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A Behavioural Fuzzy Decision Support System to Generate Strategies for the Improvement of Islamic Social Finance System

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ABSTRACT

This study aims to identify priority strategies for increasing the effectiveness of the Islamic social finance system. In this context, a new decision-making model is developed to identify key factors. A literature review resulted in the identification of 5 different strategies and 12 different criteria for this process. Opinions were sought from 10 different experts on these factors. The SWIEC technique was used to calculate the importance weights of the criteria. The MARCOS approach is used to determine the most effective strategies. In addition, behavioural leadership fuzzy sets developed by the authors are integrated into the model. The main contribution of this study to the literature is the identification of key strategies for improving the performance of the Islamic social finance system through an original decision-making model. This significantly helps reduce uncertainty regarding this issue. According to the results, the development of zakat institutions is the priority strategy that should be implemented to improve the performance of this system. The establishment of a central zakat authority, the creation of local zakat organizations, and the development of digital zakat platforms should be considered in this process.

Keywords: Islamic Social Finance, Islamic Economics, Fuzzy Logic, Decision Making, Strategy Generation

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1. INTRODUCTION

Islamic finance is an approach that arises from establishing a financial system within the framework of Islamic principles. New tools are developed considering the principles of income equality, providing resources to those in need, and adherence to ethical rules, all of which are enshrined in Islam. This can also be considered for social finance systems. For example, the Zakat system allows those in need to access financial resources more easily. This contributes to minimizing income inequality within the country. Additionally, Waqf (endowment) models are another approach used in the Islamic social finance system. These institutions can provide businesses with the funds they need (Ali et al., 2026). Furthermore, voluntary donation systems can offer more opportunities to those in need. Moreover, profit-sharing systems also support the development of social finance. In this process, fund owners and those with investment ideas can come together. This can increase new ventures and create new job opportunities for people. To increase the effectiveness of the Islamic social finance system, certain strategies need to be implemented.

Several criteria should be considered in selecting these strategies. Compliance with Sharia rules is of vital importance in this process. Otherwise, customers will lose confidence in this system, and the continuity of the applications will not be possible. Financial sustainability is another important criterion in this process. The stability of income sources and long-term growth capacity are crucial in determining strategies. Moreover, the level of digitalization is also very critical in this regard. Some applications already implemented in the Islamic finance system can reach more people when offered in a digital environment (Latif and Rahim, 2025). Therefore, having an advanced technological infrastructure in businesses can enable the selection of strategies that prioritize digitalization. On the other hand, another key element in the selection of these strategies is operational efficiency. The speed of distribution of collected funds, cost effectiveness, and the efficiency of resource utilization are very important in strategy selection.

It is necessary to determine priority strategies for increasing the effectiveness of the Islamic social finance system. However, there are not enough studies in the literature that have conducted a priority analysis of these strategies. This uncertainty constitutes a significant obstacle to the implementation of correct policies. To overcome this problem, this study aims to determine the priority strategies for increasing the performance of the Islamic social finance system. In this framework, a new fuzzy decision-making model is created. In this model, opinions are obtained from 10 different experts. The SWIEC technique is used to calculate the importance weights of the criteria, and the MARCOS approach is used to rank the strategies. Furthermore, behavioral leadership fuzzy sets developed by the authors are integrated into the model. These new fuzzy numbers are one of the most significant contributions of this study to the literature. In this process, the opinions obtained according to the leadership types of the experts are subjected to different functions. This allows for more realistic analyses.

This study consists of 5 chapters. The research gap obtained as a result of the literature review is highlighted in the second chapter. The details of the newly developed decision-making model are presented in the third chapter. The results of the analysis are explained in the fourth chapter. The final chapter discusses the general conclusions and limitations.

2. LITERATURE REVIEW

Transparency and accountability, effectiveness of Sharia compliance, and social impact are the most critical governance dimensions shaping the legitimacy and performance of Islamic Social Finance institutions (Jaradat & Oudat, 2025). These three criteria are essential because they determine institutional trustworthiness, religious credibility, and the real poverty reduction capacity of ISF mechanisms. Transparency and accountability refer to clear disclosure of financial flows, governance processes, and beneficiary targeting, which reduce risks of misuse and strengthen stakeholder confidence (Asif & Searcy, 2026). This is particularly important in ISF because the system relies on moral trust and voluntary contributions rather than purely contractual enforcement. Effectiveness of Sharia compliance ensures that institutional practices align with Islamic jurisprudence, preserving the ethical and religious foundations of operations. Social impact, especially poverty reduction capacity, evaluates whether ISF instruments generate measurable improvements in income, welfare, and social inclusion rather than symbolic redistribution. Rahman et al. (2024) found that stronger disclosure practices significantly improved donor trust and funding stability in zakat institutions. Hassan and Noor (2025) showed that effective Sharia governance frameworks enhanced operational consistency and reduced compliance disputes. Karim et al. (2024) determined that transparent waqf governance structures improved beneficiary targeting efficiency and poverty outreach. Yusoff et al. (2025) reported measurable income gains among households supported by accountable ISF institutions.

