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A New Consensus Model based on TOPSIS through Group Similarity Index Fusion for Multi-Attribute Group Decision-Making

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ABSTRACT: The purpose of this article is to briefly introduce a fair conceptual framework that captures novel uncertainties to reach consensus. When solving group decision-making problems, the use of the multi-attribute group decision-making (MAGDM) consensus model is a very important and practical concept. We propose a new group consensus technology that uses a prioritization technology based on the ideal solution of similar attitudes (TOPSIS) and an additive attitude based on the fusion of the similar preference method and the group similarity index (GSI). (AOM) and Simple Additive Weighting (SAW) methods are used to select the largest preferred consensus technology for decision-makers. Numerical experimental examples to illustrate the comparison results of the new consensus model. The results point out that the new model provides better similarity between overall decisions and selects the best solution. Finally, compared with other methods, this method is the most rigorous and accurate.

KEY WORDS: TOPSIS, AOMs, SAW, MAGDM, GSI.

I. INTRODUCTION

When people need to deal with daily life, they will choose the right things at the right time in the decision-making process, such as COVID-19. This is essentially called decision making. However, in some cases, there are sometimes events that require multiple people (for example, as shareholders) to make a decision, which is called a group decision. Therefore, the method of collective decision-making came into being, called group decision-making (GDM).

1981, Yoon and Hwang defined the Technique for Order Preference by similarity to ideal solution based on a concept, which pointed out that the selected alternative should be the shortest distance from the positive ideal solution, and the longest distance from the negative ideal solution [1]. The distance between them should be the longest to solve the multi-attribute decision-making (MADM) problem. Simultaneously, also advocate attitude-oriented method (AOM) and the simple additive weighting model (SAW) is advocated. [3]proposed the problem of group decision-making with preference relations to obtain the final solution.

The purpose of the research is proposed anew model to improve the accuracy of the multi-attribute group decision-making (MAGDM) problem, combined with the group similarity index(GSI) theory [12] to calculate the result of group satisfaction ranking. [2] pointed out consensus or synthesis depends on merging data sets supported through different sources for the acquisition of more detailed data. And use [6] to reach a restrictive consensus on all possible alternatives to evaluate the state of consensus.

II. PROPOSED A NEW CONSENSUS MODEL FOR MAGDM

This paper proposed a new consensus model based on TOPSIS through GSI fusion for MAGDM problems. [9] had defined GDM for preference relationships, which requires consensus to selection procedures before acquiring a final solution. In this research, we apply AOMs and SAW methods to describe the context of a conceptual framework. That a model for group consensus technique TOPSIS depends on two parameters through GSI fusion for preference

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aggregation approach. In which one parameter is AOM's, Eq. (1), (2) and the other one parameter is SAW, Eq. (3), (4) are denoted as follows:
Eq. (1) (2): $A^{+} = \{A_i |\max_i \min_j r_{ij}\}$, $A^{+} = \{A_i |\max_i \max_j r_{ij}\}$
Eq. (3)(4): $\mathrm{V}(A_i) = V_i = \sum_{j=1}^{n} w_j\, v_j(x_{ij}), 1 \ldots. m,\ \ V_i = \sum_{j=1}^{n} w_j\, r_{ij}, 1 \ldots. m$
The algorithm has the following property based on Figure1, numerical experiments calculate to implement in three stages in the process of MADM problem solving.Briefly explain each. The display is as follows:

1) Consensus at the beginning period (using AOMs and SAW methods)

Expressed with mathematical symbols, an alternative A^{+} is selected such as
$A^{+} = \{A_i |\max_i \min_j r_{ij}\}$ (1)
Expression with the mathematical symbols, an alternative,A^{+} is selected such as
$A^{+} = \{A_i |\max_i \max_j r_{ij}\}$ (2)
Where r_{ij} is a replace scale to X_{ij}
The SAW method is perhaps the most well-known utilized MADM.
$\mathrm{V}(A_i) = V_i = \sum_{j=1}^{n} w_j\, v_j(x_{ij}), 1 \ldots. m$ (3)
$V_i = \sum_{j=1}^{n} w_j\, r_{ij}, 1 \ldots. m$ (4)

2) Consensus at Intermediate period (TOPSIS Intervention)

The research starts with individual solving the single decision matrix of every decision- maker in the group and grants application of TOPSIS [8].

