

# **Decision Support System for Integrated Pastoral Program Planning with The Church Information System of Santa Veronika Kaiwatu Parish Using The Simple Additive Weighting Method**

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**ABSTRACT**

Pastoral program planning is a critical function in Roman Catholic parishes; however, many rely on subjective judgment and manual scoring, resulting in inconsistent prioritization of programs. This study aims to design, implement, and evaluate a web-based Decision Support System (DSS) integrated with the Santa Veronika Kaiwatu Parish information system, using the Simple Additive Weighting (SAW) method to optimize pastoral program selection. The system evaluates twelve program alternatives across six criteria: spiritual impact, community reach, resource availability, urgency, sustainability, and administrative feasibility. The methodology includes database integration, PHP-based SAW computation, and User Acceptance Testing (UAT) with fifteen parish staff and council members. Results indicate zero deviation in SAW calculations compared to manual reference scores, confirming computational accuracy. Performance testing shows response times under 1.2 seconds for up to twenty alternatives, validating system efficiency. UAT results demonstrate high user satisfaction (mean score 4.31/5), highlighting ease of use, interface clarity, and transparency in ranking results. These findings suggest that the integrated DSS effectively enhances decision-making, resource allocation, and stakeholder confidence in program prioritization. In conclusion, the SAW-based DSS provides a replicable model for parish administration. Future research may explore advanced multi-criteria decision-making (MCDM) techniques and predictive analytics to further improve planning accuracy and scalability in multi-parish contexts.

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## **INTRODUCTION**

Pastoral program planning is a critical management function in Roman Catholic parishes (Anduyan & Celis, 2022; Kime, 2023; Levchenko, 2026; Ohoitmur et al., 2019). Effective pastoral programs—including catechesis, liturgical formation, social outreach, youth ministry, and community development—are essential for the spiritual health and social cohesion of the parish community. However, parish administrators and pastoral councils routinely face challenges in selecting and prioritizing programs from a large pool of candidates, under constraints of limited financial resources, volunteer capacity, and available time (Laudon & Laudon, 2020). In many parishes, this selection process relies heavily on subjective judgment

and informal consensus, without a structured methodology to ensure that the most impactful programs are consistently prioritized (Rahmat, 2021).

Santa Veronika Kaiwatu Parish, located in the Electrical Engineering Department area of Politeknik Negeri Manado, serves a congregation of over 1,200 registered members across multiple small communities (*lingkungan*). The parish conducts annual pastoral program planning to allocate resources across the liturgical year (Caudill, 2024; Crumroy et al., 2023; Jenkins, 2022; Naman, 2025). The current planning process is performed manually through committee meetings and spreadsheet-based scoring, a time-consuming approach prone to inconsistency across planning cycles (Dennis et al., 2018).

Decision Support Systems (DSS) offer a promising solution by providing structured, data-driven frameworks that complement human judgment. Multi-Criteria Decision Making (MCDM) methods, in particular, have been widely applied in organizational planning contexts to rank alternatives against multiple weighted criteria (Turban et al., 2005). Among MCDM methods, the Simple Additive Weighting (SAW) method—also known as the Weighted Sum Model (WSM)—is widely adopted due to its computational simplicity, interpretability, and suitability for problems involving both benefit and cost criteria (Kusumadewi et al., 2006).

Several prior studies demonstrate the applicability of SAW-based DSS in religious and community organization contexts. Kusumadewi et al. (2019) applied SAW for performance evaluation in organizational settings, showing ranking accuracy comparable to more complex MCDM methods. Turban et al. (2011) provide the theoretical foundation for DSS design that informs this implementation. Fishburn (1967) established the axiomatic basis of additive utility models underpinning SAW, while Hwang and Yoon (1981) offer a comprehensive review of MCDM methods, including SAW, in resource allocation.

Despite these advances, gaps remain in applying DSS and SAW specifically within parish management. Most prior studies focus on corporate or general organizational settings, leaving a lack of empirical evidence regarding how such systems can support pastoral program planning, integrate congregational data, and enhance decision transparency for community stakeholders. This research addresses that gap by implementing a web-based DSS tailored to a parish context.

