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Decision Making Model for Temple Revitalization in Bali Using Fuzzy-SMARTER Combination Method

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Abstract: Bali is dominated by Hindus and temples as places of worship. Revitalization is carried out periodically in order to preserve the temple. Many factors are taken into consideration in revitalization decisions so that they can be approved by a group or government. Through the decision-making model of temple revitalization in Bali, the entire complexity of decision-making factors can be integrated so as to produce an objective priority ranking of improvements as supporting data for a revitalization decision. The combination of fuzzy sets and the SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank) method can help solve unstructured problems in determining temple revitalization decisions. The calculation between the Alternative sacred building and the complexity factor criteria with a final value of more than 0.5 is included as a revitalization priority suggestion.

Keywords: Combined Method;Decision Making Model;Fuzzy;SMARTER; Temple Revitalization

INTRODUCTION

Bali stands as the sole region in Indonesia where adherents of the Hindu faith predominate (Segara, 2012). Bali has been described as the "Island of the Gods" and "the land of a thousand temples" (Delfiner, 2019; I Ketut Donder, 2021; Muka, 2020). The primary objective of constructing the temple was to invoke the divine presence in all His forms through the act of worship at various pelinggih or sacrosanct structures (Heriyanti, 2019), including padmasana, bale pelik, taman sari, ngerurah, and piyasan (Dwijendra, 2020). Temple preservation initiatives include revitalization as a component. Nevertheless, the acceptance of revitalization decisions is limited by the absence of corroborating data pertaining to the preservation of the temple structure.

The intricacy of the determinants of temple revitalization decisions, which encompass age, susceptibility to natural calamities, and materials employed(Brokerhof et al., 2023; Prieto et al., 2020). This study introduces a Fuzzy SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank) Method as a Model for Determining Temple Revitalization Decisions in Bali. By integrating these diverse factors, the model aims to provide objective judgments regarding temple revitalization (Sudipa et al., 2021) and serves as a preventive maintenance measure for historic structures (Prieto et al., 2019). Fuzzy sets have the capability to function as approximators that emulate ambiguous situations, such as human reasoning (Prieto et al., 2020, 2021), thereby aiding in the evaluation of a decision. Simplification of the Multi-Attribute Rating Technique Utilizing Rank (SMARTER) can assist in the resolution of multiobjective choice problems involving multiple qualitative and quantitative criteria simultaneously.

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The criteria acquired during the process of data capture are ranked according to their degree of significance using the ROC (Rank Order Centroid) method seperti yang dipaparkan dalam penelitian oleh Bošković et al.,(2023); Esangbedo et al., (2022); dan Lubis et al., (2020). This decision model is applicable to the decision-making process regarding the revitalization of temples in Bali. Other research conducted by Rizkiyanto & Anugrah (2019) states that the SMARTER method has advantages in terms of computing speed, so it can produce the best recommendations (Rizkiyanto & Anugrah, 2019). Research conducted by Elia et al. (2021) stated that the SMARTER method has the smallest sensitivity value, namely 0.30 compared to the SMART and TOPSIS methods, so that the SMARTER method can produce the best final value. This research makes a contribution by showing that the application of the Fuzzy Set combination model and the SMARTER Calculation Method can help solve the problem of determining temple revitalization decisions objectively. Where in the process there are many criteria that must be considered and ambiguous values for each criterion. Thus, the combination of these methods is very precise and reliable in finding answers or decisions. Fuzzy helps in defining the ambiguous value of a criterion, and SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank) helps in carrying out multi-criteria calculations objectively by involving Rank Order Centroid (ROC) as a weighting method, thereby minimizing decision makers' doubts.

LITERATURE REVIEWS

Decision Support System

The utilization of decision support systems aids organizations and individuals in their decision-making processes when semi-structured and unstructured decision-making tasks involve inherent complexity and uncertainty. In order to engage with the system, users are required to perform various tasks such as entering data or input, interpreting outcomes, or reaching conclusions(Aristamy et al., 2021; Sudipa et al., 2020). In summary, the system ought to facilitate rational thought among decision makers(Phillips-Wren et al., 2019; Sahoo & Goswami, 2023).

Fuzzy Sets

Fuzzy sets are mathematical models of vague qualitative or quantitative data, which are often generated through natural language (Figueroa–García et al., 2022), this vagueness and uncertainty can be modeled with membership functions. Fuzzy can be represented in the form of Trapezoidal and Triangular curves. Triangular fuzzy is the most widely used in decision-making problems because its membership function is better modeled to map different levels of uncertainty(Kumar, 2020; Kundu et al., 2019; Manogaran et al., 2020).