Financial sustainability, operational efficiency, and digitalisation are structural determinants of whether Islamic Social Finance institutions can deliver long-term and scalable developmental outcomes (Ali et al., 2026). These criteria are critical because ISF organizations must maintain financial continuity while ensuring that resources are used effectively and responsibly. Financial sustainability ensures that zakat and waqf funds are preserved and invested to generate stable, ongoing support for social programs (Zafar & Aziz, 2026). Without sustainable models, ISF initiatives face interruptions that weaken their poverty alleviation role (Yusoff et al., 2025). Operational efficiency refers to minimizing administrative expenses while maximizing funds directed to beneficiaries, directly affecting institutional impact. Digitalisation strengthens both sustainability and efficiency through secure transactions, real-time reporting, broader outreach, and lower operating costs. Abdullah et al. (2024) showed that digital zakat platforms reduced administrative costs and accelerated fund distribution. Sulaiman et al. (2025) found that sustainable waqf investment strategies improved long-term funding reliability for social services. Firdaus et al. (2024) demonstrated that operational efficiency improvements expanded beneficiary coverage. Latif and Rahim (2025) reported that FinTech adoption significantly enhanced donor participation and institutional transparency in ISF ecosystems.

Stakeholder satisfaction, social trust, and ethical value compliance are relational dimensions that determine the public legitimacy and long-term credibility of Islamic Social Finance institutions (Taufik Syamlan et al., 2026). These criteria are essential because ISF systems depend on voluntary participation and moral commitment rather than coercive enforcement. Stakeholder satisfaction reflects how beneficiaries and donors perceive fairness, service quality, and timeliness of support, influencing continued engagement. Social trust refers to the confidence communities place in institutions to manage resources honestly and distribute funds equitably (Chowdhury et al., 2026). High trust sustains donation flows and institutional resilience during economic or social disruptions. Ethical value compliance ensures that operations align with maqasid al Shariah principles such as justice, dignity, and social welfare. Ibrahim et al. (2024) found that service reliability and communication quality strongly predicted beneficiary satisfaction in zakat institutions. Osman and Khalid (2025) demonstrated that transparent governance significantly increased public trust in waqf management bodies. Nordin et al. (2024) showed that ethical compliance frameworks reduced reputational risks and strengthened institutional resilience. Farooq et al. (2025) reported that perceived fairness and integrity were key determinants of donor retention.

Local economic contribution, risk management capacity, and innovation represent forward-looking criteria that determine the developmental reach and resilience of Islamic Social Finance systems (Akande et al., 2026). These dimensions are critical because ISF must foster sustainable economic empowerment while maintaining institutional stability in dynamic environments. Local economic contribution measures how effectively ISF instruments support microenterprises, job creation, and regional development, promoting self-reliance rather than dependency (Bonang et al., 2026). Risk management ensures that financial, operational, and Sharia-related risks are systematically identified and mitigated, protecting institutional continuity. Innovation enables ISF institutions to evolve through hybrid financial instruments, technology integration, and new governance models that expand outreach and improve performance. Bashir et al. (2024) found that productive zakat financing significantly increased microenterprise income and employment. Rahim and Haron (2025) showed that structured risk governance improved financial stability in waqf institutions. (Zainuddin et al., 2024) reported that formal risk management systems reduced operational losses in zakat distribution. (Mahadi et al., 2025) demonstrated that innovative ISF instruments generated higher social returns and broader beneficiary inclusion.

3. MODEL SPECIFICATION AND DATA

3.1 Model Specification

In this section, the information of BLFSs and formulations of SIWEC and MARCOS are introduced. In the methodology built by combining these elements, uncertainty is minimized with BLFS. Thus, realistic results are obtained by considering the impact of behavioural leadership types on decisions. Additionally, criteria are weighted with SIWEC, while alternatives are ranked with MARCOS. The steps of this developed methodology are summarized in Figure 1.

