Implementation of the Student Character and Personality Determination System Using the Certainty Factor Method
(Case Study: Universitas Suryakancana Cianjur)

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KEYWORDS	ABSTRACT
Certainty Factor Method; character; Student Personality	This research aims to implement a system to determine the character and personality of students using the Certainty Factor method. This method is used to analyze a student's personality based on various relevant factors. This research uses the Research and Development (R&D) method which involves data collection through surveys and observations of students whose character and personality have been identified. The system is implemented through the development of a computer-based application that integrates data and uses the Certainty Factor algorithm to analyze and determine the character and personality of students. The test results show that the system is able to provide predictions of student character and personality with a satisfactory level of accuracy. The implication of this research is that the application of information technology in the development of character and personality determination methods can make a positive contribution to the development of student personality in the academic environment.

1. Introduction

Higher education is an integral part of the national education system that is responsible for preparing human resources for the future. In it, students are a part that plays a central role in the higher education process. Identifying student characteristics is a crucial first step in the implementation of higher education Manurung & Rahmadi (2017). Understanding the character and personality of students is an important aspect because this knowledge can support lecturers and counsellors in providing appropriate guidance and direction for students (Sulkifli, 2021). Moreover, this understanding also helps students in their own personal development.

According to Salsabilah et al. (2021), a character refers to the nature, personality, disposition, and behaviour reflected in a person's daily life. Meanwhile, according to Karim (2020), personality includes traits, character, morality, habits, and behaviour that are part of the dynamic psychological and physical structure of each individual, which affects the way individuals adapt to their environment. About university students, their character and personality have great importance. Each

student has special and unique characteristics, in accordance with personality theory which emphasizes that individuals have differences in terms of personality and character. This means that approaches to guiding and directing students in higher education must take these differences into account to ensure effective and personalized guidance.

However, in the process of determining the character and personality of students, the approach used is often manual and subjective, which can produce less accurate and consistent results. To overcome this challenge, an expert system using the certainty factor method can be implemented as a more objective and structured solution. An expert system is a system that combines deep knowledge and data analysis to solve problems that generally require the expertise of an expert or expert (Siddieq, 2024). The use of this expert system includes consultation, analysis, diagnosis, assistance in decision making, and provision of solutions.

The method used uses the certainty factor (CF), which is an approach used to measure uncertainty in an expert's thinking. This method allows an expert to express their level of confidence in a problem at hand by using a percentage value as a representation of their certainty of a decision or prediction (Alam et al., 2022). Then one of the implementations of expert systems in the field of health, especially psychology, is to evaluate character based on personality. Personality includes a person's attitudes, feelings, expressions, temperament, visible traits, and behavior. It is considered important because personality has a significant influence on one's success and failure in life, both in the context of career and social interaction in society. Personality formation is influenced by the surrounding environment and is a dynamic process.

The application of the certainty factor method in assessing student character and personality provides a more structured and objective approach to decision-making and recommendations. This method makes it possible to measure and express the level of confidence or certainty of an expert on student personality attributes. Thus, the use of certainty factor can increase consistency and accuracy in determining student guidance and self-development strategies in higher education.

Research by Rachman & Mukminin (2018) analyzed elementary school students aged 6-12 years to find their interests and talents. The results of this study show that the expert system can identify the type of intelligence, interests, and talents of students based on the characteristics that the user chooses beforehand. The information provided includes the dominant type of intelligence as well as recommendations for stimulation of students' interests and talents. Research by Nurjannah & Asharudin (2022) focused on testing expert systems at the high school level, using the precission and recall methods to evaluate system performance. The results showed a precision rate of 70% and a recall of 100%. The implementation of this system reduces consultation time from 30-60 minutes to only 10-20 minutes, allowing educators to quickly identify and manage student characters.

Meanwhile, Nour et al. (2018) developed an expert system to test the personality and learning modalities of students using the certainty factor method. The results of the consultation with five samples showed an accuracy rate of 80%, which indicates that this system is effective in providing appropriate recommendations based on the personality characteristics and learning styles of students.

