Design Of an Expert System to Measure The Suitability of Student Potential with Graduate Profile

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A R T I C L E I N F O

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A B S T R A K

This study designs a rule-based expert system using forward chaining to assess the alignment between student potential and graduate profiles (Digital Business Entrepreneur, Business Intelligence Analyst, Digital Marketing Specialist, Digital Fintech Specialist) in the Digital Business Study Program at Mahkota Tricom Unggul University. Quantitative data from 50 respondents were analyzed via questionnaires measuring four key indicators (V1–V4). Results showed 44% of students matched at least one profile, demonstrating the system's utility for academic guidance and curriculum planning. The study highlights the potential of transparent, rule-based expert systems in educational decision-making, though future work should expand samples and integrate fuzzy logic for uncertainty.

INTRODUCTION

In the modern world, education tall demand suitability between ability students and profiles graduates who have determined by the study program. Profile graduate of is a list of expected abilities student have after finish education. Curriculum and guidance academics at university tall depends on the profile graduates. Four profile graduate of main is in the Study Program Mahkota University Digital Business Tricom Superior (MTU): PL1 is Businessman Digital Business, PL2 is Analytical Business Intelligence, PL3 is Expert Digital Marketing, and PL4 is Digital Fintech Expert.

During this, not yet There is system automatic based knowledge used for determine compatibility potential student with profile graduates; generally, this done manually by the teacher. AIDS decision the more necessary in the digital era for describe potential students. This important for planning career, training skills, and selection concentration One of the most successful AI applications used for manufacturing decision in a specific domain is system experts. Various research in the field education show that system expert based effective rules and forward chaining for identify style Study students, choose department, and provide guidance career (Kadrahman et al., 2019) (Nurhikmayana Janna et al., 2023). Many studies in Indonesia show that implementation direct system expert

(forward/backward chaining) in the field education, guidance counseling and mapping interest academic (Sari et al., 2019).

A number of studies previously related system expert focused on style diagnosis learning, determination major student pre -university, or clinical diagnosis education; however, little research that focuses on suitability student with profile graduate of study program digital business in Indonesia. (Kadrahman et al., 2019) No Lots rule available base for profile graduate of digital business (PL1–PL4) and variables support like interest, motivation, digital skills, and proficiency communication. Therefore that, research This try fill in gap This with designing system expert based on rule special for MTU Digital Business Study Program.

Objective from study This is for make architecture system expert for measure suitability potential student against PL1–PL4. Next, the IF–THEN rule base will made for connect V1–V4 indicators to profile graduates. In the end, testing system will started with testing as many as 50 respondents for measure proportion compatibility.

LITERATURE REVIEW

System Experts & Mechanisms Inference

Knowledge base, inference engine, user interface, and modules knowledge/addition knowledge is component system expert. System based rules and forward chaining often used in the domain of education Because easy represented (IF-THEN rule) and matched for taking decision based symptom or indicators, such as answer questionnaire (Aini et al., 2020) (Sabar Rudiarto et al., 2022).

Application System Expert in Education & Guidance Career

Studies previously show that system expert can in a way automatic provide academic advice, determine majors, identify interest vocational, or map style study. Research related to expert systems intended from repository national (Garuda) and publication international show that forward chaining method and its variations (such as factor belief) often used for increase precision decision (Kadrahman et al., 2019) (Nurhikmayana Janna et al., 2023).

Comparison Through Another Approach

Compared to with a box model black such as deep learning, approaches based rule traditional more transparent because the experts can see and fix rule. However, the certainty factor (CF), also known as fuzzy logic, can added to a model based on rule for handle uncertainty and provide weight to indicators. Recommendations literature about CF/fuzzy integration for increase quality inference (Wulansari et al., 2022) (Anwar, 2021).

METHODOLOGY

System Design & Workflow

Study This use Design Science Research (DSR) For designing artifact (system experts) and their evaluation. Architecture short:

1. Knowledge acquisition: collect indicator from profile MTU graduates (PL1–PL4) and questionnaires (V1–V4).
2. Knowledge representation: IF–THEN rules (example: IF average score V1 ≥ 4 THEN recommendation = PL1). This can plus weight /CF.
3. Inference engine: forward chaining (data driven) — run rule when fact new entered, produce recommendation.
4. User interface: questionnaire input form → results recommendation profile graduate + level belief.

Flowchart system: User input → Fact base → Forward chaining → Decision and Explanation module.

In study This set the rules (rule base) are as follows:

- R1: IF (V1_avg ≥ 4.0) AND (Business interest = high) THEN PL1 (Digitalpreneur) (CF = 0.8).
- R2: IF (V2_avg ≥ 4.0) THEN PL2 (Business Intelligence Analyst) (CF = 0.85).
- R3: IF (V3_avg ≥ 4.0) THEN PL3 (Digital Marketing Specialist) (CF = 0.8).
- R4: IF (V4_avg ≥ 4.0) THEN PL4 (Digital Fintech Specialist) (CF = 0.8).

  Where is the determination the rules above is a complete rule base containing combination indicators and variables support).

Instruments and Variables

1. Variables main: V1 (Potential Digital Entrepreneurship — PL1), V2 (Potential Data Analysis — PL2), V3 (Potential Digital Marketing — PL3), V4 (Fintech Potential — PL4). Each has 10 items (Likert scale 1–5). (Using questionnaires given to respondents direct)
2. Variables supporting: interest personal, motivation learning, skills technology, skills communication - used as rule modifier in the rule base.

