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Information System Design for HSE Awards at PT Wijaya Karya

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ABSTRACT

The Health Safety and Environment (HSE) Awards is an appreciation program by PT Wijaya Karya (Persero) Tbk for projects that successfully implement occupational safety, health, and environmental protection standards. The current evaluation process is conducted manually using Microsoft Excel, which is inefficient, time-consuming, and prone to subjective bias, particularly when multiple projects achieve identical scores. This research aims to design and develop a web-based information system to support the evaluation and selection of HSE Awards winners. The Multi-Attribute Utility Theory (MAUT) method was employed because of its effectiveness in handling multiple criteria and heterogeneous sub-criteria, thus ensuring fairer and more structured results. System development followed the Rapid Application Development (RAD) methodology, which shortens planning, design, and implementation phases, while Laravel and MySQL were used as the core technologies. Testing results demonstrate that the system improves efficiency, accuracy, and transparency in the evaluation process. Consequently, the proposed system contributes to better decision-making and enhances the objectivity of HSE Awards implementation.

Keyword: Decision Support System, HSE Awards, MAUT, PT Wijaya Karya, Project Evaluation, Laravel.

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1. INTRODUCTION

Health, Safety, and Environment (HSE) is a field closely related to the well-being, safety, and health of workers in an institution [1]. Every institution is responsible for ensuring occupational health and safety (OHS) for its workers and for considering the impact of their operations on others and the surrounding environment. The construction industry plays a significant role in physical infrastructure development and national economic growth through planning, design, construction, and maintenance. However, this industry is also one of the highest-risk sectors in terms of workplace accidents. According to [1], citing the National Institute of Occupational Safety and Health (NIOSH), construction is among the most hazardous occupations globally, with a high number of fatalities compared to other sectors. Based on data from Indonesia's Social Security Agency for Employment (BPJS Ketenagakerjaan) [2], there were 114,000 work accident cases in 2019, which sharply increased to 177,000 cases between January and October 2020, indicating a rising trend in workplace accidents in Indonesia.

The implementation of HSE is thus essential, particularly in the construction sector. The goal of OHS practices is to create safe, comfortable, and healthy work environments to prevent accidents and occupational diseases while improving productivity [1]. PT Wijaya Karya (Persero) Tbk is a national infrastructure company with a dedicated HSE division to oversee safety and environmental protection in all its projects. One of the key programs run by this division is the HSE Awards, which evaluates and ranks the implementation of HSE practices across projects. The top-ranked projects receive awards for best HSE implementation, and the respective project managers are also recognized.

Currently, the HSE Awards evaluation process is conducted manually using Microsoft Excel. This approach has limitations, especially when multiple projects obtain the same score. In such cases, final decisions are made through subjective discussions without algorithmic support, raising concerns over potential bias or inconsistency. Interviews with PT Wijaya Karya stakeholders reveal that the HSE Awards are an important aspect of ISO 45001 implementation, serving both as a reward and motivational mechanism for project teams. Therefore, a Decision Support System (DSS) is required to support the selection process of HSE Awards winners more objectively.

According to Turban et al. (2005), [3], a Decision Support System is an information technology-based system designed to provide relevant data, models, or algorithms to assist decision-makers in solving structured and complex problems. Power (2002) defines DSS as a system that supports decision-making processes by delivering suitable data and analysis tools. Haugen and Arsham (2003), also cited in [3], state that DSS is designed to address unstructured and complex problems by organizing and presenting relevant information. Thus, DSS can be seen as a system that enhances the quality of decision-making through structured and relevant data presentation.

This research proposes the use of the Multi-Attribute Utility Theory (MAUT) method in the development of a DSS for the HSE Awards. MAUT is a multi-criteria decision-making method that identifies the best alternatives by evaluating multiple criteria. According to [9], MAUT is capable of handling sub-criteria for each criterion, making it suitable for complex decision-making scenarios. Khair et al. [2] emphasize that each criterion can have multiple alternatives contributing to the solution. Based on these capabilities, MAUT is considered an appropriate method for assisting in the evaluation and ranking process of the HSE Awards. The proposed system aims to improve the accuracy, fairness, and transparency of the award selection process.