The novelty of the research is to develop an expert system that uses the Certainty Factor method to determine the characteristics and personality of students. The goal is for academic parties,

such as the Guardian Lecturer, to efficiently assess and direct coaching for students with the help of web-based technology. This approach is expected to simplify the identification process and provide more targeted guidance in managing students' personal development. Overall, this research is expected to make a significant contribution to improving the quality of education in Indonesia. By applying artificial intelligence in the form of an expert system for psychological problems, this research also has the potential to expand the boundaries of science in the field of artificial intelligence technology. The results of this research can be a reference and inspiration for further research in the same field, as well as enrich the development of expert system methods and applications in the context of education and psychology.

2. Materials and Methods

The research method used in this study is Research and Development (R&D). Research and Development (R&D) is a process or steps that aim to develop new products or improve existing products. This development research serves as a bridge between basic research and applied research (Okpatrioka, 2023). Data is collected through surveys and observations of students who have been identified as characters and personalities. The system is implemented through the development of a computer-based application that integrates the data and uses the Certainty Factor algorithm to analyze and determine the character and personality of students. In addition, the data collection technique in this research also involves literature studies obtained from Google Scholar with a publication period of 2014-2024. This process includes searching, selecting, and collecting various scientific articles, journals, and academic publications relevant to the research topic.

An expert framework applies human information to a computer so that the computer can illuminate issues as specialists more often than not do. A great master framework is planned to unravel a specific issue by imitating the work of specialists. With this master framework, indeed standard individuals can unravel very complex issues that can really as it were be illuminated with the assistance of specialists. For specialists, this master framework will moreover offer assistance their exercises as exceedingly experienced associates. A branch of AI that creates clients broadly learned, particularly for human-level problem-solving specialists, agreeing to Arhami, 2004.

Dynamic System Development Methodology (DSDM) is a framework in the development of a project, mainly used as a software development method; DSDM is an iterative and incremental approach that includes the principles of Agile development, including continuous user/customer involvement, so in essence this DSDM is included in this DSDM methodology approaching the Incremental and Agile Alliance methods.

The classification of expert systems based on their usefulness, according to Siswanto (2004), namely:

1. Diagnosis:
   a. Used to recommend, medicine for sick people, machine breakdown, electronic skeleton damage.
   b. Find out what the problem/crash is.
   c. Using a decision tree as a representation of his knowledge.

2. Determine:
   a. Used to determine the characteristics and personality of students,
   b. Make a diagnosis of what causes the shortcomings of students, then provide solutions to determine the personality of students,
3. Interpretasi:
   To analyze incomplete, disorganized, and contradictory data, for example: For image interpretation.
4. Prediksi
   a. Example: How a meteorologist predicts tomorrow's weather based on previous data,
   b. For weather forecasts,
   c. Determination of planting time,
5. Planning:
   a. Starting from machine planning to business management.
   b. To save cost, time and materials because of model creation.
   c. No longer needed.
   d. Example: computer configuration system
6. Control:
   a. Used to control activities that require high time precision.
   b. Example: Control in high-tech industries.

According to T. Sutojo in Aldino Moto, 2010 certainty factor is a method to prove the uncertainty of an expert's thinking, where to accommodate this one usually uses a certainty factor to describe the level of expert confidence in the problem at hand.

There are two ways to get a level of confidence from a rule, namely by using the 'Net Belief' method and by interviewing an expert. The level of confidence is obtained from the user's answers when conducting a consultation.

The certainty factor is used to deal with uncertainty in the manufacture of MYCIN. The Certainty Factor (CF) is a clinical parameter value given by MYCIN to indicate the magnitude of trust. The Certainty Factor is defined as Equation (1) CF (H, E) = MB (H, E) – MD (H, E) (1) CF (H, E) is the Certainty Factor of the H hypothesis which is influenced by the symptoms (evidence) E. The magnitude of CF ranges from -1 to 1. A value of -1 indicates absolute distrust while a value of 1 indicates absolute trust. MB (H, E) is a measure of increased belief in hypothesis H influenced by symptoms E. MD (H, E) is a measure of increased disbelief towards hypothesis H influenced by symptoms E

Table 1 Combination of Antecedent Evidence

EVIDENCE E	UNCERTAINTY VALUE
E1 or E2	Min [CF(H,E1), CF(H,E2)]
E1 or E2	Max [CF(H,E1), CF(H,2E)]

Not E	-CF(H,E)

In the application, CF(H,E) is the value of certainty given by experts to a rule, while CF(E,e) is the value of trust given by the user to the symptoms he or she experiences.