The membership function that represents the trapezoidal curve is shown in the equation below.

$$\begin{pmatrix} 0; x \leq a \cup x \geq d \\ \frac{(x-a)}{(b-a)}; a < x < b \\ 1\,; b \leq x \ \leq c \\ \frac{(d-x)}{(d-c)}; c < x < d \end{pmatrix} \qquad (1)$$

Information:
μ(x) is the degree of membership
a,b,c is the domain

The membership function that represents a triangular curve is shown in the equation, below.

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$$\begin{pmatrix} 0; x \leq a \cup x \geq c \\ \frac{(x-a)}{(b-a)}; a < x < b \\ 1\ ; \ x = b \\ \frac{(c-x)}{(c-b)}; b < x < c \end{pmatrix} \quad (2)$$

Information:
μ(x) is the degree of membership
a,b,c is the domain

SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank)

The SMARTER method (Simple Multi Attribute Rating Technique Exploiting Ranks) is a multi-criteria decision-making method proposed by Edwards and Baron in 1994. This multi-criteria decision-making method is a development of previous methods, namely SMART and SMARTS (Edwards & Barron, 1994). In the SMART and SMARTS methods, the weight given directly by the decision maker is considered unprofessional because it does not show the distance and priority of each criterion precisely (Elia et al., 2021). Meanwhile, in SMARTER, the criteria obtained in data collection are sorted based on the level of importance with the ROC (Rank Order Centroid) method so that it can show the distance and priority of criteria objectively (Dell'ovo et al., 2021).

This multi-criteria decision-making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it is compared to other criteria. The weighting in the SMARTER method uses a range between 0 and 1, making it easier to calculate and compare the value of each alternative (Odu, 2019; Zhan et al., 2020). as for the calculation stages are as follows:

1. Determine the number of criteria, these criteria will be the material for calculation and consideration in making decisions.
2. From each of these criteria, the weights will be determined by calculating the Rank Order Centroid (ROC). Usually formed with the statement "Criterion 1 is more important than criterion 2, which is more important than criterion 3". Weighting with the ROC technique is generally symbolized by (Wk) can be formulated as follows:

$$W_k = \left(\frac{1}{k}\right) \sum_{i=k}^{k} \left(1 + \frac{1}{i}\right)$$

The above formula can be explained as follows :

$$\text{If } W_i \geq W_2 \geq \ldots \geq W_k \text{ then,}$$
$$W_1 = \frac{(1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{K})}{K}$$
$$W_2 = \frac{(0+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{K})}{K} \quad (3)$$
$$W_k = \frac{(0+\cdots+\frac{1}{K})}{K}$$

3. Calculate the utility value for each criterion respectively. The utility value is also needed before calculating the final score, to calculate the utility value or (ui) requires the minimum and maximum values used in the following formula :

$$ui(a) = 100\ \%\ X \left(\frac{C_i - C_{min}}{C_{max} - C_{min}}\right) \quad (4)$$

Calculating the final value of each to get a multi-attribute value in the SMARTER method uses the following formula:

$$U_n = \sum_{k-1}^{k} W_k U_n\ (X_n) \quad (5)$$

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METHODS

Phases of Research

It starts with identifying the problem. Revitalization problems look simple but are very risky in determining decisions, because many factors are the basis and need to be considered. The next step is to collect primary and secondary data. With these conditions, it is necessary to design decision-making modeling with the Multi-Criteria Decision Making (MCDM) calculation method based on alternative data and criteria obtained. Fuzzy sets and the SMARTER method (Refinement of the SMART method) are suitable combinations to solve problems with the final stage showing the objective alternative final results of the calculation process.

Overview of Decision-Making Model

The decision-making model for temple revitalization in Bali is designed by applying the Fuzzy SMARTER combination method. The overview or concept flow scheme used is as follows.

