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| RESEARCH ARTICLE

Group Decision Making Model for Evolution and Benchmarking Explosive Ordnance Risk Education (EORE) Messages in Iraq Based on Distance Measurement and Spherical Fuzzy Set

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| ABSTRACT
Explosive Ordnance Risk Education Messages (EORE) is a multi-criteria decision-making problem (MCDM) based on three steps, namely, the identification of distinct evolution criteria, the significance criteria, and the variation of data. Because it makes use of a more sophisticated classification technique, the group decision method (GDM) based on weighted arithmetic mean (AM) to prioritize (EORE) messages is the proper approach. In contrast to GDM, which explicitly weights each criterion, GDM implicitly weights each alternative's criterion values. With the help of the new hybrid method weighting technique, we can overcome this theoretical difficulty by providing explicit weights for criteria generated with zero inconsistencies and combined with the new distance-based weighting method. SFS (spherical fuzzy set) is used in hybrid methods, although it can only be used to solve the ambiguity associated with the theoretical concerns outlined above.

| KEYWORDS

Explosive Ordnance Risk Education, Mine Action, Multi Criteria Decision Making, Hybrid Methods, Distance Measurement, Spherical Fuzzy Set

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1. Introduction

1.1 Background

An important branch of mathematics known as operations research (OR) is decision theory, which is based on MCDM/MCDA (multi-criteria decision making/ multi-criteria decision analysis). If there are several factors to consider, the optimal choice may be obtained with the use of a multi-criteria model for decision makers (DM). Real-world conflict scenarios may be assessed using (MCDM) based on several quantitative and qualitative criteria in dangerous, particular, and unpredictable contexts [Kashid, 2019]. Numerous criteria (attributes), contradictory criteria, non-comparable criteria, and ill-defined issues are all hallmarks of the MCDM approach to problem solving [Mladineo, 2016]. To solve (MCDM) issues, one must first identify the optimum or most suitable solution, then rank the alternatives according to how bad they are, and so on. In the years thereafter, several strategies have been created to assist decision-makers in resolving complicated issues, including frequently competing and qualitative criteria (Guitouni, 1998) .To address a broad range of issues, MCDM's fundamental concept has been used in a variety of sectors [Knezic, 2006]. Many OR techniques, decision models, and geographic data management systems are now part of sophisticated decision support systems that include multi-parameter modeling [Mladineo, 2003].

Iraq has a huge number of landmines and ERW (Explosive Remnants of War) as a consequence of its long history of internal and foreign fighting. Iraq now has the greatest degree of contamination from EO (Explosive Ordnance) in the world, and as a result, it covers a broad geographic region. According to DMA (Directorate for Mine Action-Iraq), many kinds of landmines (such as anti-personnel landmines, anti-tank landmines, napalm nests, etc.) have been planted. [1].

EO, that include (Mines, Cluster Munitions, Unexploded Ordnance, Abandoned Ordnance, Booby Traps, Other devices/ as defined by CCW APII, Improvised Explosive IEDS) [2] have affected the daily lives of individuals and communities, as well as sustainable development and reconstruction operations at every level. Because of the minefields left by the first Gulf War in the 1980s, military activities from 1990 to 1991, and several wars after 2003 [3].

Because of the high rates of contamination with remnants of war in Iraq in particular and the rest of the world in general, which have been affected by (EO) as a result of conflicts and conflicts, the term originated called MAH (Mine Actions for Humanitarian), and the international standards of the United Nations defined it as "MAH" as "the activities of mine action for humanitarian purposes." which aims to mitigate the social, economic and environmental impacts of mines and other explosive remnants of war." One of the relevant standards indicated that mine action is not limited to mine clearance but rather means people and communities and how they are affected by landmines and pollution resulting from explosive remnants of war and others [4,5].

The EORE activity, which is the most important activity to mine action for humanitarian purposes, refers to a group of activities that seek to reduce the risk of injury to individuals as a result of exposure to explosive ordnance by raising awareness of all segments of society (women, girls, men youth) according to their different weaknesses, role and need in order to promote behavioral change in them. EORE activities include (dissemination of information, education, and training). It has been called by several terms, including [mine risk education (MRE), risk education (RE), and the last term (EORE)] [6,7].

One of the main objectives of this activity to [8]

- Raising awareness of the dangers caused by explosive ordnance and influencing the behavior of individuals to help them avoid injuries by changing their behavior to safe behavior.
- Raising awareness in contaminated areas that require some time to be cleaned of explosive ordnance and dangers.
- Allow the normal activities necessary for social and economic recovery to be carried out despite the threat of an explosive hazard. [9].

  There are three basic goals of mine risk education: decreasing the mortality and damage caused by mines/explosive remains of war, mitigating the social and economic repercussions of mines/explosive remnants, and stimulating the establishment of mine risk education programs (supporting development) [10].

  EORE plays an important role in mine action through the information that is exchanged with community members and the relationship that is developed between mine-affected communities; the most important practical contribution that the EORE program can make within the mine action program to protect the affected population of mines are [11] :

  - Communication of safety messages.

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[1] DMA (Directorate for Mine Action-Iraq). (2017). Convention on the Prohibition of the Use, Stockpiling, Production, and Transfer of Anti-Personnel Mines and on Their Destruction - Request for Extension of the Deadline for Commitment to Implement Article 5 of the Convention on the Destruction of Anti-Personnel Mines.

[2] IMAS (International Mine Action Standards) 04.10. (2019). Glossary of mine action terms, definitions, and abbreviations.2nd edition. 1, January 2003. Amendment 10, February 2019.

[3] UNMAS (United Nations Mine Actions Service). (2011). Portfolio of Mine Action Projects.

[4] UNMAS (United Nations Mine Actions Service). (2003). International Mine Action Standard 04.10: Glossary of Terms and Definitions. Amended 2009. Geneva: United Nations Mine Action Service. Available at:http://www.mineactionstandards.org/fileadmin/user_upload/MAS/documents/imasinternational-standards/english/series-04/IMAS-04-10-Ed2-Am4.pdf Last accessed 09/11/10.

[5] IMAS (International Mine Action Standards) 04.10. (2009). Glossary of mine action terms, definitions, and abbreviations (online). Edition 2010, Definition 3.173. Available from: http://www.mineactionstandards.org/ (accessed: 20 July 2013).

[6] IMAS (International Mine Action Standards) 12.10. (2010). Mine/ERW Risk Education, Second Edition (online). Available from: http://www.mineactionstandards.org/ (accessed: 25 June 2013) .

[7] Russo, G. (2010). Gender Guiding Principles for Mine Action Programmes: United Nations.

[8] GICHD (Geneva International Centre for Humanitarian Demining). (2007). A guide to mine action and explosive remnants of war

[9] NATO (North Atlantic Treaty Organization). NATO Guidelines for Gender Mainstreaming in Mine Action: https://salw.hq.nat0.int/Content/resources/NGforGM_EN_Mine Action.pdf.

[10] GICHD (Geneva International Centre for Humanitarian Demining). (2014). Guide to Mine Action.

[11] IMAS (International Mine Action Standards) 12.10. (2013). Amendment 2, Mine/ERW Risk Education (RE).

- Collect data from at-risk groups.
- Social Media.

2. Literature review

(EORE) has been the subject of a number of investigations by scholars and international organizations.

Commons has developed educational programs utilizing customized software based on the risk education process to enhance awareness of people's safety from mine dangers and give them basic information and skills to minimize hazardous behavior and battle the negative impacts of landmine explosions; for Mine Risk Education programs (MRE), an environmental approach offers theoretical and detailed background knowledge. [12].

By adopting special programs to support the mine search and investigation process and mine risk education must become an integral part of the thought processes of mine action workers, Filippino demonstrated the importance of a positive exchange of important information that is the backbone of any mine action program, and mine risk education must become an integral part of mine action thought processes [Filippino, 2000].

In an empirical study of MRE practices based on data collected during the implementation of the (MRE) program, Durham & Sisavath focused on effective health education and promotion in the field of (MRE) and found that (MRE) practices need to be replaced with techniques that take into account the economic, social, and political conditions faced by communities at risk [Durham, 2005].

To demonstrate how effective MRE Mine Risk and the need for discipline have been shown in several nations, Baaser**,** & et al., highlighted the significance (MRE), the role (MRE) plays in mine action, and researched the impact (MRE) and measurements of its efficacy via a particular program [Baaser, 2009].

As a preliminary assessment of the (EORE) and a summary of the expected and current sector needs was provided by (GICHD), it is highly recommended that priority be given to including these actors in future discussions and research using special software based on decision modeling, taking into account the risks, as more respondents from the local population NGOs and national authorities cannot be consulted. [13].

A quantitative task is only possible if you can identify the lessons learned and the challenges you faced by analyzing data from the period between 2012 and 2019, which is what Valencia & et al. did by providing a detailed description of EO victims and (EORE) messages in Colombia between 2012 and 2019. Additionally, it is necessary to do qualitative research to see whether the methods used in Afghanistan and Somalia have had the intended effect [Valencia, 2009].