3) Consensus at last period (Using GSI to calculate priorities of decision-makers' preference attributes)

This article uses TOPSIS[5] to individually solve the single decision matrix of every decision-maker, add AOMs and SAW scores to get the average value, and use GSI to calculate the individual ranking results and summarize them into the group results [9].

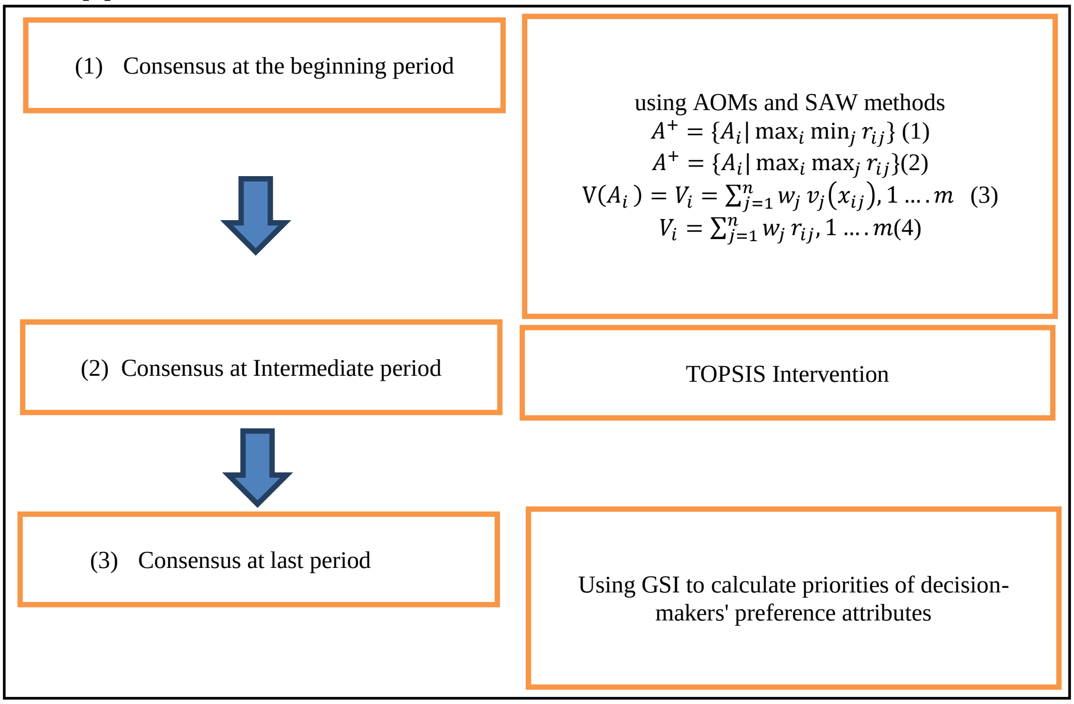

Fig.2.1 The conceptual layout of the process framework

A) MAGDM problems in a group setting

The generalized form of Multi-Attribute Decision Making (MADM) decision problem ψ includes:

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1)A set of q decision makers. $D_q; where\ , q = 1,2, \dots , s.$
2)A set of i decision Alternatives. $A_i; where, i = 1,2, \dots , m.$
3)A set of j decision Criterions. $C_j; where\ , J = 1,2, \dots , n.$
4)A set of j attribute weight for decision. $w_j; where, j = 1,2, \dots , n.$
5)Preference ratings.$x_{ij}; where, i = 1,2, \dots m; j = 1,2, \dots , n.$

Suppose assign a MADM decision problem ψ set only one decision-maker D_q(where, q = 1) or a few people in decision-making group D_q(where, q> 1). The single preference scoresx_{ij}(where, i = 1, 2, ..., m; j = 1, 2, ..., n), for the assigning of decision alternatives A_i(where,i = 1, 2, ..., m), corresponding to each attribute C_j(where, j = 1, 2, ..., n), let's accumulated a decision matrix X, as shown in (1). The rows and columns of the decision matrix express alternatives with assigned attributes, respectively. Weights of attributes are expressed by vectors in (3)

$X = [x_{ij}]; where\ , i = 1,2, \dots , m;\ j = 1,2, \dots , n$ (5)

$W = [W_j]; where\ , j = 1,2, \dots , n$ (6)

We defined the general MADM decision problem ψ as set of decision matrix X with attribute weight vector W, as

$ψ = [X \cdot W]$ (7)

We employ this concept to solve group decision problems to amplify the effect to explains the consensus-based multi-attribute group decision-making (MAGDM) [15].

