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A Decision Support System Model for Thesis Supervisor Assignment Using the Profile Matching Method

Adri Maulana Zahari[1,], Liza Efriyanti[2], Supratman Zakir[3], Riri Okra[4]*

[1,2,3,4]*Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Bukittinggi,* Indonesia

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Correspondence

E-mail: adrimaulana91@gmail.com*

A B S T R A C T K

Thesis supervisors play a crucial role in maintaining academic standards and helping students complete their degrees on time. However, supervisor assignment at the Faculty of Tarbiyah and Teacher Training (FTIK), UIN Sjech M. Djamil Djambek Bukittinggi, is still handled manually, which can lead to administrative inefficiencies, uneven supervisory workloads, and limited accessibility for students. This study developed a decision support system (DSS) using the Profile Matching method to recommend supervisors according to lecturers' competencies and students' thesis topics. The research followed a Research and Development (R&D) approach based on the Waterfall model, comprising requirements analysis, design, implementation, and system testing. The resulting DSS supports more objective and efficient assignment decisions by Heads of Study Programs, promotes fairer workload distribution, and enables electronic submission of proposed thesis titles. The application was developed with reference to the ISO/IEC 25010 software quality model. This study demonstrates the potential of Profile Matching to support structured, transparent decisions in higher education academic services.

Abstrak

Pembimbing skripsi memainkan peran penting dalam menjaga kualitas akademik dan mendukung mahasiswa agar dapat menyelesaikan studi mereka tepat waktu. Namun, di Fakultas Tarbiyah dan Keguruan, UIN Sjech M. Djamil Djambek Bukittinggi, penugasan pembimbing skripsi masih dilakukan secara manual, yang berpotensi menyebabkan inefisiensi prosedural, beban kerja pembimbingan yang tidak merata, serta keterbatasan akses bagi mahasiswa. Penelitian ini bertujuan untuk mengembangkan sistem pendukung keputusan dalam penugasan pembimbing skripsi menggunakan metode Profile Matching guna menyelaraskan kompetensi dosen dengan topik skripsi mahasiswa. Penelitian ini menggunakan pendekatan Penelitian dan Pengembangan (R&D) dengan model Waterfall, yang meliputi analisis kebutuhan, perancangan sistem, implementasi, dan pengujian. Hasil penelitian ini adalah sistem pendukung keputusan yang membantu Ketua Program Studi dalam menugaskan pembimbing secara lebih objektif, merata, dan efisien, sekaligus memfasilitasi pengajuan judul skripsi secara elektronik. Sistem ini dikembangkan dengan mengacu pada standar kualitas perangkat lunak ISO 25010 untuk memastikan fungsionalitas dan keandalannya. Penelitian ini berkontribusi pada pengembangan sistem pendukung keputusan dalam layanan akademik pendidikan tinggi melalui penerapan metode Profile Matching untuk proses penugasan pembimbing skripsi yang lebih objektif dan terstruktur.

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1. Introduction

Successful completion of an undergraduate thesis depends in part on the contribution of academic supervisors. The supervision process is an important determinant of the quality of student research [1]. A thesis also demonstrates students' ability to investigate problems and develop solutions by applying

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knowledge relevant to their field of study [2]. Therefore, thesis supervisors play an essential role in guiding students throughout the research process.

Interviews with the Head of the Informatics and Computer Engineering Education (PTIK) Study Program and the Secretary of the Islamic Religious Education (PAI) Study Program at the Faculty of Tarbiyah and Teacher Training (FTIK), UIN Sjech M. Djamil Djambek Bukittinggi, revealed that thesis supervisors are still assigned through conventional procedures. This practice creates inefficiencies in academic administration and hinders the equitable distribution of supervisory workloads because an integrated decision-making system is not yet available. Limited access to online thesis-title submission also presents a considerable obstacle for students, particularly those undertaking field teaching practice (PPL) away from campus. A decision support system (DSS) is therefore needed to improve transparency and optimize the allocation of supervisory responsibilities.

Numerous studies have developed decision support systems for thesis supervisor assignment using various algorithms. Previous approaches have included the Analytic Hierarchy Process (AHP) to weight selection criteria and software platforms to generate supervisor recommendations. However, an important research gap remains: existing systems often address individual evaluation criteria without integrating workload balancing, detailed expertise matching, and online submission services within a single platform. Furthermore, software quality evaluation based on the international ISO/IEC 25010 standard has rarely been incorporated into comparable university-based DSS studies.