(GICHD), as an example, highlighted good practices and emerging solutions in facing the challenges (risk education for improvised explosive devices, risk education in complex urban environments and inaccessible areas) by collecting data from multiple sources, innovating, forging cross-sector partnerships, constructing evidence, engaging at-risk communities and building evidence donors, mine action sector organizations, and the international community must work together to keep this process moving forward [GICHD, 2020].

3. Methodology

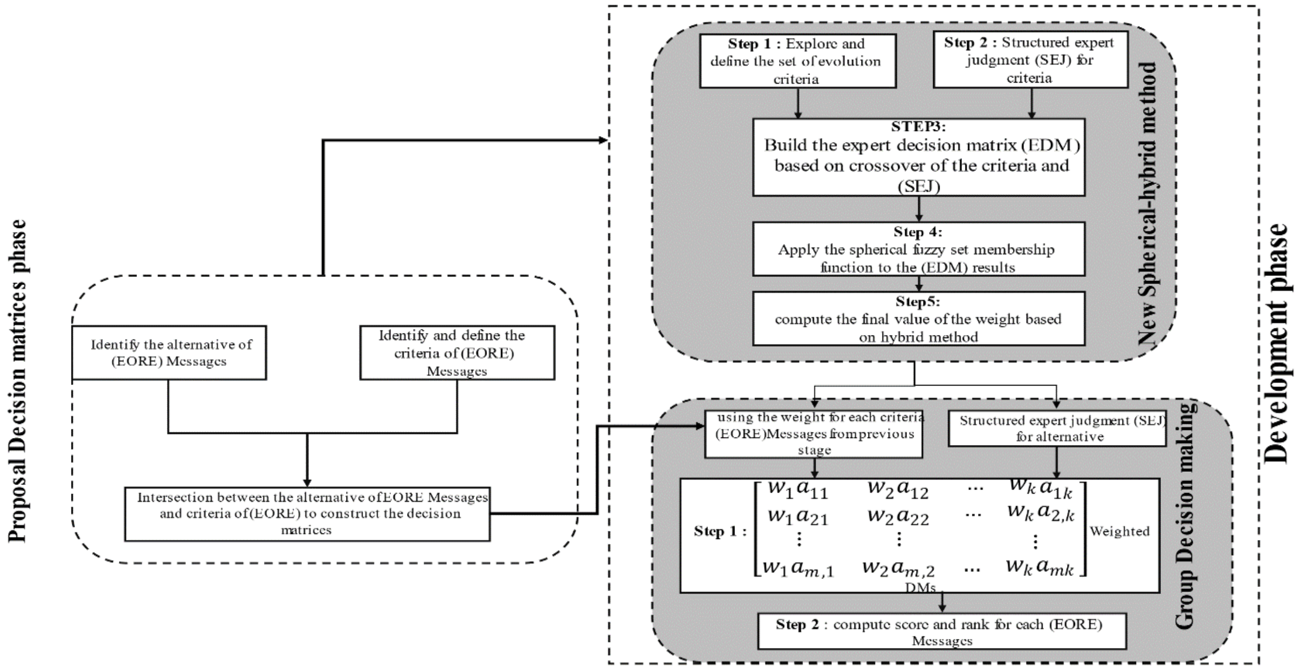
Methodologies for analyzing and measuring the EORE messages are outlined in this portion of the paper. There are two steps in this approach. Decision matrix proposals are offered in the first phase, based on (EORE) messages Twenty and the eight core ideas for the (EORE) system (criteria). SFS and TOPSIS are discussed in conjunction with the projected expansion of spherical fuzzy sets

(SFS) and the group decision making approach in the second phase of development. The stages of the process are shown in Figure 1.

[12] Commons, J. S. (1998). Mozambique Mine Awareness Education Module. Humanitarian Demining Centre. http://commons.lib.jmu.edu/cisr-studiesreports/11.

[13] GICHD (Geneva International Centre for Humanitarian Demining). (2019). Explosive Ordnance Risk Education: Sector mapping and needs analysis.

Figure 1: Methodology phases



3.1 Proposal of Decision Matrices (DM) phase

In the suggested framework, (DM) is seen as the most important component. Evolution and benchmarking of (EORE) messages are supported by (DMs). It is given utilizing the intersection of alternatives and criteria (DM). In each DM, the assessment criteria and alternative messages should be established as the (twenty) EORE messages (Secondary kind of Explosive Ordnance Risk Education).

In reference to (EORE) messages, (eight) criteria are specified [14]:

Language and symbols employed are culturally, linguistically, and socially suitable, taking into account different reading levels and the wide range of linguistic abilities seen across different cultures (C1).

Has to take into account all social, cultural, and age levels and is consistent with the environment and social customs of the groups addressed(C2).

Taking into account the political, social, and economic changes in the danger of ordnance and explosive materials and the environment, as well as the capacity to react to EORE in an appropriate way, is relevant (C3)

In the real world (C4), the messages must be good and have the intended effect on the target audience, and they should help raise the quality of living for individuals, families, and communities as a whole.
To be persuasive (C5), your message must be acceptable and have a favorable impact on the intended audience, motivating them to do the action you seek. The message does not need to be long, but it must be clear and reach the widest possible audience.

Geographically the words of awareness must reach as many people as possible, and they must do so in all of the impacted locations. This is called "coverage" (C6).

Making Efforts to Reach Specific Groups (C7): Its goal is to contact as many people as possible who have been harmed by explosive ordnance, regardless of gender, age, or ethnicity, by using a variety of techniques and methodologies.

[14] Smith, A., Generic SOPs - Handbook for Humanitarian Demining (2nd edition 2009). Now in 2019, Global SOPs. Distributed freely and widely downloaded (many well-known HMA groups use some of the content).https://www.nolandmines.com/Generic_SOPs/V2.0%20GENERIC%20SOPs%20xAnnex%20A%20MRE.pdf

Plausible Affordability (C8): A low-cost, low-investment, and easy-to-maintain technique is indicated by the procedures and tools/instruments used. In addition, it is generally inexpensive to operate, maintain, repair, and replace. As a result, the anticipated outputs and effects of the utilization are substantial and cost-effective.

There are other (Twenty) alternatives that reflect the Secondary kind of Explosive Ordnance Risk Education that follows the Explosive Ordnance Risk Education Activity. [15, 16]**:**

A1: Information, **A2**: Resource Allocation, **A3**: Society Mapping, **A4**: Protection Processes, **A5**: From Child to Child, **A6**: Prepare Society Leaders, **A7**: Sport Messages, **A8**: Radio, **A9**: Posted Signs, **A10**: Friend to Friend, **A11**: Music, **A12**: T.V, **A13**: School, **A14**: social media, **A15**: Video, **A16**: Training of Vulanters, **A17**: Release of Cleared Land, **A18**: Lectures and Seminars, **A19**: Support of Survey and Mine Clearance, **A20**: Theater.

3.2 Development phase

A dynamic and easy-to-use distribution technique for (EORE) communications is necessary because of the diverse policies implemented by different companies. There are a variety of features and qualities that seem to be used by various firms, which indicates that the allocation technique is always changing. Two (MCDM) approaches, namely weighting and ranking, were employed to construct a dynamic (EORE) selection method. When it comes to ranking, group decision making using spherical fuzzy sets is employed in conjunction with a novel hybrid approach. The (EORE) message standard may be evaluated in accordance with the demands of the business by applying subjective judgements to the weighing and ranking processes. For example, experts might prioritize a set of standards and compare these standards to other standards depending on the conditions of a certain business. With the suggested approach, every organization's policy environment may be dynamically adapted to the method's recommendations. Five phases are required for the weighted hybrid technique, whereas two stages are required for the ranking method. Each approach and its corresponding mathematical expressions will be explained in detail in the following sections.

3.2.1 EORE messages criteria using a new spherical- hybrid method

Each criterion weight is calculated using the hybrid technique in this section using the indicated dispersed criteria. Details of the hybrid method's five phases are provided below.

Step 1: The first step is to determine the criteria for assessment. Two procedures are required for this phase. Identifying and presenting a set of predetermined criteria is the first step in the procedure. The second step is to categorize and classify all of the standards that have been gathered. As will be explained in the following stage, the same panel of experts will analyze the criteria that have been created and chosen.

Step 2: Expert Judgment Structured (EJS). A group of five experts was assembled to assess and identify the relative relevance of the preceding step's criteria. The process of selecting and nominating members for the (EJS) expert panel started after the investigation and establishment of a list of quasi-experts. All members of the SEJ team were then asked to fill out an assessment form, which was subsequently transformed into its digital version.

Identify an Expert - There are no such things as undisputed experts in any field. Some individuals use "experts" to describe those who have worked in the area for a long time and are considered knowledgeable about the subject matter. To separate them from "normative experts," i.e., experts in statistics and subjective probability, these people are sometimes referred to as "domain" experts or "substantial" experts in the literature. A bibliometric examination of all authors and co-authors in the present work lists the EORE message criterion, which is used to choose experts.

