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TOPSIS METHOD-BASED MADM STRATEGY UNDER POSSIBILITY ENVIRONMENT AND ITS APPLICATION IN THE IDENTIFICATION OF THE MOST IMPORTANT PARAMETER THAT MADE EFFECTIVE THE OUTCOMES OF VIDYAJYOTI SCHOOL

BIMAL SHIL, PRASENJIT SINHA, SUMAN DAS*, AND AJOY KANTI DAS

Abstract. This paper aims to establish the notion of Hamming distance under the Possibility environment and propose a Multi-Attribute Decision-Making (MADM) strategy based on the Technique for Ordering Preference by Similarity to Ideal Solution (TOPSIS) method under the Possibility environment. Further, we validate the proposed MADM strategy by solving a real-world numerical example, namely, "Identifying the Most Important Parameter that Made Effective the Outcomes of Vidyajyoti Schools under the Mission 100 Scheme of the Government of Tripura".

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1. Introduction

MADM strategy is a decision-making process that involves evaluating and comparing multiple attributes to make a choice among different alternatives. It is commonly used in various fields, including business, engineering and public policy. To solve a MADM problem, we can follow these general steps: (i) Identify the Decision Criteria: Determine the key attributes or criteria that are relevant to the decision; (ii) Define the Alternatives: Identify the different options or alternatives available for consideration; (iii) Assign Weights to Attributes: Assign relative weights or importance to each criterion based on its significance in the decision;

*Corresponding Author: sumandas18842@gmail.com.

(iv) Evaluate the alternative against the attribute: Assess each alternative against each criterion and assign a score or rating for each combination. This can be done using subjective judgments, expert opinions, or quantitative data; (v) Normalize the Scores: Normalize the scores to eliminate any bias caused by different scales or units of measurement, which ensures that all criteria are on a common scale, making them directly comparable. There are various normalization techniques, such as min-max normalization or z score normalization; (vi) Apply a Decision-Making Method: There are several methods you can use to aggregate the scores and make a decision. Some common MADM methods include weighted sum model (WSM), the weighted product model (WPM), and analytic hierarchy process (AHP). Each method has its own assumptions and calculations for determining the best alternative; (vii) Perform sensitivity analysis: Assess the sensitivity of your decision to changes in the criteria weights or ratings. This analysis helps identify the robustness of the decision and the impact of uncertainties or variations in the inputs; (viii) Make the decision: Based on the analysis and considering the preferences and priorities, select the alternative that performs the best according to the chosen MADM method.

The TOPSIS strategy, proposed by Opricovic and Tzeng [3], is a commonly used decision-making strategy that helps in evaluating and ranking alternatives based on multiple attributes. It considers both the positive and negative aspects of each alternative and compares them to an ideal solution. The ideal solution is determined by identifying the alternative that maximizes the benefits of the positive attribute and minimizes the drawbacks of the negative attribute. Due to incomplete Knowledge of the attribute and the issue domain's inability to handle information, decision-makers may, in the actual world, prefer to evaluate characteristics using linguistic variables rather than exact values. Chen [7] extended the TOPSIS method for solving MADM problems in fuzzy environment. Awasthi et al. [1] introduced the application of fuzzy TOPSIS strategy in evaluating sustainable transportation systems. Later on, Boran et al. [4] proposed a MADM strategy for supplier selection using TOPSIS method under intuitionistic fuzzy environment. Liao and Kao [12] studied an integrated fuzzy TOPSIS to supplier selection in supply chain management. Shih et al. [17] introduced the notion of an extension of TOPSIS for group decision making.

In a fuzzy environment, where uncertainty and ambiguity are present, the TOPSIS method can be extended to handle fuzzy numbers. Fuzzy numbers represent imprecise or uncertain information and are characterized by membership functions. Further, the proposed MADM strategy will open up a new avenue of research in the possibility environment. Unpredictability and fuzziness are two types of uncertainty that are frequently present in the virtual environment. As a result, there are two different hypotheses to deal with these kinds of contradictions: one is the probability theory and the other is the possibility theory. In 1978, Zadeh [20] grounded the notion of possibility theory. In 1979, the possibility measure for the decision categorization was introduced by Baldwin and Pilsworth [2]. Afterwards, Dubois and Prade [10] looked into the possibility theory in more detail. The independence notions of the possibility theory were presented in 1999 by De Campos and Huete [8]. The idea of the possibilistic mean value and variance of fuzzy members was later developed by Carlsson and Fuller [6]. Later on, Kocalerchuk [11] presented the connections between the possibility theory and probability theory in 2017.

