Integration of the Simple Additive Weighting Method for Decision Support System Superior Fishery Products in Indramayu Regency

Moh. Ali Fikri[1], Ahmad Lubis Ghozali[2], Riyan Farismana[3], Sonty Lena[4]
[1,2,3,4]Politeknik Negeri Indramayu, Jl. Lohbener Lama No. 8, Indramayu and 45252, Indonesia
*Corresponding Author: mohalifikri@polindra.ac.id

ABSTRACT

This study develops a web-based information system to support the incubation of superior fishery product businesses in Indramayu Regency by integrating the Simple Additive Weighting (SAW) method as a decision support system (DSS) for collectors. The research is motivated by the limited market access faced by fish farmers in Indramayu and the dominance of intermediaries in the marketing chain, which reduces farmers' bargaining power. To address this issue, the system applies the SAW method to generate commodity recommendations based on several criteria, including price, production capacity, location, commodity type, and harvest time. The system was implemented as a web-based platform to facilitate digital interaction between collectors and fish farmers. System evaluation was conducted through functional testing and user satisfaction assessment. Black box testing on 53 system functions showed that all functions operated according to system requirements. In addition, a user satisfaction evaluation involving 12 respondents using a Likert scale questionnaire resulted in an average score of 85.00%, which falls into the “very good” category. The results indicate that the integration of the SAW method can provide objective commodity recommendations and improve the efficiency of commodity search processes for collectors. Furthermore, the developed platform facilitates faster interaction between collectors and fish farmers and supports the expansion of digital marketing networks for superior fishery products. This study contributes to the development of digital decision support systems to strengthen the fisheries business ecosystem at the regional level.

ARTICLE HISTORY

Received 10 October 2025
Revision 30 January 2026
Accepted 11 March 2026

KEYWORD

Decision Support System;
SAW Method;
Fisheries Sector;
Business Incubation;
Digital Platform;

1. INTRODUCTION

The fisheries sector is a crucial pillar of food security and an important contributor to the national economy. As a maritime country with one of the longest coastlines in the

world, Indonesia has abundant fisheries potential, both in capture fisheries and aquaculture (FAO, 2022). This potential, if managed effectively, can improve the welfare of coastal communities and strengthen the competitiveness of fishery commodities in domestic and international markets. However, the fisheries sector still faces several fundamental challenges, including inefficient distribution systems, dependence on intermediaries, and limited adoption of information technology to support marketing activities (Hermawan et al., 2025).

Indramayu Regency is one of the major contributors to fisheries production in West Java. According to data from the Indramayu Regency Fisheries and Maritime Affairs Office, in 2024 this region contributed approximately 32.70% of the total fisheries production in West Java. Several leading commodities widely cultivated in this region include shrimp, seaweed, milkfish, gourami, catfish, and tilapia. Despite this considerable potential, many fish farmers still experience difficulties in marketing their products directly to buyers due to their dependence on intermediaries who often determine selling prices (Febryanti & Utami, 2023). As a result, farmers tend to have a weak bargaining position and receive relatively lower profit margins compared to the final market value.

The development of information technology offers opportunities to address these challenges through digital platforms that facilitate communication and transactions among stakeholders in the fisheries supply chain. Digital platforms in the fisheries sector have been shown to improve distribution efficiency, shorten marketing chains, and enhance price transparency (Nurhayati et al., 2023). For instance, the Aruna Indonesia platform connects fishermen and fish farmers directly with buyers through a community-based digital marketplace (Safitri & Khasanah, 2023). However, the implementation of similar digital platforms at the local level, particularly in Indramayu Regency, remains limited and has not yet fully accommodated the needs of collectors, who play a key role in bridging the distribution process between farmers and broader markets.

Collectors represent strategic actors in the fisheries business ecosystem. Besides purchasing fishery products from farmers, collectors often facilitate distribution, packaging, and market access to regional and national markets (Panudju et al., 2023). Therefore, a decision support system (DSS) that assists collectors in identifying and selecting superior fishery commodities is necessary to improve efficiency in commodity search and transaction processes. The integration of multi-criteria decision-making (MCDM) methods into such systems can provide more objective and systematic recommendations.