Select experts: Select the experts who will take part in the investigation when the group of specialists has been confirmed. As a general rule, the most qualified specialists should be picked based on the resources available. Five experts were chosen for each section of the research. Personal contact is made with each of the possible experts selected at the expert assessment stage to see whether they are interested in joining the expert group and if they see themselves as potential experts there. The five experts will serve as members of the expert review panel after the list of qualified applicants is finalized.

Developing an evaluation form: Evaluation forms are important since they are used to get agreement from experts. The reliability and validity of the questionnaire were examined prior to finishing the assessment form in this research. The form was examined by the five experts who had been chosen in the previous round.

[15] DMA (Directorate for Mine Action-Iraq). (2021). Mine Risk Education Report. (IMSMA) information Management System for Mine Action. (MRE) Mine Risk Education From – Version 22.

[16] IMAS (International Mine Action Standards) 12.10. (2020). Amendment 3, Explosive Ordnance Risk Education (EORE).

Define the level of importance: Each criterion is assigned a value on a five-point Likert scale, and the five groups of experts are asked to rank the importance of each one. Theory-based reasoning is seldom used when rejecting alternative response scale lengths from a study. A continuum rather than a restricted set of views is shown in these selections. Five points have become the standard on the Likert scale, probably because this number provides enough options (only two or three options mean only measuring the direction and not the strength of opinions) and makes it easier for respondents to drive (rarely people have a clear understanding of the difference between points 8 and 9 on the 11-point agreement-disagreement scale that you answered the questionnaire with). The Likert project and other rating scales' statistics are less accurate when scale points are dropped to fewer than 5 or extended to 7, but these studies give no reason to favor a five-point scale over a seven-point scale.

Converting language scales to equivalent numerical scales: This is why preference values cannot be utilized for further analysis until they are translated to numerical values, as was previously stated: Consequently, this stage converts each expert's Language Likert Scale score for the importance/importance of each criterion into a numeric value equal (Table 1). It is assumed that EORE message standards have varying degrees of relevance and should be given by experts when using the Likert-scale. To give relevance levels, use language scales that assist the assessment of the standard procedure. "Not important" to "extremely significant" is the range of significance. However, until the elements are transformed into numerical values, it is impossible to extract relevant information from the language scores when further analysis of the scores produced by specialists is necessary. EORE message standard's significance level may be measured using each language term's equivalent value in this research.

Table 1: Five-point of linguistic terms

Numerical scale	**linguistic**
1	Very important
2	important
3	Average important
4	slight important
5	Not important

Step 3: Create a matrix of expert judgments (EDM). How to choose experts and their preferences were discussed in the previous phase. Message standards and alternatives will be compiled into an (EDM) in this stage. It is possible to bridge the EORE message standard with the EJS panel in this (EDM). Attribute (C_j) interacts with each selected expert (E_i), where each expert scores the proper significance level for each criterion, as indicated in Table 2. EDM is utilized in the next subsections to analyze the suggestions further.

Table 2: EDM

Experts / **Criteria**	**E1**	**E2**	**E3**	…	**Em**
C1	(E1/ C1)	(E2/ C1)	(E3/ C1)	…	(En/ C1)
C2	(E1/ C2)	(E2/ C2)	(E3/ C2)	…	(En/ C2)
…	…	…	…	…	…
Cn	(E1/ Cn)	(E2/ Cn)	(E3/ Cn)	…	(Em/ Cn)

Step 4: Spherical membership should be used. Defuzzification of the (EDM) data using an SFS membership function and further defuzzification are used in this stage to increase the accuracy and simplify the further analysis of the (EDM). Since assigning a precise preference rate to any standard is difficult in (MCDM), this issue is ambiguous and imprecise. It is advantageous to utilize fuzzy numbers instead of clear numbers in order to tackle the issue of inaccuracy and uncertainty **[**Akram, 2019**]** by determining the relative value of qualities (standards). Defuzzification equations and mathematical procedures are shown in Figure 2 after (SFS) membership.

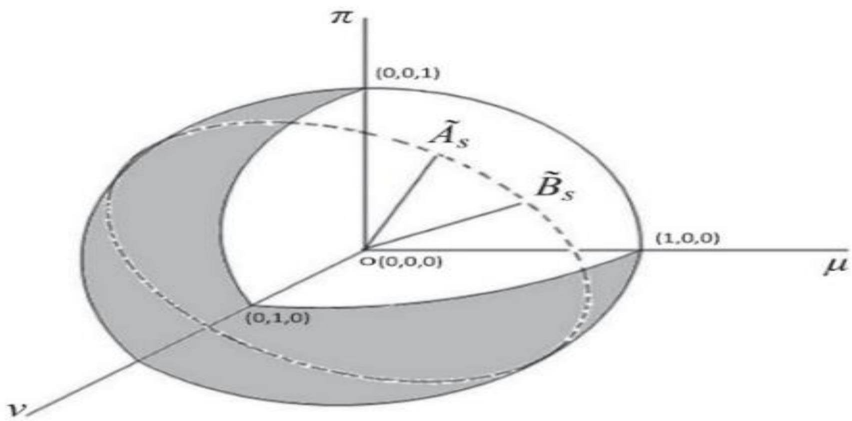


Figure 2: Membership of SFS

The SFSs is presented by [Alsalem,, 2021] and expressed in the following equations:

SFS $\tilde{A}_s$ of the universe of discourse U is given by:

$$\tilde{A}_s = \{\langle \mathrm{u},\ \mu_{\tilde{A}_s}(u),\ \nu_{\tilde{A}_s}(u),\ \pi_{\tilde{A}_s}(u)\rangle \mid u\ \in\ \mathrm{U}\} \tag{1}$$

Where

$$\mu_{\tilde{A}_s}(u): U\ \to [0,1]\ , \nu_{\tilde{A}_s}(u): U\ \to [0,1], \pi_{\tilde{A}_s}(u): U\ \to [0,1]$$

And

$$0 \le \mu^2_{\tilde{A}_s}(u) +\ \nu^2_{\tilde{A}_s}(u) +\ \pi^2_{\tilde{A}_s}(u) \le 1\ \forall_u \in\ \mathrm{U} \tag{2}$$

For each u, $\mu_{\tilde{A}_s}(u), \nu_{\tilde{A}_s}(u)$, and $\pi_{\tilde{A}_s}(u)$ represent the degrees of membership, non-membership and hesitancy of u to $\tilde{A}_s$, respectively. $\chi_{\tilde{A}_s} = \sqrt{(\ 1 - \mu^2_{\tilde{A}_s}(u) -\ \nu^2_{\tilde{A}_s}(u) -\ \pi^2_{\tilde{A}_s}(u))}$ represents the refusal degree.

The SFS operations used in this paper are represented in the following definitions [Alsalem, 2021]:

Let SFSs be $\tilde{A}_s = (\mu_{\tilde{A}_s}, \nu_{\tilde{A}_s}, \pi_{\tilde{A}_s})$ and $\tilde{B}_s = (\mu_{\tilde{B}_s}, \nu_{\tilde{B}_s}, \pi_{\tilde{B}_s})$.

Multiplication by a scalar:

$$\lambda \cdot \tilde{A}_s = \left\{ (1 - \left(1 - \mu^2_{\tilde{A}_s}\right)^{\lambda})^{1/2},\ \nu^{\lambda}_{\tilde{A}_s},\ \left((1 - \mu^2_{\tilde{A}_s})^{\lambda} - (1 -\ \mu^2_{\tilde{A}_s} -\ \pi^2_{\tilde{A}_s})^{\lambda}\right)^{1/2} \right\} \text{ for } \lambda \ge 0 \tag{3}$$

Division [Alsalem, 2021]:

$$\tilde{A}_s\ \oslash\ \tilde{B}_s = \left(\left(\frac{\left(\mu^2_{\tilde{A}_s}(2 - \mu^2_{\tilde{B}_s}\right)}{1 - \left(1 - \mu^2_{\tilde{A}_s}\right) \cdot \left(1 - \mu^2_{\tilde{B}_s}\right)} \right)^{\frac{1}{2}},\ \frac{\left(\nu^2_{\tilde{A}_s} - \nu^2_{\tilde{B}_s}\right)^{\frac{1}{2}}}{\left(1 - \nu^2_{\tilde{A}_s} \cdot\ \nu^2_{\tilde{B}_s}\right)^{\frac{1}{2}}}\ , \frac{\left(\pi^2_{\tilde{A}_s} - \pi^2_{\tilde{B}_s}\right)^{\frac{1}{2}}}{\left(1 - \pi^2_{\tilde{A}_s} \cdot\ \pi^2_{\tilde{B}_s}\right)^{\frac{1}{2}}} \right), \tag{4}$$

$$if\, \frac{\mu^2_{\tilde{B}_s}}{\mu^2_{\tilde{A}_s}} \ge \frac{1 - \pi^2_{\tilde{B}_s}\ 1 + \pi^2_{\tilde{A}_s}}{1 - \pi^2_{\tilde{A}_s}\ 1 + \pi^2_{\tilde{B}_s}} \ge 1$$

$$SAM(\tilde{A}_{S1}, \dots, \tilde{A}_{Sn}) =\ \tilde{A}_{S1} +\ \tilde{A}_{S1} + \cdots + \tilde{A}_{Sn}$$

$$= \left\{ \sqrt{\left[1 - \prod_{i=1}^{n}(1 - \mu^2_{\tilde{A}Si})\right]}\ ,\ \prod_{i=1}^{n}\nu_{\tilde{A}Si}\ ,\ \sqrt{\left[\prod_{i=1}^{n}(1 - \mu^2_{\tilde{A}Si}) - \prod_{i=1}^{n}(1 -\ \mu^2_{\tilde{A}Si} -\ \pi^2_{\tilde{A}Si})\right]} \right\} \tag{5}$$