Research Gap & Motivation:

Existing studies in the Possibility environment have focused on decision making frameworks, yet they fall short in addressing the complexities of multi-dimensional uncertainty inherent in many realworld scenarios. Moreover, current frameworks lack a systematic approach to applying Possibility environment. This gap hinders the broader application of Possibility theory in uncertainty modelling and decision making.

Motivated by this limitation, our work aims to extend the principles of Possibility Set theory to multi-dimensional spaces, introducing TOPSIS method as a robust mathematical model. This approach addresses the need for a flexible framework capable of capturing complex uncertainties, thereby advancing both theoretical research and practical applications in fields such as environmental modelling, data science, and decision support systems.

The rest of this article is divided into the following sections: Section-2 briefly explains the preliminary concerning Fuzzy Set and Possibility Set. Section-3 presents a MADM strategy based on TOPSIS method under the Possibility Set environment. Section-4 presents an illustrative numerical example, namely "Identifying of the Most Important Parameter that Made Effective the Outcomes of Vidyajyoti Schools under Mission 100 Scheme of Government of Tripura" to show the applicability and effectiveness of the proposed MADM strategy. In Section-5, we presented some discussion about the advantages and disadvantages of the suggested MADM strategy. Finally, Section-6 summarizes the results, and discusses the future scope of research.

2. Preliminaries:

In this section, we provide some existing definitions and results that will help to prepare the significant results of the article.

Definition 2.1. [21] A fuzzy set Z^F over a fixed set U is defined by $Z^F = \{(x, \mu_z(x)) : x \in U\}$, where $\mu_z(x) \in [0,1]$ is the membership value of $x \in U$ in Z^F.

Definition 2.2. [20] Let Z^F be a fuzzy sub-set of U, and let $\prod_x$ be a Possibility distribution associated with the variable x, which takes the values in U. Then, the Possibility measure, $\pi(Z)$, of Z^F is defined as follows:

$$\text{Pos}\{X \in Z\} \triangleq \pi(Z) \triangleq \text{Sup}_{u \in U}\{\mu_z(u) \wedge \pi_x(u)\}$$

where μz is the membership function for Z^F.

Definition 2.3. [11] Let $\mu(y)$ be the membership function of Fuzzy Set on the interval [0, 1]. We can normalize values of $\mu(y)$ by dividing them by the value of S which is the sum (integral) of $\mu(y)$ values in this interval and get probabilities, $p(y) = \mu(y)/S$. Alternatively, we divide $\mu(y)$ by the value of M which is the maximum of $\mu(y)$ values in the interval $[0,1]$ get possibilities $\text{Pos}(y) = \mu(y)/M$.

Definition 2.4. [19] Let $P = \{(\beta_i, \mu_P(\beta_i)) : \beta_i \in \Omega, i = 1, 2, \ldots, n\}$ and $Q = \left\{\left(\beta_i, \mu_Q(\beta_i)\right) : \beta_i \in \Omega, i = 1, 2, \ldots, n\right\}$, where $\mu_P(\beta_i)$ and $\mu_Q(\beta_i)$ are the Possibility values of β_i with respect to P and Q respectively, be two Possibility sets over a non-empty set Ω. Then, the Hamming distance between P and Q is defined by:

$$H_d(P, Q) = \sum_{i=1}^{n} \left|\mu_P(\beta_i) - \mu_Q(\beta_i)\right|.$$

Definition 2.5. [19] Let $P = \{(\beta_i, \mu_P(\beta_i)) : \beta_i \in \Omega, i = 1, 2, \ldots, n\}$ and $Q = \left\{\left(\beta_i, \mu_Q(\beta_i)\right) : \beta_i \in \Omega, i = 1, 2, \ldots, n\right\}$, where $\mu_P(\beta_i)$ and $\mu_Q(\beta_i)$

are the Possibility values of β_i with respect to P and Q respectively, be two Possibility sets over a non-empty set Ω. Let $w_i(i = 1,2,\ldots,n)$ be the corresponding weights of $\beta_i \in \Omega$. Then, the weighted Hamming distance between P and Q is defined as follows:

