



COMPARISON OF CERTAINTY FACTOR AND DEMPSTER SHAFER METHODS IN EXPERT SYSTEMS FOR IDENTIFYING FACIAL SKIN TYPES

Fajar Maulana Yusuf¹*, Andri Sukma Indrayana²

^{1,2} STMIK DCI, Indonesia

Author: Mang2494@gmail.com

ABSTRACT

*The Tematik Aperta Nusantara (TAN) Course and Training Institution (LKP) offers various training programs aimed at enhancing participant competence. However, the process of determining the appropriate training program for prospective participants is currently conducted manually through interviews and initial assessments by staff, a method that is time-consuming and prone to subjectivity. This research aims to design and develop a web-based Decision Support System (DSS) to classify prospective training participants at LKP TAN using the *Profile Matching* method, thereby making the selection process more objective, efficient, and structured. The research methodology encompasses observation, interviews, literature review, and the development of a web-based system implementing the *Profile Matching* technique. Participant data is collected via registration and questionnaires, then processed based on five criteria: interest in the training field, basic computer skills, information technology experience, communication skills, and creativity. The results demonstrate that the developed system is capable of managing participant data, criteria data, and ideal training program profiles. It performs *Profile Matching* calculations—including GAP analysis, GAP weighting, *Core Factor* and *Secondary Factor* assessments, and final score computation. The system generates training program recommendations ranked by the level of compatibility between the participant's profile and the program's ideal profile. Consequently, the developed system assists LKP TAN in classifying prospective training participants more effectively, objectively, and through a computerized process.*

Keywords: Decision support system, profile matching, participant classification, training program

I. INTRODUCTION

Advancements in information technology have brought about significant changes across various sectors of life, including education and training. Information technology is utilized not merely for data storage and processing but also as a tool to facilitate decision-making processes that demand accuracy, speed, and objectivity. One application of information technology in decision-making is the Decision Support System (DSS).

A Decision Support System is a computer-based system designed to assist decision-makers in resolving semi-structured or unstructured problems by leveraging specific data, models, and methods to produce decisions that are more effective, objective, and measurable (Nuraeni et al., 2022). DSS applications have been widely adopted in various fields, such as education, participant selection, employee selection, performance assessment, and recruitment processes.

Lembaga Kursus dan Pelatihan Tematik Aperta Nusantara (LKP TAN) is an institution that conducts various skills training programs aimed at enhancing participants' competencies to meet the demands of the workforce. The training programs offered include Computer Operator, Office Administration, Junior Web Programmer, and Content Creator. To ensure the training process runs optimally, participants must be placed in programs that align with their specific abilities and characteristics.

Preliminary observations at LKP TAN indicate that the classification process for prospective trainees is still conducted manually through interviews and subjective assessments by the management. The selection of training programs lacks the support of a system capable of structured data processing; consequently, the resulting decisions rely heavily on individual experience and judgment. This situation creates a potential risk of mismatch between a

participant's abilities and the chosen training program.

Furthermore, the increasing number of applicants in each training cycle has extended the time required for the classification process. Inaccuracies in program assignment can lead to difficulties for participants in grasping the course material or prevent them from acquiring competencies that match their true potential. Therefore, a more systematic and objective decision-making mechanism is needed to assist in the trainee classification process.

One method that can be employed to support the participant classification process is the Profile Matching method. This method operates by comparing an individual's profile against a predetermined ideal profile. The degree of alignment between the participant's profile and the ideal profile is calculated based on the gap value, thereby yielding more objective and quantifiable recommendations. A smaller gap value indicates a higher level of alignment between the participant and the evaluated alternative (Ermawita & Fauzi 2022).

Previous studies have demonstrated the applicability of the Profile Matching method to various decision-making scenarios, such as lecturer performance assessment, employee recruitment, new student admissions, and the selection of aid recipients. However, the application of the Profile Matching method to the classification of prospective training participants at course and training institutions remains relatively limited. Furthermore, most prior research has focused primarily on admission selection processes without considering the alignment of participants with the available training programs. This situation indicates an opportunity for further research into the classification of training participants based on competency.