One commonly used MCDM method is the Simple Additive Weighting (SAW) method. SAW is widely applied in decision support systems due to its simplicity and effectiveness in ranking alternatives based on multiple weighted criteria. The method normalizes decision matrices and calculates weighted scores to determine the most suitable alternative. Previous studies have successfully implemented SAW in various domains such as employee selection, scholarship selection, and product recommendation systems (Mubaliqin & Mujianto, 2025; Puspitasari et al., 2025; Rumbiarmytha et al., 2025). However, the application of SAW in fisheries-specific

business incubation systems, particularly those focusing on supporting collectors in selecting superior commodities, remains limited.

This condition indicates a research gap in the development of digital decision support systems that integrate multi-criteria recommendation methods within fisheries business incubation platforms. Most existing studies focus on general applications of SAW, while research that addresses the needs of collectors as key actors in fisheries commodity distribution is still scarce. Therefore, there is a need to develop an information system that integrates SAW-based recommendations to assist collectors in identifying superior fishery commodities more efficiently.

Based on this gap, this research develops a web-based information system for the incubation of superior fishery product businesses in Indramayu Regency by integrating the SAW method as a decision support system for collectors. The system provides commodity recommendations based on several criteria, including price, production capacity, location, commodity type, and harvest time. By integrating the SAW method into a digital platform, the system is expected to improve the efficiency of commodity searches, facilitate faster interactions between collectors and fish farmers, and support the expansion of digital marketing networks.

This research contributes both theoretically and practically. Theoretically, it enriches the literature on the implementation of multi-criteria decision-making methods in fisheries information systems. Practically, it provides a digital platform that supports decision-making processes for collectors and improves transparency and efficiency in the fisheries supply chain in Indramayu Regency.

2. RESEARCH FRAMEWORK

This research uses a software engineering approach with the Waterfall system development model, a sequential and systematic method in which each stage must be completed before proceeding to the next. The Waterfall model was chosen based on the research needs, which have clear specifications from the outset and require complete documentation at each stage of development (Supriatiningsih, 2023). The main stages in this model include which can be seen in Figure 1.

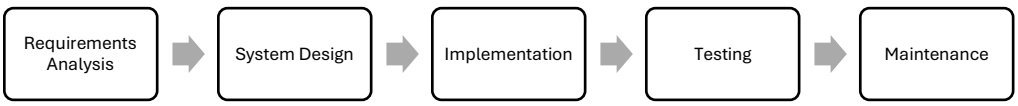

Figure 1. Research Design

2.1 Requirements Analysis

The needs analysis phase was conducted to identify the needs of system users, namely farmers, collectors, and officers from the Indramayu Regency Fisheries and Marine Affairs Office (Diskanla). Data was collected through interviews with farmer and collector partners and through a documentary study of Diskanla reports on superior fisheries

production. This needs analysis encompassed two aspects: functional and non-functional requirements.

Functional requirements included user registration, business document uploads, a commodity catalog, a SAW-based recommendation system, and status notifications. Non-functional requirements included data security, a responsive interface, cross-device compatibility, and system response speed. This phase was crucial to ensure the system could address existing issues, such as limited market access, information delays, and the dominance of intermediaries in fisheries product distribution (Purba & Handayani, 2019).

2.2 System Design

After analyzing the requirements, the next stage is system design, which includes designing process flows using the Unified Modeling Language (UML), such as use case diagrams, activity diagrams, sequence diagrams, and class diagrams. Database design is carried out using Entity Relationship Diagrams (ERD) to describe the main entities, including users, products, orders, and notifications. The system is designed web-based using PHP technology, the Laravel framework, and MySQL as the database. The interface is designed using Bootstrap and Tailwind CSS to be responsive and user-friendly. The main goal of the design is to produce a system design that is modular, easy to develop, and in accordance with user needs.

2.3 Implementation

The implementation phase is the process of converting the system design into program code. Implementation is carried out in stages based on modules, such as the registration module, product upload module, SAW recommendation module, and admin management module. The programming language used is PHP with the Laravel framework, while the database is managed using MySQL. The Simple Additive Weighting (SAW) recommendation module is integrated into the system using the following steps: (Rumbiarmytha et al., 2025)

- Determine the criteria that will be used as a reference in decision making, namely Ci.