The defuzzied (crisp) value of the SFSs is defined as follows [Alsalem, 2021**]**:

$$Def\ (\tilde{A}_s) = \left(\ \mu_{\tilde{A}_s} -\ \pi_{\tilde{A}_s}\right)^2 -\ \left(\ \nu_{\tilde{A}_s} -\ \pi_{\tilde{A}_s}\right)^2 \tag{6}$$

Using the assumption that the fuzzy number is the variable for each of the expert's standards, Table 3 explains how to convert all linguistic variables to (SFS). Therefore, an expert (EORE message expert) may be necessary to assess the relevance of the (EORE) message standard within the variables measured by the language scale [Alsalem, 2021].

Table 3: Linguistic terms and their corresponding spherical fuzzy numbers

Linguistic terms	**(μ, v, π)**		
Very important (VI)	0.85	0.15	0.1
Important (I)	0.75	0.25	0.2
Average Important (A)	0.55	0.5	0.25
Slight Important (SI)	0.25	0.75	0.2
Not Important (NI)	0.15	0.85	0.1

Step 5: Calculation of final values for the evaluation criteria's weight coefficients

This step calculates the final values of the weight coefficients for (EORE) messages $(w_1, w_2 \ldots, w_n)^{\mathrm{T}}$ using the fuzzified data from the previous step as follows:

I. Constructing the fuzzy SFS experts matrix.

In this step, we obtain performance value $\tilde{a}_{ij}$ and establish the SFS fuzzy experts matrix $\tilde{E} = [\tilde{e}_{ij}]_{K\times m}$. The SFS fuzzy experts matrix for evaluation of the (EORE) messages criteria can be presented as follows:

$$\tilde{E} = \begin{array}{c} E_1 \\ E_2 \\ \vdots \\ E_k \end{array} \begin{pmatrix} \left(\mu_{E_1}(C_1), v_{E_1}(C_1), \pi_{E_1}(C_1)\right) & \left(\mu_{E_1}(C_2), v_{E_1}(C_2), \pi_{E_1}(C_2)\right) & \cdots & \left(\mu_{E_1}(C_m), v_{E_1}(C_m), \pi_{E_1}(C_m)\right) \\ \left(\mu_{E_2}(C_1), v_{E_2}(C_1), \pi_{E_2}(C_1)\right) & \left(\mu_{E_2}(C_2), v_{E_2}(C_2), \pi_{E_2}(C_2)\right) & & \left(\mu_{E_2}(C_m), v_{E_2}(C_m), \pi_{E_2}(C_m)\right) \\ & \vdots & \ddots & \vdots \\ \left(\mu_{E_k}(C_1), v_{E_k}(C_1), \pi_{E_k}(C_1)\right) & \left(\mu_{E_k}(C_2), v_{E_k}(C_2), \pi_{E_k}(C_2)\right) & \cdots & \left(\mu_{E_k}(C_m), v_{E_k}(C_m), \pi_{E_k}(C_m)\right) \end{pmatrix}$$

Here $E_{ij} = \left(\mu_{E_k}(C_j), \lambda_{E_k}(C_j), \pi_{E_k}(C_j)\right), k = 1,2,\ldots,K$, $j = 1,2,\ldots,m$ Correspondingly, $\left(e_{kj}\right)_{K\times m}$ is defined as spherical fuzzy expert matrix.

II. Determine best and worst evolution of the criteria.

The worst and best evolution of each criterion can be computing according to the following equations:

$$E^+ = \{\langle C_j, \mu_{E^+}, v_{E^+}, \pi_{E^+}\rangle \mid C_j \in C, j = 1,2,\ldots,m\} \quad (7)$$
$$E^- = \{\langle C_j, \mu_{E^-}, v_{E^-}, \pi_{E^-}\rangle \mid C_j \in C, j = 1,2,\ldots,m\} \quad (8)$$

Where

$$\mu_{E^+}(C_j) = \max_{1\le k\le K} \mu_{E_k}(C_j) \quad , \quad v_{\mathcal{A}^+}(C_j) = \min_{1\le k\le K} v_{E_k}(C_j)\,, \qquad \pi_{\mathcal{A}^+}(C_j) = \min_{1\le k\le K} \pi_{E_k}(C_j) \qquad (9)$$

$$\mu_{E^-}(C_j) = \min_{1\le k\le K} \mu_{E_k}(C_j) \quad , \quad v_{\mathcal{A}^-}(C_j) = \max_{1\le k\le K} v_{E_k}(C_j)\,, \qquad \pi_{\mathcal{A}^-}(C_j) = \max_{1\le k\le K} \pi_{E_k}(C_j) \qquad (10)$$

III. Distance from Best and Worst solution

In real-life decision-making problems, generally, there is no spherical optimal solution ($E^+ \notin E$); otherwise, it will be the final choice suitable for multi-criteria group decision-making problems. The worst E^- is the solution to the (MCGDM) problem. The bad choice is ($E^- \notin E$).). Therefore, we continue to define the distance metric to determine the distance between each evolution and the best evolution and the worst evolution. In order to achieve this goal, the normalized Euclidean distance between each evolution of the expert and the best and worst evolution is used as follows:

$$D(E_j, E^+) = \sqrt{\frac{1}{2K}\sum_{k=1}^{K} \left[\left(\mu_{E_k}^2(\mathcal{C}_j) - \mu_{E^+}^2(\mathcal{C}_j)\right)^2 + \left(v_{E_k}^2(\mathcal{C}_j) - v_{E^+}^2(\mathcal{C}_j)\right)^2 + \left(\pi_{E_k}^2(\mathcal{C}_j) - \pi_{E^+}^2(\mathcal{C}_j)\right)^2\right.} \quad \forall j = 1,2,\ldots,m \qquad (11)$$

$$D(E_j, E^-) = \sqrt{\frac{1}{2K}\sum_{k=1}^{K}\left[\left(\mu_{E_k}^2(C_j) - \mu_{E^-}^2(C_j)\right)^2 + \left(v_{E_k}^2(C_j) - v_{E^-}^2(C_j)\right)^2 + \left(\pi_{E_k}^2(C_j) - \pi_{E^-}^2(C_j)\right)^2\right.} \quad \forall j = 1,2,..,m \quad (12)$$

IV. Final first weight calculation

The final first weight based on distance measurement with respect to the best and worst solution can be calculated as follows [Chen, 2020]:

$$Wf_j = \frac{Cs_j}{\sum_{j=1}^{m} Cs_j} \qquad \forall\ j = 1,2,\dots,m \qquad (13)$$

Where

$$Cs_j = 1 - \frac{D(E_j, E^+)}{D(E_j, E^-) + D(E_j, E^+)} \quad \forall\ j = 1,2,\dots,m \qquad (14)$$

V. second weight calculation

Calculate the ratio of the fuzzified data using Equations (4) and (5), as illustrated in Table 9. For this purpose, the symbolic form of the actual process is demonstrated in Equation (8) [Krishnan, 2021].