In this study, data on prospective participants were gathered via a questionnaire designed around several assessment criteria: interest,

basic computer skills, information technology experience, communication skills, and creativity. Participant responses were recorded using a Likert scale and subsequently converted into numerical values for processing via the Profile Matching method.

Based on this context, the authors propose the development of a "Decision Support System for Classifying Prospective Training Participants Using the Profile Matching Approach" for LKP TAN. The system is intended to assist the institution in determining the most suitable training program for each prospective participant in a manner that is objective, efficient, and structured.

II. LITERATURE REVIEW

2.1 Decision Support System

A Decision Support System (DSS) is a computer-based system used to assist the decision-making process by utilizing specific data, models, and methods to generate information that serves as a basis for making decisions (Nuraeni et al., 2022). DSS is designed to help solve semi-structured and unstructured problems, resulting in decisions that are more effective, efficient, and objective.

Decision Support Systems have been widely applied in various fields, such as education, healthcare, industry, and human resources. In the fields of education and training, a DSS can assist in the selection, placement, and classification of participants based on predetermined criteria, ensuring that the resulting decisions can be justified objectively.

2.3 Profile Matching Method

2.3.1 Definition of Profile Matching

Profile Matching is a decision-making method that involves comparing an individual's profile against a predetermined ideal profile (Ermawita & Fauzi, 2022). This method is used to determine the level of compatibility

between an individual's characteristics and desired requirements or standards.

In the Profile Matching method, the level of compatibility is determined by calculating the difference (GAP) between the individual's value and the ideal profile value.

2.3.2 Stages of the Profile Matching Method

The stages of the Profile Matching method include:

1. Determining assessment criteria.
2. Determining the ideal profile.
3. Calculating the GAP.
4. Weighting the GAP.
5. Calculating the Core Factor.
6. Calculating the Secondary Factor.
7. Calculating the final value.
8. Determining the ranking.

2.3.3 GAP Calculation

The GAP calculation is performed to determine the difference between the individual's value and the ideal profile value. The smaller the resulting GAP value, the higher the level of compatibility between the individual and the expected profile (Ermawita & Fauzi, 2022). Formula:

$$\text{GAP} = \text{Participant's Score} - \text{Ideal Profile Score}$$

2.3.4 GAP Weighting

The GAP score is then converted into a weighted value; generally, the weighting table is as follows:

Table 2.1 GAP Weighting

GAP	Weight
0	5
1	4,5
-1	4
2	3,5
-2	3
3	2,5
-3	2
4	1,5
-4	1

2.3.5 Core Factor

The Core Factor is the primary factor exerting the greatest influence on the assessment result (Ermawita & Fauzi 2022).

Formula:

$$NCF = \Sigma NC / \Sigma IC$$

Legend:

NCF = Core Factor Value

NC = Total Core Factor Value

IC = Number of Core Factor items

2.3.6 Secondary Factor

The Secondary Factor is a supporting factor used to complement the assessment process (Ermawita & Fauzi, 2022).

Formula:

$$NSF = \Sigma NS / \Sigma IS$$

Legend:

NSF = Secondary Factor Score

NS = Total Secondary Factor score

IS = Number of Secondary Factor items

2.3.7 Final Score Calculation

The final score is derived from a combination of the Core Factor score and the Secondary Factor score.

Formula:

$$N = (60\% \times NCF) + (40\% \times NSF)$$

2.3.8 Ranking

Ranking is determined based on the final score obtained by each alternative (Ermawita & Fauzi, 2022). The alternative with the highest score takes the top rank and becomes the primary recommendation.

III. RESEARCH METHODS

2.1. Method of collecting data

The data used in this study were obtained through a number of techniques, namely:

1. Observation: Primary data collection was conducted by directly observing the process of receiving and placing prospective training participants at the Aperta Nusantara Thematic Course and Training Institute (LKP TAN). This observation aims to obtain a real picture of the

ongoing procedures and identify problems occurring in the participant classification process.

