

Expert System Design for Guidance of Information Technology (It) Technopreneurships Based on Students Personal Characteristics

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Abstract— This study aims to produce design of expert system as a information technology (IT) technopreneurship guidance. This expert system application will acquire competence and knowledge of the IT technopreneurs. This study will provide benefits to further increase the interest and motivation of students to become IT technopreneurs. Results in the first phase is the mapping Technopreneurships of information technology into the 8 kinds technopreneurs namely Software Application Developer, Database Developer and Data Analyst, Systems Analyst, Software Engineer, Computer Network Engineer, Graphics Designer & Animator, Multimedia System Developer and Embedded & Computer System engineer. The mapping based on learning styles, multiple intelligences and cognitive styles. The results of the mapping used as expertise domain to prototype guidance system using intelligent computing. Result in second phase of the research is the expert system design with knowledge base, rule of system and architecture of system.

Keywords --- Expert System, Guidance, Students, Technopreneurship, Information Technology

I. INTRODUCTION

Many students and scholars wish to run a business or becoming technopreneurs. Some of them are influenced for families, motivated for a seminar or a call to a friend, forced by not got a job, and others. There are several critical success factors that must be considered by the business and are interested in becoming techno for success. Most students assume primary capital to start a business is money, and most importantly in entrepreneurship also money. This opinion armpits wrong but there are more important capital as competency for business or becoming techno [1].

Students who want to become technopreneurs need to understand various fields that can be applied technopreneurships.. It is ease to get information and business consulting and technpeneurship indispensable [2]. Bring in a mentor or practitioner would require cost and time is not small. The Higher Education as a place for science and technology development through learning and research can grow develop technopreneurships [3]. The development of information technology gives influence to human resources

skill, for example is the implementation of online training for skills improvement [4].

This research built expert system applications design that expertise information technology (IT) technopreneurship practitioners acquired as the guidance to students. Based on the above issues will require solutions to provide the information guidance information technology (IT) Technopreneurship for students. This study will answer the question how to develop the expert system for guidance of IT technopreneurships based on personal characteristics of students (learning styles, multiple intelligences and cognitive styles).

II. LITERATURE REVIEW

A. Technopreneurship

Technopreneurship is formed from two words, namely 'technology' and 'entrepreneurship'. In general, said the technology is used to refer to the practical application of science to industry or as a framework of knowledge that is used to create tools, to develop expertise and extracting the material in order to solve existing problems [3], [5], [6]. Technopreneurs spirit and character are formed by three the main component, namely intrapersonal, interpersonal, and extrapersonal. Interpersonal and interpersonal is a component of soft skill factor, while extrapersonal is related to the ability to be able to empower both components of the soft skills to be able to be implemented in more widespread impact [6].

The combination of entrepreneurship ability and technological development becomes an important domain [5]. Technopreneurship is an alternative to overcome unemployment. The environmental and education factors of students are influenced in entrepreneurship while no effect family factors [6]. Two important aspects of business development and technopreneurship which is related to information technology are infrastructure and human resources [7]. The improvement of students' innovation and creativity in developing a technopreneur must be adjusted by their ability and support from the existing stakeholders. Kamarudin & sajilan did research to study examines the fields animation. This study describes how to be successful in the field of animation technopreneur with exploratory study method [8].

In economics, business is an organization that sells goods or services to consumers or other businesses, for a profit. Historically the business word of English business, from basic word busy, which means "busy" in the context of individual,

community, or masyarakat. In the meaning, busy is doing some activity and jobs that bring profit [6].

B. Students Personal Characteristics

1. Learning Styles

Learning styles refer to the psychological state that determines who receive information, interact and respond to the learning environment. The learning styles have several variable factors include the perception and processing of information, motivation, and psychological factors. Every individual has the characteristics unique in learning. Learning styles describe the uniqueness of human like signature of each person. Based on Learning Styles Inventory Memeletics there are seven learning styles, namely [6]:

- *Visual*
This learning style that is associated with the use and utilization of pictures, images and spatial learning.
- *Aural*
The learning style that associated with the use of sound and music
- *Verbal*
The learning style that is associated with the use of writing, and speaking words in learning.
- *Physical*
The learning style that is associated with the movement of the body, hands and other senses.
- *Logical*
The learning style that is associated with the use of logic, reasoning and systems.
- *Social*
The learning style that is associated with the use of logic, reasoning and systems.
- *Solitary*
The learning styles associated with self learning or self employed.

In fact not as easy as grouping at the top, and there really is not a 100% pure students have specific learning styles. Each students would have a combination of multiple learning styles. However, usually a student has a tendency to be more dominant in one particular group learning style.