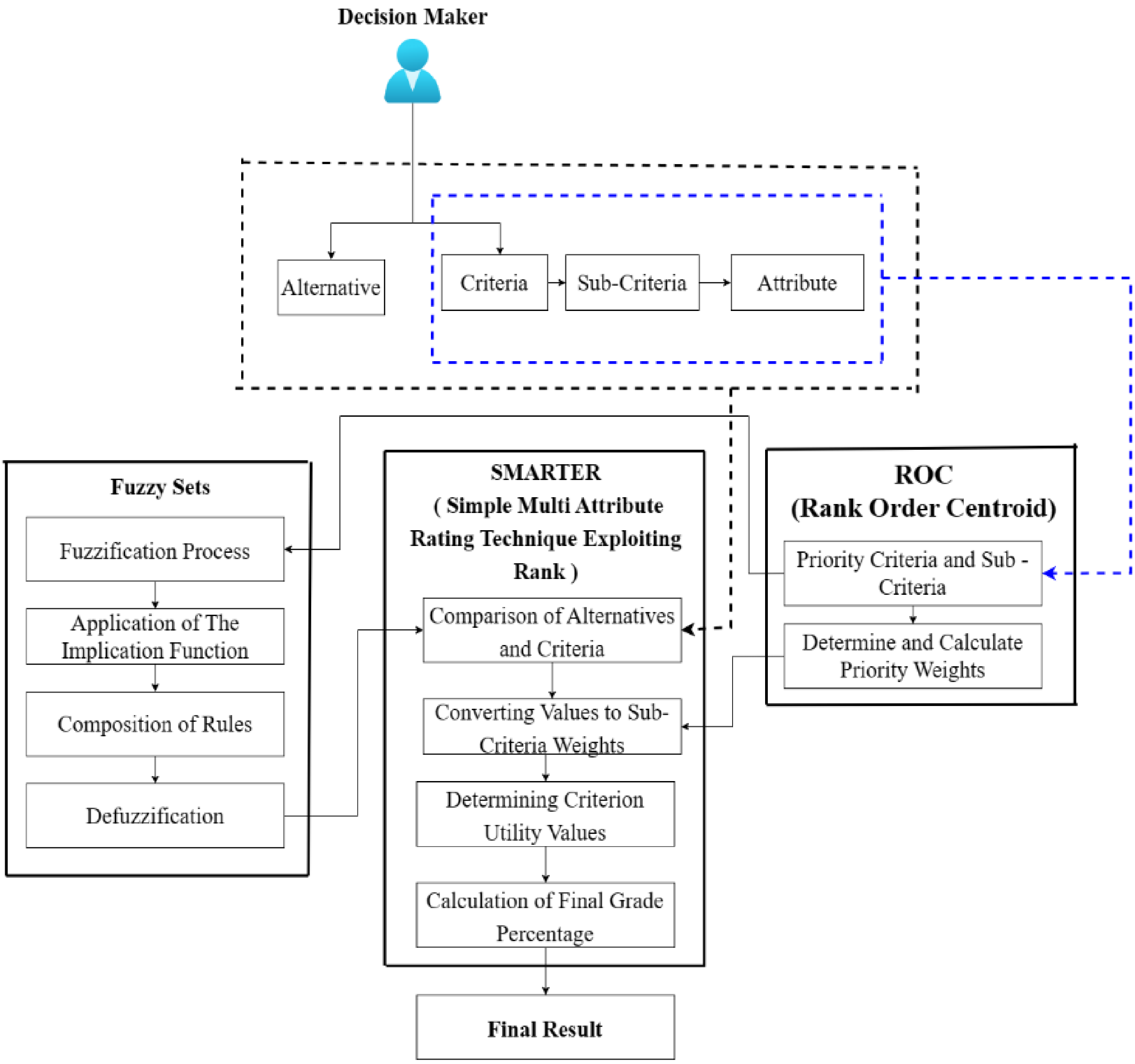

Fig. 1 Model Overview

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Figure 1 above is an overview of the decision-making model for temple revitalization in Bali using the Fuzzy SMARTER (Simple Multi Attribute Technique Exploiting Rank) Method. In the picture above, it is explained that decision makers will enter data in the form of alternatives and criteria.

Alternatives (A) used in this modeling include the category (i) Pelinggih, which is a place where God resides with types of padmasana, meru, gedong rong kalih, taksu, and others. Alternative category (ii) Candi. The temple here is intended to be a candi that functions as an entrance to the next level of the temple area in the form of a candi bentar. Next, enter the Criteria data (C). These criteria play a role in the ROC (Rank Order Centroid) stage where the criteria used in this modeling are six (6) which are sorted according to their priority level including Building Age (C1), Physical Condition (C2), Disaster Vulnerability (C3), Materials Used (C4), Last Repair Time (C5), and Percentage of Damaged Building Volume (C6).