The Certainty Factor method functions to track the input of damage symptoms and then take a density value (confidence) on each damage in accordance with the symptoms. After obtaining the density value, identification can be carried out. In Figure 1, it can be seen that the Certainty Factor inference process is used to draw conclusions in the search for solutions using a flowchart.

Figure 1 Inferential Machine
Flow Diagram

The purpose of applying the certainty factor method is to determining the characteristics and personality of students. First, an expert system can be created by applying the certainty factor method based on studies from experts and weighting that has been carried out. Second, it assists psychologists in analyzing the character and personality of students based on information technology. Third, users of the expert system can quickly determine personality.

The term personality in English is expressed as personality. The term comes from the Greek word persona, which means mask, and personal, which means to penetrate. The term mask is related to one of the attributes worn by playwrights in ancient Greece. With the mask worn and reinforced with gestures and what is said, the character of the character played can penetrate out in a sense that it can be understood by the audience.

Allport initially defined personality **as "What a man really is."** But the definition was seen as inadequate by Allport, and he revised the definition (Soemadi Suryabrata, 2005 p. 240). The definitions that were then formulated by Allport were: *"Personality is the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment"* (Singgih Dirgagunarso, 1998, p. 11). Allport's opinion above, when translated into: Personality, is a dynamic organization in an individual as a psychophysiological system that determines its distinctive way of adapting to the environment.

David Krech and Richard S. Crutchfield (1969), in their book entitled Elements of Psychology, formulate the definition of personality as follows: *"Personality is the integration of all of an*

individual's characteristics into a unique organization that determines, and is modified by, his attempts at adaption to his continually changing environment." (Personality is the integration of all the characteristics of an individual into a unique entity that determines and is modified by his efforts to adapt to a constantly changing environment.)

Adolf Heuken S.J. et al. in their book entitled The Challenge of Fostering Personality (1989: 10), stated as follows.

"Personality is a comprehensive pattern of all abilities, deeds and habits of a person, both physical, mental, spiritual, emotional and social. All of this has been arranged in its distinctive way under various influences from outside. This pattern is manifested in his behaviour, in his attempt to become a human being as he wants".

Based on the definitions of Allport, Kretch Crutchfield, and Heuken, the main points of the definition of personality can be concluded as follows.

a. Personality is a complex unity, consisting of psychological aspects, such as: intelligence, traits, attitudes, interests, ideals, etc. as well as physical aspects, such as: body shape, physical health, etc.
b. The unity of these two aspects interacts with the environment that is constantly changing, and a distinctive or unique pattern of behavior is realized.
c. Personality is dynamic, meaning that it is always changing, but in these changes there are patterns that are fixed.
d. Personality manifests itself in relation to the goals that individuals want to achieve.

According to (Wardiana & Tobing, 2012), it is revealed that: *"Personality is very important for everyone to know so that each individual is able to develop his strengths. By recognizing how one's personality and character, a person can find out what potential and shortcomings they have, as well as determine what steps can be taken to develop their potential and manage their existing shortcomings.*

Concepts that are closely related to personality are sometimes even equated with personality. Concepts related to personality are (Alwisol, 2005: 8-9) :

1. Character, which is a depiction of behaviour by highlighting values (right-wrong, good-bad) both explicitly and implicitly.
2. Temperament, which is a personality that is closely related to biological or physiological determinants.
3. Traits (traits), i.e. the same or the same response to a group of similar stimuli that last for a (relatively) long period of time.
4. Type attributes similar to traits but in a more limited group of stimuli
5. Habit is the same response and tends to repeat the same stimulus.

3. Results and Discussions

Disturbance Data Analysis

Data collection from personality disorder cases is by taking data ranging from symptom data, to solution data from students who experience personality disorders. "The use of the certainty factor inference system in the application of determining the character and personality of students" and the explanation of personality symptoms.