Table 4: Ratio of EDM

Experts / Criteria	E1	E2	…	E*m*
C1	$\frac{\widetilde{E1/C1}}{\sum_{j=1}^{n} \widetilde{E1/C_{1J}}}$	$\frac{\widetilde{E2/C1}}{\sum_{j=1}^{n} \widetilde{E2/C_{2J}}}$	…	$\frac{\widetilde{Em/C1}}{\sum_{j=1}^{n} \widetilde{Em/Cm_J}}$
C2	$\frac{\widetilde{E1/C1}}{\sum_{j=1}^{n} \widetilde{E1/C_{1J}}}$	$\frac{\widetilde{E2/C2}}{\sum_{j=1}^{n} E2/C_{2j}}$	…	$\frac{\widetilde{Em/C2})}{\sum_{j=1}^{n} \widetilde{Em/C_{mJ}})}$
…	…	…	…	…
Cn	$\frac{\widetilde{E1/C1}}{\sum_{j=1}^{n} \widetilde{E1/C_{1J}}}$	$\frac{\widetilde{E2/Cn}}{\sum_{j=1}^{n} E2/C_{2j}}$	…	$\frac{\widetilde{Em/Cn}}{\sum_{j=1}^{n} \widetilde{Em/C_{mn}}}$

The mean values are calculated to obtain the final weight coefficients values of the (EORE) messages $(\widetilde{w1}, \widetilde{w2}, \dots, \widetilde{wn})^T$.

$$Ws_j = \left(\sum_{i=1}^{m} \frac{\widetilde{E_{IJ}/C_{IJ}})}{\sum_{j=1}^{n} \widetilde{E_{IJ}/C_{IJ}}}\right)/m\ ), \text{ for } i = 1,2,3,..m \text{ and } j = 1,2,3,..n. \qquad (15)$$

VI. Final hybrid weight calculation

After completing the calculation of weight by two methods, the first method is based on distance measurement according to some features of (Topsis) method for computing the weight, and the second method is based on some operator of the spherical fuzzy set used to compute the table of the importance of each criterion and the computation of the final weight by using the table of importance now we can get the final weight for each criterion according to the hybrid method by following equation [Chen, 2020]:

$$W_j = \frac{Wf_j \times Ws_j}{\sum_{j=1}^{m} Wf_j \times Ws_j} \qquad \forall\ j = 1,2,\dots,m \qquad (16)$$

3.2.2 Group Decision Making

Step1: Calculation of the aggregation and score for each alternative

As a result, each option was grouped together using the (AM) operator. Using this operator, we may determine how well weights in group decision making work in EORE messages by multiplying them by each criteria value. As a consequence, the opinion matrices generated in the preceding step are aggregated using the (AM) operator and spherical fuzzy set in Eq (17).

$$SWAM_w(\tilde{A}_{S1}, \dots, \tilde{A}_{Sn}) = w_1\tilde{A}_{S1} + w_1\tilde{A}_{S1} + \cdots + w_n\tilde{A}_{Sn}$$

$$= \left\{ \left[1 - \prod_{i=1}^{n} (1 - \mu_{\tilde{A}_{Si}}^{2})^{w_i} \right]^{1/2}, \ \prod_{i=1}^{n} \nu_{\tilde{A}_{Si}}^{w_i}, \ \left[\prod_{i=1}^{n} (1 - \mu_{\tilde{A}_{Si}}^{2})^{w_i} - \prod_{i=1}^{n} (1 - \mu_{\tilde{A}_{Si}}^{2} - \pi_{\tilde{A}_{Si}}^{2})^{w_i} \right]^{1/2} \right\} \quad (17)$$

And score function for each alternative by following equation:

$$score\,(\tilde{A}_s) = (\mu_{\tilde{A}_s} - \pi_{\tilde{A}_s})^2 - (\nu_{\tilde{A}_s} - \pi_{\tilde{A}_s})^2 \quad (18)$$

Step2: ***EORE messages prioritization based on spherical fuzzy weight aggregation***. Decision makers' differing views on the importance of (EORE) signals need a consensus among many assessors before a final rating can be obtained. GDM was used in conjunction with (SWAM) to harmonize all of the different rankings of the decision-makers in order to arrive at the final rank. The final score was arrived at by using (AM) as well (as GDM). The best (EORE) messages are those with the greatest score value. After arriving at the final distribution rating of the EORE messages, the views of the decision makers were pooled.

4. Results and Discussion

Using weighted spherical fuzzy sets and group decision making criteria for (EORE) communications, this section examines the hybrid method's outcomes and conclusions. A mathematical formula is used to convert the views of five experts into overall weights in Section 3.1, which outlines the formula. Five experts' development is shown in Section 3.2, while Section 3.3 evaluates the (EORE) message categorization outcomes involving individuals and groups.

4.1 Results of Criteria Weighting

In this section, the weights results are represented for all the evaluation criteria used in the benchmarking of (EORE), employing the Hybrid method discussed earlier. At the end of all the steps, the criteria weights were identified by the engaged five experts for this study with no inconsistency issue. Table 5 shows the results of the hybrid method and the final weight results of the (EORE) messages benchmarking criteria.

Table 5: Criteria Weight results

Criteria / EXPERTS	Understandable	Socially Acceptable	Relevant	Realistic	Persuasive	Geographically Coverage	Reaching Targeted Groups	Economically plausible
	(μ, v, π)	(μ, v, π)	(μ, v, π)	(μ, v, π)	(μ, v, π)	(μ, v, π)	(μ, v, π)	(μ, v, π)
Expert 1	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.55,0.5,0.25)
Expert 2	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)
Expert 3	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.85,0.15,0.1)	(0.55,0.5,0.25)
Expert 4	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)
Expert 5	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.15,0.85,0.1)	(0.55,0.5,0.25)	(0.75,0.25,0.2)
$\boldsymbol{E^+}$	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.85,0.15,0.1)
$\boldsymbol{E^-}$	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)	(0.15,0.85,0.1)
$D(E_j, E^+)$	0.074966659	0.177542248	0.169443944	0.233693175	0.177542248	0.359890608	0.160938653	0.273667225
$D(E_j, E^-)$	0.66303846	0.588957766	0.609968237	0.528500237	0.588957766	0.498869973	0.630278708	0.486768682
$1 - \frac{D(E_j, E^+)}{D(E_j, E^-) + D(\ldots}$	0.898419866	0.768372805	0.782600339	0.693393866	0.768372805	0.580918575	0.796593628	0.640117961
First weight W1	0.151535117	0.129600277	0.132000013	0.116953693	0.129600277	0.097982656	0.13436024	0.107967727
Aggregation of division matrix Eq.4 & Eq. 5	(0.998,0.00,0.03)	(0.992,0.00,0.07)	(0.994,0.00,0.05)	(0.979,0.00,0.12)	(0.992,0.00,0.07)	(0.971,0.00,0.13)	(0.996,0.00,0.04)	(0.967,0.00,0.15)
Defuzzification	0.932815	0.839338	0.882641	0.721012	0.83974	0.684644	0.913758	0.639985
Second weight W2	0.144534	0.130051	0.13676	0.111717	0.130113	0.106082	0.141582	0.099162
W1*W2	0.021902	0.016855	0.018052	0.013066	0.016863	0.010394	0.019023	0.010706
Final weight using Eq.16	0.172646	0.132859	0.142301	0.102992	0.132923	0.081934	0.149951	0.084394

Regarding the steps of the hybrid method, the criteria weight is generated through applying the membership function process, which transfers the crisp values into fuzzy numbers. Consequentially, the process of transformation and the defuzzification of experts' opinions were achieved in relation to the importance of the 8 EORE messages criteria. The negative and positive solutions were computed by equations (7) and (8), followed by calculating the distance from negative and positive solutions for each criterion by using equations (11) and (12). Afterward, operations (13) and (14) were applied to determine the first weight for the eight criteria. For the second method, the ratio values were computed by equations (4) and (5), followed by calculating the mean of the experts' preference for each criterion to define the fuzzy weight. Afterward, operations (6) and (15) were applied to determine the final weight for the eight criteria for computing the final weight by the hybrid between the two methods by applied operations (16). Result shows that the highest weight was attributed to C1 '**Understandable**' (0.172646), C7 '**Reaching Targeted Groups**' (0.149951), C3 '**Relevant**' (0.142301), C5 '**Persuasive**' (0.132923), C2 '**Socially Acceptable**' (0.132859), C4 '**Realistic**' (0.102992) and C8 '**Plausible Economically**' (0.084394) respectively. Result also shows that the lowest weight was attributed to C6 '**Geographically Coverage'** (0.081934). The weights of all the remaining criteria are shown in table 5.

4.2 Evolution Results

In this section, the evaluation results of (EORE) are provided on the basis of experts in (EORE) messages. The (EORE) benchmarking is pre-processed with the fuzzy opinion matric using the 5 Likert Scale. In this decision matrix, opinions were given by five experts and converted into the fuzzy matrix as presented in equation 1. The following tables (Table 6 to Table 15) present the results of the evaluation and spherical fuzzy evaluation for each expert.