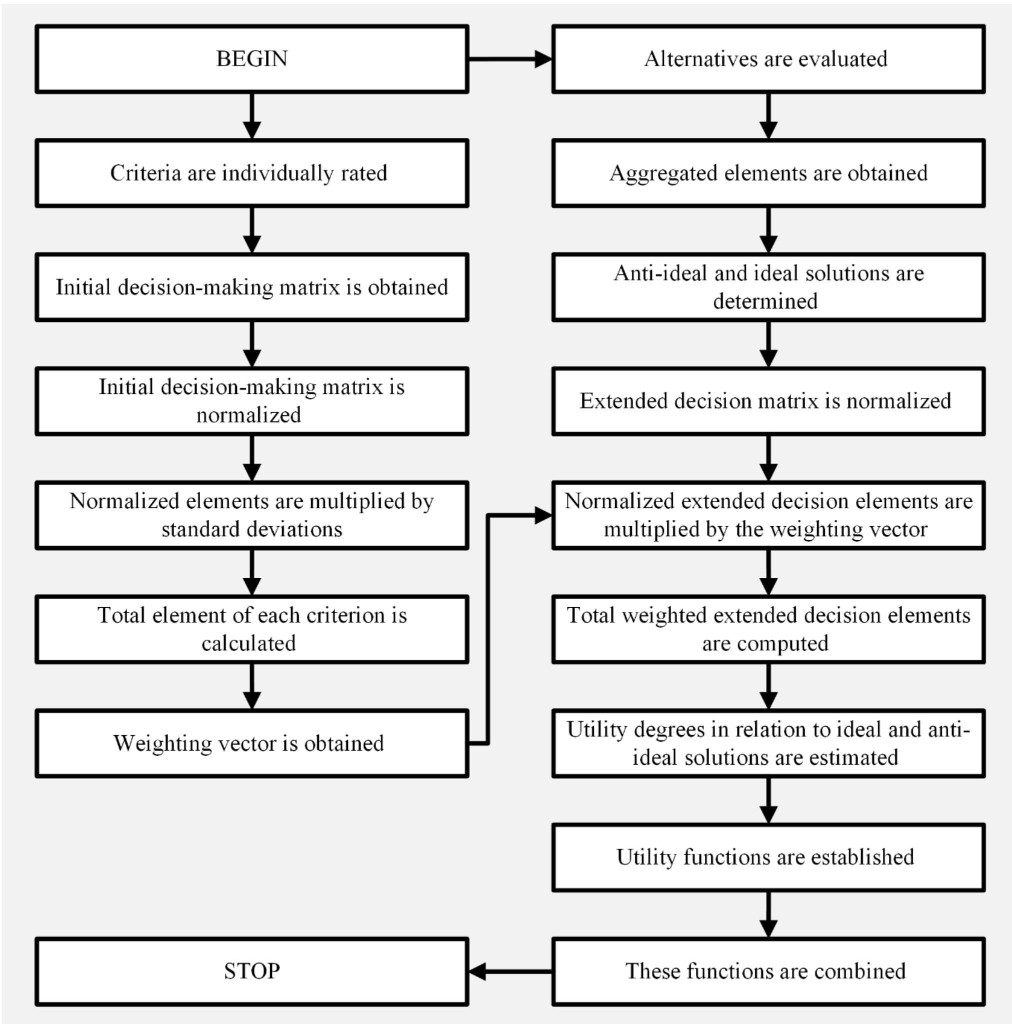

Figure 1: *Steps of Developed Methodology*

Assume that $\mathcal{D}$ is a finite universe set. Then, a BLFS $(\tilde{\mathcal{B}})$ over $\mathcal{D}$ is identified by Equation (1).

$$\tilde{\mathcal{B}} = \left\{ \langle \mathscr{b}, \left(e^{\mathscr{b}-1}, \frac{1}{1+e^{-10(\mathscr{b}-0.5)}}, e^{-\frac{\mathscr{b}^2}{2}}, e^{-\mathscr{b}}, -e^{-\frac{\mathscr{b}^2}{2}}+1 \right) \rangle \mid \mathscr{b} \in \mathcal{D} \right\} \quad (1)$$

Wherein $\mathscr{b}$ is raw membership grade and among 0 and 1. The memberships represent the membership grades of authoritarian, democratic, transformational, Laissez-Faire, and servant behavioural leadership styles, respectively. The memberships are built regarding to the decision-making features of the behavioural leadership style. This reason is that each evaluator exhibits a certain level of adherence to various styles of behavioural leadership. That is, decision makers don't possess only one style of behavioural leadership trait. Whence, decisions do not reflect a behavioural leadership feature (Gülen Ertosun et al., 2026). Accordingly, in place of analysing the evaluations in raw form, analysing them through the feature membership of the behavioural leadership style allows decision makers to produce more realistic solutions.

Consider that $\tilde{B} = (a, b, c, d, e)$ is any BLFS. Then, score and accuracy functions of $\tilde{B}$ are established by Equations (2) and (3), respectively.

$$\mathbb{S}(\tilde{B}) = a + b - c - d + e + 1 \quad (2)$$

$$\hbar(\tilde{B}) = \frac{a + b + c + d + e}{5} \quad (3)$$

Let $\tilde{B} = (a, b, c, d, e)$, $\tilde{B}_1 = (a_1, b_1, c_1, d_1, e_1)$ and $\tilde{B}_2 = (a_2, b_2, c_2, d_2, e_2)$ be three BLFNs. Then, basic operations for these fuzzy numbers are defined using Equations (4) – (7).