B) The consensus technique involves TOPSIS additive AOMs and SAW method

We proposed the new consensus technique and operation steps as following:

Step 1) Attitude Oriented Method

Employ Attitude Oriented Method: Applying (1) building a matrix.

Step 2) Acquire the rank outcome

Step 3) Establish the rank matrix (R_q)

The result rank matrix (R_q) , as shown in (8).

$R_q = [r_{iq}]; where, i = 1,2, \dots , m; q = 1,2, \dots , s$ (8)

Step 4) Supply SAW score

The SAW [11] score V_{iq}(where, i = 1, 2, ..., m; q = 1, 2, ..., s) for assign alternatives A_i(where, i = 1, 2, ..., m) regarding several person in decision-making group D_q(where, q = 1, 2, ..., s) can be acquired using (9)

$V_{iq} = i - r_{iq}$; where, i=1, 2, …, m; q =1, 2, …, n (9)

The result rank score matrix V is shown as (10)

$V = [V_{iq}]; where,\ i = 1, 2, \dots , m; q = 1, 2, \dots , n$ (10)

Step 5) Determine positive and negative ideal rank score

The positive ideal (V^*) with negative ideal (V^-) rank scores for a single decision-maker D_q(where, q = 1, 2, ..., s) is determined from (10) as

$V^* = [V^*{}_q]; where,\ q = 1, 2, \dots , n$ (11)

$V^- = [V^-{}_q]; where, q = 1, 2, \dots , n$ (12)

Where

$V^*{}_q = \max (V_{iq})$; where, i=1, 2, …, m; q=1, 2, …, n.

$V^-{}_q = \min (V_{iq})$; where, i=1, 2, …, m; q=1, 2, …, n.

Step 6)cquire separation measures for alternative

For every decision alternative (As the alternative A_i, where i = 1, 2, ..., m), partition from the positive-ideal score V* with the negative-ideal score V- can applying (10) - (12) as

$G_i^* = \sqrt{\sum_{q=1}^{s}(V_{iq} - V_q^*)^2}$; i=1, 2, …, m; q=1, 2, …, n. (13)

$G_i^- = \sqrt{\sum_{q=1}^{s}(V_{iq} - V_q^-)^2}$; i=1, 2, …, m; q=1, 2, …, n. (14)

Step 7) Compute Similarities to Positive-Ideal Solution

The score of every decision alternative A_i(I = 1, 2, ..., m) was acquired through applying (13), (14) for example

$F_i^* = \frac{G_i^-}{G_i^* + G_i^-}$; i=1, 2, …, m. (15)

Step 8) Acquire the overall rank score. Choose an alternative with the maximum.

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C) Consensus Technology Assessment

With the availability of the additive AOMs and SAW scores technique and TOPSIS [10][11][14] according to consensus technology, a comparative evaluation is needed to find out which one can best satisfy all decision-maker. [4] introduced a performance indicator called group similarity index (GSI). The consensus technique choosing can achieve utilizing the follows:

Step1) Compute rank correlation for every group outcome

$$\rho = 1 - \frac{n\sum_{i=1}^{m} S_i^2}{m^3 - m};\ i = 1,2, \dots, m. \quad (16)$$

where S_i is differences between levels for the alternative A_i.