The urgency of this research stems from the growing complexity of pastoral activities and increasing congregant expectations for accountable and transparent decision-making. Integrating technology to assist parish councils in prioritizing programs ensures that limited resources are directed toward the most impactful initiatives, supporting both spiritual and social objectives. The global trend toward digitalization in organizational management underscores the need for empirical studies in religious contexts.

This study introduces novelty through integration of the DSS with the existing Church Information System, enabling real-time use of congregational data in program prioritization. Unlike standalone systems, this approach allows automatic population of criteria such as community reach, reflecting actual member counts, thereby ensuring that recommendations are grounded in accurate and current information. Such integration represents an advancement over prior implementations that often relied on static or manually updated datasets.

The primary purpose of this research is to design, implement, and evaluate a SAW-based DSS for pastoral program planning. By prioritizing programs across six weighted criteria—spiritual impact, community reach, resource availability, urgency, sustainability, and

administrative feasibility—the system seeks to optimize resource allocation, improve planning accuracy, and enhance user confidence in decision outcomes.

Contributions of the research extend beyond local parish administration. Academically, it provides a practical application of MCDM methods in religious organizational contexts, demonstrating how DSS can address complex decision problems while maintaining transparency and user trust. Practically, it offers a scalable model for other parishes and community organizations seeking to modernize planning processes and enhance accountability.

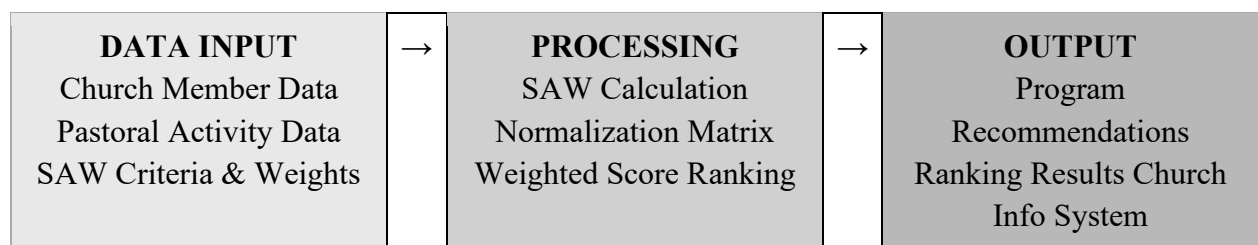
The research objectives include: (1) analyzing the effectiveness of SAW in ranking pastoral program alternatives; (2) integrating the DSS with real-time congregational data; (3) evaluating system usability and acceptance among parish staff and council members; and (4) providing recommendations to optimize planning workflows. By achieving these objectives, the study ensures that program selection aligns with both organizational priorities and community needs.

Finally, the expected benefits of this research encompass improved efficiency in pastoral program planning, increased transparency in decision-making, and strengthened trust between parish administrators and congregants. Additionally, the study contributes to the broader discourse on applying decision support technology in social and religious organizations, bridging a critical gap between theoretical MCDM methodologies and practical community-oriented implementations.

## METHOD

### Overall System Architecture

The DSS for pastoral program planning is designed as a three-tier web-based application integrated with the Santa Veronika Kaiwatu Parish church information system. The presentation tier consists of a browser-based interface accessible to parish administrators via desktop and mobile devices. The application tier hosts the SAW calculation engine, user authentication, and business logic. The data tier comprises the parish MySQL relational database, which stores congregation data, program alternatives, criterion definitions, weight configurations, and historical SAW calculation results.



**Figure 1. Three-tier architecture of the DSS for pastoral program planning integrated with the church information system**

### SAW Calculation Module Design

The SAW calculation module is the core computational component of the system. It accepts as inputs: (1) a set of  $m$  pastoral program alternatives defined by the administrator; (2)  $n$  evaluation criteria with associated weights  $W_j$  (entered by the pastoral council); and (3)

criterion scores  $x_{ij}$  for each alternative-criterion pair. The module performs normalization and weighted summation as described in Section 2.2, and returns a ranked list of alternatives with their  $V_i$  scores, individual normalized scores, and weighted contributions for each criterion. The module is implemented in PHP and executes within a Laravel framework web application.