$$\tilde{B}_1 \oplus \tilde{B}_2 = (a_1 + a_2 - a_1 a_2, b_1 + b_2 - b_1 b_2, c_1 c_2, d_1 d_2, e_1 + e_2 - e_1 e_2) \quad (4)$$

$$\tilde{B}_1 \otimes \tilde{B}_2 = (a_1 a_2, b_1 b_2, c_1 + c_2 - c_1 c_2, d_1 + d_2 - d_1 d_2, e_1 e_2) \quad (5)$$

$$\lambda \odot \tilde{B} = \left(1 - (1 - a)^{\lambda}, 1 - (1 - b)^{\lambda}, c^{\lambda}, d^{\lambda}, 1 - (1 - e)^{\lambda}\right);\ \lambda > 0 \quad (6)$$

$$\tilde{B}^{\lambda} = \left(a^{\lambda}, b^{\lambda}, 1 - (1 - c)^{\lambda}, 1 - (1 - d)^{\lambda}, e^{\lambda}\right);\ \lambda > 0 \quad (7)$$

SIWEC is a unique method that prioritizes ratings based on the spread between an evaluator's ratings. The main goal of the method is to guide evaluators towards more realistic ratings, thus aiming for more accurate calculation of criterion weighting values. The integration of SIWEC with BLFNs is introduced below (Dereköy et al, 2026).

Each of the n criteria is individually rated by the evaluators. After these ratings are converted into raw membership grades, the function values for the five behavioural leadership styles in Equation (1) are calculated. Thus, initial decision-making matrix formed in Equation (8) is obtained.

$$\tilde{X} = \left[\tilde{x}_{ij}\right]_{k \times n} \quad (8)$$

Wherein k is the number of evaluators and $\tilde{x}_{ij} = \left(a_{\tilde{x}_{ij}}, b_{\tilde{x}_{ij}}, c_{\tilde{x}_{ij}}, d_{\tilde{x}_{ij}}, e_{\tilde{x}_{ij}}\right)$. Later, the initial decision-making matrix is normalized using Equation (9).

$$\mathfrak{z}_{ij} = \frac{\mathbb{S}(\tilde{x}_{ij})}{\max\left(\mathbb{S}(\tilde{x}_{ij})\right)} \quad (9)$$

Wherein $\max\left(\mathbb{S}(\tilde{x}_{ij})\right)$ refers to the maximum score value of initial decision-making matrix. Next, the standard deviations are estimated by Equation (10).

$$\sigma_i = \sqrt{\frac{1}{n}\sum_{j=1}^{n}\left(\mathfrak{z}_{ij} - \frac{1}{n}\sum_{j=1}^{n}\mathfrak{z}_{ij}\right)^2} \quad (10)$$

Behind, the normalized elements are multiplied by standard deviations. This is because the more common the ratings are, the more realistic the evaluator's rating is. Therefore, these ratings should be highlighted. For this, Equation (11) is used.

$$v_{ij} = \sigma_i \mathfrak{z}_{ij} \quad (11)$$

Subsequently, the total element of each criterion is calculated with the help of Equation (12).

$$z_j = \sum_{i=1}^{k} v_{ij} \quad (12)$$

Finally, the weighting vector is obtained via Equation (13).

$$\varpi_j = \frac{z_j}{\sum_{j=1}^{n} z_j} \quad (13)$$

MARCOS adopts an approach that uses both the anti-ideal and ideal solutions in ranking alternatives. Thus, it aims to produce more robust ranking results. The integration of SIWEC with MARCOS is introduced below.

Each of the *m* alternatives is evaluated by the evaluators regarding to criteria. After these evaluations are converted into raw membership grades, the function values for the five behavioural leadership styles in Equation (1) are calculated. Next, aggregated elements are obtained using Equations (14) and (15) (Aydin et al., 2025).

$$\tilde{d}_{ij}^{p} = \frac{1}{k} \odot \tilde{e}_{ij}^{p} \quad (14)$$

$$\tilde{y}_{ij} = \tilde{d}_{ij}^{1} \oplus \tilde{d}_{ij}^{2} \oplus \cdots \oplus \tilde{d}_{ij}^{k} \quad (15)$$

Wherein $\tilde{e}_{ij}^{p} = \left(a_{\tilde{e}_{ij}^{p}}, b_{\tilde{e}_{ij}^{p}}, c_{\tilde{e}_{ij}^{p}}, d_{\tilde{e}_{ij}^{p}}, e_{\tilde{e}_{ij}^{p}}\right)$ is evaluations for alternative regarding criterion of evaluator. Next, anti-ideal and ideal solutions are determined using Equation (16) and (17), respectively.

$$ais_j = \begin{cases} \min\limits_i \mathbb{S}(\tilde{y}_{ij}) & j \in B \\ \max\limits_i \mathbb{S}(\tilde{y}_{ij}) & j \in C \end{cases} \quad (16)$$

$$is_j = \begin{cases} \min\limits_i \mathbb{S}(\tilde{y}_{ij}) & j \in C \\ \max\limits_i \mathbb{S}(\tilde{y}_{ij}) & j \in B \end{cases} \quad (17)$$

Afterwards, extended decision matrix is normalized with Equations (18) and (19).