$$WH_d(P,Q) = \sum_{i=1}^{n} w_i \left|\mu_P(\beta_i) - \mu_Q(\beta_i)\right|.$$

Definition 2.6. [19] Let $P = \{(\beta_i, \mu_P(\beta_i)) : \beta_i \in \Omega, i = 1,2,\ldots,n\}$ and $Q = \left\{\left(\beta_i, \mu_Q(\beta_i)\right) : \beta_i \in \Omega, i = 1,2,\ldots,n\right\}$, where $\mu_P(\beta_i)$ and $\mu_P(\beta_i)$ are the Possibility values of β_i with respect to P and Q respectively, be two Possibility sets over a non-empty set Ω. Then, the normalized Hamming distance between P and Q is defined as follows:

$$NH_d(P,Q) = \frac{1}{n}\sum_{i=1}^{n} \left|\mu_P(\beta_i) - \mu_Q(\beta_i)\right|.$$

3. TOPSIS Based MADM Strategy Via Possibility Environment:

TOPSIS method provides a systematic approach for decision making by considering multiple attribute simultaneously. However, it's important to note that the method relies on subjective judgments when assigning weights to attribute and assumes that the attribute are independent and have linear relationships.

For a Decision Maker (DM), selecting an alternative from a set of feasible alternatives based on some attributes is challenging. To do so, the DM should design a MADM strategy for making the decision. Assume that $P = \{P_1, P_2, \ldots, P_n\}$ be the collection of n alternatives, and $G = \{G_1, G_2, \ldots, G_m\}$ be the family of m attributes. The DM gives evaluation information in terms of Possibility values for each alternative $P_i(i = 1,2,\ldots,n)$ depending on the attribute $G_j(j = 1,2,\ldots,m)$. As a result, a decision matrix can express the entire evaluation information of all Possibility values. The TOPSIS strategy incorporates the concept of both positive ideal solutions and negative ideal solutions to determine the relative closeness of alternatives to the ideal solution.

The following are the steps of the suggested MADM strategy:
Step-1: Construct the Decision Matrix using the Possibility Values

The whole evaluation assessment of each alternative $P_i(i = 1, 2, \ldots, n)$ against the attributes $G_j(j = 1, 2, \ldots, m)$ is presented in terms of Possibility value, which is the evaluation assessment of alternative P_i $(i = 1, 2, \ldots, n)$ over the attribute $G_j(j = 1, 2, \ldots, m)$.

Then, the decision matrix $\left(D^M\right)$ is given by:

D^M	G_1	G_2	$\ldots$	$\ldots$	G_m
P_1	$\mu_{P_1}(G_1)$	$\mu_{P_1}(G_2)$	$\ldots$	$\ldots$	$\mu_{P_1}(G_m)$
P_2	$\mu_{P_2}(G_1)$	$\mu_{P_2}(G_2)$	$\ldots$	$\ldots$	$\mu_{P_2}(G_m)$
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
P_n	$\mu_{P_n}(G_1)$	$\mu_{P_n}(G_2)$	$\ldots$	$\ldots$	$\mu_{P_n}(G_m)$

Step-2: Determination of Normalized Decision Matrix

The normalized value $\mu_{P_i}\left(G_j\right)$ is defined as follows:

$$\mu_{P_i}\left(G_j\right) = \frac{\left(\mu_{P_i}\left(G_j\right) - \mu_{P_i}\left(G_j^-\right)\right)}{\left(\mu_{P_i}\left(G_j^+\right) - \mu_{P_i}\left(G_j^-\right)\right)}, i = 1, 2, \ldots, n \text{ and } j = 1, 2, \ldots, m,$$

where, $\mu_{P_i}\left(G_j^+\right) = \max_i\left\{\mu_{P_i}\left(G_j\right)\right\}$ and $\mu_{P_i}\left(G_j^-\right) = \min_i\left\{\mu_{P_i}\left(G_j\right)\right\}$.

After finding the normalized value $\mu_{P_i}\left(G_j\right)$ using the above formula, we get the normalized decision matrix.

Step-3: Determination of weighted normalized decision matrix

MADM strategy relies heavily on the attribute weights while making decisions. The compromise function below should be used if it is assumed that the decision-makers are unaware of the information weights associated with all attributes. The decision-maker can then choose the weights for the attributes.

Compromise Function: The compromise function is defined as follows:

(1) $$\xi_j = \sum_{i=1}^{n} \mu_{P_i}\left(G_j\right)$$

Then, the weight of the j^{th} attribute is defined as follows

(2) $$w_j = \frac{\xi_j}{\sum_{j=1}^{m} \xi_j}$$

Here, $\sum_{j=1}^{m} w_j = 1$.