Table 6: Evolution of (EORE) from Expert 1

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	G	VG	G	G	G	A	A	A
A2	G	A	G	G	A	A	A	A
A3	VG	VG	G	G	VG	VG	VG	G
A4	G	G	A	A	A	A	VG	G
A5	VG	VG	VG	VG	VG	A	G	G
A6	G	G	G	G	A	G	G	VG
A7	G	G	VG	VG	VG	A	G	A
A8	VG	VG	VG	VG	VG	A	A	VG
A9	G	G	G	G	A	A	A	B
A10	VG	VG	G	G	A	B	B	VG
A11	G	A	A	A	G	G	A	VG
A12	VG	VG	VG	VG	VG	A	A	G
A13	VG	VG	VG	VG	VG	VG	VG	VG
A14	G	G	G	G	A	B	B	VG
A15	VG	G	G	G	VG	A	G	A
A16	VG	G	G	G	G	G	A	A
A17	G	G	A	A	A	A	G	A
A18	VG	VG	VG	VG	VG	VG	G	VG
A19	G	G	G	G	G	A	A	A
A20	VG	G	G	G	G	A	G	B
	VG: Very Good G: Good A: Average B: Bad VB: Very Bad							

Table 7: Evolution of (EORE) from Expert 2

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	VG	G	VG	VG	VG	A	G	B
A2	G	G	G	VG	G	A	G	B
A3	G	G	G	G	G	A	G	G
A4	G	G	G	G	G	A	G	B
A5	G	G	G	G	G	A	A	B
A6	G	G	G	G	G	A	A	B
A7	G	VG	G	G	G	A	G	B
A8	G	A	A	G	A	A	A	B
A9	G	A	G	G	G	A	A	B
A10	G	G	G	G	G	A	A	B
A11	G	G	G	G	G	A	A	B
A12	G	G	G	G	G	A	A	B
A13	G	G	G	G	G	G	G	B
A14	G	G	G	G	G	A	A	B
A15	G	G	G	G	G	A	A	B
A16	VG	A	G	A	A	A	A	B
A17	VG	A	A	A	A	A	G	B
A18	G	G	G	G	G	A	A	B
A19	G	G	G	G	G	G	A	B
A20	G	G	G	G	G	A	A	B
	VG: Very Good G: Good A: Average B: Bad VB: Very Bad							

Table 8: Evolution of (EORE) from Expert 3

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	G	G	VG	VG	VG	A	VG	A
A2	A	G	VG	VG	VG	A	VG	A
A3	VG	G	A	A	A	A	A	A
A4	VG	A	A	A	A	G	A	A
A5	VG	G	VG	VG	VG	A	G	A
A6	VG	VG	VG	VG	VG	A	A	A
A7	VG	VG	VG	VG	VG	A	G	A
A8	A	A	A	A	A	B	B	B
A9	VG	A	G	A	B	VG	A	A
A10	VG	G	G	G	G	A	A	A
A11	A	A	B	B	B	B	VB	B
A12	G	G	A	A	A	A	A	A
A13	VG	VG	VG	VG	VG	G	G	A
A14	VG	G	G	G	G	G	G	A
A15	G	G	G	G	G	A	A	A
A16	G	G	G	G	G	A	A	A
A17	VG	VG	G	G	G	A	A	A
A18	VG	VG	VG	VG	VG	G	G	G
A19	G	A	A	A	A	A	A	A
A20	VG	VG	G	G	G	G	G	A
	VG: Very Good G: Good A: Average B: Bad VB: Very Bad							

Table 9: Evolution of (EORE) from Expert 4

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	**A**	**G**	**G**	**G**	**A**	**G**	**A**	**B**
A2	**A**	**G**	**G**	**G**	**A**	**G**	**G**	**G**
A3	**VG**	**G**	**G**	**G**	**G**	**A**	**G**	**G**
A4	**VG**	**G**	**G**	**G**	**G**	**A**	**A**	**G**
A5	**VG**	**G**	**G**	**G**	**G**	**A**	**G**	**G**
A6	**G**	**G**	**G**	**G**	**G**	**G**	**G**	**G**
A7	**G**	**G**	**G**	**G**	**G**	**A**	**A**	**G**
A8	**B**	**G**	**B**	**B**	**B**	**G**	**A**	**B**
A9	**VG**	**G**	**G**	**G**	**G**	**G**	**G**	**A**
A10	**G**	**G**	**G**	**G**	**A**	**B**	**A**	**G**
A11	**A**	**B**	**B**	**B**	**B**	**B**	**B**	**G**
A12	**G**	**G**	**G**	**G**	**A**	**A**	**A**	**B**
A13	**G**	**G**	**G**	**G**	**G**	**A**	**A**	**G**
A14	**A**	**B**	**B**	**B**	**A**	**B**	**B**	**G**
A15	**G**	**G**	**G**	**G**	**G**	**B**	**A**	**G**
A16	**G**	**G**	**G**	**G**	**A**	**G**	**A**	**G**
A17	**G**	**G**	**G**	**A**	**A**	**A**	**G**	**G**
A18	**G**	**G**	**G**	**G**	**G**	**A**	**G**	**G**
A19	**VG**	**VG**	**VG**	**VG**	**VG**	**G**	**G**	**G**
A20	**G**	**A**	**G**	**G**	**A**	**B**	**A**	**B**
	VG: Very Good G: Good A: Average B: Bad VB: Very Bad							

Table 10: Evolution of (EORE) from Expert 5

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	A	G	G	A	A	B	A	A
A2	G	G	G	A	A	VB	B	G
A3	G	G	A	A	A	A	B	G
A4	G	G	VG	G	G	A	A	VG
A5	G	G	VG	G	G	A	VG	G
A6	G	G	VG	G	G	A	G	G
A7	G	G	A	A	G	A	G	A
A8	G	G	G	G	G	G	VG	B
A9	G	G	G	G	G	B	A	A
A10	G	VG	G	G	G	A	G	VG
A11	G	B	A	A	A	B	B	A
A12	G	G	G	G	G	G	G	A
A13	VG	VG	G	G	G	G	VG	VG
A14	G	G	G	G	G	G	A	VG
A15	G	G	G	G	G	G	G	B
A16	G	G	G	A	A	A	G	G
A17	VG	VG	G	G	VG	G	VG	VG
A18	G	A	G	A	G	A	A	G
A19	G	G	VG	VG	G	G	VG	G
A20	G	A	B	B	G	B	A	A
	VG: Very Good G: Good A: Average B: Bad VB: Very Bad							

Table 11: spherical fuzzy Evolution of (EORE) from Expert 1

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A2	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A3	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**
A4	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**
A5	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A6	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**
A7	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A8	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.85,0.15,0.1)**
A9	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A10	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.85,0.15,0.1)**
A11	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.85,0.15,0.1)**
A12	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A13	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**
A14	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.85,0.15,0.1)**
A15	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A16	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A17	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A18	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**
A19	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A20	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**

Table 12: spherical fuzzy Evolution of (EORE) from Expert 2

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A2	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A3	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A4	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A5	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A6	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A7	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A8	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A9	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A10	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A11	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A12	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A13	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A14	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A15	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A16	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A17	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**
A18	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A19	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A20	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**

Table 13: spherical fuzzy Evolution of (EORE) from Expert 3

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**
A2	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**
A3	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A4	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A5	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A6	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A7	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A8	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**
A9	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.85,0.15,0.1)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A10	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A11	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.15,0.85,0.1)**	**(0.25,0.75,0.2)**
A12	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A13	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A14	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A15	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A16	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A17	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A18	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A19	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**
A20	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**

Table 14: spherical fuzzy Evolution of (EORE) from Expert 4

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A2	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A3	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A4	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A5	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A6	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A7	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A8	**(0.25,0.75,0.2)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A9	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**
A10	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A11	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.75,0.25,0.2)**
A12	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**
A13	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A14	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.25,0.75,0.2)**	**(0.75,0.25,0.2)**
A15	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.25,0.75,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A16	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**
A17	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A18	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A19	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.85,0.15,0.1)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**
A20	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.75,0.25,0.2)**	**(0.75,0.25,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**	**(0.55,0.5,0.25)**	**(0.25,0.75,0.2)**

Table 15: spherical fuzzy Evolution of (EORE) from Expert 5

Criteria / Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.25,0.75,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)
A2	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.15,0.85,0.1)	(0.25,0.75,0.2)	(0.75,0.25,0.2)
A3	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.25,0.75,0.2)	(0.75,0.25,0.2)
A4	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.85,0.15,0.1)
A5	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.85,0.15,0.1)	(0.75,0.25,0.2)
A6	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.75,0.25,0.2)
A7	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.55,0.5,0.25)
A8	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.25,0.75,0.2)
A9	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.25,0.75,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)
A10	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.85,0.15,0.1)
A11	(0.75,0.25,0.2)	(0.25,0.75,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.25,0.75,0.2)	(0.25,0.75,0.2)	(0.55,0.5,0.25)
A12	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)
A13	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.85,0.15,0.1)
A14	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.85,0.15,0.1)
A15	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.25,0.75,0.2)
A16	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.75,0.25,0.2)
A17	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.85,0.15,0.1)
A18	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)	(0.75,0.25,0.2)
A19	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.85,0.15,0.1)	(0.75,0.25,0.2)	(0.75,0.25,0.2)	(0.85,0.15,0.1)	(0.75,0.25,0.2)
A20	(0.75,0.25,0.2)	(0.55,0.5,0.25)	(0.25,0.75,0.2)	(0.25,0.75,0.2)	(0.75,0.25,0.2)	(0.25,0.75,0.2)	(0.55,0.5,0.25)	(0.55,0.5,0.25)

4.3 Ranking Results

Using GDM-AM and the spherical fuzzy set, the benchmarking results of (EORE) are shown in this section. Using the 5 Likert Scale, the (EORE) benchmarking is pre-processed using the fuzzy opinion matrix. There were five experts in this choice matrix, and their views were translated into the opinion matrix shown in equation 1. The findings for each expert and group are shown in the following table 16.