2. Interview: Conducted directly with the leadership, operators/admins, and training instructors. The interview aims to obtain in-depth information related to the determination of training programs, the criteria used in assessing participants, and the system requirements needed for development.

3. Literature Study: Conducted by examining books, scientific journals, research articles, and other relevant references regarding Decision Support Systems (DSS), the Profile Matching method, web application development, and participant classification techniques. This study aims to strengthen the conceptual and methodological foundation of the research.

4. Questionnaire: Data collection instrument distributed to prospective training participants. The questionnaire contains statements measured using a five-level Likert scale (ranging from Strongly Disagree to Strongly Agree) to assess participants based on predetermined criteria such as interest, computer skills, IT experience, communication skills, and creativity.

2.2. Application of the Certainty Factor Method

The Profile Matching method is used as the core decision-making algorithm to determine the level of suitability of prospective participants to the available training programs. The calculation stages include:

1. Determine Assessment Criteria and Ideal Profile: Establish the core and secondary criteria for evaluation, then determine the target value (ideal profile) for each criterion across every training program.

2. GAP Calculation: Calculate the difference (gap) between the participant's actual value obtained from the questionnaire and the ideal

profile value using the equation: $GAP = \text{Participant Value} - \text{Ideal Profile Value}$

3. GAP Weighting: Convert the obtained GAP value into a weight value based on the standard Profile Matching weighting table.

4. Core Factor (CF) and Secondary Factor (SF) Calculation: Calculate the average weight of the criteria designated as Core Factors (NCF) and Secondary Factors (NSF). Core factors are the primary elements with the greatest influence, while secondary factors act as supporting elements.

5. Final Value Calculation: Merge the NCF and NSF values using a predetermined percentage (60% for CF and 40% for SF) to obtain the final score using the combination formula: $N = (60\% \times NCF) + (40\% \times NSF)$

6. Ranking: Sort the final values from highest to lowest. The training program with the highest final score becomes the primary recommendation for the participant. This method emphasizes a structured comparison process to minimize subjectivity and accurately match individual competencies with institutional requirements.

2.3. System Development Method

The software development method applied to build this web-based Decision Support System is the Waterfall model. Steps taken include:

1. Requirements Analysis: Identifying system requirements through the gathered data, observations, and interviews.
2. System Design: Designing the system architecture using Flowmaps to illustrate workflows, Data Flow Diagrams (DFD) for process mapping, and Entity Relationship Diagrams (ERD) for database structuring.
3. Implementation: Translating the system design into a functional web application using PHP, HTML, CSS, JavaScript, and a MySQL database.
4. Testing: Ensuring all system functions work properly according to user requirements using

the Black Box Testing method, which focuses on input and output accuracy. This structured approach allows the development process to run sequentially from the initial analysis phase to system maintenance..

IV. RESULTS AND DISCUSSION

4.1. Dataset Description

Dataset used in this study was sourced from the data collection process through registration forms and structured questionnaires at LKP TAN. The data consists of four categories of training programs, namely Computer Operator, Office Administration, Junior Web Programmer, and Content Creator. Each category is evaluated based on a number of criteria that become the indicators in the classification process. Overall, there are five criteria used as evaluation variables in the system: Interest in the training field (K1), Basic computer skills (K2), Information technology experience (K3), Communication skills (K4), and Creativity (K5). Each criterion is assessed using a Likert scale with a range of 1 to 5 (from Strongly Disagree/Very Poor to Strongly Agree/Excellent).

Table 1. Summary of Research Dataset

Component	Amount	Information
Training Programs	4	Computer Operator, Office Admin, Web Programmer, Content Creator
Assessment Criteria	5	K1–K5 (Divided into Core & Secondary Factors)
Assessment Scale	5 levels	1 (Minimum) – 5 (Maximum)
Data source	Participants & Admin	Registration Form & Questionnaires

The data structure shows that each training program has specific target scores (ideal profiles) for the five criteria that are interconnected through the Profile Matching calculation rules. This relationship pattern forms the knowledge base that is central to the classification process.