After finding the weights of the attributes, we get the weighted normalized matrix using the following formula. The calculations for weighted normalized values are as follows:

$$Z_{\mathrm{ij}} = w_j \times \mu_{P_i}\left(G_j\right), \text{ where } i = 1, 2, \ldots n, \text{ and } j = 1, 2, \ldots m.$$

Step-4: Determination of the Ideal Possibility Positive Estimates (IPPE) and Ideal Possibility Negative Estimates (IPNE) for the decision matrix

The IPPE for the decision matrix is presented as:

$$Z^{+} = \left[\mu_P^{+}(G_1), \mu_P^{+}(G_2), \ldots, \mu_P^{+}(G_m)\right], \tag{3}$$

where $\mu_P^{+}\left(G_j\right) = \left\{\max_j \left(Z_{ij}\right) : i = 1, 2, \ldots, n\right\}$.

The IPNE for the decision matrix is presented as:

$$Z^{-} = \left[\mu_P^{-}(G_1), \mu_P^{-}(G_2), \ldots, \mu_P^{-}(G_m)\right], \tag{4}$$

where $\mu_P^{-}\left(G_j\right) = \left\{\min_j \left(Z_{ij}\right) : i = 1, 2, \ldots, n\right\}$.

Step-5: Determination of the Separation Measures Possibility Coefficient (SMPC) from IPPE & IPNE

The SMPC of each alternative from IPPE is presented as:

$$S_i^{+} = \sum_{i=1}^{n} \left|\left(Z_{ij}\right) - Z^{+}\right|. \tag{5}$$

where $i = 1, 2, \ldots, n, j = 1, 2, \ldots, m$.

The SMPC of each alternative from IPNE is given below:

$$S_i^{-} = \sum_{i=1}^{n} \left|\left(Z_{ij}\right) - Z^{-}\right|. \tag{6}$$

where $i = 1, 2, \ldots, n, j = 1, 2, \ldots, m$.

Here, $S_i^{+}$and $S_i^{-}$are the identification coefficient used to adjust the range of the comparison environment and to control the level of differences of the relation coefficients.

Step-6: Determine the Relative Closeness Coefficient to the IPPE

The Possibility relative relational degree of each alternative can be defined as follows:

$$R_i = \frac{s_i^+}{s_i^+ + s_i^-} \tag{7}$$

where $i = 1, 2, \ldots, p$.

Step-7: Rank the alternatives

The ranking of all alternatives can be determined using the relative relational closeness coefficient in ascending order. The best alternative is the one with the highest R_i value.

Step-8: End

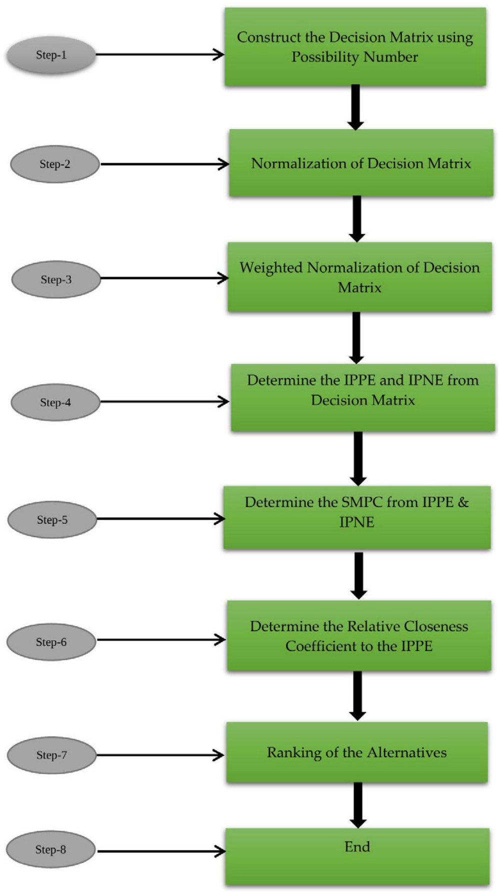

Figure 1. Flow Chart of the Proposed MADM Strategy

4. Application of the Proposed MADM Strategy:

In this section, we provide a numerical example to show the applicability and effectiveness of the suggested MADM strategy.

Example 4.1. ”Identifying the Most Important Parameter that Made Effective the Outcomes of Vidyajyoti Schools under Missionon 100 Scheme of the Government of Tripura.”