From these criteria there are a total of twenty-two (22) Sub Criteria (SC) with details such as Building Age Criteria (C1) has Sub Criteria (i) Very Old, (ii) Old, (iii) Medium, (iii) Young. Physical Condition Criteria (C2) has Sub Criteria (i) Cracks and (ii) Erosion. Disaster Vulnerability Sub-Criterion (C3) has Sub-Criteria (i) Highly Vulnerable, (ii) Moderately Vulnerable, (iii) Mildly Vulnerable. Criteria for Materials Used (C4) has sub criteria (i) Tile, (ii) Palm fiber, (iii) Wood, (iv) Red Brick, (iv) Stone. The last repair time criterion (C5) has sub-criteria (i) Old, (ii) Medium, (iii) New, (iv) No repair yet. Criteria Percentage of Damaged Building Volume (C6) has sub-criteria (i) Severely Damaged, (ii) Moderately Damaged, (iii) No Damage.

In the Physical Condition criteria (C2) with two (2) Sub criteria, it also has attributes in each of its sub criteria including sub criteria (i) Cracks, has attributes (a) Severe Cracks, (b) Moderate Cracks, (c) Light Cracks, (d) No Cracks and in sub criteria (ii) Scraping has attributes (a) Severe Scraping, (b) Moderate Scraping, (c) Light Scraping and (d) not scraped.

In the Criteria for Materials Used (C4) with five (5) Sub-Criteria, it also has attributes in several sub-criteria, including In sub-criterion (iii) Wood has attributes (a) Teak Wood, (b) Merbau Wood, (c) Sandalwood, (d) Cempaka Wood, and (e) Jackfruit Wood. Sub-criterion (iv) Stone has attributes (a) Temple Stone and (b) Paras Stone. In the next stage, all prioritized criteria, sub criteria and sub criteria attributes are weighted according to the priority level.

The next stage utilizes fuzzy sets. All criteria, sub criteria, and criteria attributes that have been sorted based on the priority level will be converted into fuzzy sets with a fuzzification process using a trapezoidal curve on criteria with four (4) domains, namely C1, C2, C5, C6 and using a triangular curve on criteria with three (3) domains, namely C3. Criterion C4 is not subjected to the fuzzification process because the sub-criteria of the materials used can already be clearly identified.

After going through the fuzzification stage, it will continue with the stage where each rule is implied using the implication function according to the curve. Furthermore, combining the rule composition of all rule outputs. The next stage is defuzzification, where the output will be converted into a firm value used in the calculation process in the SMARTER method.

In the next stage, the SMARTER method is used as the final calculation method with the first stage of comparison between alternatives and criteria. The criteria value used is the defuzzified value. Next, enter the stage where all the criteria values entered will be converted according to the weight value of the sub criteria that have been determined in the ROC method. The calculation of utility helps in determining the extent to which each alternative meets the predetermined criteria. This utility value is then used to classify and compare alternatives, so that decision makers can determine which alternative best suits their preferences. Followed by the final stage, namely, the calculation of the percentage of the final value. In this process, the utility value obtained will be multiplied by the weight of the criteria and then multiplied by the full value of 100% to get the percentage of the final value. The final value that is below 0.50 is not recommended for revitalization, because the condition of the holy building is still feasible. Meanwhile, the final value that is equal to and more than 0.50 is recommended to be revitalized, in order to maintain the strength and stability of the function of the sacred building. All these data can be used as supporting data in an objective temple revitalization decision in Bali.

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RESULTS

Alternative Data Analysis

In the calculation step with the SMARTER method, alternatives become one of the important conditions that must be met. In the decision-making model of temple revitalization in Bali, the alternatives used are as follows.

Table 1. Alternative Data

Category	Alternative Code (A)	Alternative Name
Pelinggih	A1	Padmasana
Pelinggih	A2	Meru
Pelinggih	A3	Taksu
Pelinggih	A4	Gedong Rong Kalih
Candi	A5	Candi Bentar

In table 1 above, there are two (2) categories in determining alternatives, including the pelinggih category and the temple category. Pelinggih has four (4) alternatives including Padmasana, Meru, Taksu, and Gedong Rong Kalih. While the temple category has one (1) alternative, namely Candi Bentar.

Criteria Data Analysis

Criteria is a requirement in the calculation of the SMARTER method. In this study, the criteria obtained can be detailed with descriptions, priority criteria and sub criteria, as well as the range of values that can be seen as follows.