Table 1. Criteria Simple Additive Weighting (SAW)

Code	Criteria
C1	Price
C2	Production Capacity
C3	Location
C4	Commodity Type
C5	Harvest Time

- Determine the suitability rating of each alternative for each criterion.

Table 2. Rating Criteria Simple Additive Weighting (SAW)

Code	Criteria	Rating
C1	Price	Cost
C2	Production Capacity	Benefit
C3	Location	Cost
C4	Commodity Type	Benefit
C5	Harvest Time	Benefit

- Create a decision matrix based on criteria (Ci).

$$X_{ij} = \begin{bmatrix} X_{1.1} & X_{1.2} & X_{1.n} \\ X_{2.1} & X_{2.1} & X_{2.n} \\ X_{m.1} & X_{m.1} & X_{m.n} \end{bmatrix} \quad (1)$$

Description:

X_{ij} : Decision Matrix

i : Alternative (Row)

j : Criteria (Column)

i : Number of Attributes/Criteria

m : Number of Alternatives/Row

- Perform matrix normalization based on equations adjusted to the attribute type to obtain a normalized matrix *r*.

If *j* is the benefit attribute, use equation 2.

$$r_{ij} = \frac{X_{ij}}{\max \quad X_{ij}} \quad (2)$$

$$r_{ij} = \frac{\min \quad X_{ij}}{X_{ij}} \quad (3)$$

if *j* is the cost attribute using equation 3.

- The final result is obtained from the ranking process, namely the sum of the multiplication of the normalized matrix r with the weight vector so that the largest value is obtained which is selected as the best alternative (Ai) as a solution.

$$V_i = \sum_{j}^{n} w_j + r_{ij} \quad (4)$$

Description:

V_i : Preference Value

w_j : Weight

r_{ij} : Normalized Matrix

j : Criteria/Attributes

n : Number of Criteria/Attributes.

2.4 Testing

System testing is performed to ensure that each function operates according to requirements specifications. The method used is black box testing, which focuses on output based on specific inputs without considering the internal structure of the code (Pratama et al., 2023). A total of 53 functions were tested, including login, registration, document upload, commodity management, recommendation systems, and notifications.

Additionally, a user satisfaction test was conducted using a Likert-based questionnaire with 12 respondents, consisting of farmers, collectors, and service officers. Respondents were asked to rate aspects of ease of use, information clarity, system speed, and application benefits. The assessment results were converted into percentages to determine the level of system acceptance (Sugiyono, 2010).

Table 3. SIBIKANDA testing instrument

No	Statement	Score
X1	System Functionality	
X1.1	The system is capable of recording and storing fisheries production data in a structured manner.	[ ]
X1.2	The system is capable of recording and displaying fisheries product distribution data.	[ ]
X1.3	The system provides digital marketing features (e-catalog, partner contacts, etc.).	[ ]
X1.4	The system displays business and distribution location maps using GIS.	[ ]
X1.5	The system provides a business partner ranking feature using the SAW method.	[ ]
X2	System Usability	
X2.1	The system interface is easy to understand for MSME users.	[ ]
X2.2	Navigation between system pages is smooth and intuitive.	[ ]
X2.3	Information such as partner names, locations, and products is easy to find.	[ ]
X2.4	The system provides a fast response when inputting, saving, and searching data.	[ ]
X2.5	A system user manual is available and easily accessible.	[ ]
X3	Technology Readiness (TRL)	
X3.1	The system ran stably in the test environment and experienced no errors/failures.	[ ]
X3.2	All key features have been tested by target users (MSMEs, government agencies, and facilitators).	[ ]

No	Statement	Score
X3.3	The system has demonstrated interoperability between the GIS, DSS, and marketing modules.	[ ]
X3.4	Technical and functional documentation is available.	[ ]
X3.5	The system is ready to be implemented on a limited scale with real partners.	[ ]

Table 4. Interpretation score

Score	Interpretation
1	Very inappropriate
2	Not appropriate
3	Somewhat appropriate
4	Appropriate
5	Very appropriate

2.5 Maintenance

The maintenance phase is carried out after the system has been tested and declared suitable. Activities at this stage include bug fixes, improving data security, and adding features according to user needs. Maintenance also includes regular system monitoring to ensure the application's continued functionality. This phase is crucial because the application is planned for ongoing use by farmer and collector partners in Indramayu.