$$\mathfrak{y}_{ij} = \frac{\mathbb{S}(\tilde{y}_{ij})}{is_j}; j \in B \quad (18)$$

$$\mathfrak{y}_{ij} = \frac{is_j}{\mathbb{S}(\tilde{y}_{ij})}; j \in X \quad (19)$$

Behind, the normalized extended decision elements are multiplied by the weighting vector via Equation (20).

$$t_{ij} = \varpi_j \mathfrak{y}_{ij} \quad (20)$$

Subsequently, total weighted extended decision elements are computed by Equation (21).

$$S_i = \sum_{i=1}^{n} t_{ij} \quad (21)$$

Next, the utility degrees in relation to ideal and anti-ideal solutions are estimated with the help of Equations (22) and (23), respectively.

$$K_i^{+} = \frac{S_i}{S_{is}} \quad (22)$$

$$K_i^- = \frac{S_i}{S_{ais}} \quad (23)$$

After that, utility functions are established using Equations (24) and (25).

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \quad (24)$$

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \quad (25)$$

Finally, these functions are combined and alternatives ranked via Equation (26).

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f\left(K_i^+\right)}{f\left(K_i^+\right)} + \frac{1 - f\left(K_i^-\right)}{f\left(K_i^-\right)}} \quad (26)$$

4. METHODOLOGY

A mostly mathematical description of the method (method or model) to be used in a theoretical or empirical analysis. Appropriate application based on the chosen method computer implementation using a software package.

The criteria that influence the effectiveness of the social finance system are determined through research. All identified criteria are designed in a benefit manner. The criteria and their abbreviated versions are shown in Table 1.

Table 1: *Criteria and Abbreviated Versions*

Criterion	Abb
Transparency and Accountability	TAC
Effectiveness of Sharia Compliance	ESC
Social Impact (Poverty Reduction Capacity)	SIP
Financial Sustainability	FIS
Operational Efficiency	OPE
Level of Digitalization	LOD
Stakeholder Satisfaction	STS
Social Trust and Reputation	STR
Ethical Governance and Value Alignment	EGV
Local Economic Contribution	LEC
Risk Management Capacity	RMC
Innovation and Product Diversity	IPD

These criteria are individually rated by the evaluators. In this process, evaluators use a five-point scale: "very low, low, medium, high, and very high". The raw membership grades for these scales are equal to .2, .4, .6, .8, and 1, respectively. Next, the function values for the five behavioural leadership styles in Equation (1) are calculated and linguistic ratings are transformed into BLFNs. Using these fuzzy numbers, initial decision-making matrix is created. This matrix is given in Table 2.

***Table 2:** Initial Decision-making Matrix*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
E1	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)
E2	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.67,.731,0,.549,1)	(.67,.731,0,.549,1)	(1,.993,0,.368,1)	(1,.993,0,.368,1)	(1,.993,0,.368,1)	(1,.993,0,.368,1)
E3	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)	(1,.993,0,.368,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(1,.993,0,.368,1)	(.819,.953,0,.449,1)	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)
E4	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(1,.993,0,.368,1)	(.67,.731,0,.549,1)	(.67,.731,0,.549,1)
E5	(.449,.047,.135,.819,.865)	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(.67,.731,0,.549,1)	(.67,.731,0,.549,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(1,.993,0,.368,1)
E6	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)	(.449,.047,.135,.819,.865)	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.819,.953,0,.449,1)	(.449,.047,.135,.819,.865)
E7	(.549,.269,0,.67,1)	(.449,.047,.135,.819,.865)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.67,.731,0,.549,1)	(.449,.047,.135,.819,.865)
E8	(.449,.047,.135,.819,.865)	(.549,.269,0,.67,1)	(.549,.269,0,.67,1)	(1,.993,0,.368,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.67,.731,0,.549,1)	(1,.993,0,.368,1)	(.819,.953,0,.449,1)	(.549,.269,0,.67,1)	(.819,.953,0,.449,1)
E9	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.67,.731,0,.549,1)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.67,.731,0,.549,1)
E10	(.449,.047,.135,.819,.865)	(.449,.047,.135,.819,.865)	(.67,.731,0,.549,1)	(1,.993,0,.368,1)	(.549,.269,0,.67,1)	(.67,.731,0,.549,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(.819,.953,0,.449,1)	(1,.993,0,.368,1)	(.67,.731,0,.549,1)

Afterwards, the initial decision-making matrix is normalized using Equation (9). The normalized initial decision-making matrix is illustrated in Table 3.