Table 2 Annoyance

Code	Annoyance
C001	Students who are easy to think positively
C002	Students who easily think negatively
C003	Students who talk more than listen
C004	Students who are easy to make friends and easy to get along with
C005	Passionate students
C006	Students who are full of curiosity
C007	A fun student who always looks cheerful
C008	Students who love entertainment and making others Entertained
C009	Students who are able to convince others with logic and facts
C010	Students who are firm and strong-willed
C011	Students who desperately need change
C012	Talented students lead
C013	Students who do something that has a goal in mind
C014	Students who are easily confident and independent
C015	Irritable and sensitive college students
C016	Students who are full of thoughts and love to analyze
C017	Students who like to plan and be scheduled
C018	Students who demand perfection (perfectionists and idealists)
C019	Students who love details for both small and big things
C020	Students who are chatty and like to criticize
C021	Students who love peace and avoid all forms of chaos
C022	Humble students
C023	Obedient and tolerant students
C024	Shy and quiet students
C025	Fearful students
C026	Patient and friendly students

Table 3 Solution

Solution Code	Personality based on psychology	Information
C001	Extrovert	social, friendly, joy-enjoying nature, active, talkative, impulsive, fun, spontaneous, friendly
C002	Introvert	Shy, aloof, has self-control The good
C003	Neuroses	Anxiety, tension, paleness and nervousness
C004	Choleric	Temperament's thinking is quick to anger, easy offended, impatient

C005	Melancholy	Temperament, remorse, pessimism, easy to be sad, easily discouraged
C006	Phlegmatic	Slow, passive, lazy and sometimes apathetic or timeless stupid
C007	Sanguinis	Jovial, active, dynamic and dexterous

Formation of the Decision Tree

Choice tree investigation could be a plan utilized to build a framework of expert systems. Within the choice tree chart, the ultimate arrangement of each look will be looked. The choice tree chart will make it simpler to compile the information base and rules of each identity clutter look.
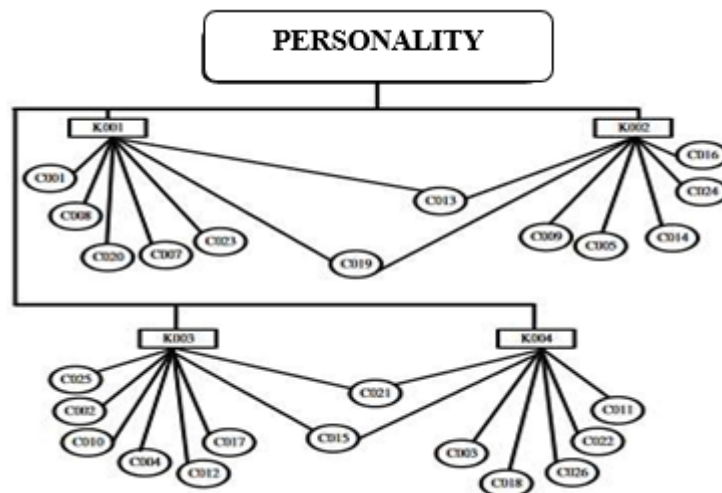
Figure 2 Personality Disorder Decision Tree

Certainty factor is a search strategy through the search process from a set of data or facts; from these data, a conclusion is sought that becomes a solution to the problem faced. To determine the personality disorder that the patient suffers from, rules are determined

The production rules will present the results of the decision tree. The following is a table of production rules for the diagnosis of psychiatric disorders that contain symptoms and types of diseases that can be seen in the table:

Table 4 Rule results from the Decision tree

Code	Rules
C001	IF C001 AND C008 AND C020 AND C007 AND C023 AND C019 AND C013 THEN K001 SANGUINIS CF=1
C002	IF C001 AND C008 THEN K001 SANGUINIS CF =0,2