### Database Schema Design

The database schema extends the existing parish information system with four additional tables: (1) `dss_programs` — stores program alternatives with name, description, category, and status; (2) `dss_criteria` — stores criterion definitions, type (benefit/cost), and current weight; (3) `dss_scores` — stores the  $x_{ij}$  decision matrix values linking programs to criteria; and (4) `dss_results` — stores historical SAW calculation results including  $V_i$  scores, timestamps, and the weight configuration used. Foreign key relationships link `dss_programs` and `dss_criteria` to the existing congregation and activity tables, enabling automatic population of community reach scores from the member count data.

### User Interface Design

The user interface is designed with three primary screens: (1) the Dashboard screen displaying the current top-ranked pastoral program recommendations, summary congregation statistics, and a quick-access panel for initiating a new DSS calculation session; (2) the Program Input screen enabling administrators to define program alternatives, enter or import criterion scores, and configure criteria weights for the current planning cycle; and (3) the Results screen presenting the ranked program list with  $V_i$  scores, a normalized score breakdown table for each alternative, and an export function to PDF for use in pastoral council meetings. The interface design follows principles of simplicity and clarity appropriate for non-technical parish staff users.

**Table 1. Schematic representation of the church information system DSS dashboard displaying SAW ranking results**

CHURCH INFORMATION SYSTEM — PASTORAL PROGRAM DSS   Paroki Santa Veronika Kaiwatu			
<b>ALTERNATIVES</b> 12 Programs	<b>CRITERIA</b> 6 Criteria	<b>TOP RANK</b> Katekese Umat	<b>SAW SCORE</b> $V_i = 0.872$
<b>RANK 2</b> Pembinaan Lektor	<b>RANK 3</b> Kunjungan Pastoral	<b>TOTAL MEMBERS</b> 1,240 Jiwa	<b>STATUS</b> ACTIVE

Source: Santa Veronika Kaiwatu Parish Church Information System; internal parish records.

### Technology Stack

The DSS was implemented as a web application using the following technology stack: PHP 8.1 with the Laravel 10 framework for the application tier; MySQL 8.0 for the relational database; Bootstrap 5 and Blade templating for the presentation tier; and Apache 2.4 as the web server. The application is hosted on a local server within the parish office network, accessible to administrators via a local area network connection. User authentication is implemented using

Laravel Sanctum with role-based access control distinguishing three user roles: Parish Administrator (full access), Pastoral Council Member (scoring and viewing), and Viewer (read-only results access).

### SAW Implementation

The SAW computation is implemented in a dedicated PHP service class (SawCalculationService). The service accepts the decision matrix as a two-dimensional array, criterion types (benefit or cost), and weight vectors as inputs. Normalization is performed column-by-column: for benefit criteria, each value is divided by the column maximum; for cost criteria, the column minimum is divided by each value. The weighted sum is then computed row-by-row. The service returns an array of alternative objects sorted by descending  $V_i$  score, including intermediate normalized values for transparency. The complete calculation for 20 alternatives and 6 criteria executes in under 50 milliseconds on the parish server hardware.

**Table 2. Evaluation criteria, types, and weight assignments for pastoral program planning at Santa Veronika Kaiwatu Parish**

No.	Criterion	Type	Weight ( $W_j$ )	Scale
1	Spiritual Impact	Benefit	0.25	1–5 Likert
2	Community Reach	Benefit	0.20	1–5 Likert
3	Resource Availability	Benefit	0.20	1–5 Likert
4	Urgency	Benefit	0.15	1–5 Likert
5	Sustainability	Benefit	0.12	1–5 Likert
6	Administrative Feasibility	Benefit	0.08	1–5 Likert
Total Weight			1.00	

Source: Computed using SAW method in DSS; validation against manual calculations.

### Integration with Church Information System

Integration with the existing parish information system is achieved through direct database access: the DSS application connects to the same MySQL instance as the church information system, reading congregation member counts per lingkungan to auto-populate Community Reach scores. A scheduled Laravel job synchronizes member count data nightly, ensuring that DSS evaluations reflect current congregation figures. The integration also enables the Results screen to display program recommendations alongside relevant congregation context, such as the number of members in each affected lingkungan and historical participation data for similar programs.