4.2. System Design

4.2.1. The System Flow that will be designed

Following is a description of the system flow that is designed. This flow provides a channel where the prospective participant accesses the system to register and fill out a questionnaire based on the assessment criteria. After the user has finished answering the questions, the admin executes the analysis process to identify the appropriate training program using the Profile Matching method. The system performs the computational process—calculating GAP, GAP weighting, Core Factor, Secondary Factor, and Final Score—to make a final decision by determining the ranking of the training programs. Finally, the system stores the processing results and displays the recommendation to both the participant and the institutional leader.

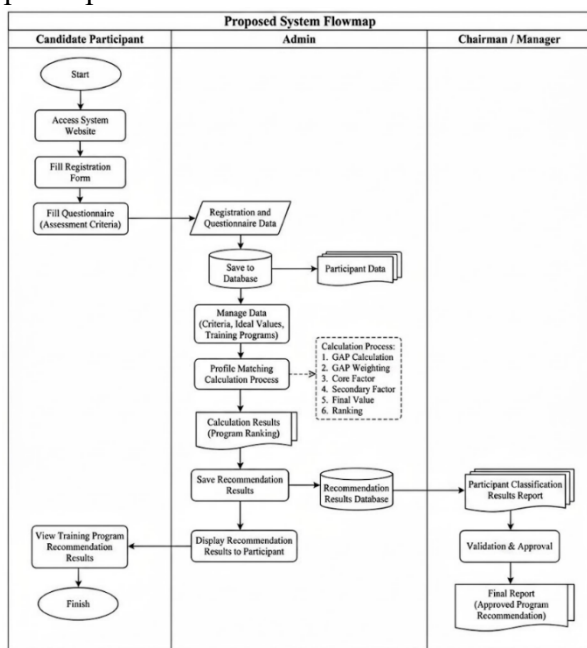


Figure 1. Flowmap of the Proposed System

3.2.2. Context Diagram System

Following is a context diagram in the Decision Support System for Classifying Training Participants. For this system, there are three types of interacting entities, namely Admin, Participant, and Leader (Pimpinan). recommendation reports.

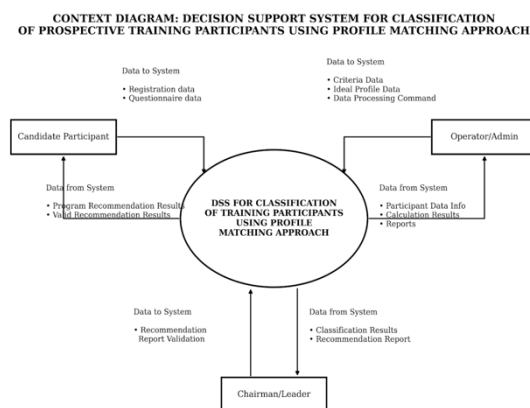


Figure 2. Context Diagram of the Decision Support System for Classifying Training Participants

Explanation:

- Admin has access rights to manage all over the systems, including activities like inputting, updating, and deleting participant data, training programs, criteria, and ideal profiles. In addition, the Admin triggers the Profile Matching calculation and manages the final reports.
- System provides a platform for interaction between users and admins with all the information contained therein. This facilitates communication, data exchange, and management of information in an effective way within the system.
- Participants have access to the system to input personal registration data and provide answers to the questionnaire regarding their skills and interests. As a response, the system provides output in the form of a recommended training program based on the inputted data.

- d. Leader (Pimpinan) receives output from the system in the form of validated final classification results and recommendation reports.

3.2.3. Design Entity Relationship Diagram (ERD)

Following is the Entity Relationship Diagram (ERD) design from the system for classifying training participants. The entities mapped within the database include User, Peserta (Participant), Program, Kriteria (Criteria), Ideal Profile, Penilaian (Assessment), and Hasil (Result).