Education is the key to transforming individuals and societies, and Vidyajyoti schools in Tripura stands as a shining example of the power of education. Situated amidst the verdant landscapes of Tripura, this institution has become a beacon of knowledge, empowering students with holistic development and nurturing their potential. With its commitment to academic excellence, innovation, and character-building, Vidyajyoti schools has emerged as a leading educational institution in the region. The school follows a comprehensive curriculum that encompasses a wide range of subjects, including mathematics, science, social sciences, languages, and the arts. The experienced faculty members employ innovative teaching methodologies and technology-driven approaches to engage students actively in the learning process. The emphasis on practical application of knowledge ensures that students not only grasp theoretical concepts but also develop critical thinking and problemsolving skills. Recognizing the importance of holistic development, Vidyajyoti schools places equal emphasis on extracurricular activities and sports. The school offers a plethora of opportunities for students to explore their talents and interests, including music, dance, drama, debate, and sports. These activities foster creativity, teamwork, leadership, and a sense of discipline among the students. Regular inter-school competitions and cultural events provide a platform for students to showcase their skills and gain confidence.

Vidyajyoti schools boasts state-of-the-art infrastructure, which creates an ideal environment for learning and growth. The school is equipped with well-equipped classrooms, science and computer laboratories, a library, and sports facilities. The use of technology, such as smart boards and multimedia resources, enhances the teaching and learning experience. The school also provides a safe and secure campus, ensuring the well-being of its students. Vidyajyoti schools recognizes the significance of character building and instilling strong values in its students. The institution nurtures an atmosphere of respect, integrity, and compassion. Various initiatives and programs are undertaken to inculcate moral values, social responsibility, and ethical behaviour among the students. The school encourages active participation in community service, fostering a sense of empathy and altruism. Vidyajyoti schools believes in the importance of involving parents in the educational journey of their children. The institution maintains open lines of communication with parents through regular meetings, progress reports, and interactive sessions. Parent-teacher collaboration plays a vital role in addressing the individual needs and aspirations of students, ensuring their overall development.

In the state of Tripura, there are several schools that provide education to students, apart from the schools under the Mission 100 scheme initiative. These schools play a significant role in the education system of Tripura, catering to the diverse needs of students across the state. The schools in Tripura offer education from primary level to higher secondary level, equipping students with knowledge and skills to pursue their academic and career aspirations. These schools follow the curriculum prescribed by the Tripura Board of Secondary Education (TBSE) and focus on providing a wellrounded education to their students. One notable aspect of schools in Tripura is their commitment to promoting regional culture and traditions. Many schools incorporate local customs and traditions into their curriculum, allowing students to connect with their roots and develop a sense of pride in their heritage. This emphasis on cultural values enhances the overall learning experience and fosters a strong sense of identity among the students. Additionally, Vidyajyoti schools in Tripura strive to provide a conductive learning environment by employing qualified teachers and maintaining adequate infrastructure. They aim to create an atmosphere where students can explore their potential, engage in critical thinking, and develop essential life skills. Various co-curricular activities such as
sports, arts, and extracurricular clubs are encouraged to promote holistic development and nurture students' talents and interests. Furthermore, schools in Tripura play an essential role in promoting social inclusivity and equity in education. Efforts are made to ensure that education is accessible to all sections of society, irrespective of their socio-economic background or geographic location. Scholarships and other financial assistance programs are often provided to support economically disadvantaged students, enabling them to pursue their education without hindrance. While the schools in Tripura not under the Mission 100 scheme initiative may operate independently, they still contribute significantly to the state's education landscape. They continue to shape the lives of countless students, providing them with a solid foundation for their future endeavours and contributing to the overall development of the state.

Education plays a pivotal role in shaping individuals and societies, equipping them with the knowledge, skills, and values necessary for personal growth and societal progress. In this pursuit of educational excellence, Vidyajyoti schools emerge as a beacon of hope, empowering young minds and illuminating their futures. This essay explores the mission, vision, and core values of Vidyajyoti schools, highlighting its commitment to holistic education and fostering the overall development of students.

The impact on the performance of Vidyajyoti schools can then be managed by monitoring various features. In actuality, the technique can be put into practise by using particular, advanced smooth algorithms, which are utilised to fairly and unbiasedly locate the vital qualities. In order to help decision-makers make the best choice possible in light of their preferences, important approaches are analysed using a structured and rationalised framework developed by MADM strategies, a prominent subject in the field of decision theory.