3. RESULTS AND DISCUSSION

The results of this study cover the system implementation process, the application of the Simple Additive Weighting (SAW) method, the results of system functionality testing, and user satisfaction evaluation. The entire series of tests was conducted to assess the extent to which the developed information system for business incubation of superior fishery products meets the needs of users, particularly collectors as the main actors in the fisheries distribution chain in Indramayu Regency.

3.1 Implementation of Business Incubation is

The fisheries business incubation information system application was successfully implemented web-based using the Laravel framework, MySQL as a database, and a Bootstrap and Tailwind CSS-based interface.

Figure 2. Use case information system

Figure 2 shows that cultivators, collectors, buyers, and service officers operate within the system to perform its primary functions. This diagram helps understand the roles and activities of each actor within the system, including login processes, document uploads, commodity ordering, and data management by service officers.

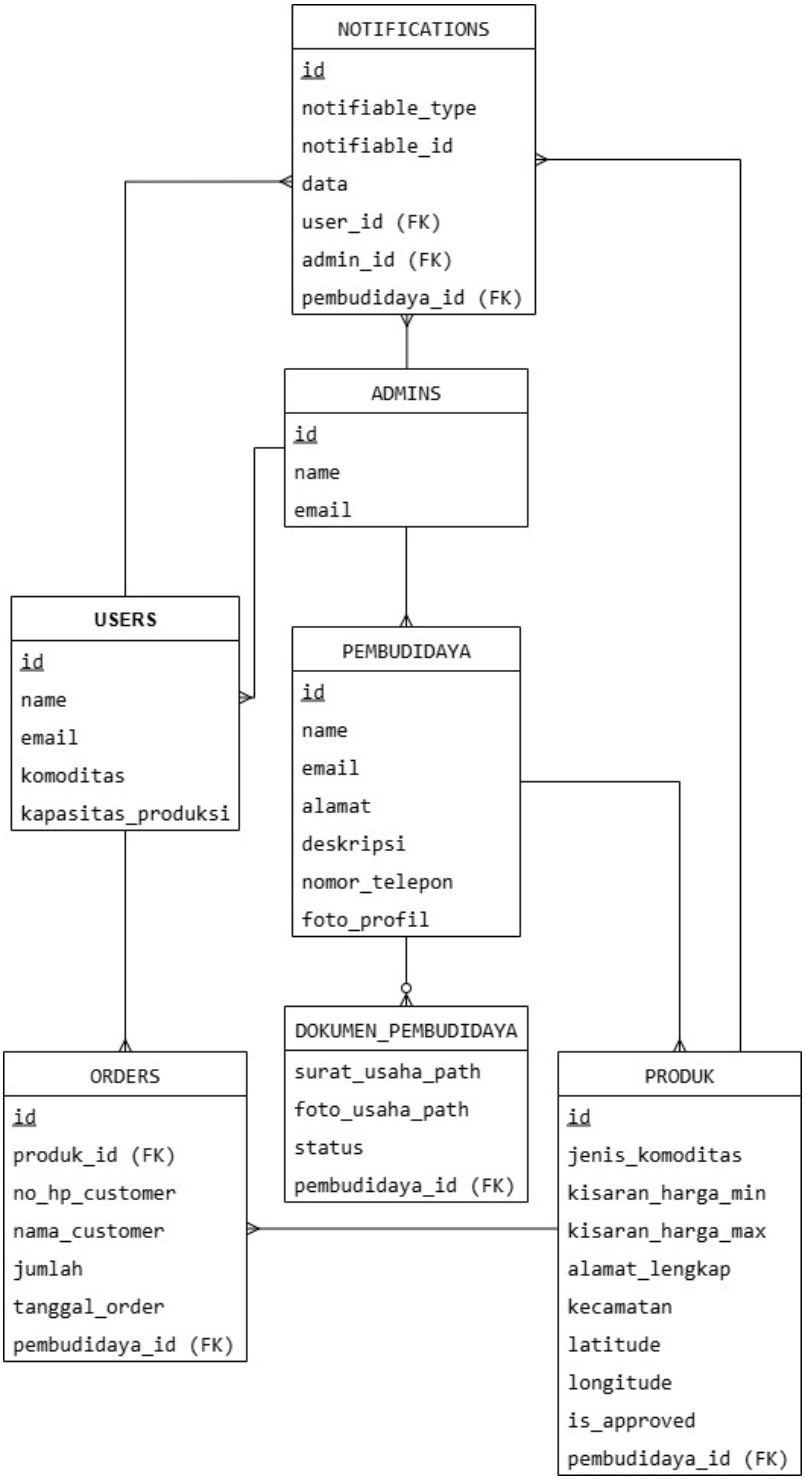

Figure 3. ERD Design