2. METHODS

This study uses the Rapid Application Development (RAD) methodology as the system development approach. According to Sukamto and Shalahudin (2016), [4], RAD is an incremental software development model particularly suitable for projects with a short development timeline. This is supported by Nugroho et al. [5], who state that to produce a reliable information system within a relatively short time, an appropriate development method is needed—namely, the RAD method. The RAD approach shortens the time required for planning, designing, and implementing the system, making it suitable for fast-paced projects.

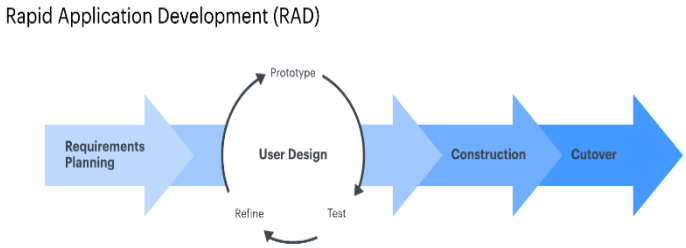

Figure 1. RAD Development Model

2.1 Requirement Planning

This stage involved identifying problems and gathering user requirements. Data collection was conducted through interviews with the HSE Manager at PT Wijaya Karya and observations of the existing manual assessment process using Microsoft Excel. Key problems identified include inefficiency, potential bias in decision-making, and the absence of algorithmic support when project scores are identical. The functional requirements gathered include user role management, project data input, criteria and sub-criteria input, weight assignment, and MAUT-based decision support. Non-functional requirements focused on responsiveness, accessibility via web, and security across user roles.

2.2 User Design

During this phase, the research team created system designs and wireframes based on the gathered requirements. Unified Modeling Language (UML) diagrams such as use case and activity diagrams were used to visualize interactions. The design emphasized clarity for users and represented the actual workflow of HSE Awards evaluation. This phase ensured that each page—such as project input, criteria management, evaluation input, ranking result, and history—was tailored to user needs, especially for the HSE team and decision makers.

2.3 Construction

In this stage, the system was developed using the Laravel framework with a MySQL database, based on the design artifacts. Each feature was implemented incrementally, including login and authentication, project and criteria management, weight input, scoring using the MAUT algorithm, and PDF report generation. All modules were tested during development, and improvements were made according to feedback from PT Wijaya Karya. Screens such as the dashboard, evaluation form, and ranking result were integrated into a role-based system to ensure correct access control.

2.4 Cutover

The final phase involved functional validation of the system through Black Box Testing, as outlined in the testing scenarios. Each core function—such as data input, evaluation process, and result generation—was tested based on expected outcomes. The system successfully passed all test scenarios, confirming that the features aligned with stakeholder requirements. The validated system was then demonstrated to HSE personnel for final review and deployment readiness. This confirmed that the decision support system is capable of replacing the previous manual method with a more objective, accurate, and efficient digital solution.

3. RESULTS AND DISCUSSION

3.1 Development Stage

3.1.1 Requirement Planning

In this stage, problem identification and system requirement gathering were carried out through interviews with the HSE division of PT Wijaya Karya. It was found that the existing evaluation process for the HSE Awards was still performed manually using Microsoft Excel. This approach led to inefficiencies, inconsistencies, and subjectivity, particularly when multiple projects achieved the same scores and required manual discussion to determine the final ranking.

Based on this analysis, the system was required to support login functionality with role-based access for admin and evaluator users, enable input of project data, criteria, and sub-criteria, allow scoring of evaluations, and automatically calculate results using the MAUT method. In addition, the system needed to generate reports in PDF format. From a non-functional perspective, the system had to be web-based, responsive, secure, and easy to use by both admin and evaluator users. These requirements served as the foundation for the design and development process in the next stages.

3.1.2 User Design

In this phase, the system interface was designed to align with the operational needs of the HSE division at PT Wijaya Karya, emphasizing usability and clarity for both administrators and evaluators. The design process translated functional requirements into visual and interactive components using use case diagrams and interface mockups. These designs ensured that HSE administrators could efficiently manage project data, criteria, and sub-criteria, while evaluators could perform assessments and view results in a structured manner. The outputs of this phase included the use case diagram and page mockups, which served as the foundation for the system's development in the next construction phase.

3.1.2.1 Use Case Diagram

Figure 2. Use Case Diagram

The use case diagram illustrates the interactions between system actors Admin and Evaluator with the system's core features. These features include login/logout, dashboard access, project data management, criteria and sub-criteria input, evaluation scoring, ranking result viewing, and PDF report generation. As shown in Figure 2, this diagram ensures that each user role has a clearly defined interaction path that reflects the actual workflow of the HSE Awards process and supports objective and data-driven decision-making.