The rank correlations every group results and consequence O_q produced by each decision-makers D_q acquired through applying (16) as

$$\mathrm{RC}(O_{S1})_q = \rho\left(O_{S1}, O_q\right); q = 1,2, \dots, n \quad (17)$$

$$\mathrm{RC}(O_{S2})_q = \rho\left(O_{S2}, O_q\right); q = 1,2, \dots, n \quad (18)$$

$$\mathrm{RC}(O_{S3})_q = \rho\left(O_{S3}, O_q\right); q = 1,2, \dots, n \quad (19)$$

$$\mathrm{RC}(O_S)_q = Average \sum_{i=1}^{3} \mathrm{RC}(O_{Si})_q, (i = 1,2,3) (20)$$

$$\mathrm{RC}(O_T)_q = \rho\left(O_T, O_q\right); q = 1,2, \dots, n (21)$$

Step2) Compute the group similarity index

The GSI for every group consequence is acquired (22) with (23) through the average rank correlation as

$$\mathrm{GSI}(O_S) = \left(\sum_{q=1}^{n} RC(O_S)_q\right)/n \quad (22)$$

$$\mathrm{GSI}(O_T) = \left(\sum_{q=1}^{n} RC(O_T)_q\right)/n \quad (23)$$

Step3) Using GSI fusion

III. NUMERICAL EXPERIMENT

A) By Proposed Approach

Suppose an example of the new consensus model based on TOPSIS through GSI for MAGDM application, we are construct one matrix is group decision problem according to 8 alternatives (by A represent) ($A_{1,}A_{2,\dots}A_8$) and 6 decision makers (by D represent) in the group ($D_{1,}D_{2,\dots}D_6$) as following:

Matrix of Group Decision Problem

A\D	D_1	D_2	D_3	D_4	D_5	D_6
A_1	7	1	0	3	2	5
A_2	5	2	1	4	1	3
A_3	1	3	7	1	3	4
$A_{4,}$	2	0	2	3	2	7*
A_5	1	5	4	7	7	2
A_6	0	2	3	2	4	1
A_7	4	4	2	5	5	0
A_8	3	7	5	0	0	1

Single rank results from every decision-maker acquired where their own decision matrix (7) with use of the preferred method for ranking (8), and evolved matrixR_q in Table 1. Table 2 focus on rank score evolved matrix V through application of (9), (10) on Table 1. Applying (11)-(15) in Table 2, concentrated ranking score F_i (i=1, 2, …., m) is planned from every assigned decision alternative $A_i(i = 1, 2, \dots, m)$. Alternatives A_i are ranked according to concentrated ranking score F_i to acquire group consequence. Table 3. Shows the ranking acquired through the TOPSIS according to consensus technique additive AOMs with SAW methods through GSI fusion.

Phase 1) Building the weight normalization matrix

Assigned weight of 1,$\sum_{i=1}^{n} w_i = 1$, then we set value $w_1 = 0.2, w_2 = 0.2, w_3 = 0.2, w_4 = 0.2, w_5 = 0.1, w_6 = 0.1$.

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Table1. Weight Normalization Matrix

A\ D	D_1	D_2	D_3	D_4	D_5	D_6
A_1	1.4*	0.2	0–	0.6	0.2	0.5
A_2	1.0	0.4	0.2	0.8	0.1	0.3
A_3	0.2	0.6	1.4*	0.2	0.3	0.4
$A_{4,}$	0.4	0–	0.4	0.6	0.2	0.7*
A_5	0.2	1.0	0.8	1.4*	0.7*	0.2
A_6	0–	0.4	0.6	0.4	0.4	0.1
A_7	0.8	0.8	0.4	1.0	0.5	0–
A_8	0.6	1.4*	1.0	0–	0–	0.1

Note: * indicates the most preferred (best) alternative, - indicates the least preferred (worst) alternative.

Step1) Single the rank results from every decision-maker acquired their own decision matrix (7), preferred ranking method through (8), and evolved matrix R_q in Table 2

Table2. Ranking Matrix from individual

A\ D	D_1	D_2	D_3	D_4	D_5	D_6
A_1	1	7	8	5	6	3
A_2	3	6	7	4	7	5
A_3	7	5	1	7	5	4
$A_{4,}$	6	8	6	5	6	1
A_5	7	3	4	1	1	6
A_6	8	6	5	6	4	7
A_7	4	4	6	3	3	8
A_8	5	1	3	8	8	7

Step2) Table3-1 highlights the rank score matrix generated through applying (9) in Table 2.