The ERD design in Figure 5 displays the logical structure of the database for the superior fish commodity business incubator information system in Indramayu. This diagram outlines key entities such as users, admins, farmers, farmer documents, products, orders, and notifications, complete with attributes and relationships between entities. The purpose of this ERD is to ensure data integrity and support an integrated information flow throughout the system. The resulting information system can be accessed via https://sibikanda.com using a browser on a mobile device or computer.

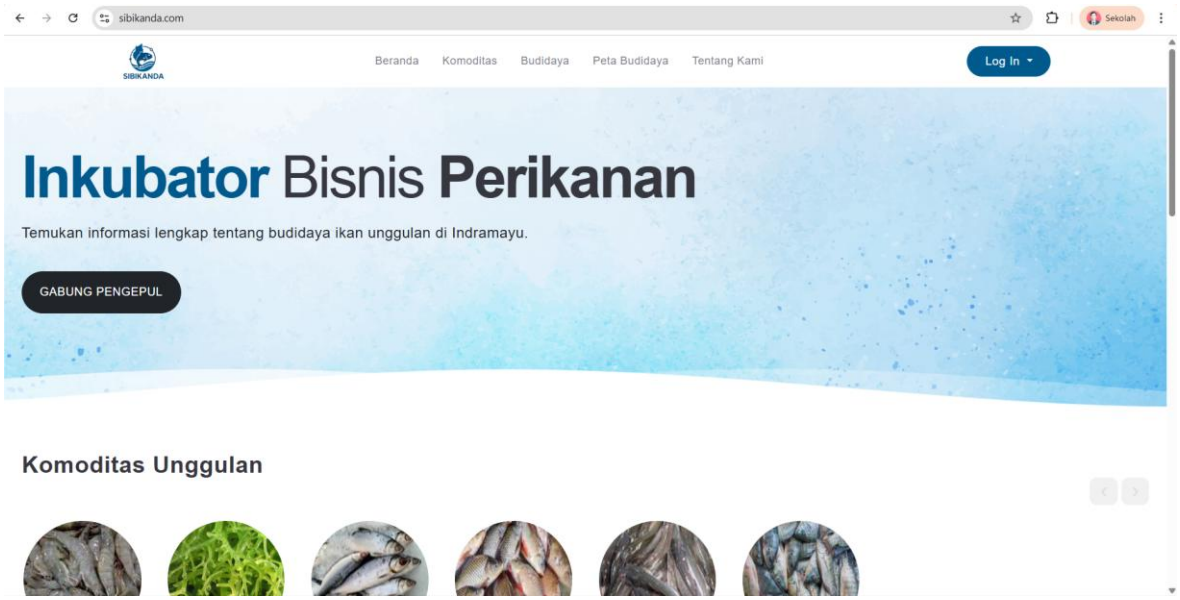

Figure 4. Main view of the information system

The system's implementation demonstrated that the application facilitated interactions between fish farmers and collectors more efficiently than conventional methods. This aligns with research by Setiawan & Resdiana (2022), which confirmed that community-based digital platforms can increase distribution effectiveness and shorten the marketing chain for fishery products.

3.2 Integration of Simple Additive Weighting (SAW)

The SAW method is used to provide recommendations for superior fishery products based on several criteria. In this study, the criteria used include:

- Log in as a cultivator. If you haven't already, register using Google Authentication, which is very easy.
- Click the recommendations button on the main page, then you'll be presented with several SAW criteria fields according to Table 1.