Table 2. Criteria Data

Criteria Priority	Criteria Code (C)	Criteria Name	Description	Priority Of Sub-Criteria	Sub-Criteria Name	Range Number of Value Report
1	C1	Age of Building	The age of the building from the time it was built until the time of checking.	(i)	Very Old	> 50 Th
				(ii)	Old	26 – 50 Th
				(iii)	Medium	15 – 25 Th
				(iv)	Young	< 15 Th
2	C2	Physical Condition	Refers to the external (physical) condition of a building with indications of cracking and erosion.	(i)	Retak	> 50 %
				(ii)	Scraping	20 – 50%
3	C3	Vulnerable to Disaster	The age of the building from the time it The level of disaster-prone environmental conditions in the location of the temple and the area around the temple	(i)	High Vulnerable	> 3 Times in 6 Months
				(ii)	Medium Vulnerable	1 – 3 Times in 6 Months
				(iii)	Lightly Vulnerable	<1 Times in 6 Months

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Criteria Priority	Criteria Code (C)	Criteria Name	Description	Priority Of Sub-Criteria	Sub-Criteria Name	Range Number of Value Report
4	C4	Materials Used	Refers to the type of materials used in temple construction	(i)	Tile	-
				(ii)	Palm fiber	-
				(iii)	Wood	-
				(iv)	Red Brick	-
				(v)	Stone	-
5	C5	Last Maintenance Time	Refers to the last time the temple or building underwent a maintenance process	(i)	Old	> 60 Years
				(ii)	Medium	30 – 60 Years
				(iii)	New	< 30 Years
				(iv)	No Repair	0
6	C6	Percentage of Damaged Building Volume	Refers to the volume of a part or space of a building that has suffered structural damage or destruction.	(i)	Severely Damaged	> 50%
				(ii)	Moderately Damaged	20 – 50%
				(iii)	Light Damage	< 20%
				(iv)	No damage	0

In table 2 above, there are 6 (six) priority orders of criteria used in this modeling ranging from C1 to C6 and also a description of each criterion. Each criterion and sub-criteria has a range of fuzzy scale values that facilitate calculation, except for criterion C4 or Material Used. C4 does not require a scale range because it can be clearly defined. In sub-criteria C4 there are attributes, including sub-criteria (iii) Wood has attributes (a) Teak Wood, (b) Merbau Wood, (c) Sandalwood, (d) Cempaka Wood, and (e) Jackfruit Wood. Sub-criteria (iv) Stone has attributes (a) Temple Stone and (b) Paras Stone.

SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank) Calculation

The calculation stages in the combination of fuzzy sets with the SMARTER method start from determining the priority weights of criteria and sub-criteria, defuzzifying alternative-criteria data, adjusting the deffuzification value to the range of weighting values of criteria and sub-criteria, calculating utility values and calculating the percentage of the final value to get the recommended revitalization priority ranking.

Weight Prioritization of Criteria and Sub Criteria

The first stage in the SMARTER calculation is to determine the priority weights of criteria and sub-criteria carried out by calculating the Rank Order Centroid (ROC) weighting method as equation (3), the weighting results are shown below.

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Table 3. Weight Data of Criteria and Sub Criteria

Criteria Code (C)	Criteria Weight (W_1)	Priority Of Sub-Criteria	Sub-Criteria Weight (W_2)
C1	0,408333	(i)	0,52083333
		(ii)	0,27083333
		(iii)	0,14583333
		(iv)	0,0625
C2	0,241667	(i)	0,75
		(ii)	0,25
C3	0,158333	(i)	0,61111111
		(ii)	0,27777778
		(iii)	0,11111111
C4	0,102778	(i)	0,45666667
		(ii)	0,25666667
		(iii)	0,15666667
		(iv)	0,09
		(v)	0,04
C5	0,061111	(i)	0,52083333
		(ii)	0,27083333
		(iii)	0,14583333
		(iv)	0,0625
C6	0,027778	(i)	0,52083333
		(ii)	0,27083333
		(iii)	0,14583333

Table 3 above shows the results of weighting criteria and sub criteria. This weighting value will be used as a reference in the following stages

Comparison of Alternative Criteria Data Values is then continued with the Defuzzification Process

At this stage, a comparison of alternatives and criteria for determining temple revitalization decisions in Bali is carried out, as can be seen in table 4 below.

