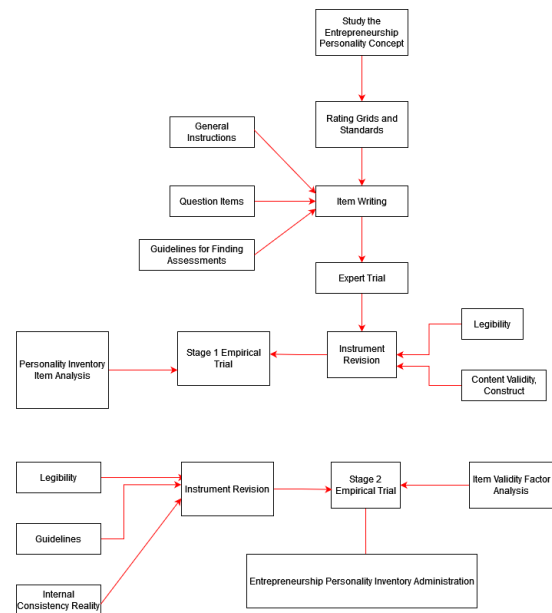

Figure 2. Steps for Developing Entrepreneurship Personality Inventory Instruments

c. Develop

At this stage, coding development and display revisions are carried out based on expert and user input (Vocational BK teachers and students). Besides that, experts will also assess the level of validity of these personality types with the existing factors, to test the level of validity of this personality type and the factors that influence it, the Confirmatory Factor Analysis method is used to test it. After the personality type and the factors that influence it are valid, then the data transfer process is carried out to the computer system. Then to compare the data from the system with the original data from the expert, the Bayesian method was used.

Bayesian method will classify the data with a statistical model that can be used to predict the

probability of membership in a class. This Bayesian method is used to analyze in helping to achieve the best decision making, especially in determining the type of personality and career according to the user's personality. Besides that, one of the purposes of using the Bayesian method in this study is to facilitate the processing of inconsistent and biased data. The model of the expert system application development process starts from comparing the entrepreneurship personality test applications that already exist in several countries around the world, such as PIKEN, IVEY, ERASMUS, SANTANDER and others, from the advantages and disadvantages of each application, then adjusted with the needs and culture in Indonesia.

d. Disseminate

The next process is to find personality variables that influence a career in entrepreneurship. Based on factor analysis using Confirmatory Factor Analysis, four factors that dominate the entrepreneurial personality were found, namely: Leader, Extroverted, Ambitious, Moderate Risk Taker. After the personality factor is found, the stage of compiling a blue print from the entrepreneurial personality inventory begins, after which validation is carried out by experts. After being valid, an expert system analysis was made using the Bayesian method and the design of a decision tree from the entrepreneurial personality inventory.

The career development expert system application process model using an entrepreneurial personality is depicted in Figure 3:
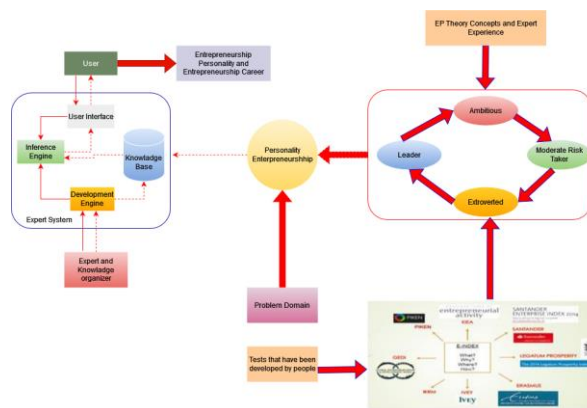

Figure 3. Expert system Application Process Model Career Development Using Entrepreneurship Personality

The last process model is the transfer of knowledge into the expert system application, then a comparison of the results obtained from the psychometric experts and the results obtained from the system is compared. After this process is complete, the system

can be disseminated to users involving BK teachers, and vocational students, at this stage the effectiveness level of the expert system application that has been disseminated can be measured, at this stage we can see the achievement of the applications that have been developed.

3. Results and Discussion

At this stage of the results and discussion, it will be described in stages according to the 4-D development stages so that it becomes systematic and easy to understand.

3.1. Define

At this stage, the results of the data analysis on the needs analysis of the product development expert system application for career development. It can be stated that the average score for needs analysis is 41.52, thus it can be determined that the percentage of needs analysis is 83.04% with a high level of needs category for the development of career development expert system applications.

3.2. Design

At this stage, it is done to build or construct a personality type based on the data that has been distributed and a comparison with expert data is carried out using the Confirmatory Factor Analysis method as shown in Figure 4.

Confirmatory Factor Analysis is a model to see whether the data from the field entered with the structure can fit or not[22]. For the fit of the model with the data obtained, there are several measures, the Tukey-Lewis Index (TLI), Comparative Fit Index (CFI) and Root Mean Square Residual (SRMR).

The fit value for each measure is TLI > 0.90; CFI > 0.95; and SRMR < 0.08 . Entrepreneurial personality fit test results are displayed in the form of Table 1.