2. Multiple Intelligences

Theory of multiple intelligences was introduced in 1983 by Dr. Howard Gardner. Howard Gardner promoted that intelligence is not a single entity that can be measured in a simple can be measured by IQ tests. Intelligence can be improved and developed throughout the history of human life. Gardner defines intelligence as the capacity to solve permasalahan or formed products are valued in one or more cultural backgrounds [6].

Concept of multiple intelligences is a descriptive assessment that see how people use their intelligences to solve problems and produce something. This approach is a tool to see how the human brain operate in the world, be it concrete objects and abstract. Gardner initially formulated seven multiple intelligences. In the development of his research, he added one more intelligence. Multiple intelligences by Gardner [6]:

- *Liguistic Intelligence*
Intelligence related to the capacity to use language to express thoughts and understand the words of others, either verbally or in writing. This intelligence has four skills, namely listening, reading, writing and speaking.
- *Logical – Mathematical Intelligence*
Intelligence related to the capacity to use numbers, think logically, to analyze cases or problems, and perform mathematical calculations. This intelligence is linked to the intelligence of the scientists, accountants, computer programmers and so on. Skills related to this intelligence is to solve puzzles, recognize geometric shapes, explore ideas, pengenalkan patterns, enriching the experience of interacting with mathematical concepts, games and others.
- *Visual-Spatial Intelligence*
Intelligence related to the capacity to recognize and perform the depiction of objects or patterns received by the brain. This intelligence is very important because it gives students the freedom to express themselves. Skills related to this intelligence in drawing and painting, doodling, recognize and visualize a concept, make crafts and others.
- *Bodily-Kinesthetic Intelligence*
Intelligence related to the capacity to coordinate the movement of the whole body. The students with this intelligence indicates already ripening of students in taking action. Maturity is dependent on the motor nerve and muscle information owned. Skills associated with this intelligence to dance, role play, drama, physical exercise, various sports and others.
- *Musical Intelligence*
Intelligence related to the capacity to recognize the voice and composing rhythm and tone. The students with prominent musical intelligence easily recognize and remember the tones. It also can transform words into songs and create music games. Skills associated with this intelligence singing, whistling, humming, like knock-ngetukan hands and feet, like to listen to music and others.
- *Interpersonal Intelligence*
Intelligence related to the capacity to understand the intentions, motivations and desires of others. This intelligence must be developed in students from an early age because it concerns how to deal with the outside world or other people besides his family. It is necessary that students do not be shy or embarrassed and do not want to play with his friends. Skills related to this intelligence is to lead, organize, share, play groups, cooperation and others.
- *Intrapersonal Intelligence*
Intelligence related to the capacity to understand and assess the motivation and sense of self. In life must have a lot of issues and problems, then we must understand the concept of self, that is to know the advantages and disadvantages of self, known as self-image. Intelligence skills related to this thinking, designing purposes, thoughtful reflection, journaling, judging ourselves, introspection, and so forth.

- *Naturalist Intelligence*

Intelligence related to the capacity to recognize and classify certain features in the surrounding physical environment, such as animals, plants, and weather conditions. Student who stand out with this intelligence has an interest in the natural surroundings. They enjoy objects and stories relating to natural phenomena such as the occurrence of clouds and rain, the origin of the animals, the growth of plants, the solar system and others.

3. Cognitive Styles

Cognitive Styles are differences in cognitive behavior, thinking and memory that will affect the behavior and activities of individuals, both directly and indirectly. According to Martin Cognitive Styles or cognitive style consisting of [6]:

- *Systematic Style*

Systematic cognitive style is a cognitive style characterized by a way of thinking and processing information with systematic and structured.

- *Intuitive Style*

Cognitive styles rely on intuition and receive information and think with unpredictable ordering.

- *Integrated Style*

This cognitive style is combine from systematics and intuitive styles.

- *Undifferentiated Style*

This cognitive style is the opposite of integrated cognitive style. A person with this cognitive style in berpikir and process information in a systematic lack or intuition.

- *Split Style*

Cognitive style is in the middle between systematic and intuitive. A person with a cognitive style is processing information and thinking systematically and intuitively in size medium.

C. Expert System

Intelligent computing is a computer programming paradigm that is trying to approach human intelligence. Intelligent computing the most popular today is the expert system, this is due to its application in various fields, both in the development of science and especially in the field of business has proved very helpful in decision making [9], [10]. The expert system is also the field of artificial intelligence techniques most widespread applicability. Expert systems is a software package of decision-making or problem solving to reach new levels of performance similar or even more with human experts in several specialized fields and usually narrow down the problem areas [11], [12].

Expert systems composed by two main parts, namely the development environment and consultation environment [11]. The development of expert systems used to incorporate expert knowledge into an expert system environment, while the consulting environment used by users not an expert in order to obtain expert knowledge [13], [14].