This study applies the Profile Matching method to assess the alignment between lecturers' competencies and students' thesis topics. Ideal supervisor profiles are defined using key criteria, including disciplinary expertise, publication records, and competencies reflected in courses taught. Additional factors include the current supervision workload (quota), previous supervision experience, and preferences [3]. Profile Matching calculates the gaps between actual and ideal profiles and applies criterion weights to produce a ranked list of suitable supervisors [4].

This study contributes a Profile Matching-based criteria and weighting model integrated with supervision quota constraints to support objective assignments and more equitable workload distribution. In addition to delivering a functional DSS, the study provides a methodological basis for assigning thesis supervisors according to lecturers' competency profiles. Recommendations are assessed through expert verification by the Head of Study Program, while software quality is evaluated against ISO/IEC 25010 to examine the system's functionality and reliability in a changing academic environment.

2. Research Methodology

This study adopts a Research and Development (R&D) approach focused on producing a functional decision support system (DSS) to address practical problems in assigning thesis supervisors. The system was developed using the Waterfall model within the Software Development Life Cycle (SDLC), encompassing planning, requirements analysis, design, implementation, and testing [5]. R&D involves both the development of a product and the evaluation of its feasibility. The SDLC provides a structured framework for implementing the DSS and systematically defining supervisor-selection criteria. Its sequential stages facilitate the application of Profile Matching to academic staff profiles and support progressive verification of compliance with ISO/IEC 25010 quality requirements [6]. The Waterfall model is a conventional SDLC approach, also described as the classic life cycle [7]. in which each stage is completed before the next begins [8]. The resulting application is intended to help Heads of Study Programs distribute supervisory workloads fairly and enable students to submit proposed thesis titles online. The Waterfall stages, as described by Pressman are illustrated below [9].

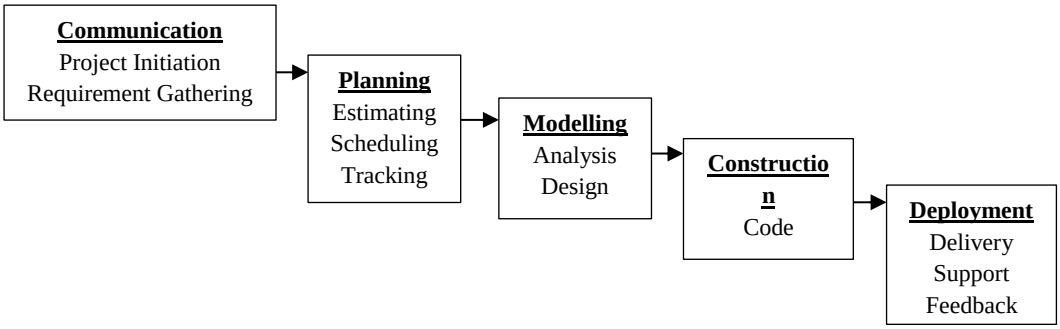

Figure 1. Pressman's Waterfall model

The stages illustrated in Figure 1 are described as follows:

2.1. Communication

This stage defines the project objectives, scope, and required documentation. Interviews were conducted with Heads of Study Programs, academic supervisors, and students at UIN Sjech M. Djamil Djambek Bukittinggi. Questions focused on difficulties in distributing supervisory workloads, relevant lecturer competency criteria, and existing thesis-title submission procedures. The interview findings were translated into system requirements, including appropriate lecturer assessment criteria for Profile Matching and an online facility for students to submit thesis titles.

2.2. Planning

The planning stage focused on identifying the system's functional requirements and mitigating administrative constraints, particularly the synchronization of lecturer data and alignment with internal study-program regulations. Establishing clear milestones at the outset provided an operational basis for development. The principal outputs were requirements-planning documents and an implementation schedule used to monitor progress throughout the project.

2.3. Modelling

The modelling stage involved designing the system architecture, including the data structure through an entity–relationship diagram (ERD), process flows represented by UML use case and class diagrams, and the user interface. This stage also established assessment criteria, gap-mapping procedures, core-factor and secondary-factor weights, and the Profile Matching ranking formula. These designs provided a logical foundation for implementation and were intended to support objective allocation of supervision workloads.

2.4. Construction

During construction, system designs were translated into executable program code. Once coding was completed, the application underwent testing to identify defects and verify that the implemented functions met the specified requirements. Black-box testing was used to examine functional behavior by evaluating inputs and outputs without inspecting the program's internal code or design.

2.5. Deployment

The deployment stage involved introducing the software to Heads of Study Programs, lecturers, and students, followed by continued operation, optimization, evaluation, and improvements in response to user feedback.