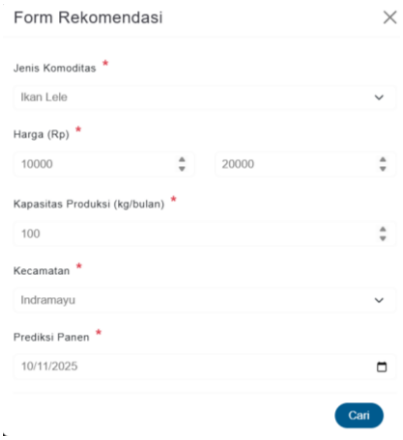

Figure 4. Percentage of test results

- The information system performs mathematical calculations starting from equation 1 to equation 3 to obtain the final preference value for cultivator selection using the saw method.

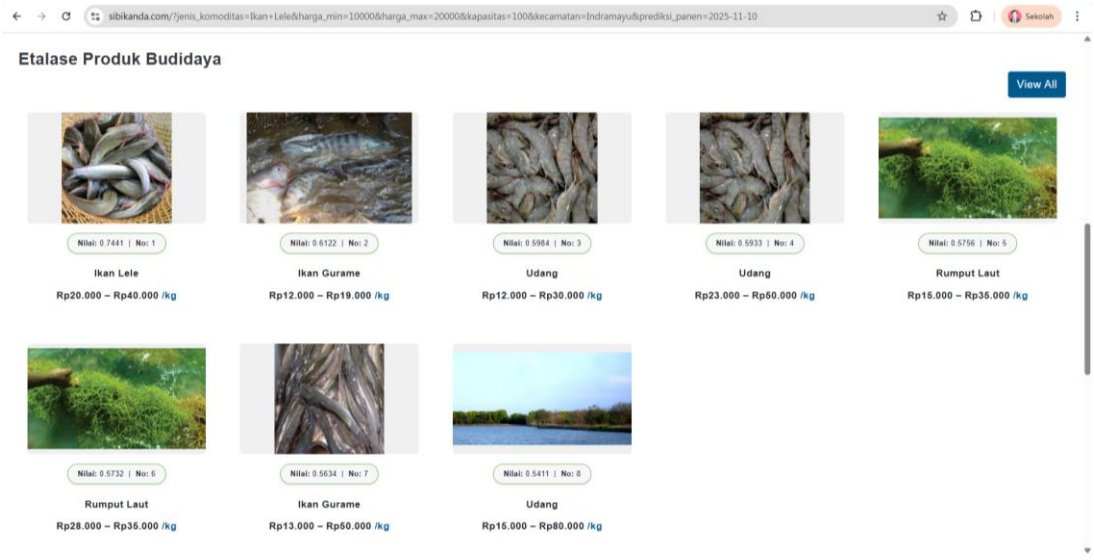

Figure 5. Results of the decision support system for selecting superior fishery commodity cultivation in Indramayu Regency

The implementation of the Simple Additive Weighting (SAW) method in the fisheries business incubation information system was carried out to assist collectors in determining the best farmers based on certain established criteria. The criteria used in this study include: product price, production capacity, cultivation location (district), commodity type, and predicted harvest time. Each criterion is weighted according to the level of user importance, namely price (0.30), production capacity (0.25), location (0.20), commodity type (0.15), and harvest time (0.10).

The system automatically normalizes the scores for each alternative (cultivator) based on these criteria, then calculates a final score through a weighting process and the summation of standardized scores. The final ranking results, indicating the most recommended cultivators for collectors, are displayed on the Cultivation Product Showcase page in the Sibikanda system.

Based on the results of the SAW calculation visualized in the image, the order of eight cultivators was obtained with the following final preference values:

Table 5. Final Preference Value of Cultivator Selection Using the SAW Method

No	Comodity	Preference Value (Vi)	Ranking
1	Ikan Lele	0.7441	1
2	Ikan Gurame	0.6122	2
3	Udang	0.5984	3
4	Udang	0.5933	4
5	Rumput Laut	0.5756	5

No	Comodity	Preference Value (Vi)	Ranking
6	Rumput Laut	0.5732	6
7	Ikan Gurame	0.5634	7
8	Udang	0.5411	8

These results demonstrate the effectiveness of the SAW method in addressing the complex decision-making challenges faced in the fisheries sector. The system's final preference scores provide a quantitative basis for collectors in prioritizing purchases and collaborating with farmers. Practically, this system helps collectors shorten selection time, increase process transparency, and reduce subjectivity in decision-making.