3.1.3 Construction

The construction phase involved implementing all system features based on the design structure and technical specifications defined during the previous stages. The system was developed using Laravel as the backend framework, Blade templates for the frontend, and MySQL for database management. This technology stack enabled efficient development and integration of core modules while ensuring maintainability and scalability. The modular approach allowed each component—such as login and dashboard, project (alternative) management, criteria and sub-criteria input, evaluation scoring, ranking calculation, and PDF report generation—to be built, tested, and improved independently. This ensured that development could be carried out iteratively while incorporating feedback from the HSE division of PT Wijaya Karya.

3.1.3.1 Login and Dashboard Page

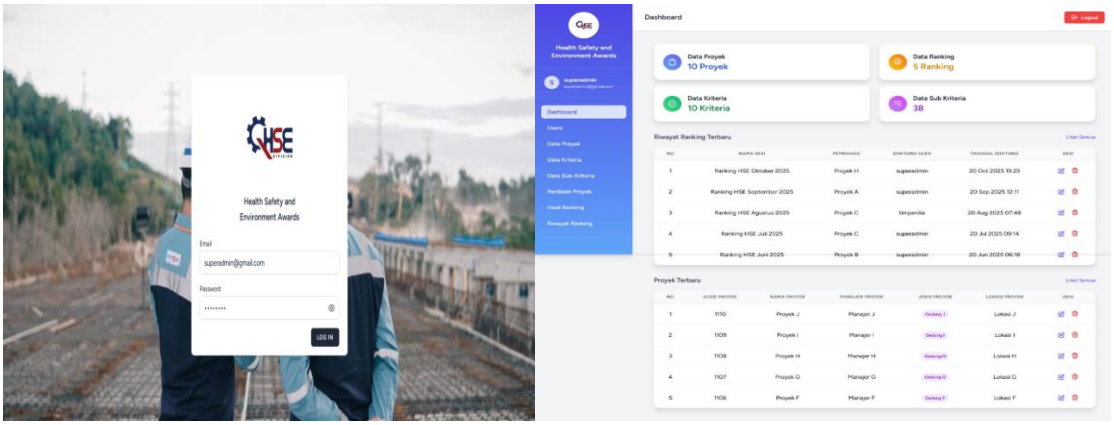

Figure 3. Login and Dashboard Page

The login page provides secure access to the system through role-based authentication. Users must enter their credentials, and upon successful login, they are redirected to a dashboard that corresponds to their respective roles. This ensures that each user, whether administrator or evaluator, can only access features relevant to their responsibilities. The main dashboard, accessed by the Super Admin, serves as the central hub for information and navigation. At the top of the dashboard, summary cards display the total number of stored data, including Project Data, Criteria Data, Sub-Criteria Data, and Ranking Data. Below the summary cards, the system presents two tables that provide important insights: the "Latest Ranking History" table, which contains records of previous evaluations including session name, winning project, and calculation date; and the "Latest Projects" table, which lists newly added projects along with detailed project information.