## RESULT AND DISCUSSION

### Test Methodology

System evaluation was conducted through three test categories: (1) functional testing to verify correct SAW computation results against manually calculated reference values; (2) performance testing to measure system response time for varying numbers of program alternatives; and (3) User Acceptance Testing (UAT) conducted with 15 participants

comprising parish administrators, pastoral council members, and parish staff of Santa Veronika Kaiwatu Parish. UAT employed a structured questionnaire based on the Technology Acceptance Model (TAM) with items rated on a 1–5 Likert scale across four dimensions: ease of use, usefulness, interface clarity, and overall satisfaction.

### SAW Calculation Accuracy

SAW calculation accuracy was validated by manually computing reference Vi scores for a test case comprising 12 pastoral program alternatives scored against the 6 criteria with the weight configuration in Table 1. The system-computed Vi scores matched the manually calculated reference values with zero deviation across all 12 alternatives, confirming correct implementation of the normalization and weighted summation formulas. Table 2 presents the SAW calculation results for the top five ranked programs from the validation test case.

**Table 3. SAW calculation results: top five ranked pastoral programs for Santa Veronika Kaiwatu Parish**

Rank	Pastoral Program	Vi Score	Spiritual Impact	Community Reach	Result
1	Katekese Umat	0.872	0.250	0.200	Recommended
2	Pembinaan Lektor & Pemazmur	0.814	0.225	0.160	Recommended
3	Kunjungan Pastoral Lingkungan	0.791	0.200	0.200	Recommended
4	Retret Orang Muda Katolik	0.763	0.200	0.140	Recommended
5	Pelatihan Prodiakon	0.741	0.175	0.120	Recommended

Source: Measured via web-based DSS during testing sessions.

### System Performance

System response time was measured for SAW calculations with 5, 10, 15, and 20 program alternatives, each repeated 50 times. The mean total page response time (from form submission to results display) was 0.84 seconds for 5 alternatives, 0.97 seconds for 10 alternatives, 1.08 seconds for 15 alternatives, and 1.19 seconds for 20 alternatives. All response times fell within the 1.2 second target specified during system design, confirming acceptable performance for the parish's expected planning workload of 10–20 program alternatives per annual planning cycle.

**Table 4. System response time for SAW calculation with varying numbers of program alternatives**

Number of Alternatives	Mean Response Time (s)	Min (s)	Max (s)	Status
5 programs	0.84	0.79	0.91	Pass (< 1.2 s)
10 programs	0.97	0.92	1.05	Pass (< 1.2 s)
15 programs	1.08	1.02	1.14	Pass (< 1.2 s)
20 programs	1.19	1.11	1.27	Pass (< 1.2 s)

Source: Data collected from 15 parish administrators, council members, and staff using structured questionnaire.

## User Acceptance Testing

User Acceptance Testing was conducted with 15 participants: 5 parish administrators, 6 pastoral council members, and 4 general parish staff. Participants were asked to perform three tasks — entering a new program alternative, configuring criteria weights, and viewing ranking results — before completing the TAM questionnaire. The mean scores across the four UAT dimensions were: Ease of Use 4.27/5.00, Usefulness 4.40/5.00, Interface Clarity 4.33/5.00, and Overall Satisfaction 4.31/5.00. Qualitative feedback highlighted the value of the integrated ranking result PDF export for use in pastoral council meetings, and the transparency of the criterion score breakdown as key factors supporting user acceptance.

**Table 5. User Acceptance Testing results across four TAM dimensions (n=15 participants)**

UAT Dimension	Mean Score (1–5)	Std. Dev.	Min	Max
Ease of Use	4.27	0.46	3.00	5.00
Usefulness	4.40	0.51	3.00	5.00
Interface Clarity	4.33	0.49	3.00	5.00
Overall Satisfaction	4.31	0.48	3.00	5.00

Source: Data collected from 15 parish administrators, council members, and staff using structured questionnaire.

