

Implementation of a Web-Based Decision Support System for New Employee Recruitment Using the VIKOR Method

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Abstract

An effective and objective employee selection process is essential to obtain high-quality human resources. This study aims to develop a web-based decision support system to assist in the recruitment of new employees using the VIKOR method. The VIKOR method is chosen because it can rank alternatives based on their closeness to the ideal solution while considering compromise among criteria. The criteria used in the system include education, work experience, skills, interview results, and work personality. This research adopts the waterfall approach for system development and implements PHP programming language with a MySQL database. The testing results indicate that the system is capable of providing accurate and consistent rankings of job candidates, as well as facilitating the HR team in conducting evaluations more efficiently.

Keywords: Decision Support System, VIKOR, Employee Recruitment, Website, Multi-Criteria Decision Making (MCDM)

1. Introduction

The recruitment process is a crucial stage in human resource management, as selecting the right employees not only enhances company productivity but also ensures long-term operational sustainability and organizational competitiveness, and in today's era of global competition companies are required to implement more effective, efficient, and structured selection methods to ensure that candidates possess qualifications aligned with organizational needs and job requirements [1]. However many companies still rely on conventional approaches such as direct interviews and manual form submissions which are often time-consuming, prone to human error, subjective in judgment, and lacking transparency and consistency in decision-making, as evidenced by a 2023 study conducted by Statistics Indonesia showing that approximately 60% of small and medium enterprises experience difficulties in identifying suitable candidates due to the absence of objective and systematic evaluation tools [2], therefore the adoption of technology through Decision Support Systems (DSS) has become an increasingly relevant and effective solution as it enables the integration and processing of both qualitative and quantitative data in a structured manner to support more accurate, consistent, and data-driven decisions, one of the widely applied methods within DSS is the VIKOR method (Vise Kriterijumska Optimizacija I Kompromisno Resenje) which is specifically designed to determine optimal solutions based on a compromise ranking among multiple conflicting criteria, making it highly suitable for complex decision-making scenarios such as employee selection processes that involve various assessment aspects [3], furthermore by implementing a web-based DSS utilizing the VIKOR method, organizations can improve accessibility, scalability, and real-time data processing capabilities while minimizing bias and increasing objectivity in evaluating candidates, thus this study aims to design and develop a web-based decision support system that applies the VIKOR method to assist companies in selecting the best candidates based on multiple criteria including work experience, educational background, technical competencies, and communication skills, ultimately contributing to improved efficiency in the recruitment process, optimal allocation of organizational resources, enhanced transparency in decision-making, and higher accuracy in determining candidates who best match the company's strategic needs and goals [4].

2. Theoretical Basis

2.1. Previous Research

Previous In this study, the author reviews previous research to avoid duplication or plagiarism and to support the development of knowledge on the topic [1], including a study by Fitri Wahyuni (2022) titled "Implementation of the VIKOR Method for Supplier Selection" which showed that VIKOR provides more accurate results in multi-criteria decision-making [5], a study by Ahmad Fadli (2023) titled "Decision Support System for Employee Recruitment Using AHP and VIKOR" which found that combining AHP and VIKOR improves the accuracy of selecting the best candidates [6], and a study by Yulia Hartati (2021) titled "Application of the VIKOR Method in a Web-Based System for Employee Selection" which demonstrated that a web-based VIKOR system can support more objective and efficient recruitment decisions [7].

2.2. Decision Support Systems

A Decision Support System (DSS) is a computer-based system that assists in decision-making for semi-structured or unstructured problems by integrating data, analytical models, and user interfaces, and it is widely used in fields such as business, education, and healthcare.

2.3. Viktor Metod

The VIKOR method (Visekriterijumska Optimizacija i Kompromisno Resenje) is a multi-criteria decision-making approach used to solve optimization problems by determining the best compromise solution among alternatives based on given criteria through steps including normalization of the decision matrix, identification of ideal and anti-ideal solutions, calculation of the distance of each alternative to these solutions, and computation of the VIKOR index to rank the alternatives.

2.4. Web Based Application

A web-based application is software that runs through an internet browser using technologies such as HTML, CSS, JavaScript, and PHP, offering advantages like easy access, centralized data, and cross-device usability without installation, and it is widely used in areas such as e-commerce, education, and information systems.

2.5. Employee Acceptance

Employee recruitment is the selection process used to identify the best candidates who meet the qualifications for specific positions within a company, typically involving stages such as applicant data collection, interviews, and evaluation of both technical and non-technical skills, and with the application of appropriate methods, this process can be managed more objectively and efficiently.