3.1.3.2 Project Input Page (Alternative)

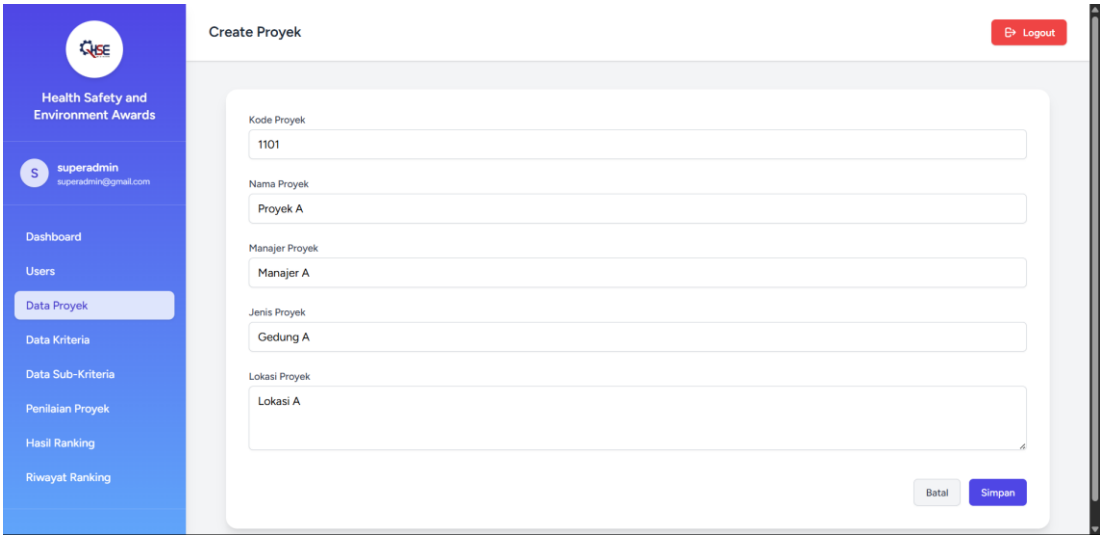

Figure 2. Project Input Page (Alternative)

The project input page is accessible only to Super Admin and Admin. As shown in Figure 4, this page provides a form to enter project code, name, manager, type, and location. Users can save the data using the “Save” button or cancel the action with the “Cancel” button. Newly added projects appear in the project list, while project manager and project type are managed through separate master data pages integrated with the system.

3.1.3.3 Criteria Input Page

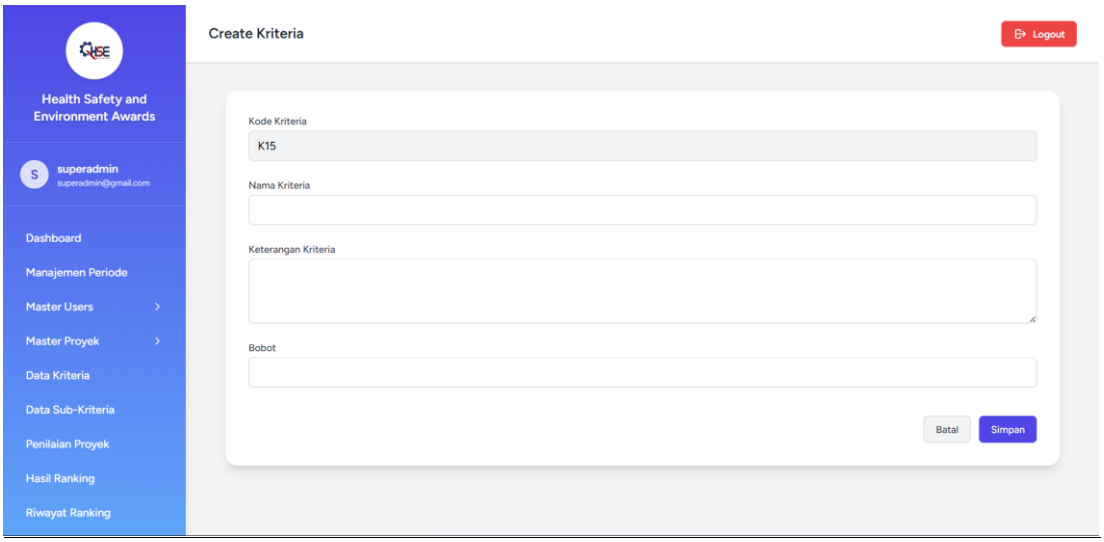

Figure 3. Criteria Input Page

The criteria input page is accessible only to Super Admin and Admin. As shown in Figure 5, this page provides a form to enter the criteria code, name, description, type, and weight. After completing the form, users can save the data with the “Save” button or cancel with the “Cancel” button. Newly added criteria are displayed in the criteria list. A validation rule is applied so that the total weight cannot exceed 1, in accordance with the MAUT method which requires weights to be within the range of 0–1.