***Table 3:** Normalized Initial Decision-making Matrix*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
E1	.388	.787	.916	.388	.787	.592	.787	.916	.916	.916	.388	.592
E2	.388	.592	.787	.388	.787	.916	.787	.787	1.000	1.000	1.000	1.000
E3	.388	.592	.592	1.000	.592	.916	.592	.787	1.000	.916	.592	.592
E4	.592	.787	.388	.592	.592	.916	.592	.916	1.000	1.000	.787	.787
E5	.388	.388	.592	.916	.787	.787	.592	.916	1.000	.916	1.000	1.000
E6	.592	.592	.388	.388	.787	.916	.916	.916	.916	1.000	.916	.388
E7	.592	.388	.916	1.000	.592	.592	.787	.916	.916	.916	.787	.388
E8	.388	.592	.592	1.000	.592	.916	1.000	.787	1.000	.916	.592	.916
E9	.388	.787	.916	.388	.787	.787	.916	.787	.787	.916	1.000	.787
E10	.388	.388	.787	1.000	.592	.787	.916	.916	.916	.916	1.000	.787

Behing, the standard deviations for normalized initial-decision making elements of evaluators are estimated by Equation (10). Next, the normalized elements are multiplied by standard deviations using Equation (11). The weighted normalized initial decision-making matrix is displayed in Table 4.

***Table 4:** Weighted Normalized Initial Decision-making Matrix*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
E1	.081	.165	.192	.081	.165	.124	.165	.192	.192	.192	.081	.124
E2	.083	.127	.169	.083	.169	.197	.169	.169	.215	.215	.215	.215
E3	.075	.114	.114	.193	.114	.177	.114	.152	.193	.177	.114	.114
E4	.110	.146	.072	.110	.110	.170	.110	.170	.186	.186	.146	.146
E5	.085	.085	.130	.201	.173	.173	.130	.201	.219	.201	.219	.219
E6	.137	.137	.090	.090	.181	.211	.211	.211	.211	.231	.211	.090
E7	.122	.080	.189	.206	.122	.122	.162	.189	.189	.189	.162	.080
E8	.079	.120	.120	.203	.120	.186	.203	.160	.203	.186	.120	.186
E9	.072	.146	.169	.072	.146	.146	.169	.146	.146	.169	.185	.146
E10	.080	.080	.163	.207	.122	.163	.190	.190	.190	.190	.207	.163

Subsequently, the total element of each criterion is calculated with the help of Equation (12). Finally, the weighting vector is obtained via Equation (13). These results are summarized in Table 5.

***Table 5:** Total Elements and Weights of Criteria*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
Total	.924	1.200	1.408	1.446	1.422	1.668	1.623	1.779	1.943	1.935	1.661	1.483
Weight	.0500	.0649	.0761	.0782	.0769	.0902	.0878	.0962	.1051	.1046	.0898	.0802

According to weight results in Table 5, the most important criteria for social finance system are ethical governance and value alignment with .1051 and local economic contribution with .1046, respectively. The third important criterion is social trust and reputation with .0962.

The same evaluators then assess Islamic social financial systems. These systems are identified as Zakat Institutions/Zakat Management Models (ZAKM), Waqf Models (WAQM), Sadaqa/Voluntary Donation Systems (SADV), Islamic Microfinance Models (IMFM), Profit-Sharing Based Social Funds (PSBF), and Hybrid Models (HYBM). The evaluations for these systems are collected using five-point scale and then, transformed into raw membership grades. Later, the function values for the five behavioural leadership styles in Equation (1) are calculated. Next, aggregated elements are obtained using Equations (14) and (15). The aggregated elements are exhibited in Table 6.

***Table 6:** Aggregated Elements*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
ZAKM	(1,.9822,0,.4066)	(1,.9854,0,.3985)	(1,.9901,0,.3829)	(1,.9783,0,.4148)	(1,.9783,0,.4148)	(1,.9822,0,.4066)	(1,.988,0,.3906)	(1,.9822,0,.4066)	(1,.9679,0,.4317)	(1,.9822,0,.4066)	(1,.9854,0,.3985)	(1,.9854,0,.3985)
WAQM	(.6398,.6763,0,.6313)	(.5894,.5071,0,.657)	(.6439,.6696,0,.6065)	(.6912,.7785,0,.5599)	(.6398,.6763,0,.6313)	(.6066,.5856,0,.644)	(.7091,.8138,0,.5488)	(.6607,.701,0,.5945)	(.602,.554,0,.644)	(.6646,.7222,0,.5945)	(.6479,.693,0,.6065)	(.6749,.7487,0,.5827)
SADV	(.6973,.7843,0,.5488)	(.7229,.8315,0,.5379)	(.6876,.7616,0,.5599)	(.7058,.7996,0,.5488)	(.6973,.7843,0,.5488)	(.5763,.4015,0,.644)	(.6777,.7365,0,.5712)	(.7066,.8048,0,.5379)	(.6786,.7434,0,.5599)	(.7066,.8048,0,.5379)	(.7157,.8234,0,.5273)	(.6684,.7164,0,.5712)
IMFM	(.4973,.2039,.0082,.7558)	(.5502,.352,.0003,.6839)	(.6305,.6272,0,.5945)	(.5114,.1873,.0037,.7261)	(.569,.4552,.0001,.6703)	(.5775,.4695,0,.657)	(.569,.4552,.0001,.6703)	(.6187,.588,0,.6065)	(.5515,.4256,.0002,.6977)	(.5726,.429,.0001,.657)	(.564,.4137,.0001,.6703)	(.5726,.429,.0001,.657)
PSBF	(1,.7834,0,.5599)	(1,.9721,0,.4317)	(1,.9468,0,.4771)	(1,.804,0,.5488)	(1,.9753,0,.4232)	(1,.9448,0,.4584)	(1,.9303,0,.4868)	(1,.9064,0,.5066)	(1,.9233,0,.4868)	(1,.8996,0,.4966)	(1,.9521,0,.4584)	(1,.9068,0,.4966)
HYBM	(1,.9092,0,.4868)	(1,.9358,0,.4677)	(1,.97,0,.4317)	(1,.946,0,.4584)	(1,.9753,0,.4232)	(1,.9742,0,.4232)	(1,.9556,0,.4493)	(1,.9566,0,.4493)	(1,.9358,0,.4677)	(1,.8437,0,.5169)	(1,.9797,0,.4148)	(1,.9556,0,.4493)