There are various types of investigation process available. It's hard to pick the essential aspect influencing education systems. The investigative reporter can select specific attributes that will serve as the foundation for their inquiry or process improvement authority and other requirements. Assume that the decision makers select six alternatives after the initial screening.

The following are the different alternatives taken for the study:

(i) Infrastructure (P_1): Vidyajyoti schools with good infrastructure provides a solid foundation for the holistic development of its students. It encompasses a range of physical facilities and resources designed to support the learning process and create an environment conducive to academic, social, and emotional growth. Vidyajyoti schools infrastructure starts with well-designed and maintained classrooms. These spaces are spacious, well-lit, and properly ventilated, providing a comfortable learning environment. Adequate seating arrangements, ergonomic furniture, and appropriate storage facilities ensure that students can focus on their studies without unnecessary distractions. In addition to classrooms, Vidyajyoti schools infrastructure includes specialized rooms for science laboratories, computer labs, libraries, and art studios. These dedicated spaces are equipped with modern tools, equipment, and resources that enable students to explore and engage in hands-on learning experiences. State-of-theart technology, high-speed internet connectivity, and up-to-date software ensure that students have access to the latest educational resources and can develop digital literacy skills.

(ii) Academic Excellence (P_2): Vidyajyoti schools places a strong emphasis on academic excellence, recognizing that it forms the foundation for future success. The school follows a comprehensive curriculum that combines theoretical knowledge with practical application. Highly qualified and dedicated teachers impart education using innovative teaching methodologies, ensuring that students receive a well-rounded and engaging learning experience. The school also promotes critical thinking, problem-solving skills, and a love for learning, fostering an environment that stimulates intellectual growth and curiosity.

(iii) Holistic Development (P_3): While academic achievement is vital, Vidyajyoti schools understand the importance of holistic development. The school offers a range of extracurricular activities, including sports, arts, music, and cultural events, allowing students to explore and develop their talents beyond the confines of the classroom. These activities nurture creativity, teamwork, discipline, and leadership skills, preparing students to face the challenges of life with confidence and resilience.

(iv) Character Building and Values (P_4): Vidyajyoti schools firmly believes in instilling strong values and character traits in its students. The school promotes integrity, honesty, respect, compassion, and a sense of social responsibility. Through various programs, students are encouraged to engage in community service, develop empathy, and understand the importance of giving back to society. These values cultivate responsible citizens who contribute positively to their communities and make a difference in the world. Students directly participate in Vidyajyoti schools committees such as SMC, Eco-Club, NSS, Prahari-Club, and DNA Club, which fosters leadership qualities.

(v) Student Support and Well-being (P_5): Recognizing that each student is unique, Vidyajyoti schools provides a supportive and inclusive environment that caters to individual needs. The school has a student support system in place, ensuring that students receive personalized attention and guidance. Teachers and staff are trained by workshops and seminar conducted by department of education, Govt. of Tripura to identify and address any academic or emotional challenges that students may face, fostering an atmosphere of trust and care. The school also promotes physical and mental well-being through sports activities, counselling services, and mindfulness programs.

(vi) Parental Involvement (P_6) : Vidyajyoti schools recognizes the significant role parents play in a child's education and overall development. The school actively involves parents in the learning process, organizing parent-teacher meetings, workshops, and seminars to foster collaboration and mutual understanding. This partnership between the school and parents creates a strong support system that enhances the educational journey of the students.

Vidyajyoti schools stands as a testament to the transformative power of education. By providing quality education, fostering holistic development, and instilling strong values, the school empowers its students to become confident, compassionate, and socially responsible individuals. Through its unwavering commitment to academic excellence, character building, and student well-being, Vidyajyoti schools illuminates the path to a brighter future, inspiring generations to strive for personal growth and contribute meaningfully to society.

Let $G = \{G_1, G_2, G_3, G_4\}$ be the collection of attributes based on which the decision maker will select the most appropriate parameter/alternative, where G_1 = Parent's Survey, G_2 = Student's Survey, G_3 = Media Survey and G_4 = Expert Survey.

The attributes and alternatives used in this study were selected after analysing the literature. To determine the fundamental components regulating overall educational development, we refer [34, 9, 13, 18] When most of these alternatives and attribute data are standardized, these factor data become unit less. After that, the mean of each data point is utilized to standardize the entire data set.