Table 1. Confirmatory Factor Analysis Fit Test Value

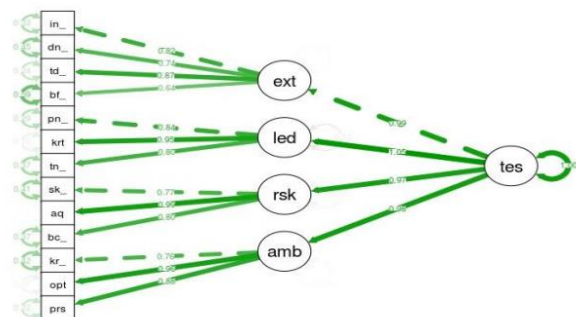| CFI	TLI	SRMR
0.81	0.75	0.01
Marginal Fit	Marginal Fit	Fit

Figure 4. Entrepreneurship Personality Construct Validation Results

Based on construct validation that has been carried out using confirmatory factor analysis, a high correlation is obtained between latent variables and manifest variables, in Figure 4 the correlation between the latent variable extrovert and the manifest variable interaction obtained a value of 0.82, with the external manifest variable of 0.74, with the independent manifest variable obtained a value of 0.87 while the correlation between the latent variable extrovert and the manifest variable of practical thinking obtained a value of 0.64. While the correlation between the latent variable Leader and the manifest variable influencing others obtained a value of 0.84, while the creative manifest variable obtained a value of 0.95 and the manifest variable obtained a value of 0.80.

The correlation between Moderate Risk Taker and the manifest variable of challenges is obtained a value of 0.77, with the manifest variable of fighting power obtained a value of 0.99, and the manifest variable of reading opportunities is obtained a value of 0.80. Finally, it can be seen that there is a high correlation between the Ambitious latent variable and the hard worker manifest variable of 0.76, with the optimistic manifest variable of 0.96, and the achievement drive manifest variable of 0.88. So it can be concluded that there is a high correlation between the latent variables forming the entrepreneurial personality and the manifest variables.

3.3. Develop

After the stage of calculating the probability using the Bayesian method manually is completed, the process of transferring knowledge to the system is carried out as shown in Figure 7. Next is the development of coding to display the entrepreneurial personality inventory, as shown in Figure 8. Each user will check the statements which is considered to be in accordance with his personality. After filling in the statement items, the user can see the results on the consultation report menu and print the results of the tests that have been carried out, as shown in Figure 5.

(a)

(b)

Figure 5. Entrepreneurship Personality Indicator Value Based on Expert Data

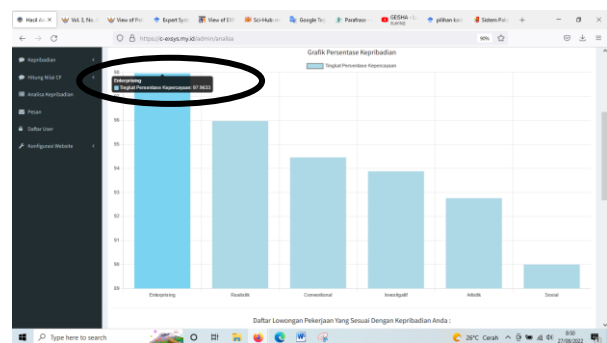(a) Initial Entry of Personality Indicator Values (b) Percentage of Personality Indicator Values

Figure 6. Personality Percentage Graph and Trust Percentage Level

Based on Figure 6, it will show a graph of the proportion of personality and level of trust in users.

Figure 7. List of Job Vacancies by Personality Indicator

3.4. Disseminate

At this stage, the application is disseminated and sees the level of effectiveness of the Expert system application that has been built. The results of the effectiveness of the product development of the Expert system application can be described in table 3:

Table 2. Summary of Practical Results of Respondents' Perception Applications

No Item	Score	Description	Results of Practical Aspect Assessment
Item 1	84.11	Practical	
Item 2	81.92	Practical	
Item 3	92.60	Very Practical	APPLICATION Aspect Format 86.58 Practical
Item 4	85.48	Practical	
Item 5	91.51	Very Practical	
Item 6	83.84	Practical	
Item 1	80.55	Practical	
Item 2	83.29	Practical	
Item 3	90.41	Very Practical	APPLICATION Aspect Content 85.07 Practical
Item 4	83.56	Practical	
Item 5	90.96	Very Practical	
Item 6	81.64	Practical	

Based on Table 2, it is stated that the average score for effectiveness is 111.33, thus it can be determined the percentage of needs analysis is 82.47% with a high level of effectiveness category for the use of career development expert system applications.

4. Conclusion

Based on the research product development method used and the research data obtained, it can be concluded as follows: The addition of new instruments in measuring entrepreneurial personality and career development, namely the Entrepreneurship Personality Inventory. As well as the discovery of 4 groupings of personality types based on the correlation of indicators obtained from the results of factor analysis using confirmatory factor analysis while the 4 personality types formed from the results of this factor analysis are Extrovert, Leader, Moderate Risk Taker and Ambitious. Besides that, it can reduce the cost of personality tests which have been expensive because they are still paper-based and the cost of psychological consultations with expert system applications that are already based online. Availability of career development expert system applications using valid, practical and effective entrepreneurial personality. The application of the Career Development Expert system using the Entrepreneurship Personality was declared Valid (0.887), Very Practical (91.11) and effective (82.47).

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