3. Research Methods

3.1. Literature Study

Conducting a preliminary study to understand the employee recruitment process in the target company, identify key criteria used by HR in candidate selection, and examine information technologies applicable to a web-based decision support system.

3.2. Data collection

Collecting data on the current employee selection process, including criteria such as education, work experience, technical skills, and interviews through HR interviews and company documents, determining the weight of each criterion through surveys or interviews with HR staff, and gathering candidate data along with relevant attributes for each criterion as alternatives to be processed by the system.

3.3. Research Stages

This study involves collecting data on selection criteria, criteria weights, and applicants through interviews and surveys, analyzing criteria such as education, work experience, technical skills, interview results, and personality with assigned weights, designing a web-based system using MVC architecture with HTML, CSS, JavaScript, PHP, MySQL, and frameworks like CodeIgniter or Laravel, implementing the VIKOR method through data normalization, index calculation, and ranking, conducting black-box testing and simulations to ensure functionality and accuracy, and evaluating the system by comparing its results with manual decision-making.

3.4. System Implementation

The web-based decision support system for employee recruitment using the VIKOR method is implemented with main features including data input forms for applicants and criteria, automatic calculation of VIKOR index values, and presentation of applicant rankings based on the results.

3.5. Identification of Criteria and Weighting

Based on interviews, selection criteria (education, work experience, technical skills, interview results, and personality) were defined, and HRD assigned weights to each using a Likert scale.

Table 1: Employee Acceptance Criteria

Code	Criterion Name	Weight
C1	Education	5
C2	Work experience	4
C3	Technical Expertise	4
C4	Interview Results	3
C5	Personality	4

Table 2: Criterion Weighting Scale

Weight	Interest
1	Not important
2	Less Important
3	Quite Important
4	Important
5	Very important

3.6. System Development Methods

The system was developed using the SDLC Waterfall model, including requirements analysis, UML-based design (use case, activity, sequence, and class diagrams), implementation with PHP and MySQL on XAMPP using Visual Studio Code, system testing with black-box and usability questionnaires, and web-based deployment for HRD access.

3.7. Calculation Method with Vikor

The VIKOR method is used to support decision-making by handling conflicting criteria and selecting the best alternative through compromise, involving steps such as defining criteria and weights, constructing a decision matrix, determining best and worst values, calculating S_i and R_i , computing Q_i (with $v \approx 0.5$), and ranking alternatives where the lowest Q_i indicates the best choice.

4. System Analysis and Design

This chapter discusses the analysis and design of a web-based decision support system for employee recruitment using the VIKOR method, focusing on identifying hardware, software, and functional and non-functional requirements, as well as outlining the system structure.

4.1. Functional Requirements Analysis

Functional requirements describe the main features of the system, including inputting applicant data, defining criteria and weights, processing rankings using the VIKOR method, displaying selection results, and managing employee, criteria, and weight data.

4.2. Data analysis

The data used consists of applicant information with various selection criteria, analyzed by identifying criteria, assigning weights based on HRD priorities, scoring each applicant, and processing the data using the VIKOR method through normalization and calculation of S , R , and Q values to produce the best ranking alternatives.

4.3. System Design

The system is designed as a web-based client-server architecture where users interact via a browser and data is processed on the server using PHP and MySQL, supported by context and use case diagrams (managing applicants, criteria and weights, VIKOR selection, and displaying results), a flowchart covering data input, VIKOR calculation, and ranking output, a simple responsive interface (home, criteria, candidates, analysis, and VIKOR results pages), and a database consisting of applicant, criteria, weight, and result tables.

5. Results and Discussion

This chapter presents the implementation and testing results of a web-based employee recruitment decision support system using the VIKOR method, evaluating its effectiveness in providing recommendations based on defined criteria and weights.

5.1. Dataset

The system is designed as a web-based client-server architecture where users interact via a browser and data is processed on the server using PHP and MySQL, supported by context and use case diagrams (managing applicants, criteria and weights, VIKOR selection, and displaying results), a flowchart covering data input, VIKOR calculation, and ranking output, a simple responsive interface (home, criteria, candidates, analysis, and VIKOR results pages), and a database consisting of applicant, criteria, weight, and result tables.

Table 3: Sample Applicant Dataset

No	Applicant Name	Education	Experience	Skill	Interview	Personality
1.	Dilan	5	5	5	5	5
2.	Cika	4	4	4	5	4
3.	Lufi	5	4	3	3	4
4.	Rudi	5	5	3	4	2

5.	Vila	3	5	5	5	3
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5.2. VIKOR Method Calculation Process

The VIKOR method ranks applicants by normalizing decision matrix values based on benefit criteria, identifying the best (maximum) and worst (minimum) values for each criterion, calculating S_i as the total weighted deviation from the ideal solution and R_i as the maximum individual deviation, then computing Q_i using a compromise parameter ($v = 0.5$) to balance group utility and individual regret, and finally determining the ranking where the applicant with the lowest Q_i is selected as the best alternative.