Table 16: Results of ranking (EORE) messages for group and each expert

Alternatives	Expert 1		Expert 2		Expert 3		Expert 4		Expert 5		Group	
	score	rank	score	rank	score	rank	score	rank	score	rank	Score	Rank
A1	0.265401	13	0.407569	1	0.406365	6	0.158923	16	0.104059	18	1.342317	10
A2	0.159137	20	0.283677	3	0.370927	7	0.230894	12	0.157049	16	1.201684	14
A3	0.474624	3	0.282363	4	0.178837	15	0.328439	2	0.128278	17	1.392542	7
A4	0.235107	14	0.255131	6	0.16405	16	0.295869	6	0.310715	8	1.260873	12
A5	0.463616	4	0.218679	8	0.412465	5	0.328439	2	0.360255	4	1.783453	2
A6	0.293831	12	0.218679	8	0.419046	4	0.3	5	0.32035	6	1.551906	5
A7	0.365983	7	0.291957	2	0.448135	3	0.248429	8	0.204549	14	1.559054	4
A8	0.458695	5	0.103787	20	-0.04844	19	-0.04252	18	0.314891	7	0.786406	19
A9	0.184015	18	0.184032	17	0.211561	14	0.327922	4	0.218966	13	1.126495	16
A10	0.305062	9	0.218679	8	0.276524	11	0.206597	14	0.340317	5	1.347179	9
A11	0.198489	17	0.218679	8	-0.18857	20	-0.1422	20	0.010495	20	0.096893	20
A12	0.435678	6	0.218679	8	0.12682	17	0.184015	15	0.281824	10	1.247015	13
A13	0.56	1	0.273993	5	0.463173	2	0.248429	8	0.440932	2	1.986528	1
A14	0.212713	16	0.218679	8	0.327922	9	-0.0967	19	0.290078	9	0.952692	18
A15	0.346364	8	0.218679	8	0.228294	12	0.239782	10	0.273993	11	1.307112	11
A16	0.295316	11	0.169246	19	0.228294	12	0.236359	11	0.227912	12	1.157127	15
A17	0.169484	19	0.171512	18	0.313659	10	0.227912	13	0.475259	1	1.357827	8
A18	0.521017	2	0.218679	8	0.478083	1	0.282363	7	0.190038	15	1.69018	3
A19	0.228294	15	0.238921	7	0.085856	18	0.478083	1	0.403445	3	1.434599	6
A20	0.302987	10	0.218679	8	0.363274	8	0.13417	17	0.068534	19	1.087644	17

The results of benchmarking are shown in the table above (GDM-AM). For each possibility, experts supplied a different response based on how important they thought it was to them. Expert 1 and the group have a combined score of 0.56, while A13 is the top-ranked option, followed by A1 and A18, while experts 3, 4, and 5 have combined scores of 1.986528. The last alternative with the lowest score is A2, followed by A8 and A11, before experts 1, 2, and 5. The majority of the ranking alternatives, on the other hand, do not hold up when compared across all DMs. As for the rest, they are meeting several levels of variation: a minor degree of variance (e.g., A11), a medium degree of variation (A4, a15), and a high degree of variation (e.g., A1, A2, A3, A5, A6, A7, A8, and so on) throughout all of the DMs. Group decision making (GDM) context is essential because of the absence of distinct ranking outcomes and varying degrees of variance in the results. Overcomes variance and provides a single rating for all variant choices with the help of GDM. As shown in the above table 16, Figures 3–4 indicate GDM-AM scores and ranks for each option, based on the opinions of experts and groups.

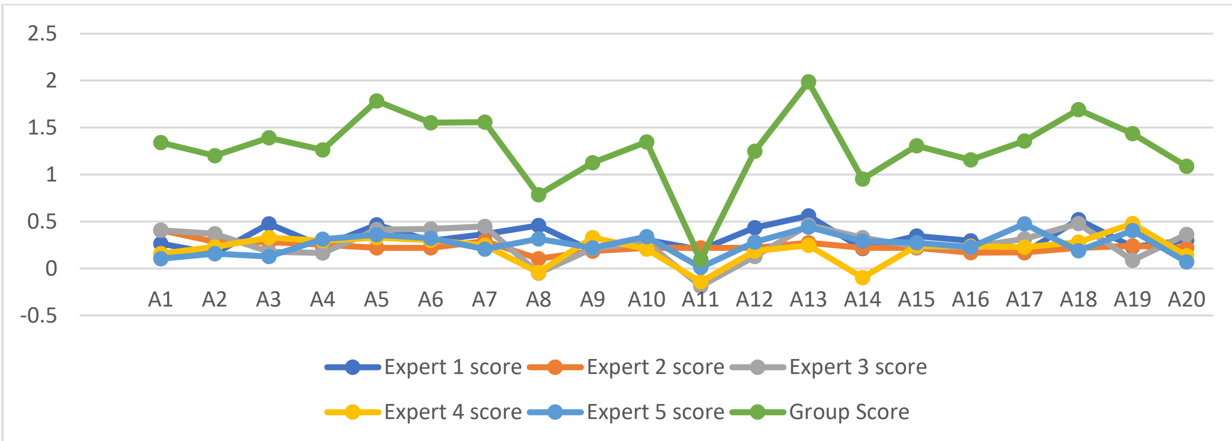


Figure 3: score results for expert and group

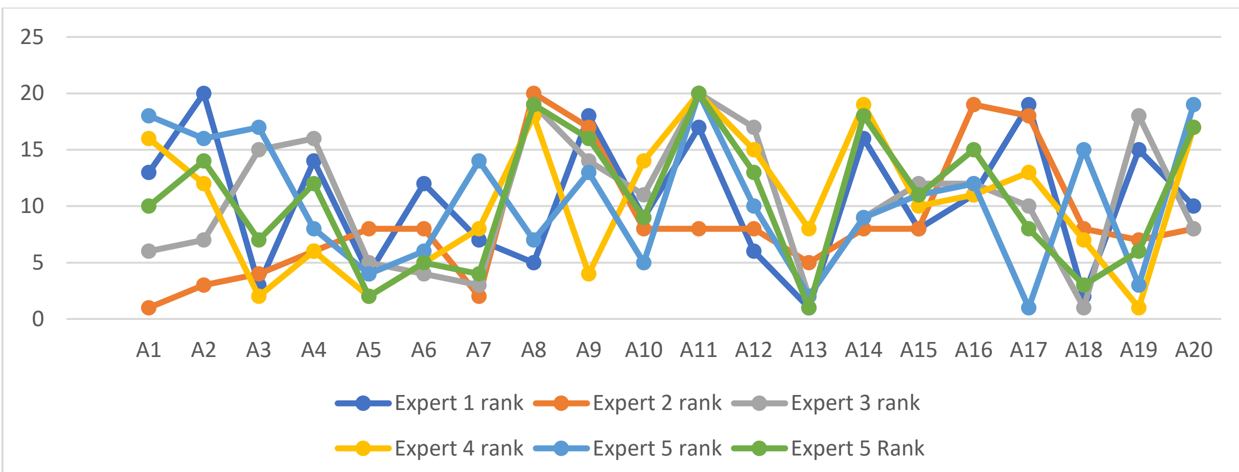


Figure 4: rank results for expert and group

5. Sensitivity analysis evaluation

The suggested framework's sensitivity to changes in the standard weights is examined in depth. Analysis of sensitivity evaluates the influence of the increased substantial contribution criteria on the (EORE) message ranking system. For the sensitivity analysis, the "greater substantial contribution standard" is chosen from the eight (EORE) assessments (standards) generated by the Hybrid approach. To a large and considerable degree, this research relies on the comprehensible standard (0.172646), as can be shown in Table 5. On the basis of this, the elasticity coefficient (c) is used to construct a relative standard weight of all other standard weights relative to the standard with the most significant contribution. (Equation (19)) (real-time standard). According to Table 17, an offset.

$$w_c = (1 - w_s) \times (w_c^o / W_c^0) = w_c^o - \Delta x \alpha_c \qquad (19)$$

where

- w_s is higher important criteria.
- w_c^o reflects the hybrid method's weight vector.
- W_c^0 calculates the new weighted average based on the original weights.
- Δx The limit value of the real-time standard is represented by the weight value fluctuation range applied to the 12 smart key ideas (standards), namely $-0.1726 \leq \Delta x \leq 0.8274$.

The given interval of $-0.1726 \leq \Delta x \leq 0.8274$ was divided into 9 scenarios and produced new weight values, as shown in Table 17.