Formation of System Models

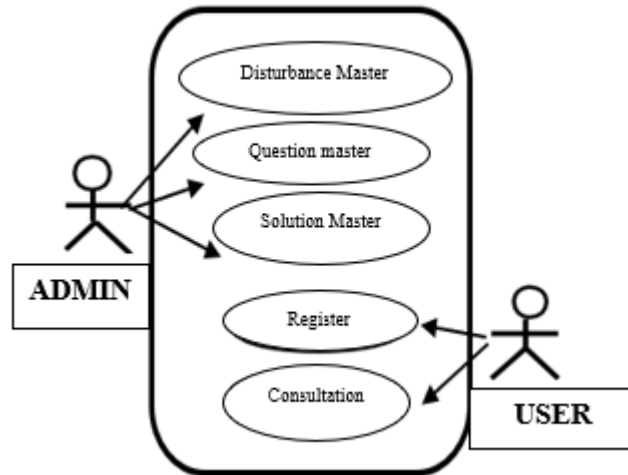   a.   Use Case Diagram

Figure 3 *Use Case Diagram Determining Student Character and Personality*
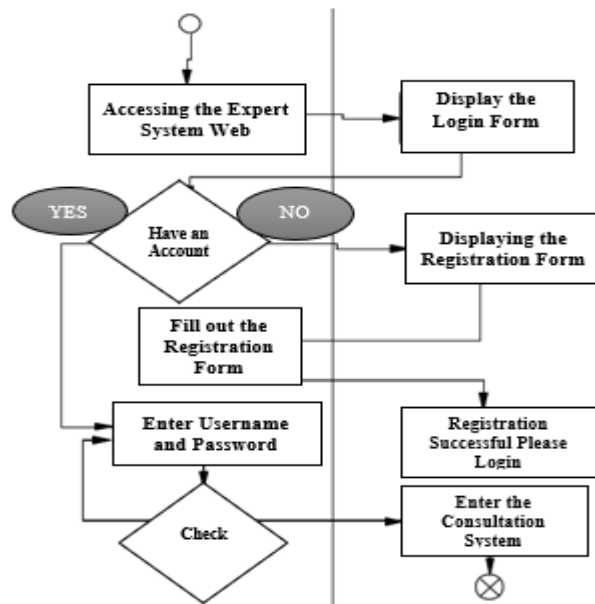
   b. Activity Diagram
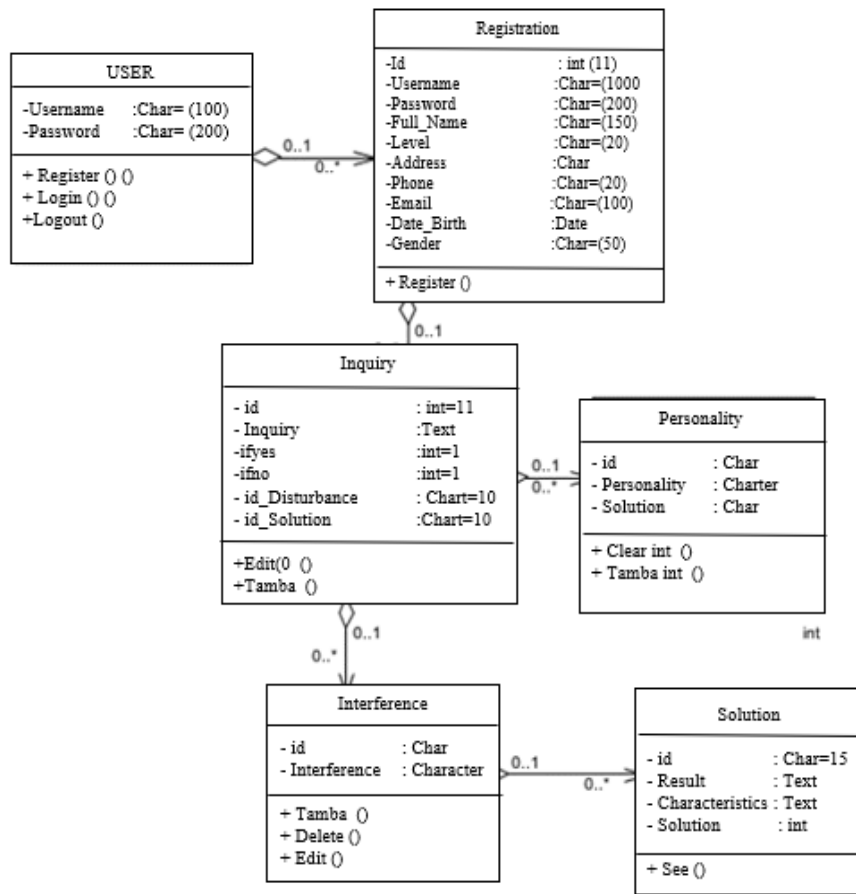