Table 3: Sample Applicant Dataset

No.	Applicant Name	S_i	R_i	Q_i	Ranking
1.	Dilan	0	0	0	1
2.	Rudi	9.5	4	0.785135	2
3.	Cika	9.83333333333333	4	0.798649	3
4.	Vila	7.66666666666667	5	0.810811	4
5.	Lufi	12.3333333333333	4	0.9	5

5.3. System Implementation

The system is developed using PHP and MySQL with an interface designed using HTML, CSS, Bootstrap, and JavaScript, and includes several main pages such as:

1. Home Page

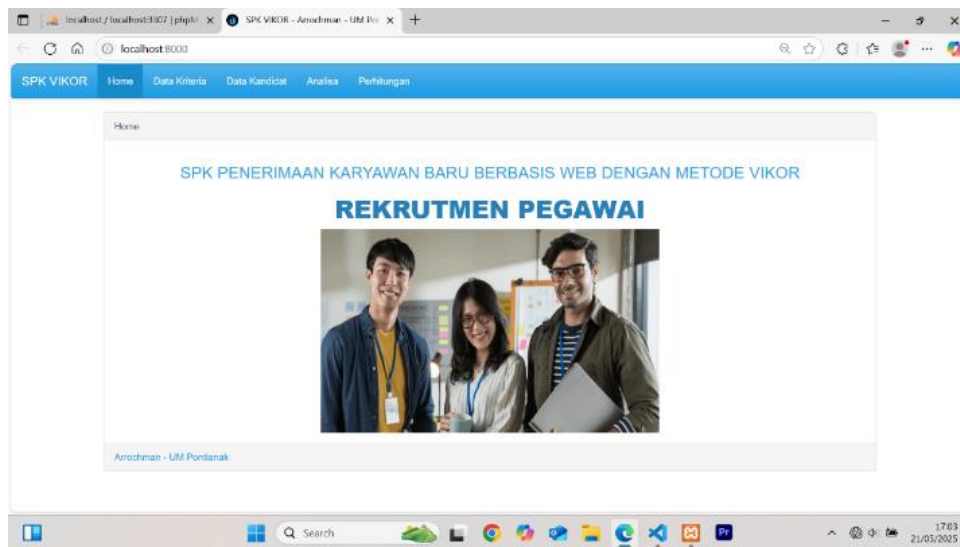


Fig. 1: Home Page

Displays home page, criteria data, candidate data, analysis, and calculations.

2. Criteria Data Page

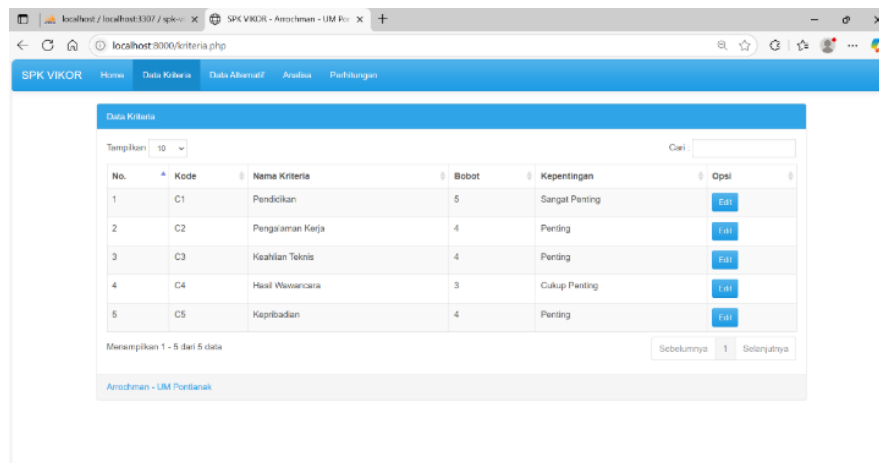


Fig. 2: Criteria Data Page

Displays the criteria data page on this system.