Next, anti-ideal and ideal solutions are determined using Equation (16) and (17), respectively. It should be emphasized that all criteria in this process are based on benefit. At the same time, aggregated elements are defuzzified. The extended decision matrix is expressed in Table 7.

Table 7: *Extended Decision Matrix*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
Anti-Ideal	1.929	2.218	2.663	1.965	2.354	2.334	2.354	2.600	2.279	2.344	2.307	2.344
ZAKM	3.576	3.587	3.607	3.564	3.564	3.576	3.597	3.576	3.536	3.576	3.587	3.587
WAQM	2.685	2.439	2.707	2.910	2.685	2.548	2.974	2.767	2.512	2.792	2.734	2.841
SADV	2.933	3.016	2.889	2.957	2.933	2.334	2.843	2.974	2.862	2.974	3.012	2.814
IMFM	1.929	2.218	2.663	1.965	2.354	2.390	2.354	2.600	2.279	2.344	2.307	2.344
PSBF	3.223	3.540	3.470	3.255	3.552	3.486	3.444	3.400	3.437	3.403	3.494	3.410
HYBM	3.422	3.468	3.538	3.488	3.552	3.551	3.506	3.507	3.468	3.327	3.565	3.506
Ideal	3.576	3.587	3.607	3.564	3.564	3.576	3.597	3.576	3.536	3.576	3.587	3.587

Afterwards, extended decision matrix is normalized with Equations (18) and (19). The normalized extended decision elements are exhausted in Table 8.

Table 8: *Normalized Extended Decision Elements*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
Anti-Ideal	.539	.618	.738	.551	.661	.653	.654	.727	.644	.656	.643	.654
ZAKM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
WAQM	.751	.680	.750	.817	.753	.713	.827	.774	.710	.781	.762	.792
SADV	.820	.841	.801	.830	.823	.653	.790	.832	.809	.832	.840	.784
IMFM	.539	.618	.738	.551	.661	.668	.654	.727	.644	.656	.643	.654
PSBF	.902	.987	.962	.913	.997	.975	.957	.951	.972	.952	.974	.951
HYBM	.957	.967	.981	.979	.997	.993	.975	.981	.981	.930	.994	.978
Ideal	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Behind, the normalized extended decision elements are multiplied by the weighting vector via Equation (20). The weighted extended decision matrix is presented in Table 9.

Table 9: *Weighted Extended Decision Matrix*

	TAC	ESC	SIP	FIS	OPE	LOD	STS	STR	EGV	LEC	RMC	IPD
Anti-Ideal	.027	.040	.056	.043	.051	.059	.057	.070	.068	.069	.058	.052
ZAKM	.050	.065	.076	.078	.077	.090	.088	.096	.105	.105	.090	.080
WAQM	.038	.044	.057	.064	.058	.064	.073	.074	.075	.082	.068	.063
SADV	.041	.055	.061	.065	.063	.059	.069	.080	.085	.087	.075	.063
IMFM	.027	.040	.056	.043	.051	.060	.057	.070	.068	.069	.058	.052
PSBF	.045	.064	.073	.071	.077	.088	.084	.091	.102	.100	.088	.076
HYBM	.048	.063	.075	.077	.077	.090	.086	.094	.103	.097	.089	.078
Ideal	.050	.065	.076	.078	.077	.090	.088	.096	.105	.105	.090	.080

Subsequently, total weighted extended decision elements are computed by Equation (21). Next, the utility degrees in relation to ideal and anti-ideal solutions are estimated with the help of Equations (22) and (23), respectively. These results are summarised in Table 10.

Table 10: *Totals and Utility Degrees*

	S_{ais}	S_i	K^-	K^+
Anti-Ideal	.650			
ZAKM		1.000	1.538	1.000
WAQM		.760	1.170	.760
SADV		.803	1.236	.803
IMFM		.651	1.002	.651
PSBF		.959	1.476	.959
HYBM	S_{is}	.976	1.502	.976
Ideal	1.000			

After that, utility functions are established using Equations (24) and (25). Finally, these functions are combined and alternatives ranked via Equation (26). These results shared in Table 11.