Product testing was conducted with reference to ISO/IEC 25010, which defines eight software product quality characteristics [10], This study evaluated three characteristics: functional suitability, compatibility, and usability. These characteristics were selected because of their relevance to the system's core decision-support functions and to acceptance by its principal users, namely Heads of

Study Programs and students. Other characteristics, including security and maintainability, were not examined in depth and are proposed for evaluation in subsequent work.

2.5.1. Functional Suitability

Functional suitability was evaluated by software development experts to determine whether automated gap-score calculations and lecturer rankings operated accurately and as specified. The feasibility percentage was calculated using the following formula:

$$\text{Feasibility percentage (\%)} = \frac{Skor\ yang\ didapat \times 100\%}{Skor\ maksimal} \quad \frac{\text{Skor yang didapat} \times 100\%}{\text{Skor maksimal}}$$

The calculated percentages were interpreted according to the rating categories presented in Table 1.

Table 1. Interpretation of software quality percentages

No	Achievement Percentage	Interpretation
1	0% - 20%	Very Poor
2	21% - 40%	Poor
3	41% - 60%	Fair
4	61% - 80%	Good
5	81% - 100%	Very Good

2.5.2. Compatibility

Compatibility testing examined whether the thesis-title submission and supervisor-assignment system could operate alongside other applications installed on the same device. The comparison applications included a camera application, WhatsApp, YouTube, Google Chrome, Instagram, Microsoft Word, and antivirus software. Feasibility percentages were calculated using the method cited in and interpreted according to Table 1.

2.5.3. Usability

Usability was assessed using the USE Questionnaire attributed to Arnold M. Lund and the STC Usability and User Experience Community [13]. Fourteen participants were purposively selected because they were directly involved with the system: two Heads of Study Programs, three academic advisers, and nine FTIK students at UIN Sjech M. Djamil Djambek Bukittinggi. Participants completed task scenarios involving online thesis-title submission and simulation of Profile Matching-based supervisor assignment. They then rated their experience on a five-point Likert scale: 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree.

Usability scores were calculated by weighting the frequency of each response category as follows [12]:

$$\text{Total score} = (JSS \times 5) + (JS \times 4) + (Jc \times 3) + (JTS \times 2) + (JSTS \times 1)$$

In this formula, JSS denotes the number of strongly agree responses, JS the number of agree responses, Jc the number of neutral responses, JTS the number of disagree responses, and JSTS the number of strongly disagree responses.

The percentage score used to determine the usability interpretation category was calculated using the following formula [12] :

$$P\ Skor = \frac{Skor\ total\ \times 100\%}{i \times r \times 5}$$

Here, the total score is the sum of participants' weighted responses, i is the number of questionnaire items, and r is the number of respondents.

3. Results and Discussion

3.1. Results

3.1.1. Communication

3.1.1.1. Project Initiation

During project initiation, interviews with the Head of the PTIK Study Program and Secretary of the PAI Study Program identified the unequal allocation of thesis supervisors as a key problem. Both respondents expressed a need for an application that would simplify and improve the assignment process.

3.1.1.2. Requirements Gathering

Four categories of requirements were identified: user requirements, lecturer requirements, human resource requirements, and technology requirements. The system users comprised administrators, academic advisers, Heads of Study Programs, and students. System requirements were further divided into functional and non-functional requirements to specify the complete scope of the application. Human resource requirements addressed the personnel needed, whereas technology requirements described the necessary equipment and technical specifications.

3.1.2. Planning

3.1.2.1. Estimating (Task Estimation)

The DSS supports four principal user roles. Administrators log in and manage access permissions, menus, and master records for lecturers, Heads of Study Programs, and students. Academic advisers and Heads of Study Programs can log in, edit their profiles, and participate in processing submitted thesis titles. The Head of Study Program is responsible for evaluating lecturers and making the final supervisor-assignment decision. Students can log in, submit proposed thesis titles, and revise their submissions.

3.1.2.2. Scheduling

System development was scheduled from the initial design on January 1, 2024, through maintenance activities on January 31, 2024.

3.1.2.3. Tracking

The application was developed using the CodeIgniter 3 framework and subsequently deployed online using paid hosting. The original uinftik.my.id domain was configured for the DSS subdomain, which can be accessed at www.spk.uinftik.my.id.www.spk.uinftik.my.id

3.1.3. Modelling

3.1.3.1. Data Structure

The application was developed and designed using the CodeIgniter 3 framework.

3.1.3.2. Design

3.1.3.2.1. Use Case Diagram

A use case diagram provides a visual representation of the interactions between system actors and the application.