Table3-1.Ranking Score Matrix

A\ D	D_1	D_2	D_3	D_4	D_5	D_6
A_1	7	1	0	3	2	5
A_2	5	2	1	4	1	3
A_3	1	3	7	1	3	4
$A_{4,}$	2	0	2	3	2	7
A_5	1	5	4	7	7	2
A_6	0	2	3	2	4	1
A_7	4	4	2	5	5	0
A_8	3	7	5	0	0	1

Table3-2 highlights the rank score matrix generated through applying (10) in Table 2.

Table3-2. Ranking Score Matrix

A\ D	D_1	D_2	D_3	D_4	D_5	D_6
A_1	7	1	0	3	2	5
A_2	5	2	1	4	1	3
A_3	1	3	7	1	3	4
$A_{4,}$	2	0	2	3	2	7
A_5	1	5	4	7	7	2
A_6	0	2	3	2	4	1
A_7	4	4	2	5	5	0
A_8	3	7	5	0	0	1

Phase2) Consensus Technique Evaluation

Step1) Building matrix

Applying (1) and based on Table 1 to building matrix, we find the minimum rating for each candidate (attribute), and then choose the maximum among the minimums. The $A^+ = \{A_i | \max_i \min_j r_{ij}\}$ outcomes as shown on $Table4 - 1$:

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Table4-1.Attitude Oriented Method matrix (Max-Mim)

A \ D	D_1	D_2	D_3	D_4	D_5	D_6	min	Score S_1
A_1	7	1	0	3	2	5	0	
A_2	5	2	1	4	1	3	1	max
A_3	1	3	7	1	3	4	1	max
$A_{4,}$	2	0	2	3	2	7	0	
A_5	1	5	4	7	7	2	1	max
A_6	0	2	3	2	4	1	0	
A_7	4	4	2	5	5	0	0	
A_8	3	7	5	0	0	1	0	
Candidate	A_2,A_3,A_5							

Kernel:{A_2,A_3,A_5} =1,Candidate: A_2,A_3,A_5.
Applying (2) and based on Table 1 to building matrix, we find the maximum rating for each candidate (attribute), and then choose the maximum among the maximum. The $A^+ = \{A_i | \max_i \max_j r_{ij}\}$outcomes as shown in Table 4-2:

Table4-2.Building Attitude Oriented Method matrix (Max-Max)

A \ D	D_1	D_2	D_3	D_4	D_5	D_6	max	Score S_2
A_1	7	1	0	3	2	5	7	max
A_2	5	2	1	4	1	3	5	
A_3	1	3	7	1	3	4	7	max
$A_{4,}$	2	0	2	3	2	7	7	max
A_5	1	5	4	7	7	2	7	max
A_6	0	2	3	2	4	1	4	
A_7	4	4	2	5	5	0	5	
A_8	3	7	5	0	0	1	7	max
Candidates	A_1,A_3A_4, A_5, A_8							
Note: * indicates the most preferred (best) alternative. - indicates the least preferred (worst) alternative.								

Kernel: $\{A_1, A_3, A_4, A_5, A_8\} = 7$, Candidates: A_1,A_3A_4, A_5, A_8.

Step2) Simple Additive Weight method (SAW)

Applying (3) and (4), based on Table 1 to building SAW method matrix, we find the rating for each candidate (attribute), and then choose the maximum among the attributes. The outcomes as shown in Table 5:

Table5. Rank of SAW

	$V(A_1)$	$V(A_2)$	$V(A_3)$	$V(A_4)$	$V(A_5)$	$V(A_6)$	$V(A_7)$	$V(A_8)$
Score S_3	2.9	2.8	3.1	2.3	4.3	1.5	3.5	3.1
Rank	5	6	3	7	1	8	2	3
Candidates	$A_5 \succ A_7 \succ A_3 = A_8 \succ A_1 \succ A_2 \succ A_4 \succ A_6$							

Rank: $V(A_5) \succ V(A_7) \succ V(A_3) = V(A_8) \succ V(A_1) \succ V(A_2) \succ V(A_4) \succ V(A_6)$

Kernel:$A_5 = 4.3$, Candidates: $A_5 \succ A_7 \succ A_3 = A_8 \succ A_1 \succ A_2 \succ A_4 \succ A_6$ are chosen for the position.