Table 17: New weight values for each criterion of 31 scenarios

Scenario	C1	C2	C3	C4	C5	C6	C7	C8
S1	0	0.160583	0.171995	0.124484	0.16066	0.099031	0.181242	0.102005
S2	0.125	0.14051	0.150495	0.108923	0.140578	0.086652	0.158587	0.089254
S3	0.25	0.120437	0.128996	0.093363	0.120495	0.074273	0.135932	0.076504
S4	0.375	0.100364	0.107497	0.077802	0.100413	0.061894	0.113276	0.063753
S5	0.5	0.080292	0.085997	0.062242	0.08033	0.049516	0.090621	0.051002
S6	0.625	0.060219	0.064498	0.046681	0.060248	0.037137	0.067966	0.038252
S7	0.75	0.040146	0.042999	0.031121	0.040165	0.024758	0.045311	0.025501
S8	0.875	0.020073	0.021499	0.01556	0.020083	0.012379	0.022655	0.012751
S9	0.99993	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
alpha	0.208673	0.160583071	0.171994835	0.124484	0.16066	0.099031	0.181242	0.102005

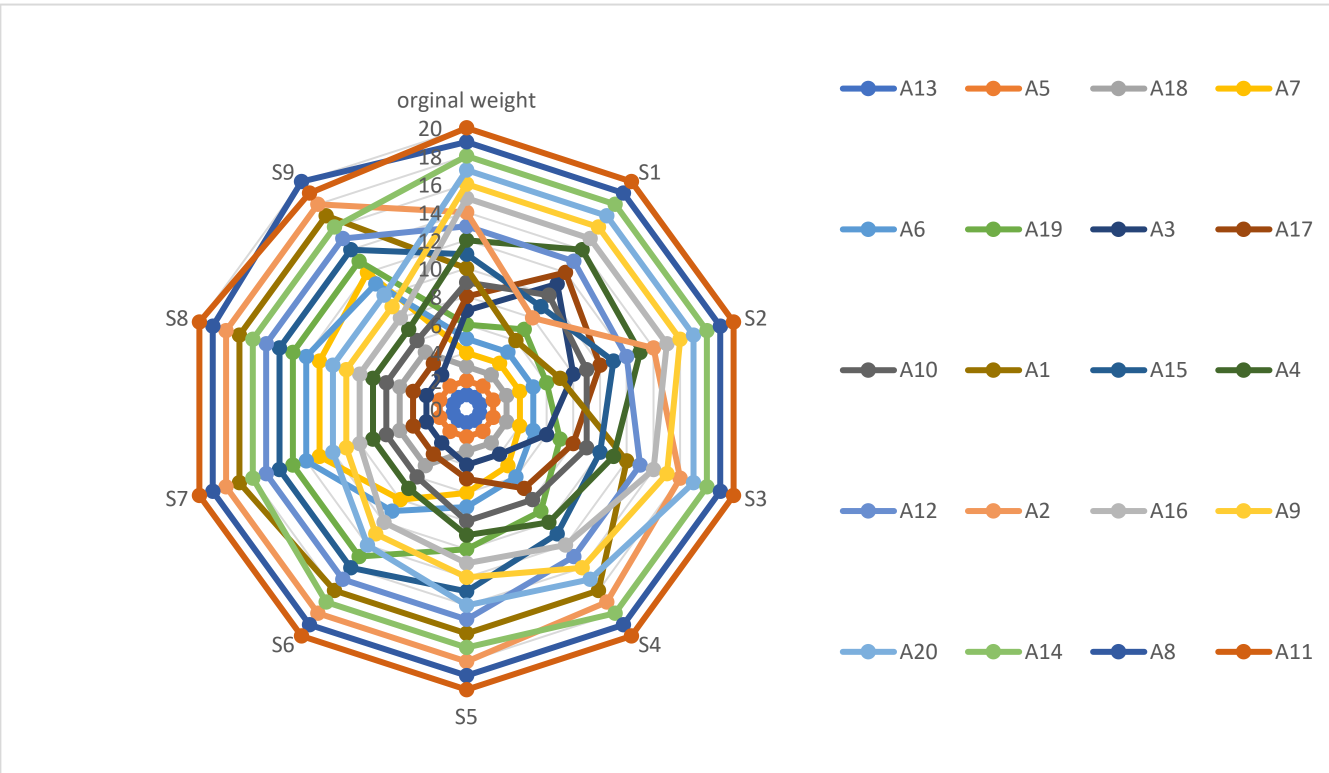


Figure 5: Sensitivity analysis of the ranking of alternatives in 9 scenarios for (EORE) messages

Using these updated weight values, EORE data management apps were tested for each category's sensitivity, as shown in Figure 5. Those findings corroborated the study's assertions on the criticality of the eight concepts (EORE). There were certain cases where modifying the criterion weight values affected how each application ranked. The effectiveness of the suggested hybrid integration approach (GDM-SFS) is shown in the majority of the nine situations, and this backs up the systematic ranking findings.

Table 16 shows that the top two rankings (A13 and A5) were compared for (EORE) message data management apps. In 9 situations, A13 stayed at the top of the rankings, while A5 remained at the bottom. A18 ranked fifth in five situations but dropped to sixth in four scenarios. There were only minor adjustments in A8 and A11 across all circumstances. Alternate A3 raises the rank from 7th to 11th and 8th in scenarios 1 and 2 but ranks 3rd to 6th in scenarios 6 to 9 based on other messages.

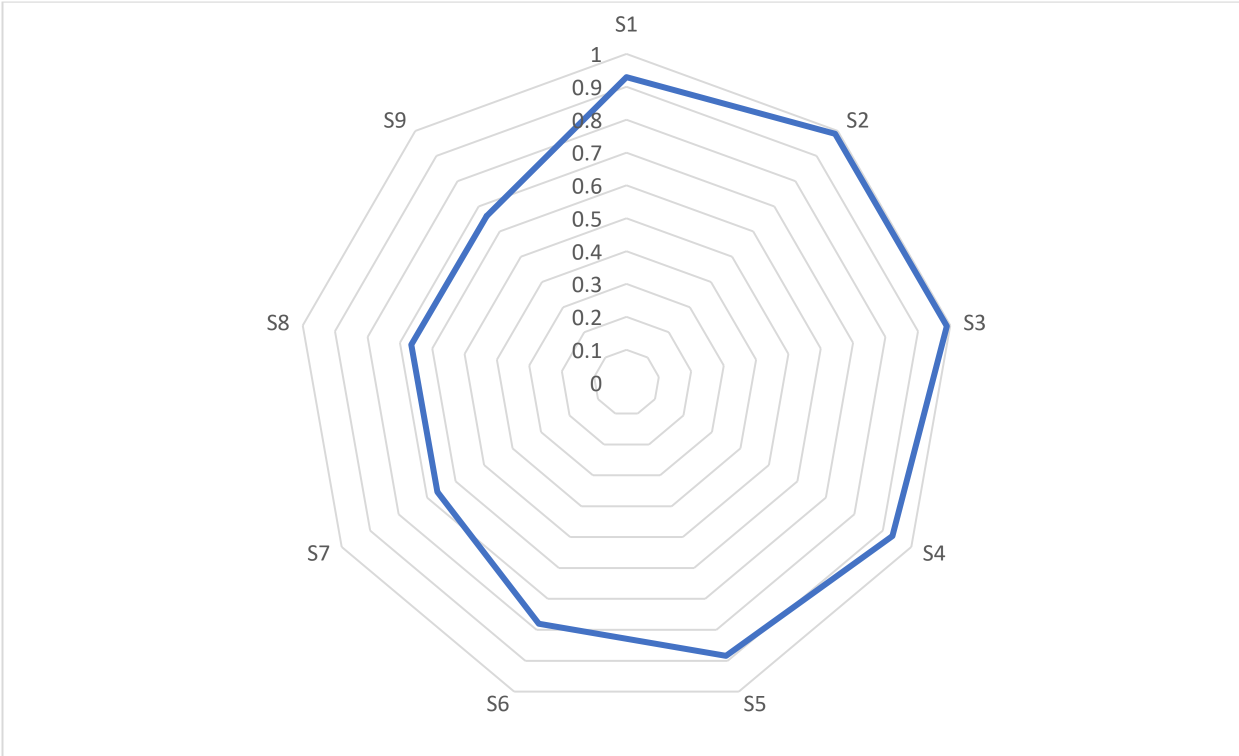


Figure 5: Correlation of ranks among 9 scenarios for (EORE) messages

6. Conclusion

It is our goal to provide a novel weighting approach for the diffuse environment of the spherical ensemble based on distance measurement hybrid technology and expert assessment ratio. For an alternative classification, spherical fuzzy sets (GDM-AM) based on a conventional weighted hybrid approach and its integration (GDM-AM) are presented in Figure 1. (EORE) messages are evaluated using the approach presented in this paper. The suggested method's sturdiness is examined via the use of sensitivity analysis and two different kinds of systematic ranking assessment. However, there are three major drawbacks to this system that may be addressed in the future. An aggregation operator is used to develop the hybrid technique and the (GDM-AM) approach. For the second time, both techniques employ just one defuzzification method to get the final weighted and ranking outcomes. It also does not take into account the weight assigned to each decision maker's choice, as shown in these two methodologies. There are a number of possibilities for the future: Assist the victim by presenting and processing massive data sets, Extend the novel approach to additional types of fuzzy sets, such as image-fuzzy sets, wavering fuzzy sets, and so on. Utilize different methods of group decision making.

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