Table 4. Comparison of Alternatives and Criteria

Alternative Code (A)	Alternative Name	Total Material Type	Building Part	C1 (Th)	C2		C3	C4	C5 (Th)	C6 (%)
					Crack (%)	Scraping (%)				
A1	Padmasana	Only One	All Sections	30	20	10	3	Temple Stone	0	10
A2	Meru	More Than One	Roof	15	0	30	3	Palm fiber	0	10
			Center	25	20	10	3	Jackfruit Wood	0	10
			Bottom	25	10	5	3	Paras Stone	0	15
A3	Taksu	Only One	All Sections	30	6	0	3	Stone Temple	0	5

Alternative Code (A)	**Alternative Name**	**Total Material Type**	**Building Part**	**C1 (Th)**	**C2**		**C3**	**C4**	**C5 (Th)**	**C6 (%)**
					Crack (%)	**Scraping (%)**				
A4	Gedong Rong Kalih	More Than One	Roof	8	25	5	3	Tile	3	25
			Center	10	5	5	3	Cempaka Wood	0	5
			Bottom	10	5	0	3	Paras Stone	0	5
A5	Candi Bentar	Only One	All Sections	30	8	0	0	Red Brick	10	10

Table 4 above shows the comparison of alternative and criteria data obtained. Besides considering the criteria, there is also an additional category for each alternative. The category is the Number of Material Types, which serves to identify the type of parts of a building. If the alternative has only one type of material, then all parts of the building consist of the same material, so the data entered covers the whole. Meanwhile, if the alternative has more than one type of material, the data entered corresponds to the roof, middle, and bottom of the building. Then, the data obtained according to each criterion is also displayed.

Furthermore, the Defuzzification process is carried out which is a stage of the Fuzzy Set with the calculation process according to equations (1) and (2). The defuzzification results can be shown in the table below.

Table 5. Defuzzification Result Value

Alternative Code (A)	**Alternative Name**	**Total Material Type**	**Building Part**	**C1 (Th)**	**C2**		**C3**	**C4**	**C5 (Th)**	**C6 (%)**
					Crack (%)	**Scraping (%)**				
A1	Padmasana	Only One	All Sections	0,8	1	0,5	0	Batu Candi	0	0,5
A2	Meru	More Than One	Roof	1	0	0,6667	0	Ijuk	0	0,5
			Center	1	1	0,5	0	Kayu Nangka	0	0,5
			Bottom	1	0,5	0,25	0	Batu Paras	0	0,75
A3	Taksu	Only One	All Sections	0,8	0,3	0	0	Batu Candi	0	0,25
A4	Gedong Rong Kalih	More Than One	Roof	0,5333	0,8333	0,25	0	Genteng	0,1	0,8333
			Center	0,6667	0,25	0,25	0	Kayu Cempaka	0	0,25
			Bottom	0,6667	0,25	0	0	Batu Paras	0	0,25
A5	Candi Bentar	Only One	All Sections	0,8	0,4	0	0	Bata Merah	0,3333	0,5

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Table 5 above shows the value of defuzzification results from alternative data values on criteria C1, C2, C3, C5 and C6. This process aims to get the real value adjusted to table 2 data criteria and sub criteria to determine the sub-criteria class.

Process of Converting Values to Weights

The next stage is to convert the defuzzification value to the weight value of the sub-criteria. The value of the conversion results can be shown in the following table.

Table 6. Conversion of Sub-Criteria Weight Value

(A)	Building Part	C1	C2	C3	C4	C5	C6
A1	All Sections	0,2708	0,2396	0,2778	0,0400	0,0625	0,1458
A2	Roof	0,1458	0,1146	0,2778	0,2567	0,0625	0,1458
	Center	0,1458	0,2396	0,2778	0,1567	0,0625	0,1458
	Bottom	0,1458	0,1458	0,2778	0,0400	0,0625	0,1458
A3	All Sections	0,2708	0,1250	0,2778	0,0400	0,0625	0,1458
A4	Roof	0,0625	0,2396	0,2778	0,4567	0,1458	0,2708
	Center	0,0625	0,1458	0,2778	0,1567	0,0625	0,1458
	Bottom	0,0625	0,1250	0,2778	0,0400	0,0625	0,1458
A5	All Sections	0,2708	0,1250	0,1111	0,0900	0,1458	0,1458
MIN		**0,0625**	**0,1146**	**0,1111**	**0,0400**	**0,0625**	**0,0625**
MAX		**0,2708**	**0,2396**	**0,2778**	**0,4567**	**0,2708**	**0,1458**

Table 6 above shows the value of the conversion results according to the sub-criteria weights in table 2. This value will be used in the next stage of the calculation.