Phase 3) Compute rank correlation for every group outcome using TOPSIS

By applying (8)-(12) based on Table1, the overall score is computed for every assign decision alternative. The set of alternatives are ranked according to overall ranking score to acquire group rank results. Table4 illustrate rank score with group rank acquired through TOPSIS according to consensus technique with cumulative AOM and SAW methods through GSI fusion.

Step1) Building the Matrix based Table 3-1, 3-2

Step2) Weighted Normalization

Table6. Weight Normalization Matrix

A \ D	0.2	0.2	0.2	0.2	0.1	0.1
	D_1	D_2	D_3	D_4	D_5	D_6
A_1	1.4*	0.2	0–	0.6	0.2	0.5
A_2	1.0	0.4	0.2	0.8	0.1	0.3
A_3	0.2	0.6	1.4*	0.2	0.3	0.4
$A_{4,}$	0.4	0–	0.4	0.6	0.2	0.7*
A_5	0.2	1.0	0.8	1.4*	0.7*	0.2
A_6	0–	0.4	0.6	0.4	0.4	0.1
A_7	0.8	0.8	0.4	1.0	0.5	0–
A_8	0.6	1.4*	1.0	0–	0–	0.1
Note: * indicates the most preferred (best) alternative, - indicates the least preferred (worst) alternative.						

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Step3) Positive-Ideal and Negative-Ideal Solution
$G^* = (1.4^*, 1.4^*, 1.4^*, 1.4^*, 0.7^*, 0.7^*)$, $G^- = (0^-, 0^-, 0^-, 0^-, 0^-, 0^-)$.
Step4) Separation Measure

The separation measure from A^* are computed first: $G_i^* = \sqrt{\sum_{q=1}^{s}(V_{iq} - V_q^*)^2}$, show in Table 7.

Table7. Calculated Results of the positive–ideal solution of TOPSIS

G_i^*	G_{A1}^*	G_{A2}^*	G_{A3}^*	G_{A4}^*	G_{A5}^*	G_{A6}^*	G_{A7}^*	G_{A8}^*
score	2.08	1.86	1.94	2.20	1.48	2.24	1.66	1.90
Rank	3	6	4	2	8	1	7	5
Candidates	$A_6 \succ A_4 \succ A_1 \succ A_3 \succ A_8 \succ A_2 \succ A_7 \succ A_5$							

Candidates: $A_6 \succ A_4 \succ A_1 \succ A_3 \succ A_8 \succ A_2 \succ A_7 \succ A_5$.

The separation measure from A^- are compute first: $G_i^- = \sqrt{\sum_{q=1}^{s}(V_{iq} - V_q^-)^2}$, show on Table 8.

Table8. Calculated Results of TOPSIS

G_i^-	G_{A1}^-	G_{A2}^-	G_{A3}^-	G_{A4}^-	G_{A5}^-	G_{A6}^-	G_{A7}^-	G_{A8}^-
score	1.62	1.39	1.62	1.10	2.04	0.72	1.64	1.82
Rank	4	6	4	7	1	8	3	2
Candidates	$A_5 \succ A_8 \succ A_7 \succ A_1 = A_3 \succ A_2 \succ A_4 \succ A_6$							

Candidates:$A_5 \succ A_8 \succ A_7 \succ A_1 = A_3 \succ A_2 \succ A_4 \succ A_6$.
Step5) Calculate Similarities to Positive-Ideal Solution
All Closeness Index are $F_i^* = \frac{G_i^-}{G_i^* + G_i^-}$, Show in Table 9.

Table9. Closeness Index based TOPSIS

F_{G_i}	$F_{G_{A1}}$	$F_{G_{A2}}$	$F_{G_{A3}}$	$F_{G_{A4}}$	$F_{G_{A5}}$	$F_{G_{A6}}$	$F_{G_{A7}}$	$F_{G_{A8}}$
Index	0.43	0.42	0.45	0.31	0.92	0.24	0.49	0.48
Rank	5	6	4	7	1	8	2	3
Preference	$A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6$							

Preference: $A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6$.
Step6) Rank the preference order
Rank: $\{A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6\}$.
Kernel: A_5 =0.92, preferences: $A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6$.