3.1.3.4 Sub-Criteria Input Page

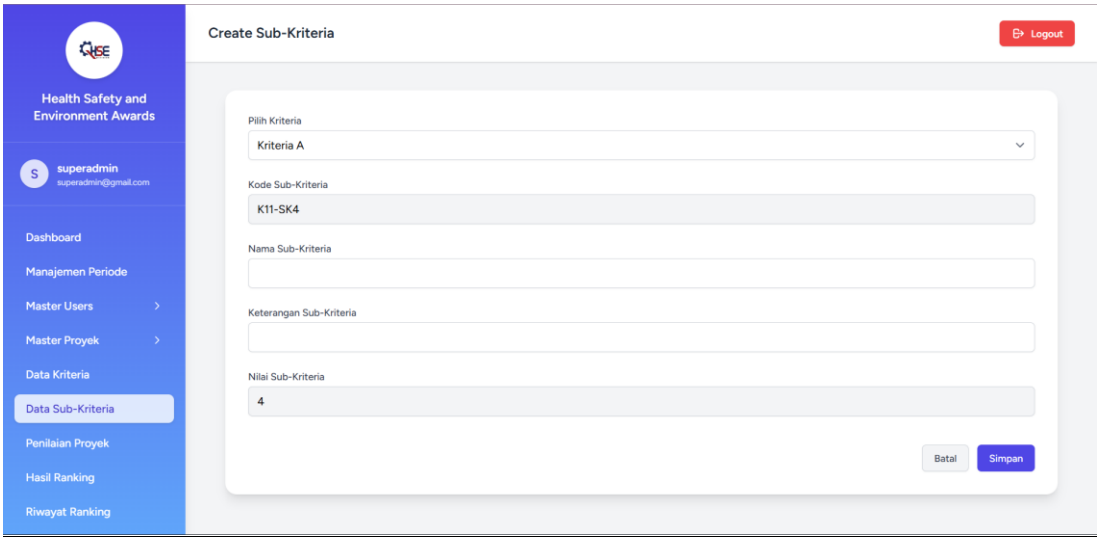

Figure 4. Sub-Criteria Input Page

The sub-criteria input page is accessible only to Super Admin and Admin. As shown in Figure 6, this page provides a form to select the related criteria, enter the sub-criteria code, description, and value. After filling in the form, users can save the data with the “Save” button or cancel the action with the “Cancel” button. Newly added sub-criteria are displayed in the sub-criteria list and grouped according to the selected main criteria, ensuring structured data management for the evaluation process.

3.1.3.5 Evaluation Input Page

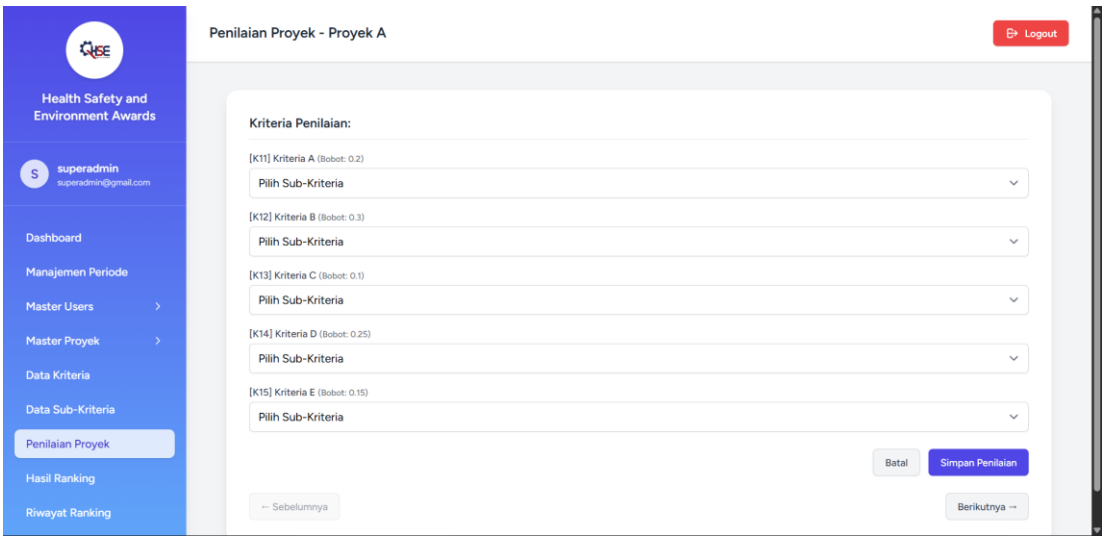

Figure 5. Evaluation Input Page

The evaluation input page is a core component of the system for calculating project scores. As shown in Figure 7, this page provides a form to enter evaluation values for each project based on predefined criteria and sub-criteria. After completing the form, users can save the assessment using the “Save” button or cancel with the “Cancel” button. Newly evaluated projects are displayed in the project evaluation list, marked with a green checklist icon to indicate completion. An additional delete icon is provided to allow evaluators to remove existing scores when necessary. All input values are later processed automatically by the MAUT method to generate the final ranking.