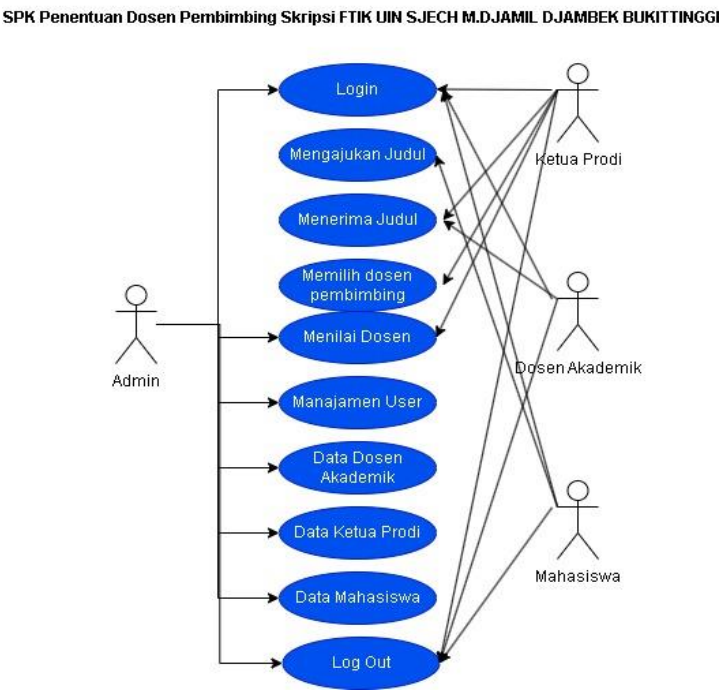

Figure 2. Use case diagram of the thesis supervisor assignment DSS

Figure 2 illustrates four system actors: administrator, Head of Study Program, academic adviser, and student. The administrator manages system records, including the addition, modification, deletion, and printing of data. The Head of Study Program acts as the principal decision-maker, validating proposed titles, assigning thesis supervisors, and monitoring the process. Academic advisers participate in the initial title submission process and may contribute to internal assessments. Students initiate thesis submissions and specify their preferences.

3.1.3.2.2. Status Output Design

The output design for academic adviser data is presented below:

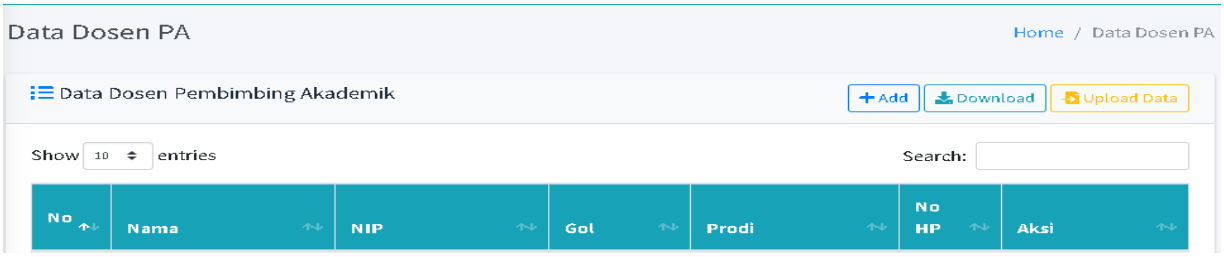

Figure 3. Output design for academic adviser data

The output design for Head of Study Program data is presented below:

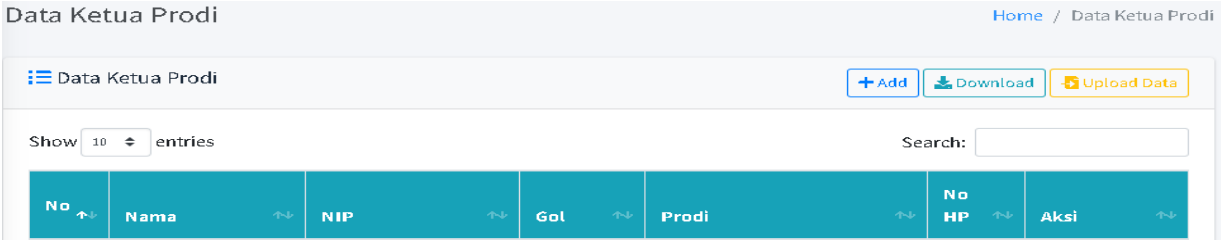

Figure 4. Output design for Head of Study Program data

The output design for student data is presented below:

