Leader Culling using AHP – PROMETHEE Methodology

Vandana Bagla
Maharaja Agrasen Institute of Technology, Guru Gobind Singh Indraprastha University, Delhi, India.

Anjana Gupta
Maharaja Agrasen Institute of Technology, Guru Gobind Singh Indraprastha University, Delhi, India.

Bhavna Sharma
Maharaja Agrasen Institute of Technology, Guru Gobind Singh Indraprastha University, Delhi, India.

ABSTRACT

The candidate selection process involves thoughtful empirical decisions which determine the best fit from a pool of contesting candidates. A wide range of criteria is used to assess the candidates. This paper utilizes an improved PROMETHEE II (Preference Ranking Organization Method for Enrichment Evaluation) methodology which efficiently establishes its applicability and potentiality to solve such types of decision-making problems with multiple conflicting criteria and alternatives. The employed methodology utilizes systematic approach to screen and ultimately select the most suitable candidate. The factors considered here explore personal as well as professional aspects of the aspiring candidates.

Keywords

Analytic Hierarchy Process (AHP), PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation), Multi Criteria Decision Making (MCDM).

1. INTRODUCTION

Almost all Multi-Criteria Decision Making (MCDM) problems involve multiple, diverse and complex set of social, pragmatic and sensible factors which are quite hard to be overcome by mere intuition. Selecting a suitable candidate is of vital importance for a responsible citizen. This study describes the use of the AHP (Analytical Hierarchy Process) with the PROMETHEE II (Preference Ranking Organization Method for Enrichment Evaluation) to rank the contesting candidates on a set of judgment criteria. The developed methodology facilitates the selection procedure in a rational and transparent way that can be examined and understood by the concerned voters.

PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) is a multi-criteria decision making method developed by Brans [6]. Since then it has successively been applied in many fields especially in the investment analysis and performance evaluation. Albadvi [1], Babic and Plazibat [2], Bouri [4], Mareschal [8], Mareschal and Brans [9, 10] and Vranegl [12], all applied PROMETHEE in decision making. There are many competing candidates and several critical criteria for choosing the most suitable one. By using the Analytical Hierarchy Process (AHP) introduced by Saaty [11], suitable weights are allocated to all the associated criteria which are crucial for a felicitous selection. Two surveys, a general survey and the AHP survey had been conducted to achieve these objectives. The first general survey was performed to collect general views of the citizens to identify the perceived critical selection criteria, while the AHP survey was conducted to prioritize and assign the important weighing to the perceived criteria in the general survey. The study includes Indian citizens above 18 years of age.

The paper is organized in six sections. Section 1 is introductory. Section 2 gives an overview of AHP and PROMETHEE II methodologies. Section 3 describes the problem under consideration presenting a hierarchical structure of the specified criteria and introduces an application. Section 4 explains the application part using proposed methodology to provide final rankings. Section 5 illustrates the methodology via an example. Finally, we present some pertinent conclusions, followed by giving recommendation for further research in section 6

2. OVERVIEW OF METHODOLOGIES

2.1 Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) provides a comprehensive framework for structuring a decision problem to represent and quantify its elements. The out-come of AHP is a prioritized weighing of each decision alternative. The AHP converts these evaluations to numerical values that can be processed and compared over the entire range of the problem. A numerical weight or priority is derived for each element of the hierarchy, allowing diverse and often incommensurable elements to be compared to one another in a rational and consistent way. The first step in the Analytical Hierarchy Process is to model the problem as a hierarchy. The hierarchy is a structured means of describing the problem at hand. It consists of an overall goal at the top level, a group of options or alternatives for reaching the goal and a group of factors or criteria that relate the alternatives to the goal. In most cases the criteria are further broken down into sub criteria, as per the requirement of the problem.

Once the hierarchy has been constructed, the participants use the AHP to establish priorities for all its nodes. For this, the elements of a problem are compared in pairs with respect o their relative impact on a property they share in common. The pair wise comparison is quantified in matrix form by using the scale of Relative Importance developed by Saaty [11] as shown in Table 1.

Table 1 Analytic Hierarchy Measurement Scale

Reciprocal measure of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Moderate importance	Experience and judgments moderately favor one activity over another
7	Strong Importance	An activity is strongly favored and its dominance is demonstrated in practice
9	Absolute Importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between two adjacent judgments.	When compromise is needed

During the elicitation process, a positive reciprocal matrix is formed in which the $(i,j)^{th}$ element a_{ij} is filled by the corresponding number from the Table 1 and the number is chosen according to the following criterion.

$$\begin{cases} a_{ij}, \text{ if } x_i \text{ dominates } x_j \\ \frac{1}{a_{ij}}, \text{if } x_j \text{ dominates } x_i \\ 1, \text{ if } x_i \text{ does not dominate } x_j \text{ and } x_j \text{ does not dominate } x_i. \end{cases}$$

The matrix so formed is called the reciprocal matrix. This reciprocal matrix is used to calculate the local priority weight of each criterion. The local priority weight (w) is the normalized eigen vector of the priority matrix corresponding to the maximum eigen value of the matrix. For detail reasoning of this account we refer to Ball and Noel [3], Bryson and Mobolurin [6], Lunging [7] and Saaty [11].

An interesting property of the priority matrix is that if in addition its elements are such that

$$a_{ij}\, a_{jk} = a_{ik}, \quad \forall\, i \le j \le k \qquad (1)$$

Then the derived priority vector w satisfies

$$w_i / w_j = a_{ij}, \quad \forall\, i < j \qquad (2)$$

Any reciprocal matrix satisfying (1) is called consistent. However in practice, the priority matrix seldom satisfies (1), thereby making it more important to define some relaxed measuring of consistency check. Saaty [11] introduced the concept of consistency index CI of a reciprocal matrix as the ratio

$\frac{\lambda_{max} - n}{n-1}$, Where λ_{max} and 'n' respectively stand for the maximum eigen value and order of the reciprocal matr1x.