3.1.3.6 Calculation Process Page

Rekap Penilaian Proyek

No	Kode Proyek	Manajer Proyek	K11	K12	K13	K14	K15
1	KP-11	Manajer A	1	2	3	3	2
2	KP-12	Manajer B	2	1	4	1	2
3	KP-13	Manajer C	3	1	1	2	1
4	KP-14	Manajer D	2	2	2	2	2
5	KP-15	Manajer E	1	1	1	1	1

Tahap 1: Mencari Nilai MAX, MIN, dan Selisih

MAX/MIN	K11	K12	K13	K14	K15
MAX	3	2	4	3	2
MIN	1	1	1	1	1
Selisih	2	1	3	2	1

Tahap 2: Normalisasi Nilai Utilitas

Kode Proyek	K11	K12	K13	K14	K15
KP-11	0.000000	1.000000	0.666667	1.000000	1.000000
KP-12	0.500000	0.000000	1.000000	0.000000	1.000000
KP-13	1.000000	0.000000	0.000000	0.500000	0.000000
KP-14	0.500000	1.000000	0.333333	0.500000	1.000000
KP-15	0.000000	0.000000	0.000000	0.000000	0.000000

Tahap 3: Perkalian Nilai Utilitas dengan Bobot Kriteria

Kode Proyek	K11	K12	K13	K14	K15
KP-11	0.000000	0.300000	0.066667	0.250000	0.150000
KP-12	0.100000	0.000000	0.100000	0.000000	0.150000
KP-13	0.200000	0.000000	0.000000	0.125000	0.000000
KP-14	0.100000	0.300000	0.033333	0.125000	0.150000
KP-15	0.000000	0.000000	0.000000	0.000000	0.000000

Figure 8. Calculation Process Page

The calculation process page displays the detailed steps of the MAUT method implemented by the system. As shown in Figure 8, the process begins by determining the MIN and MAX values for each criterion, followed by utility normalization. Next, the normalized values are multiplied by the corresponding weights to obtain weighted utility scores. These stages ensure transparency of the decision-making process by presenting all intermediate results before reaching the final output.

3.1.3.7 HSE Awards Result Page

Tahap 4: Perangkingan HSE Awards

PERINGKAT	KODE PROYEK	NAMA PROYEK	MANAJER PROYEK	SKOR MAUT
1	KP-11	Proyek A	Manajer A	0.766667
2	KP-14	Proyek D	Manajer D	0.708333
3	KP-12	Proyek B	Manajer B	0.350000
4	KP-13	Proyek C	Manajer C	0.325000
5	KP-15	Proyek E	Manajer E	0.000000

Figure 9. HSE Awards Result Page

The HSE Awards result page presents the final outcome of the evaluation. As shown in Figure Y, the table lists all projects along with their respective scores, arranged from the highest to the lowest. This output reflects the system's objective calculation using the MAUT method, clearly identifying the best-performing project as the award recipient.

3.1.4 Cutover

The cutover phase involved the final validation of the developed system through Black Box Testing conducted on all main functional pages. Each module—such as user login, project input, criteria and sub-criteria management, evaluation input, ranking results, and PDF report generation—was tested to ensure functionality aligned with the defined requirements. The testing scenarios simulated real user interactions by providing predefined inputs and comparing them with the expected outputs. All test cases were executed successfully, indicating that the system met its functional objectives and was ready to be implemented in supporting the HSE Awards evaluation process at PT Wijaya Karya.

3.2 Result

To further evaluate the system, a series of tests and simulations involving key user roles (Super Admin and Assessement team) were conducted. The simulated activities included project data entry, criteria and sub-criteria management, project evaluation, ranking calculation, and PDF report generation. The system successfully handled all interactions, recorded inputs accurately, and generated results in accordance with the predefined requirements. The automated calculation using the Multi Attribute Utility Theory (MAUT) method produced ranking outputs that were consistent with manual calculations. Validation testing showed that the system achieved an accuracy level of 100%, confirming the reliability of the implemented algorithm. In addition, Black Box Testing performed on all main functional modules—such as login, data management, evaluation input, ranking, and PDF reporting—demonstrated that the system operated without errors and aligned with user expectations. These results confirmed that the developed DSS is capable of improving efficiency, accuracy, and objectivity in the evaluation process of the Health Safety and Environment (HSE) Awards at PT Wijaya Karya (Persero) Tbk.