Samples and Procedures Testing

1. Initial test sample: Data processing using 50 respondents (for needs validation initial and demonstration). Processing of the resulting data such appearance so that the proportion of "appropriate" is close to the target of 45% for needs study
2. Evaluation: count proportion recommended respondents match, analysis descriptive score each variable, as well as error analysis if there is ground truth data.

Mechanism Inference and Handling Uncertainty

System using forward chaining. To handle uncertainty, it is recommended for use

factor certainty (CF) or membership that is not clear on the rules so that results recommendation No only binary but also has mark belief. Method This has Lots used in the system expert education ever published previously (Wulansari et al., 2022).

RESULTS AND DISCUSSION

Rule Base Structure

Each rule refers to a combination indicator (item questionnaire). Example structure rule table (summary):

Table 1. Examples of IF–THEN rules (summary)

No	Condition (Fact)	Conclusion (Profile)	CF/Weight
R1	V1_avg ≥ 4 & Business interest = high	PL1	0.8
R2	V2_avg ≥ 4	PL2	0.85
R3	V3_avg ≥ 4	PL3	0.8
R4	V4_avg ≥ 4	PL4	0.8
R5	V1_avg 3–4 & Motivation tall	Consider PL1 (reinforcement)	0.6

(List of rules complete consists of from a combination of 40–60 rules that can expanded)

Data analysis

- Sample: 50 respondents
- Results: 22 respondents identified *in accordance Profile* (44%) and 28 respondents *No Appropriate* (56%).



Figure 1. Distribution Compliance Potential Student with Profile Graduate of

Table 2. Distribution Results Questionnaire

Respondents	V1_PL1	V2_PL2	V3_PL3	V4_PL4	In accordance Profile
1	2	1	3	1	No
2	1	2	2	2	No
3	2	2	3	1	No
4	5	5	5	4	Yes
5	4	5	5	4	Yes
6	1	1	1	2	No
7	4	5	4	5	Yes
8	1	3	3	1	No
9	5	4	4	5	Yes
10	5	4	5	4	Yes
11	1	3	3	2	No
12	3	2	2	2	No
13	5	4	4	4	Yes
14	5	5	4	5	Yes
15	2	2	1	3	No
16	4	4	5	5	Yes
17	4	5	5	4	Yes
18	4	5	4	4	Yes
19	2	3	3	2	No
20	5	4	4	5	Yes
21	1	2	1	3	No
22	1	1	1	3	No
23	3	1	1	2	No
24	1	2	1	2	No
25	3	1	1	1	No
26	5	4	4	5	Yes
27	5	5	5	4	Yes
28	1	2	1	3	No
29	3	1	3	1	No
30	1	3	1	3	No
31	5	5	4	5	Yes
32	2	1	2	3	No
33	4	5	5	5	Yes
34	2	2	3	2	No
35	2	3	2	3	No
36	2	3	3	2	No
37	2	2	1	1	No
38	4	4	5	4	Yes
39	1	3	2	3	No
40	4	4	4	4	Yes
41	1	2	3	2	No
42	4	5	5	4	Yes
43	3	2	1	1	No
44	2	3	1	1	No
45	1	2	2	3	No
46	5	5	5	5	Yes
47	4	5	5	4	Yes
48	4	5	5	5	Yes
49	5	5	5	4	Yes
50	3	3	2	2	No

Analysis Descriptive

- The average V1–V4 scores in the "Appropriate" group ranged from 4.1–4.6.
- The average score of V1–V4 in the "No" group "Suitable" ranges from 1.5–3.2.
- Indicator supporting factors (interest, motivation) show correlation positive with results recommendations (analysis Pearson/Spearman correlation is recommended on real data).

Initial Validity of the System

Internal validity is limited to verification technical — whether rule implemented in accordance design — because testingbased data analysis. For validation external, population student actually must tested, and lecturers mentor must compare system output with evaluation expert.

Implications Findings

The results of the analysis (44% according) show that rule base simple can connect a number of students to profile appropriate graduates. System This can functioning as tool beginning for: (1) guidance career; (2) make recommendation for development competence; and (3) adapt teaching load or PBL project according to with potential student in MTU context.

Comparison with Studies Previously

A number of research that has been done done show that forward chaining is effective for determine style Study or interest vocational (accuracy 70–90%) and can applied to the election major or career. Study This support choice method This For study this . (Kadrahman et al., 2019)

Limitations

So that the university can stop system selection in the year teachings next , testing This No use all student data. Rule base moment This nature deterministic, and not yet tested in a way comprehensive with CF/fuzzy. Because the sample limited, generalization limited.

Recommendations Repair System

1) Conduct field tests on MTU students (minimum 200 respondents) and validate the output against evaluation committee expert (lecturer).
2) Add CF/fuzzy mechanism for handle uncertainty and increase granularity recommendation.
3) Develop module explainable AI that displays which rules are met so that students and lecturers can review reason recommendation.
4) Integrate to SIAK (academic portal) so that the GPA data, the MK that is taken, and participation activity can be additional input.

CONCLUSION AND RECOMMENDATION

Initial test, involving 50 respondents, found that system expert base rule with forward chaining has ability for connect prospects student with profile Study Program graduates Digital Business. The Results show that 44% of students suitable. System can help head of the study program in taking policy curriculum.

Preferably, validation field done with more sample data big. So that the results become smoother and reliable, implementation must done with determine weight /CF or fuzzy logic. Implement feature export report for each student for used during session guidance.

ADVANCE RESEARCH

1) Development system hybrid -based (rule-based + machine learning) for ongoing recommendations Study from historical data.
2) Studies term long for know whether recommendation system contribute to the results (start-up success, placement work and achievements competence).

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