Utility Value Calculation

The next stage, all values that have been converted, will be used in the calculation of utility value with equation (4). The results of the utility value calculation are shown in the following table.

Table 7. Utility value calculation results

(A)	Building Part	C1	C2	C3	C4	C5	C6
A1	All Sections	1	1	1	0	0	0
A2	Roof	0,4	0	1	0,52	0	0
	Center	0,4	1	1	0,28	0	0
	Bottom	0,4	0,25	1	0	0	0
A3	All Sections	1	0,08333	1	0	0	0
A4	Roof	0	1	1	1	1	1
	Center	0	0,25	1	0,28	0	0
	Bottom	0	0,08333	1	0	0	0
A5	All Sections	1	0,08333	0	0,12	1	0

Table 7 above shows all calculation results with a value range of 0 to 1 to help decision makers determine alternatives that have the potential to support revitalization decisions.

Calculation of Final Grade Percentage

This stage is the final stage in the SMARTER Method calculation process. At this stage, calculations are carried out using equation (5) and the final result values are shown in the following table.

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Table 8. Calculation of Final Value Percentage

(A)	Building Part	C1	C2	C3	C4	C5	C6	Final Grade	Percentage (%)
A1	All Sections	0,2708	0,2396	0,2778	0,0400	0,0625	0,1458	0,80833	0,808
A2	Roof	0,1458	0,1146	0,2778	0,2567	0,0625	0,1458	0,37511	0,375
	Center	0,1458	0,2396	0,2778	0,1567	0,0625	0,1458	0,59211	0,592
	Bottom	0,1458	0,1458	0,2778	0,0400	0,0625	0,1458	0,38208	0,382
A3	All Sections	0,2708	0,1250	0,2778	0,0400	0,0625	0,1458	0,58681	0,587
A4	Roof	0,0625	0,2396	0,2778	0,4567	0,1458	0,2708	0,59167	0,592
	Center	0,0625	0,1458	0,2778	0,1567	0,0625	0,1458	0,24753	0,248
	Bottom	0,0625	0,1250	0,2778	0,0400	0,0625	0,1458	0,17847	0,178
A5	All Sections	0,2708	0,1250	0,1111	0,0900	0,1458	0,1458	0,50192	0,502

Table 8 shows the final results of multi-criteria calculations using the SMARTER Method. Based on these final results, support for the decision to revitalize temples in Bali has been obtained, which is shown in the following table.

Table 9. Final Result Value Table

Repair Priority	Final Value Percentage	Alternative Code (A)	Alternative Name	Category	Category Of Building Parts To Be Checked	Revitalization Suggestions	Recommended Building Parts
1	0,80833	A1	Padmasana	Pelinggih	All Sections	Need to be Repaired	All Sections
2	0,59211	A2	Meru	Pelinggih	Center	Need to be Repaired	All Sections
3	0,59167	A4	Gedong Rong Kalih	Pelinggih	Roof	Need to be Repaired	Roof
4	0,58681	A3	Taksu	Pelinggih	All Sections	Need to be Repaired	All Sections
5	0,50192	A5	Candi Bentar	Candi	All Sections	Need to be Repaired	All Sections
6	0,38208	A3	Meru	Pelinggih	Bottom	No Need to Repair	-
7	0,37511	A3	Meru	Pelinggih	Roof	No Need to Repair	-
8	0,24753	A4	Gedong Rong Kalih	Pelinggih	Center	No Need to Repair	-
9	0,17847	A4	Gedong Rong Kalih	Pelinggih	Bottom	Need to be Repaired	-

In Table 9, the final results are obtained in the form of a priority ranking of improvements equipped with a percentage of the final value based on calculations with the SMARTER method, alternative codes, alternative names, alternative categories, parts of the building that are checked, revitalization suggestions, and parts of the building that are recommended to be revitalized.