Phase 4) Using GSI fusionintervention

For the availability of the cumulative AOM and SAW score technique combined with TOPSIS [10][16] according to consensus technique, comparative evaluations need find out conditions that best satisfy all decision-makers, to compute group satisfaction. In this paper, we applied group similarity index (GSI)[12] to intervene the new consensus model based on TOPSIS additive AOM and SAW for the MAGDM. GSI is acquired according to rank result similarities and group result with single decision-maker results. The group result acquired by the cumulative AOM and SAW method defined as O_S and group consequence acquired through TOPSIS aggregation technique defined as O_T. Rank results acquired through decision-maker D_q can be denoted as O_q. The consensus technique choice can be achieved by utilizing the followings:
Step1) Compute rank correlation for every group outcome
Step2) Calculate group similarity index (GSI)
Step3) Results of Group similarity index
For the assigned multi-attribute group decision-making problem, consensus technology and higher GSI should be selected, in which the corresponding rank result will be the group result.as illustrated in Table 10.

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Table10. Results of Group Similarity Index (GSI)

consensus technique	Rank Correlation RC_q(q=1, 2, …,8)								
	O_1	O_2	O_3	O_4	O_5	O_6	O_7	O_8	GSI
AOMs and SAW(O_S)	4.03	4.01	4.07	3.9	3.99	3.73	4.16	4.07	$\text{GSI}(O_S) = 15.92$
TOPSIS(O_T)	0.43	0.42	0.45	0.31	0.92	0.24	0.49	0.48	$\text{GSI}(O_T) = 0.29$
Average$\frac{O_S}{O_T}$	9.3	9.5	9.0	1.25	4.3	15.5	8.48	8.47	1.05
Rank	3	2	4	8	7	1	5	6	
Priority of candidate	$O_6 \succ O_2 \succ O_1 \succ O_3 \succ O_7 \succ O_8 \succ O_5 \succ O_4$								

Priority of candidate: $O_6 \succ O_2 \succ O_1 \succ O_3 \succ O_7 \succ O_8 \succ O_5 \succ O_4$.

B) Comparative with existing similar research

In this section, based on literature reviews developed new consensus model, which comparative with existing similar research about [10][11][12], respectively. show as Table 11:

Table11. Comparative with existing similar research

No	Authors\Alternative	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
1	Liu (2013)	0.43	0.42	0.45	0.31	0.92	0.24	0.49	0.48
	Order of alternatives	$A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6$							
2	Wang (2016)	2.44	2.40	2.51	2.20	3.07	1.91	2.66	2.52
	Order of alternatives	$A_5 \succ A_7 \succ A_8 \succ A_3 \succ A_1 \succ A_2 \succ A_4 \succ A_6$							
3	Chakraborty et al.(2018)	51	50	48	51	32.6	54	104	39.5
	Order of alternatives	$A_7 \succ A_6 \succ A_4 = A_1 \succ A_2 \succ A_3 \succ A_8 \succ A_5$							
4	This paper Proposed (2021)	9.3	9.5	9.0	1.25	4.3	15.5	8.48	8.47
	Order of alternatives	$A_6 \succ A_2 \succ A_1 \succ A_3 \succ A_7 \succ A_8 \succ A_5 \succ A_4$							

The comparative results were list in Table 11, in which as it could be observed the priority selection madeby the proposed method is comparable with the three exist methods which areexpressive in themself and approves of the reliability and validity of the proposed method.

IV. CONCLUSION

Group decision-makers use new consensus technology to determine the choice of strategy. The consensus technology method on similarity provides the best overall group satisfaction [7][13]. Numerical experiment outcome focuses on the advantage of new TOPSIS according to integrated AOMs, with SAW scores consensus technique through GSI fusion in generating group ranking results, which yield significant option in mixed practical group decision problem settings. The numerical experiment results in this paper highlight the advantages of TOPSIS combined with AOM and SAW scoring consensus technology (through GSI fusion) in generating group ranking results, which is an important choice in the setting of group decision problems using multiple methods. Ultimately, it is proved that compared with other methods, our proposed is the most rigorous andPreciseness.

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