Table-1: The tabular representation of the information of alternatives/parameters P_1, P_2, P_3, P_4, P_5 and P_6 against the attributes G_1, G_2, G_3 and G_4 with the help of Possibility value

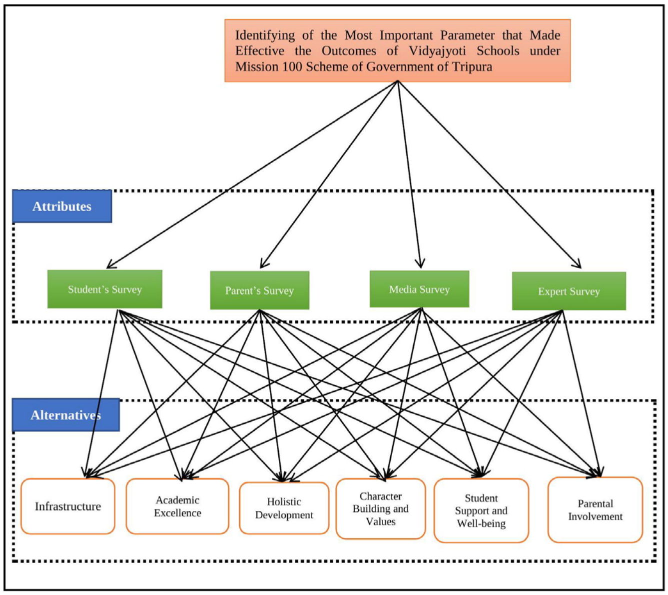

Figure 2. Decision Hierarchy of the Current MADM Problem

	G_1	G_2	G_3	G_4
$\boldsymbol{P_1}$	0.8	0.7	0.75	0.75
$\boldsymbol{P_2}$	0.8	0.63	0.55	0.45
$\boldsymbol{P_3}$	0.75	0.5	0.74	0.6
$\boldsymbol{P_4}$	0.8	0.84	0.6	0.75
$\boldsymbol{P_5}$	0.6	0.66	0.9	0.7
$\boldsymbol{P_6}$	0.72	0.82	0.52	0.48

Table-2: Determination of Normalized Decision Matrix

	G_1	G_2	G_3	G_4
$\boldsymbol{P_1}$	1	0	0.5	0.5
$\boldsymbol{P_2}$	1	0.514286	0.285714	0
$\boldsymbol{P_3}$	1	0	0.96	0.4
$\boldsymbol{P_4}$	0.833333	1	0	0.625
$\boldsymbol{P_5}$	0	0.2	1	0.333333
$\boldsymbol{P_6}$	0.705882	1	0.117647	0

By using the eq. (1) and eq. (2), we get the weights of the attributes as follows:

$w_1 = 0.272394881, w_2 = 0.252894576, w_3 = 0.247410116$ and $w_4 = 0.2273C$

Table-3: Determination of Weighted Normalized Decision Matrix

	G_1	G_2	G_3	G_4
P_1	0.272395	0	0.123705	0.11365
P_2	0.272395	0.13006	0.070689	0
P_3	0.272395	0	0.237514	0.09092
P_4	0.226996	0.252895	0	0.142063
P_5	0	0.050579	0.24741	0.075767
P_6	0.192279	0.252895	0.029107	0

Table-4: Determination of the Ideal Possibility Positive Estimates (IPPE) and Ideal Possibility Negative Estimates (IPNE) for the Decision Matrix

	G_1	G_2	G_3	G_4
P_1	0.272395	0	0.123705	0.11365
P_2	0.272395	0.13006	0.070689	0
P_3	0.272395	0	0.237514	0.09092
P_4	0.226996	0.252895	0	0.142063
P_5	0	0.050579	0.24741	0.075767
P_6	0.192279	0.252895	0.029107	0
Z^+	0.272395	0.252895	0.24741	0.142063
Z^-	0	0	0	0

Table-5: Determine the Relative Closeness Coefficient to the IPPE

	S_i^+	S_i^-
P_1	0.405012	0.50975
P_2	0.441619	0.473144
P_3	0.313934	0.600829
P_4	0.292809	0.621953
P_5	0.541007	0.373756
P_6	0.440482	0.47428

Table-6: Ranking the Alternatives

	$\mathbf{R}_i = \frac{s_i^+}{s_i^+ + s_i^-}$
P_1	0.442751
P_2	0.482769
P_3	0.343186
P_4	0.320093
P_5	0.591418
P_6	0.481526

From Table-6, it is clear that $R_5 > R_2 > R_6 > R_1 > R_3 > R_4$. Therefore, P_5 i.e., Student Support and Well-being is the most important parameter that made effective the outcomes of Vidyajyoti schools under Mission 100 Scheme of Government of Tripura.