3. Edit Criteria

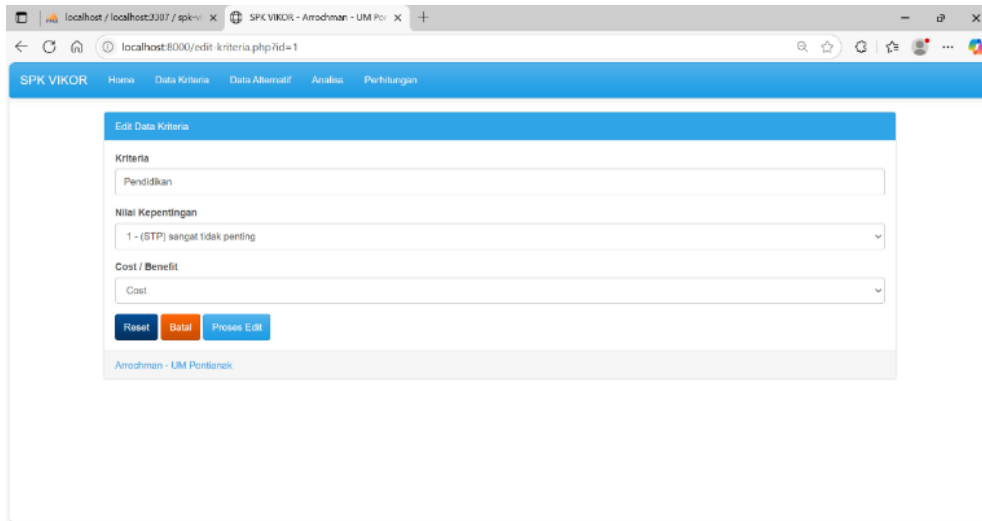


Fig. 3: Edit Criteria

Displays the criteria data edit page, here the criteria can be edited as desired.

4. Alternative/Candidate Data

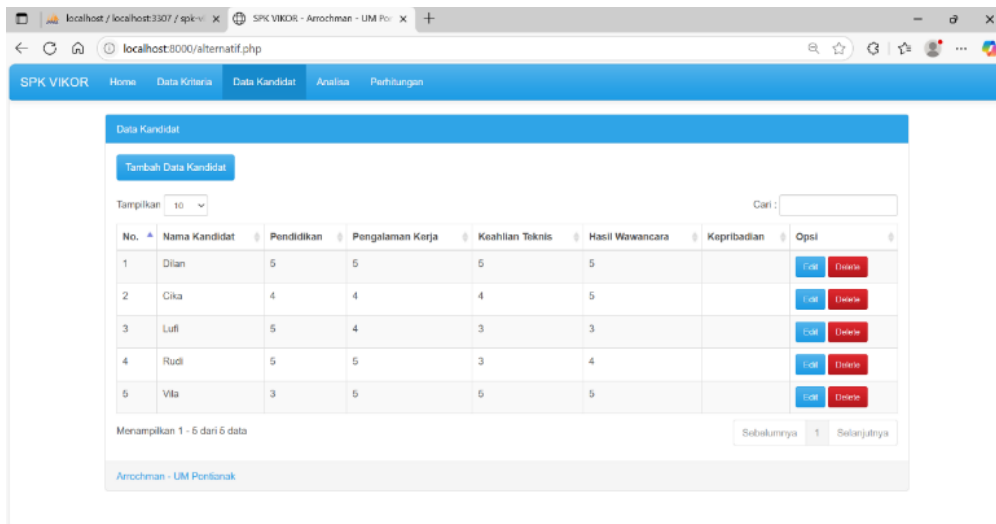


Fig. 4: Alternative/Candidate Data

Displays candidate data or incoming applicant data.

5. Analysis

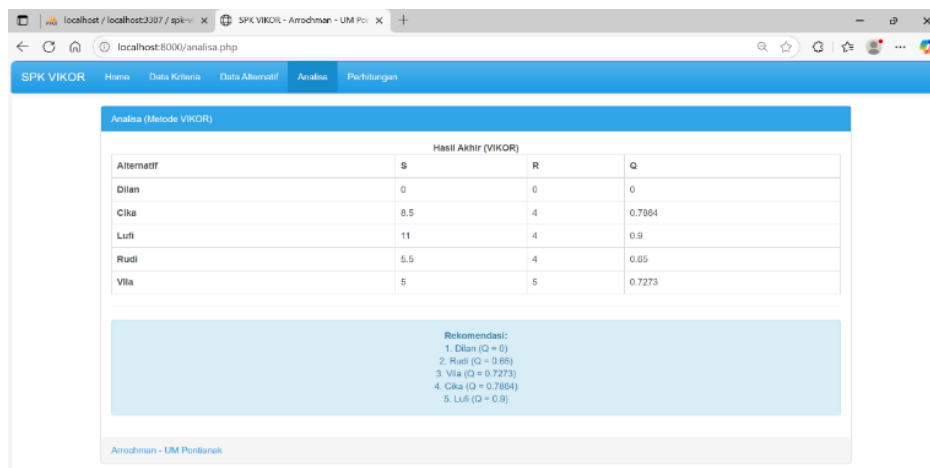


Fig. 5: Analysis

Displays the analysis page, on this page the S, R, and Q values are analyzed for each candidate's value that has been assessed by HRD.