CONCLUSION

This research successfully developed a web-based Decision Support System (DSS) to determine the winners of the Health Safety and Environment (HSE) Awards at PT Wijaya Karya (Persero) Tbk. The system was built using the Laravel framework with PHP programming language and MySQL database, and it is capable of managing project data, criteria, sub-criteria, and users effectively. The Multi Attribute Utility Theory (MAUT) method was successfully implemented as the core calculation engine of the system. This method proved to be effective in handling multi-criteria evaluation processes with non-uniform sub-criteria, in accordance with the needs of the case study. The developed system demonstrated improvements in both efficiency and objectivity compared to manual evaluations using Microsoft Excel. Efficiency was achieved through automated calculations and structured workflows, while objectivity increased due to the use of standardized criteria and weights, which eliminated ambiguity in the event of tied scores. Validation testing showed that the system achieved 100% accuracy when compared with manual calculations. This confirms that the logic and implementation of the MAUT algorithm within the system are valid, reliable, and suitable for supporting structured decision-making in the HSE Awards evaluation process.

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REFERENCES

[1] J. Y. Waisapi, "Keselamatan dan Kesehatan Kerja dan Lingkungan," Formosa Journal of Social Sciences (FJSS), vol. 1, no. 3, pp. 285–298, 2022.

[2] K. Rusba, D. Saputra, and D. A. Putri, "Implementasi Program Keselamatan dan Kesehatan Kerja di PT. Mutu Kota Balikpapan," Journal of Innovation Research and Knowledge, vol. 4, no. 8, pp. 5937–5946, 2025.

[3] N. Notoadmojo, Kesehatan Masyarakat: Ilmu dan Seni. Jakarta: Rineka Cipta, 2007. (Waisapi, 2022).

[4] E. Turban, J. E. Aronson, and T.-P. Liang, Decision Support Systems and Intelligent Systems. Upper Saddle River: Prentice Hall, 2005. (Sarwandi et al., 2023).

[5] D. J. Power, Decision Support Systems: Concepts and Resources for Managers. Westport, CT: Greenwood Publishing Group, 2002.

[6] S. Haugen and H. Arsham, "Decision support systems overview," 2003. (Sarwandi et al., 2023).

[7] Yulinawati, M. G. Resmi, and I. Kaniawulan, "Penerapan metode MAUT dalam sistem pendukung keputusan untuk pemilihan supplier," Sekolah Tinggi Teknologi Wastukancana, 2022.

[8] K. Khair, M. H. Nasution, and D. S. Khairani, "Sistem Pendukung Keputusan Pemilihan Pegawai Terbaik Menggunakan Metode MAUT," Jurnal Ilmu Komputer dan Informatika, vol. 7, no. 1, pp. 12–21, 2021.

[9] R. G. U. Arsendy Putra and A. W. Utami, "Decision Support System for Selecting Cryptocurrency Exchange Platforms Using the Multi Attribute Utility Theory (MAUT) Method Based on a Website," Journal of Emerging Information System and Business Intelligence (JEISBI), vol. 5, no. 2, pp. 136–147, 2024.

[10] O. Irnawati and G. B. A. Listianto, "Metode Rapid Application Development (RAD) pada perancangan website inventory PT. Sarana Abadi Makmur Bersama (S.A.M.B) Jakarta," 2018.

[11] W. Nugroho, F. W. N. Rozaaq, T. A. Ramadhan, H. A. Sihombing, and R. Wiranto, "Penerapan Metode Rapid Application Development (RAD) pada Sistem Informasi Data Barang Berbasis Website," 2024.

[12] PT Wijaya Karya (Persero) Tbk., "Keselamatan, Kesehatan, dan Lingkungan," [Online]. Available: . [Accessed: Dec. 24, 2024].

[13] L. T. Sarwandi, N. A. H. Sianturi, I. G. I. Sudipa, M. Syahrizal, Alwendi, Mesran, Muqimuddin, D. M. Budanis, N. L. W. S. R. Meilani, Ginanta, and L. M. I. Fajar, Sistem Pendukung Keputusan. Jakarta: CV. Graha Mitra Edukasi, 2023.

[14] W. Setiyaningsih, Konsep Sistem Pendukung Keputusan. Yogyakarta: Graha Ilmu, 2015.