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From the results above, the alternative Pelinggih Padmasana (A1) has the highest percentage value of 0.80833 with suggestions for improvement in all parts. This is because the data inputted in the sample table has the oldest age, the level of physical condition that is vulnerable, and the environment that is vulnerable to natural disasters, resulting in the highest calculation value. In addition, the second improvement priority with a final percentage value of 0.59167 is the Meru alternative (A2) with suggestions for improvements to all sections. This is because the center has a greater value than the roof and bottom. In accordance with the rules and regulations of temple revitalization in Bali. So pelinggih meru is recommended to revitalize all parts. The third repair priority with a percentage of the final value of 0.59167 is the alternative Pelinggih Gedong Rong Kalih (A4) with suggestions for repairs only on the roof because the section has a moderate level of cracking and erosion of physical conditions and the percentage of the volume of damage to the roof material is more than other parts. So it is suggested that there is a need for revitalization steps. The next repair priority with a value of 0.58681 is the alternative Pelinggih Taksu (A3) with suggestions for repairing all parts, because the materials used are similar and old. There are also some percentages of damage to parts. The last priority suggested for revitalization with a value of 0.50192 is the Bentar Temple alternative (A5) with suggestions for repairs to all parts. This is due to its old age and the materials used have several percentages of damage volume with a longer repair period than other alternatives, so it is recommended to revitalize the temple.

Consideration of whether or not revitalization is needed refers to a value of 0.5. If the alternative value is <0.5 then it is not recommended to revitalize, because the condition of the building is still strong. However, if the alternative value ≥ 0.5 then it is recommended to revitalize in order to maintain the strength and functionality of the sacred building in the temple area. Other alternative parts are not recommended for revitalization because the condition data is still strong and manifested by the percentage of the final value is below the limit of the determining value.

The part of the building that is recommended to be revitalized refers to the part of the building that is checked and the part of the building that is checked refers to the number of types of building materials. If the highest value is obtained by an alternative with only one type of material, then all parts are checked and suggested to be revitalized. If the highest value is obtained by an alternative with more than one type of material, then the roof, middle and lower parts will be adjusted for revitalization. If the highest value is obtained in the roof section, it is recommended to revitalize the roof section only. However, if the highest value is obtained in the middle or lower part, it is advisable to revitalize the entire part, because a sacred building must be repaired according to the rules starting from top to bottom as a symbolic head to foot in order to maintain the sanctity of the building.

These results can be used as one of the objective supporting data in determining revitalization decisions. This modeling can help the community in checking a building in the temple area according to alternative categories and predetermined criteria, so that the condition of a sacred building can be monitored regularly.

DISCUSSION

Based on the results obtained from calculations using a combination of Fuzzy and SMARTER, it is known that this combination of methods is able to solve the problem of determining temple revitalization decisions in Bali. The situation in question is the diversity of criteria that are "actually" required in the decision-making process with criteria values that cannot be ascertained. Based on previous research by Prieto et al., (2021) entitled "A Fuzzy Logic Approach to Preventive Conservation of Cultural Heritage Churches in Popayán, Colombia", it is also explained that fuzzy logic is a technique that can be used to model uncertainty and complexity. In the context of cultural heritage conservation, this approach is used to make decisions about conservation measures that need to be taken based on various factors that may not be clear or certain. So in this research it is shown that the combination of fuzzy and SMARTER is a good combination idea. Collaboration between fuzzy set numbers and SMARTER where fuzzy sets help calculate uncertain value intervals and convert them into real values, making identification easier. The SMARTER method can help carry out calculations by weighting using the ROC method. So that decision makers will be helped in determining the weight of criteria with the concept of priority level of importance. Thus, modeling with a combination of these methods is able to produce the expected, objective and factual final value.

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CONCLUSION

This research contributes by showing that the application of the Fuzzy Set combination model and the SMARTER Calculation Method can help solve a problem of determining temple revitalization decisions objectively. Where in the process there are many criteria that must be considered and ambiguous values on each criterion. Thus, the combination of methods is very appropriate and reliable in finding an answer or decision. Fuzzy helps in defining the ambiguous value of a criterion, and SMARTER (Simple Multi Attribute Rating Technique Exploiting Rank) helps in performing multi-criteria calculations objectively by involving Rank Order Centroid (ROC) as a weighting method, thus minimizing the decision maker's doubts. The decision-making model for temple revitalization in Bali uses five (5) alternatives, six (6) criteria and twenty-two (22) sub-criteria to produce the highest ranking of alternatives that are then suggested to need revitalization. In this model, the alternative Pelinggih Padmasana has the highest final percentage value of 0.80833 so it is recommended to revitalize all parts, and other temples such as pelinggih meru, taksu and gedong rong kalih are recommended to revitalize some or all parts. While there are other alternatives that are not recommended for revitalization because they have a value that is less than the decision limit value of 0.5. This final result shows that the calculation with the combination of Fuzzy SMARTER is able to solve a problem according to complex uncertainty conditions and is able to produce an objective, factual and targeted decision ranking for a Temple Revitalization Decision in Bali.

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