6. Calculation

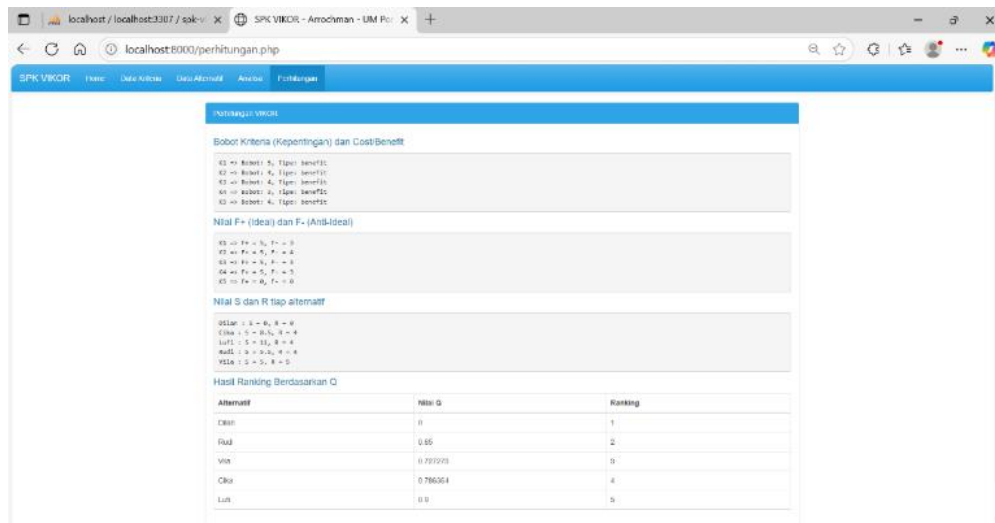


Fig. 6: Calculation

6. Conclusion

Based on the research and implementation, the VIKOR method was successfully applied to objectively rank job candidates using criteria such as education, work experience, technical skills, interview results, and work attitude with company-defined weights, while the web-based system automates calculations, presents clear ranking results, and supports a faster, more efficient, and accountable recruitment process.

References

- [1] Khaeruman, "Strategi Perencanaan Sumber Daya Manusia Untuk Meningkatkan Kinerja Organisasi," *Jurnal Riset Bisnis dan Manajemen Tirtayasa (JRBMT)*, vol. 7, no. 1, pp. 41-50, 2023.
- [2] H. Savitri, "Citizen Journalism Dalam Kebijakan Redaksional: Studi Kasus Rubrik Kompas Kampus di Harian Kompas," *Jurnal Universitas Islam Negeri Syarif Hidayatullah*, vol. 1, no. 1, pp. 1-20, 2023.
- [3] G. Lestari, "SISTEM PENDUKUNG KEPUTUSAN PEMBERIAN TUNJANGAN KARYAWAN MENGGUNAKAN METODE ANALYTICAL HIERARCHY PROCESS (AHP) STUDI KASUS: PT MUTIARA FERINDO INTERNUSA," *Jurnal Teknologi dan Sistem Informasi (JTSI)*, vol. 2, no. 3, pp. 38-48, 2021.
- [4] S. R. A. Furat, "SPK Rekrutmen Karyawan Pada PT Bhandawa Metafora Warsoyo Menggunakan Gabungan Metode AHP dan SAW," *Universitas Islam Negeri Syarif Hidayatullah*, vol. 2, no. 1, pp. 7-15, 2023.
- [5] N. Putra, "SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN SUPPLIER PADA TB.NAMEENE DENGAN METODE SIMPLE ADDITIVE WEIGHTING (SAW)," *STMIK GICI*, vol. 8, no. 1, pp. 45-50, 2020.
- [6] M. Sweety, "Implementasi Metode VIKOR - AHP Dalam Perekrutan Jurnalis pada Kantor Sumut Pos," *Jurnal Riset Sistem Informasi Dan Teknik Informatika (JURASIK)*, vol. 9, no. 2, pp. 933-946, 2024.
- [7] V. Julianto, "Penerapan Metode Simple Additive Weighting (SAW) untuk Penentuan Seleksi Staf Terbaik Politeknik Negeri Tanah Laut Berbasis Web Mobile," *Jurnal Sains dan Informatika*, vol. 4, no. 2, pp. 120-129, 2018.