Furthermore, the visual display of ranking results on the Aquaculture Product Showcase page allows users to easily compare each alternative based on SAW scores and price parameters. By integrating these features, the Indramayu fisheries business incubation information system successfully combines an information technology approach with quantitative decision-making methods, strengthening its role as a supporting platform for the digital fisheries business ecosystem at the regional level.

3.3 Test Results

Based on the test results in Table 3-4, it shows that the business incubation information system for innovative superior fishery commodity products in Indramayu Regency in terms of functionality (X1) obtained an average value of 4.25 (very appropriate), while the results of the system usability test obtained an average value of 4.38 (very appropriate), and the results of the technology readiness test were 4.30 (very appropriate). So that from the three variables measured, the test results were 4.31 (very appropriate).

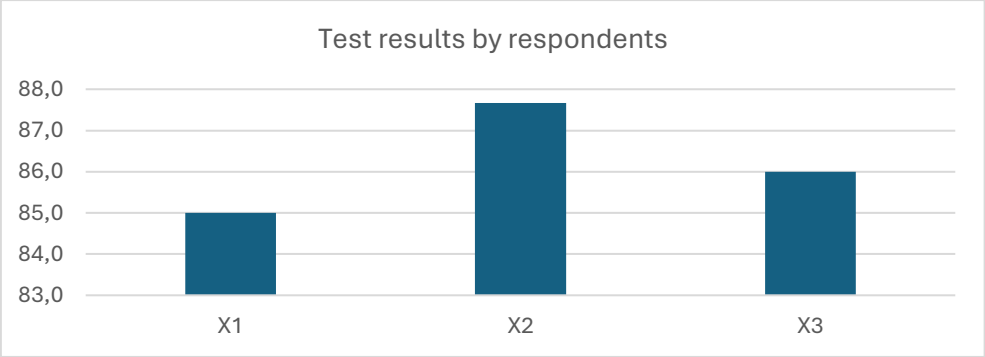

Figure 5. Percentage of test results

Based on the graph displayed in Figure 5, it shows that the business incubation information system for innovation of superior fishery commodity products in Indramayu Regency obtained the highest percentage value in the system usability variable of 87.7%, then secondly in the technology readiness variable of 86.0%, and finally in the functionality variable of 85.0%.

3.4 Test Results

Based on the implementation and testing results, it can be concluded that the integration of the SAW method into the fisheries business incubation information system has proven effective in providing decision support for collectors. This system not only helps accelerate the search for superior commodities but also facilitates direct interaction between farmers and collectors, thereby minimizing the dominance of intermediaries.

Technically, the system has fulfilled all its planned functions, and in terms of user acceptance, the application received a positive response with a very good satisfaction rating. This confirms that DSS-based digital solutions can be an effective strategy in addressing local fisheries marketing challenges.

4. CONCLUSION

This research has successfully developed a web-based business incubation information system that integrates the Simple Additive Weighting (SAW) method as a decision support system for collectors in selecting superior fishery products in Indramayu Regency. The developed application provides key features, including user registration with document verification, a fishery commodity catalog, a multi-factor criteria-based recommendation system, status notifications, and admin validation. Implementation results demonstrate that the system functions according to user needs, particularly in facilitating collectors in selecting commodities based on predetermined preferences.

The integration of the SAW method has proven to provide significant benefits in the decision-making process. By considering criteria such as price, production capacity, location, commodity type, and harvest time, the system is able to generate objective rankings that meet user needs. Testing results using black box testing on 53 functions showed that all system functions functioned well, while user satisfaction evaluation using a Likert questionnaire yielded an average score of 85.52%, categorized as very good. This demonstrates that the developed system is not only technically feasible but also well-received by users.