Table 11: *Utility Functions*

	$f(K^-)$	$f(K^+)$	$f(K)$
ZAKM	.394	.606	.796
WAQM	.394	.606	.605
SADV	.394	.606	.640
IMFM	.394	.606	.519
PSBF	.394	.606	.764
HYBM	.394	.606	.777

When Table 11 is examined, the most appropriate Islamic social financial system is zakat institutions / zakat management models with .796. The second and third most appropriate Islamic social financial systems are hybrid models with .777 and profit-sharing based social funds with .764, respectively.

To demonstrate the generalizability and reliability of the results, sensitivity analysis, or robustness testing, is applied. In this context, the results are first compared using a different method. The TOPSIS method is preferred for this purpose as it is frequently accepted in the literature. The TOPSIS results are presented in Table 12.

Table 12: *TOPSIS Results*

	S^*	S^-	TOPSIS
ZAKM	.000	.048	1.000
WAQM	.034	.017	.340
SADV	.028	.023	.448
IMFM	.048	.001	.014
PSBF	.006	.043	.872
HYBM	.004	.045	.913

Comparing the results in Table 12 with the results in the analysis section, it is seen that the ranking results are the same. In other words, the Spearman correlation coefficient between the ranking of Islamic social financial systems obtained from the TOPSIS and MARCOS methods is 1. The Pearson correlation coefficient is equal to .9996. A high coefficient indicates that the results are methodologically independent and reliable.

Next, as part of the sensitivity analysis, minimal changes in criterion weights are examined. In this context, each criterion weight is normalized by increasing it by 10% and 20%. Using these updated weights, MARCOS analysis is applied to rank Islamic social financial systems. The results of the case study are summarized in Table 13.

Table 13: *Case Study Result*

	TAC+20%	ESC+20%	SIP+20%	FIS+20%	OPE+20%	LOD+20%	STS+20%	STR+20%	EGV+20%	LEC+20%	RMC+20%	IPD+20%
ZAKM	.7966	.7963	.7956	.7968	.7961	.7961	.7961	.7956	.7962	.7961	.7962	.7961
WAQM	.6055	.6046	.6047	.6064	.6051	.6046	.6061	.6050	.6045	.6055	.6053	.6056
SADV	.6401	.6401	.6391	.6404	.6398	.6374	.6394	.6395	.6397	.6400	.6401	.6393
IMFM	.5180	.5184	.5193	.5178	.5187	.5188	.5186	.5194	.5185	.5187	.5185	.5186
PSBF	.7637	.7642	.7633	.7638	.7641	.7639	.7637	.7631	.7640	.7636	.7640	.7636
HYBM	.7773	.7771	.7766	.7777	.7772	.7773	.7770	.7766	.7772	.7763	.7774	.7771
	TAC+10%	**ESC+10%**	**SIP+10%**	**FIS+10%**	**OPE+10%**	**LOD+10%**	**STS+10%**	**STR+10%**	**EGV+10%**	**LEC+10%**	**RMC+10%**	**IPD+10%**
ZAKM	.7964	.7962	.7959	.7965	.7961	.7961	.7961	.7959	.7962	.7961	.7962	.7961
WAQM	.6054	.6049	.6050	.6058	.6052	.6049	.6057	.6051	.6049	.6054	.6053	.6054
SADV	.6398	.6398	.6393	.6400	.6397	.6385	.6395	.6396	.6396	.6398	.6399	.6394
IMFM	.5183	.5185	.5190	.5182	.5186	.5187	.5186	.5190	.5186	.5186	.5186	.5186
PSBF	.7637	.7640	.7635	.7638	.7639	.7638	.7637	.7634	.7639	.7637	.7639	.7637
HYBM	.7772	.7771	.7768	.7774	.7771	.7772	.7770	.7768	.7771	.7767	.7772	.7771

According to Table 13, the ranking of the Islamic social financial systems remains the same. That is, the results are not affected by changes in the criteria. In other words, the ranking of the Islamic social financial systems is robust despite minimal changes in the criteria.

4. DISCUSSION AND CONCLUSION

This study aims to identify priority strategies for improving the performance of the Islamic social finance system. A new decision-making model has been developed, and the zakat system has been identified as the most important strategy. The developed decision-making model has several advantages compared to previous models. A significant originality is the development of behavioural leadership fuzzy sets by the authors in this model. These sets provide more realistic results compared to other fuzzy numbers because they consider the leadership characteristics of experts. The establishment of a central zakat authority will significantly increase the effectiveness of this system. This will significantly contribute to the development of the zakat system nationwide. Similarly, the development of digital zakat platforms is also critically important in the widespread implementation of zakat. Despite all these contributions, this study also has some limitations. This study provides a general analysis; country-specific analyses have not been conducted. However, the results obtained may vary depending on the social and economic characteristics of the countries. Therefore, comparative analyses of different country groups can be conducted in future studies. In this way, specific strategies can be presented for each country.

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