Application of expert system is used almost in all domain of life. Expert system is used for selecting software development methodology with rule based [15]. Expert system is applied to identify trusted partner for business to business collaboration [9]. Expert system design uses for guidance of educational and career based multi agent system and ontology [16]. Expert system is used to measure of the competences which are increased human psychological perception and perform in work place [10].

III. RESEARCH METHOD

The initial step of the research was the mapping of information technology (IT) technopreneurships. The next step is making Knowledge representation and policy or rule and prototyping system based on intelligent computing consulting. The step of the research shown like figure 1 below.

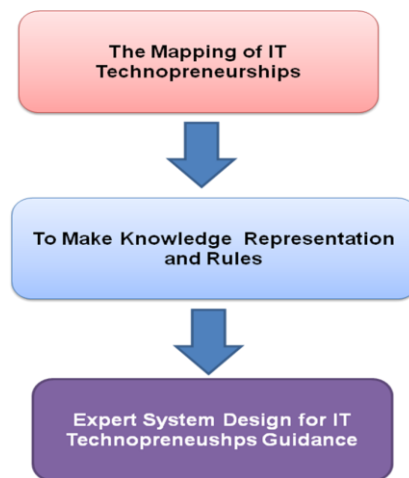


Figure 1. Research Method

Initial step of the research was a descriptive research approach model and subsequently carried out research development. The descriptive analysis to produce the mapping of information technology (IT) technopreneurships. The development research was used to make prototype consultation system of IT technopreneurship based on expert system. The research data obtained by interview, questioner and literature study.

IT Technopreneurships are numerous and wide-ranging. In this research, there were restrictions and field descriptions of IT technopreneurships, based on Forum Group Discussion (FGD), literature study, interview and questionnaire to Computer and Management lecturer, Technopreneur of Information Technology, Education Psychology practitioner. There are 8 kind of IT technopreneurs : Software Applition Developer, Database System Developer & Data Analyst, System Analyst, Software Engineer, Computer Network Engineer, Graphics Designer & Animator, Multimedia System Developer, and Embedded & Computer System Engineer.

The analysis and design system in research refers to the expert system approach. The results of IT Technopreneurships mapping were then processed in the form of knowledge representation with indicators of Learning Styles, Multiple Intelligences and Cognitive Styles.

IV. RESULT AND DISCUSSION

The mapping of IT technopreneurships based learning styles, multiple intelligences and cognitive style generated through literature, analysis of related subjects, questionnaires, interviews, focus group discussion (FGD) and observation, then the mapping scheme as Figure 2 below:

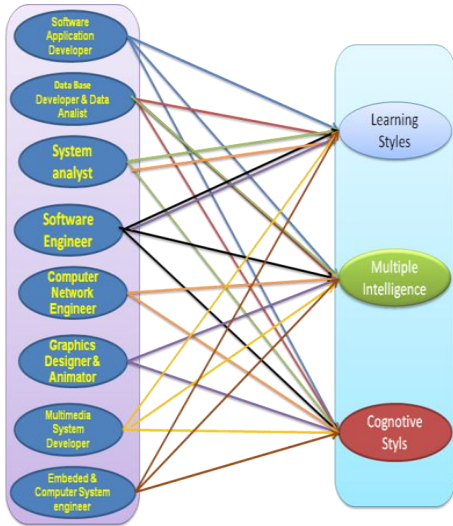


FIGURE 2. THE MAPPING IT TECHNOPRENEURSHIPS

The method that used to represent rule-based knowledge was IF-THEN statements where the THEN section would be true if one or more sets of facts or relationships between facts are known to be true, fulfill the IF section. In general IF premise and THEN conclusions.