Overall, this research makes a significant contribution to the development of digital solutions in the regional fisheries sector, particularly in strengthening information transparency, distribution efficiency, and increasing the added value of leading commodities. Going forward, this system can be enhanced by adding direct communication features, integrating digital payments, and developing a mobile version for greater accessibility for a wider range of users.

5. REFERENCES

FAO. (2022). The State of World Fisheries and Aquaculture 2022. FAO. https://doi.org/10.4060/cc0461en

Febryanti, D. I., & Utami, D. A. (2023). Pemanfaatan Platform Digital dalam Pemasaran Produk Perikanan dan Kelautan: Studi Kasus Aruna Indonesia. Jurnal Green Growth Dan Manajemen Lingkungan, 12(1), 66–83.

Hackett, S. M., & Dilts, D. M. (2004). A Systematic Review of Business Incubation Research. The Journal of Technology Transfer, 29(1), 55–82. https://doi.org/10.1023/B:JOTT.0000011181.11952.0f

Hermawan, A. P., Oktaviani, C., Ardiansyah, F., Praja, G. I., & Agustina, T. (2025). Tantangan dan Peluang Usaha pada Koperasi Sektor Perikanan: Studi Lapangan KUD Minasari Pangandaran. Koaliansi: Cooperative Journal, 4(2), 83–92.

Mahendra, G. S., & Aryanto, K. Y. E. (2019). SPK penentuan lokasi ATM menggunakan metode AHP dan SAW. Jurnal Nasional Teknologi Dan Sistem Informasi, 5(1), 49–56.

Mubaliqin, A., & Mujianto, A. H. (2025). JUTECHSY: Journal of Technology and Information System Penerbit: https://journal.synersa.org/index.php/jutechsy/index Vol Implementasi Sistem Seleksi karyawan Terbaik Menggunakan Metode Simple Additive Weighting Pada CV Kamajaya Cell Berbasis Web (Vol. 1, Issue 1). https://journal.synersa.org/index.php/jutechsy/index

Nurhayati, A., Handaka, A. A., Herawati, T., Yustiati, A., & others. (2023). The resilience of fishery production supply chain in West Java Province, Indonesia. IOP Conference Series: Earth and Environmental Science, 1289(1), 12016.

Panudju, A. T., Rahardja, S., Nurilmala, M., & others. (2023). Decision Support System in Fisheries Industry: Current State and Future Agenda. International Journal on Advanced Science, Engineering & Information Technology, 13(2).

Pratama, S. D., Lasimin, L., & Dadaprawira, M. N. (2023). Pengujian Black Box Testing Pada Aplikasi Edu Digital Berbasis Website Menggunakan Metode Equivalence Dan Boundary Value. Jurnal Teknologi Sistem Informasi Dan Sistem Komputer TGD, 6(2), 560–569.

Puspitasari, L., Maulindar, J., & Atina, V. (2025). Penggunaan Metode SAW dalam Sistem Pendukung Keputusan Pemilihan Pegawai Terbaik. Infotek: Jurnal Informatika Dan Teknologi, 8(1), 104–115.

Rumbiarmytha, D. A., Sembiring, B. O., & Andriana, S. D. (2025). IMPLEMENTASI METODE SIMPLE ADDITIVE WEIGHTING DALAM MENENTUKAN PEMILIHAN JURUSAN SESUAI BAKAT DI SMK NEGERI 1 KUTALIMBARU BERBASIS WEB. Jurnal Kecerdasan Buatan Dan Teknologi Informasi, 4(3), 255–263. https://doi.org/10.69916/jkbti.v4i3.346

Safitri, J., & Khasanah, A. U. (2023). Pengaruh Harga, Brand Image, Kualitas Produk, Dan Digital Marketing Terhadap Minat Pembelian Produk Nadiraa Hijab. AJIE, 5–13. https://doi.org/10.20885/ajie.vol7.iss1.art2

Sugiyono, P. D. (2010). Metode Peneliian. Kuantitatif, Kualitatif, Dan R&D.

Supriatiningsih, S. (2023). Implementasi Metode Waterfall Pada Aplikasi Inventory Barang Berbasis Web. Informatics and Computer Engineering Journal, 3(2), 148–156.