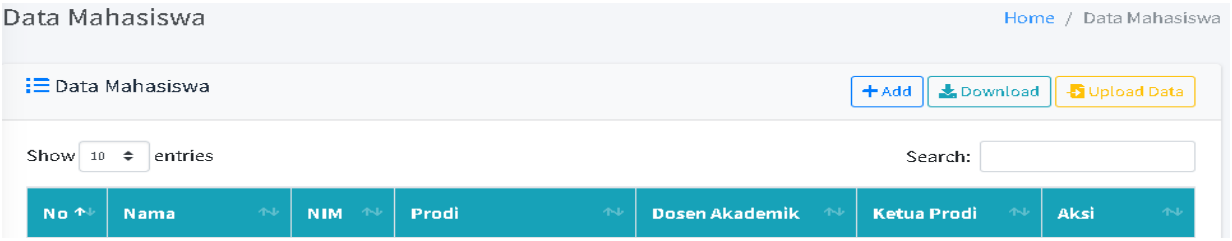

Figure 5. Output design for student data

3.1.3.2.3. System Login Page Design

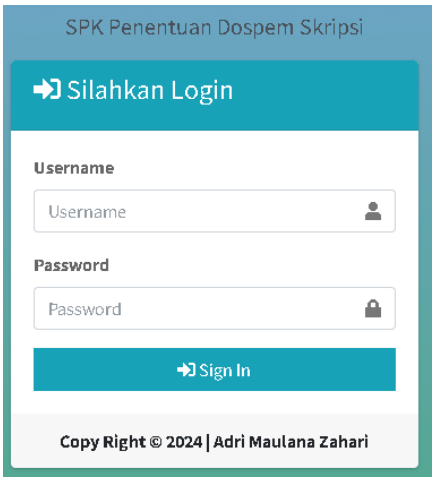

Figure 6. Login page design

3.1.4. Construction

Black-box testing was carried out to verify that the software interface and its functions operated as expected. Tests covering the administrator, academic adviser, Head of Study Program, and student menus indicated that the user interface functioned satisfactorily.

Functional suitability testing was performed by three computer science lecturers familiar with software development. The assessment produced a score of 81, which was interpreted as "Very Feasible" according to the feasibility criteria used in the study.

Compatibility was assessed by operating the system alongside seven other applications on the same device. Three computer science lecturers conducted the assessment, producing a total score of 21. The result was classified as "Very Feasible" using the study's compatibility assessment criteria.

Usability testing involved 14 participants: two Heads of Study Programs, three academic advisers, and nine FTIK students at UIN Sjech M. Djamil Djambek Bukittinggi. The usability score was 85.6%, which fell within the "Very Feasible" category according to the study's interpretation table.

3.1.5. Deployment

The final stage involved operating and maintaining the completed system through the following activities:

3.1.5.1. Delivery

The application was delivered to users through WhatsApp groups and USB-based file transfer.

3.1.5.2. Support

The application was intended to benefit the institution by providing an accessible, efficient, engaging, and easy-to-use system that can be accessed from different locations and at different times.

3.1.5.3. Feedback

At this stage, the researchers updated the application and addressed deficiencies identified during system evaluation and testing.

3.1.5.4. Dissemination

The dissemination stage involved introducing the completed Profile Matching-based decision support system for thesis supervisor assignment at FTIK, UIN Sjech M. Djamil Djambek Bukittinggi.

The application is available at www.spk.uinftik.my.id. Students, Heads of Study Programs, academic advisers, and IT administrators can explore the system and provide feedback to inform further product development.www.spk.uinftik.my.id

3.2. Discussion

This study developed a Profile Matching-based decision support system to assist Heads of Study Programs in assigning thesis supervisors. Software quality was evaluated with reference to ISO/IEC 25010. The reported evaluation covered functional suitability, compatibility, usability, language, content, and software-related aspects and involved relevant reviewers and users.

The reported assessment results were as follows: functional suitability, 100% ("Very Feasible"); compatibility, 100% ("Very Feasible"); usability, 85.6% ("Very Feasible"); language, 95 ("Very Feasible"); content, 80% ("Very Feasible"); and software, 80% ("Very Feasible").

4. Conclusion

The Profile Matching-based decision support system was developed to help Heads of Study Programs assign thesis supervisors and distribute supervision workloads more objectively and equitably. It also enables students to submit thesis titles online more conveniently. The product was assessed with reference to ISO/IEC 25010, with reported results of 100% for functional suitability, 100% for compatibility, 85.6% for usability, 95 for language, 80% for content, and 80% for software-related assessment. Based on the reported findings, the application was considered feasible for supporting thesis supervisor assignment in the PTIK Study Program.

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