TABEL 1. RULES OF SYSTEM

RULES	STATEMENT
RULE 1	IF Visual Learning Style Medium AND Verbal Learning Style medium AND Logical Learning Style high AND Social Learning Style medium AND Linguistics Intelligece medium AND Logical-Mathematics Intelligence high AND Visual-Spatial Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Software Application Developer</i>
RULE 2	IF Visual Learning Style medium AND Gaya Belajar Logical Learning Style high AND Social Learning Style medium AND Linguistics Intelligece medium AND Logical-Mathematics Intelligence high AND Interpesonal Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Database System Developer & Data Analyst</i>
RULE 3	IF Visual Learning Style Medium AND Verbal Learning Style high AND Logical learning Style tinggi AND Aural Learning Style medium AND Gaya Belajar Social medium AND Linguistics Intelligece high AND Logical-Mathematics Intelligence high AND Visual-Spatial Intelligence medium AND Musical Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>System Analyst</i>
RULE 4	IF Visual Learning Style Medium AND Verbal Learning Style high AND Logical Learning Style high AND Aural Leraning Style medium AND Social Learning Style medium AND Linguistics Intelligece high AND Logical-Mathematics Intelligence tinggi AND Visual-Spatial Intelligence medium AND Musical Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Software Engineer</i>
RULE 5	IF Visual Learning Style Medium AND Verbal Learning Style medium AND Logical Learning Style high AND Physical Learning style medium AND Social Learning style medium AND Linguistics Intelligece high AND Logical-Mathematics Intelligence tinggi AND Visual-Spatial Intelligence medium AND Body-Kinesthetics Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Computer Network Engineer</i>
RULE 6	IF Visual Learning Style high AND Verbal Learning Style medium AND Physical Learning Style medium AND Aural Learning Style medium AND Social Learning Style medium AND Linguistics Intelligece tinggi AND Visual-Spatial Intelligence high AND Body-Kinesthetics Intelligence medium AND Musical Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Graphics Desaigner & Animator</i>
RULE 7	IF Visual Learning Style tinggi AND Logical Learning Style medium AND Verbal Learning Style medium AND Physical Learning Style medium AND Aural Learning Style medium AND Social Learning style medium AND Linguistics Intelligece medium AND Visual-Spatial Intelligence tinggi AND Body-Kinesthetics Intelligence medium AND Musical Intelligence medium AND Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style high AND Integrated Style medium THEN <i>Multimedia System Developer</i>
RULE 8	IF Visual Learning style medium AND Logical Learning style high AND Verbal Learning Style medium AND Physical Learning Style medium AND Social Learning Style medium AND Linguistics Intelligece medium AND Logical-Mathematical Intelligence high AND Visual-Spatial Intelligence medium AND Body-Kinesthetics Intelligence medium AND Musical Intelligence medium AND

	Interpesonal Intelligence medium AND Naturalist Intelligence medium AND Systematics Style highAND Integrated Style medium THEN <i>Embeded & Computer System Engineer</i>
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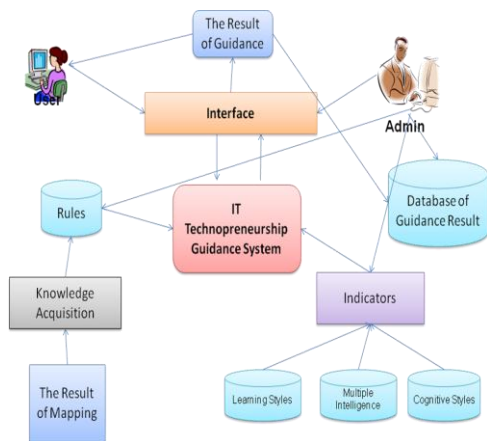
In this research, there are 8 rules based on IT Technopreneurs mapping result. Each rule deals with student personal characteristics indicators of learning styles, multiple intelligences and cognitive styles. The determination of rules based on the results of questionnaires, Interviews and observations with the expertise domain. The expertise domain consists of IT Technopreneurs, Computer academics, business and management academics and practitioners of educational psychology. The determination of the rules involves 40 expertise domains that produce the results as in table 2 below:

TABEL 2. RESULT EXPERTISE DOMAIN ACCEPTED

No	Statement of Indicators	Expertise Domain Accepted
1	The learning styles of students can be used as indicators for IT Technopreneurship guidance	92.5 %
2	The multiple intelligences of students can be used as indicators for IT Technopreneurship guidance	100 %
3	The cognitive styles of students can be used as indicators for IT Technopreneurship guidance	85 %

Table 2 above shows that the three indicators of learning style, multiple intelligences and cognitive styles can be used for reference to IT technopreneurship guidance. The average result of expertise domain accepted is 92.5%.

The next step is to generate an expert system architecture for IT technopreneurship guidance for students, like figure 3 below:



Figurer 3. Architecture of System

The IT Guidance System consists of a indicators questionnaires of learning styles , multiple intelligences and cognitive styles, rules, inference machines with expert system approach. The students or users fill the learning styles indicators, multiple intelligences and cognitive styles, the results of these input data will be stored in their respective databases. The Guidance System will process input data based on available rules, resulting in the output of suitability

between students' personal characteristics with 8 types of IT technopreneurs. The results of guidance will be stored in the database guidance result.

V. CONCLUSION

1. The Mapping of IT technopreneurships carried out with reference mapping based Learning Styles, multiple intelligences and Cognitive Styles. The mapping produce 8 types Technopreneurships and Business Information Technology ie Software Application Developer, Data Base Developer & Analyst , System analyst, Software Engineer, Computer Network Engineer, Graphics Designer & Animator, Multimedia System developer and Embeded & Computer System engineer.
2. Results of the mapping is used as domain expertise in design of systems guidance using expert system approach.

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