Figure 4 Activity Diagram System

c. Class Diagram

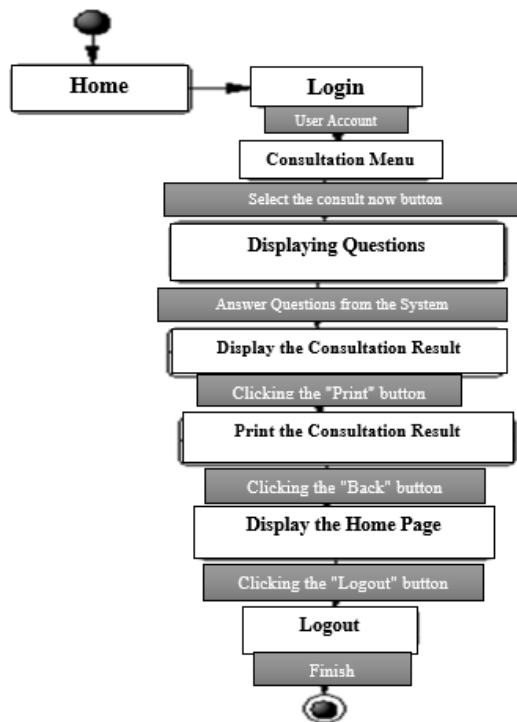**Figure 5 Class Diagram System**

d. Statechart diagram

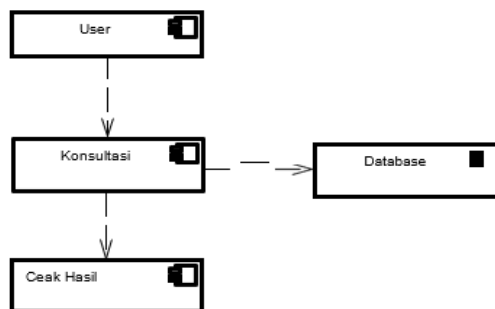
Figure 6 Statechart diagram

e. Component Diagram

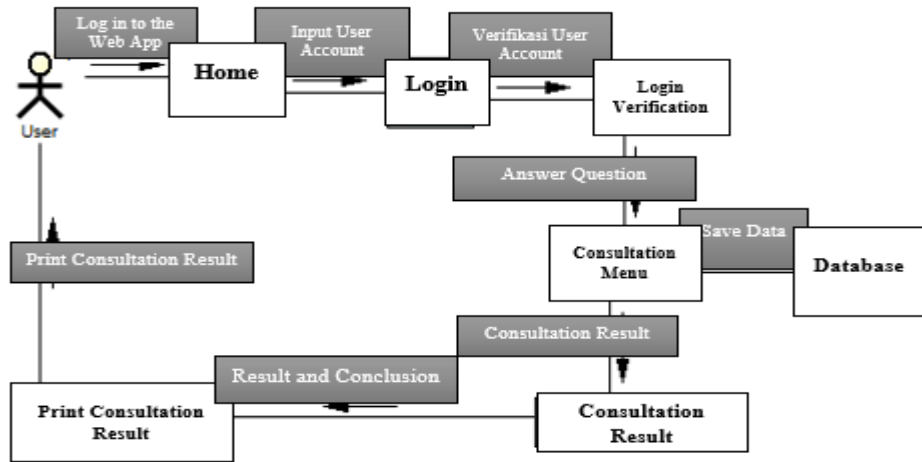**Figure 7 Component Diagram System**

f. Communication Diagram

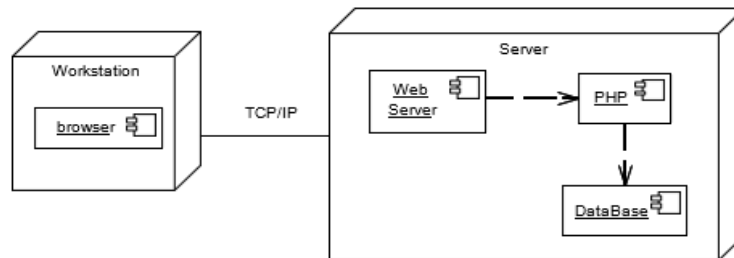**Figure 8 Comunication Diagram System**

g. Deployment Diagram

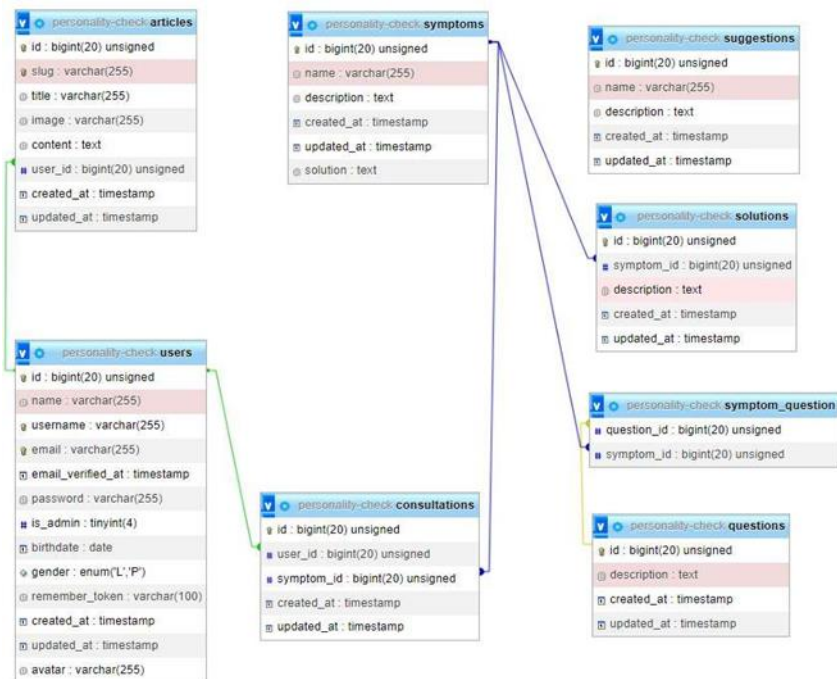**Figure 9 Deployment Diagram System**

h. Database

Figure 10 System Diagram Database Relationship Schema

System Interface
a. Registrasi User

Figure 11 Registration Interface (Registration)

b. Frequently Asked Questions

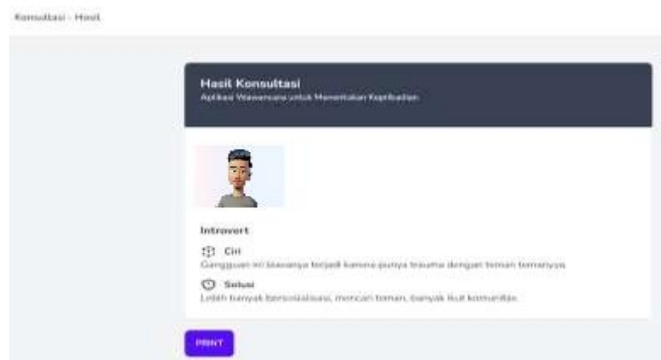
Figure 12 Consultation Interface

c. Consultation Results

Figure 13 Consultation Results Interface

d. Interference Master

Figure 14 Interference Data Master Interface

4. Conclusion

Based on the description above, the expert system to recognize personality characteristics in students can be used as a medium for applying the intelligence of an expert or expert as well as an assistant in helping to analyse and determine the type of personality characteristics, and this application can provide information to users about the types of personality characteristics in students along with explanations and appropriate solutions according to the symptoms and characteristics owned by the client.

Suggestions for further research Expert systems can use other methods in resolving the level of confidence which can be an alternative comparison to find out which method is closest to the reality of the level of truth, The development of this expert system can be done using other programming languages, such as Php, java.

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