5. Discussion:

The proposed TOPSIS method based MADM strategy operates as a structured efficient approach to support decision making tasks under uncertain conditions. This approach finds effective application for education assessment ranking and additional MADM problems. The model's ability to assist decision making suffers from three principal drawbacks: it depends on human judgment for Possibility value assignment and makes attribute independence assumptions and shows high sensitivity to data changes. Enhanced model effectiveness requires resolving limitations through advanced modeling techniques which should include hybrid approaches using neutrosophic logic and machine learning systems.

Advantages of the Proposed MADM Strategy:

- Systematic Decision Making Process: The proposed model arranges decisions through a systematic procedure which examines multiple criteria before choosing alternatives through closeness assessments toward the perfect solution.
- Integration of Possibility Theory: Real-world problems benefit from the proposed model because Possibility theory handles imprecise information and uncertain data to process incomplete fuzzy data sets.
- Effective Ranking Mechanism: The model determines objective best alternatives through its relative closeness coefficient calculation framework.
- Weight Estimation Using Compromise Function: This approach outpaces traditional TOPSIS method since it automatically determines attribute weights through a compromise function which minimizes subjective errors.
- Applicability to Educational Assessment: The practical utility of this model was proven during its implementation for evaluating Vidyajyoti School effectiveness in educational performance measurement.

- Handles Both Positive and Negative Attribute: The methodology includes assessments of positive attributes and negative attributes to rank alternatives with an encompassing evaluation process.
- Computational Simplicity: Execution of the steps to normalize the decision matrix and produce the weighted matrix as well as calculate separation measures demonstrates easy implementation with computational efficiency.
- Flexibility in Attribute Selection: The model structure remains flexible so decision makers can add relevant attributes throughout diverse applications without modifying the framework.

Disadvantages of the Proposed MADM Strategy:

- Assumption of Independence Between Attribute: A key assumption of this model requires that decision attribute function independently while having linear relationships yet some complex real-world environments fail to meet these requirements.
- Subjectivity in Possibility Values: Decision making becomes inconsistent because assigning Possibility values to alternatives requires expert evaluations that bring subjective elements to evaluation processes.
- Weight Calculation May Not Reflect True Importance: The compromise function provides an automatic weight determination process yet its output might diverge from actual practical weight distributions.
- Sensitivity to Data Variations: Changes in either the Possibility values or attribute weights produce significant effects on alternative rankings thus making the model responsive to minor input shifts.
- Computational Complexity for Large Data Sets: The process of normalizing along with weighing and ranking alternatively increases substantially when the number of alternatives reaches high levels combined with many attributes.
- Limited Interpretability for Decision Makers: The objective ranking system provided by mathematical solutions requires interpretation from decision makers who lack Possibility theory understanding and MADM expertise.

5. Conclusion:

In this article, a TOPSIS method based MADM strategy has been developed under Possibility set environment. Also, the proposed MADM strategy has been validated by solving an illustrative MADM problem to demonstrate the applicability and effectiveness of the MADM strategy.

Furthermore, in future, the proposed MADM strategy will open up a new avenue of research in the Possibility set environment.

The TOPSIS method based MADM strategy is evaluated in this work in a potential setting with the identification of the most crucial factors influencing schools under the Mission 100 scheme. This will be advantageous not only on its own, but it will also make it possible for motivated researchers to use comparable strategies to find answers to other uncertainty related problems. The Possibility value was calculated using an innovative method in the study that followed, which used examples of realworld decision making situations like teacher selection, employee selection, weaver selection, etc. This MADM strategy will show to be quite useful in many real-life situations when making decisions is the main objective.

Declarations:

Conflict of Interest: The authors declare that they have no conflict of interest.
Ethical Approval: This article does not contain any studies with human participants or animals performed by any of the authors.
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Department of Statistics, Tripura University, Agartala-799022, Tripura, India.
Email address: bimalshil738@gmail.com

Department of Statistics, Tripura University, Agartala-799022, Tripura, India.
Email address: drprasenjitsinha2012@gmail.com,

Department of Education, NIT Agartala, Jirania-799046, Tripura, India
Email address: sumandas18842@gmail.com

Department of Mathematics, Tripura University, Agartala-799022, Tripura, India
Email address: ajoykantidas@gmail.com