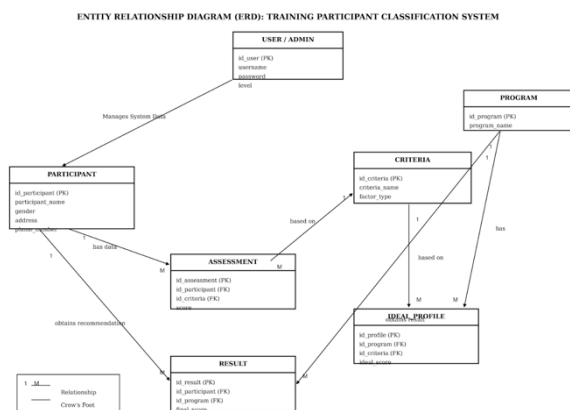


Figure 3. ERD Design of the Decision Support System for Classifying Training Participants

3.3. System Implementation

Program implementation refers to the execution of the application system that accommodates the different user roles. The system was built using the PHP programming language and a MySQL database. Participants can use the system to fill out their competency questionnaire and view their training program recommendation. Admin, on the other hand, is responsible for managing all master data, configuring the ideal profile targets for each program, and executing the Profile Matching computational engine.

3.4. Model Performance Comparison

The evaluation was conducted using the Black Box Testing method to ensure all

functions operate according to requirements. Each functional case was tested, and the results were then compared based on their compliance with the expected system output.

Table 2. Summary of Black Box Testing Results

Test Cases	Expected Result	Actual Result	Compliance
Login Authentication	System grants or denies access based on credentials	System functions properly	In accordance
Participant Registration	Input data is saved to the database	Data successfully saved	In accordance
Questionnaire Submission	Answers are stored for calculation	Data successfully saved	In accordance
Profile Matching Calculation	System computes GAP, CF, SF, and Final Score	Accurate calculation displayed	In accordance
Recommendation Results	System displays sorted program rankings	Rankings successfully displayed	In accordance

Based on testing, the system shows consistent results. The computational engine accurately processes the raw questionnaire data into final rankings without logical errors.

3.5. Scientific Interpretation

Research results show that the Profile Matching method is highly capable of representing expert reasoning in resolving placement uncertainties. This method gives a precise measurement because its approach focuses on calculating the exact gap between a participant's actual competencies and the target requirements of the training programs. In a conceptual way, these findings indicate that the Profile Matching computational structure—which partitions criteria into Core Factors (60%) and Secondary Factors (40%)—is highly effectively applied to classification systems based on multidimensional human skills. It successfully reduces the subjectivity previously found in manual interview assessments.

3.6. Synthesis of Discussion

In an overall view, the developed Decision Support System is capable of:

1. Identifying and classifying prospective training participants based on 5 specific competency criteria.
2. Producing training program recommendations in the form of rankings tailored to the ideal profile of each course.
3. Showing that the Profile Matching method provides a stable, objective, and computerized alternative to manual participant placement. This result strengthens the argument that implementing a structured inference method in a Decision Support System significantly improves the efficiency, consistency, and accuracy of institutional decision-making.

V. CONCLUSION

This study has successfully designed and implemented a web-based Decision Support System (DSS) to classify prospective training participants at the Tematik Aperta Nusantara Course and Training Institute (LKP TAN). The system was developed based on the Profile Matching method, which systematically compares prospective participant profiles with the ideal profiles of each training program through the calculation of GAP, Core Factor, Secondary Factor, and final scores.

Test results using the Black Box Testing method demonstrate that all system functions operate smoothly according to user requirements, ranging from the participant registration process and questionnaire filling to data processing and recommendation presentation. The system is proven capable of processing questionnaire data effectively and generating accurate training program recommendations based on the highest level of compatibility with the predetermined ideal profiles.

In terms of system implementation, the generated recommendations are displayed in an

intuitive ranking format, significantly facilitating the management and institutional leaders in determining the most suitable training programs for the participants. By replacing the conventional, manual, and subjective evaluation process, this system serves as a highly objective, structured, and accountable alternative.

Overall, this study demonstrates that the application of the Profile Matching method in a Decision Support System can significantly improve the effectiveness and efficiency of participant placement. These findings provide a computerized solution that helps educational and training institutions make faster, more consistent, and measurable decisions, thereby minimizing human subjectivity in the classification process.

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