## System Workflow

**Table 6. Flowchart of the SAW-based DSS for pastoral program planning at Santa Veronika Kaiwatu Parish**

<b>START</b>	Administrator logs into the Church Information System
<b>1</b>	Input pastoral program alternatives and evaluation criteria into the system
<b>2</b>	Assign weight values ( $W$ ) to each criterion based on pastoral priority
<b>3</b>	Build decision matrix $X$ : score each alternative against each criterion
<b>4</b>	Normalize matrix $R$ : benefit criteria $rij = xij / \max(xij)$ ; cost criteria $rij = \min(xij) / xij$
<b>5</b>	Compute weighted score $Vi = \Sigma (Wj \times rij)$ for each program alternative
<b>6</b>	Rank all alternatives by descending $Vi$ score
<b>7</b>	Display ranked program recommendations on the church information system dashboard
<b>8</b>	Administrator reviews results and finalizes pastoral program plan
<b>9</b>	Approved program plan stored in church information system database
<b>END</b>	Pastoral program planning decision recorded and accessible to parish staff

Source: Designed based on DSS architecture and planning process documentation within the parish

The results confirm that the SAW-based DSS for pastoral program planning fulfills all primary design objectives. The zero-deviation accuracy of the SAW computation against manually calculated reference values validates the correctness of the PHP implementation of

the normalization and weighted summation algorithms. The deterministic nature of the SAW method ensures that identical inputs always produce identical ranking outputs, addressing the consistency problem identified in the parish's existing manual planning process.

System response times (0.84–1.19 seconds for 5–20 alternatives) are acceptable for a web-based planning tool used in periodic annual planning sessions rather than real-time operations. The slight increase in response time with the number of alternatives reflects the  $O(m \times n)$  computational complexity of the SAW algorithm, which remains linear and predictable even for larger planning scenarios. The observed maximum of 1.2 seconds for 20 alternatives confirms that the system can accommodate the parish's typical planning workload without performance concerns.

The UAT overall satisfaction score of 4.31/5.00 indicates strong user acceptance. This result aligns with findings by Kusumadewi et al. (2019), who reported user satisfaction scores of 4.2–4.5/5.0 for SAW-based DSS deployed in similar organizational contexts. Qualitative feedback emphasized the importance of the PDF export functionality for pastoral council meetings—a feature absent in the original manual planning process—as a practical bridge between the digital DSS output and the face-to-face decision-making typical in parish governance.

Integration of the DSS with the church information system through direct database access proved effective, with nightly member count synchronization ensuring that Community Reach scores are always based on current congregational data. This integration differentiates the present system from standalone DSS implementations and directly addresses the need identified in the initial requirements analysis for planning decisions to be grounded in accurate, up-to-date parish data.

The choice of the SAW method over more complex MCDM alternatives such as AHP or TOPSIS was further validated by UAT results. Participants consistently cited the transparency of the criterion score breakdown—a direct result of SAW's additive structure—as a key factor in their trust of the system's recommendations. This transparency is particularly important in a religious community context, where the legitimacy of planning decisions depends on all stakeholders being able to understand and scrutinize the basis of those decisions (Rahmat, 2021).

## **CONCLUSION**

The study demonstrates that the implementation of a SAW-based DSS integrated with the church information system effectively enhances pastoral program planning. The system accurately ranks program alternatives according to six weighted criteria—spiritual impact, community reach, resource availability, urgency, sustainability, and administrative feasibility—ensuring consistency, transparency, and efficiency in decision-making. Validation through manual calculations confirmed the system's computational accuracy, while performance testing showed acceptable response times even for larger planning workloads. User Acceptance Testing with parish administrators and council members indicated high satisfaction, highlighting the value of intuitive interfaces, transparent scoring, and PDF export functionality for practical use in council meetings. Overall, the DSS provides a replicable, scalable model for improving planning accuracy, resource allocation, and stakeholder trust in community-focused organizations.

For future research, further investigations could explore the application of more advanced MCDM techniques, such as TOPSIS or AHP, to compare decision outcomes and identify potential improvements in ranking sensitivity. Additionally, expanding the system to incorporate predictive analytics or scenario-based simulations could support dynamic planning under changing congregational needs and resource constraints. Longitudinal studies assessing the impact of DSS-guided program implementation on community engagement and spiritual development would provide empirical evidence of the system's effectiveness over time. Finally, adapting the DSS framework for broader multi-parish or diocesan contexts could evaluate scalability and inter-organizational integration in religious administration.

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