Table 2 Random consistency Index (RI)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

The obtained CI value is compared with the random index RI given in Table 2. The Table 2 had been calculated as an average of CI's of many thousand matrices of the same order whose entries were generated randomly from the scale 1 to 9 with reciprocal effect. The simulation results of RI for matrices of size 1 to 10 had been developed by Saaty [11] and are given in Table 2. The ratio of CI and RI for the same order matrix is called the consistency ratio CR. In general, a consistency ratio of 10% or less is considered very well. If inconsistency of judgments within the matrix has occurred then evaluation process should be reviewed and improved upon. Eigenvector extraction can be facilitated through the use of proprietary software. Several firms supply computer software to assist in using the process like Expert Choice, CGI etc. The Analytic Hierarchy Process (AHP) has unique advantages when important elements of the decision are difficult to quantify or compare or where communication among team members is impeded by their different specializations, terminologies or perspectives.

2.2 PROMETHEE II (Preference Ranking Organization Method for Enrichment Evaluation)

PROMETHEE is a ranking method well adapted to problems where a finite number of alternatives are to be ranked considering several, sometimes conflicting, criteria.

Let A_i, i = (1, ...,m) be a set of 'm' alternatives, C_j, j = (1, ...,n) be 'n' evaluation criteria and W_j, j = (1, …, n) be the associated criteria weights as shown in Table 3. Furthermore criteria weights W_j are normalized and have been determined by an appropriate method. Without loss of generality,
we may assume that these criteria weights are to be maximized.

Table 3 Decision Matrix

(A_i) ↓	C_1	C_2	C_n
	W_1	W_2	W_n
A_1 A_2 A_m		$f_j(A_i)$	

The procedural steps as involved in PROMETHEE II are enlisted below.

Step 1: Obtain an evaluation x_{ij} corresponding to every $f_j(A_i)$ as crisp score for each alternative corresponding to the respective criterion. Here x_{ij} is the performance measure of i^{th} alternative with respect to j^{th} criterion.

Step2: Normalize the decision matrix using the following equation:

$$r_{ij} = \frac{[x_{ij} - min(x_{ij})]}{[max_j(x_{ij}) - min_j(x_{ij})]} \quad (i = 1,...,m), \forall j \quad (3)$$

For non-beneficial criteria, Eqn. (3) can be rewritten as follows:

$$r_{ij} = \frac{[max_j(x_{ij}) - x_{ij}]}{[max_j(x_{ij}) - min_j(x_{ij})]} \quad (i = 1,...,m), \ \forall j \quad (4)$$

Step 3: Now to find the evaluative differences of i^{th} alternative with respect to other alternatives, calculate the preference function, $P_j\ (A_i,\ A_{i'})$. This step involves the calculation of differences in criteria values between different alternatives pair-wise. There are mainly six types of generalized preference functions as proposed by Brans et. al [5], Mareschal and Brans [10]. But these preference functions require the definition of some preferential parameters, such as the preference and indifference thresholds. However, in real time applications, it may be difficult for the decision maker to specify which specific form of preference function is suitable for each criterion and also to determine the parameters involved. To avoid this problem, the following simplified preference function is adopted here:

$$P_j(A_i, A_{i'}) = 0, \qquad if\ r_{ij} \le r_{i'j} \qquad (5)$$

$$P_j(A_i, A_{i'}) = r_{ij} - r_{i'j}, \qquad if\ r_{ij} > r_{i'j} \qquad (6)$$

$0 \le P_j(A_i, A_{i'}) \le 1$ and

$P_j(A_i, A_{i'}) = 0$ means no preference or indifference,
$P_j(A_i, A_{i'}) \approx 0$ means weak preference,
$P_j(A_i, A_{i'}) \approx 1$ means strong preference,
$P_j(A_i, A_{i'}) = 1$ means strict preference.

The simplicity is the main advantage of these preferences functions. There are not more than two parameters at a time, each having a clear chronological significance.

Step 4: A multi criteria preference index $\pi(A_i, A_{i'})$ of A_i over $A_{i'}$ can then be defined considering all the criteria:

$$\pi(A_i, A_{i'}) = \sum_{j=1}^{n} W_j . P_j(A_i, A_{i'}) \qquad (7)$$

where W_j is the relative importance (weight) of j^{th} criterion.

This index also takes values between 0 and 1 and represents the global intensity of preference between the couples of alternatives.

Step 5: Determine the leaving (or positive) and entering (or negative) outranking flows as follows:

$$\varphi^+(A_i) = \frac{1}{m-1} \sum_{i=1}^{m} \pi(A_i, A_{i'}), \quad (i \ne i') \qquad (8)$$

$$\varphi^-(A_i) = \frac{1}{m-1} \sum_{i=1}^{m} \pi(A_{i'}, A_i), \quad (i \ne i') \qquad (9)$$

where 'm' denotes number of alternatives. $\varphi^+(A_i)$ and $\varphi^-(A_i)$ denote positive and negative outranking flows respectively. Here, each alternative faces (m-1) number of other alternatives. The leaving flow expresses how much an alternative dominates the other alternatives, while the entering flow denotes how much an alternative is dominated by the other alternatives.

Step 6: calculate the net outranking flow for each alternative:

$$\varphi(A_i) = \varphi^+(A_i) - \varphi^-(A_i) \qquad (10)$$

Step 7: Determine the ranking of all the considered alternatives depending on the values of $\varphi(A_i)$. The higher value of $\varphi(A_i)$ the better is the alternative. Thus, the best alternative is the one having the highest $\varphi(A_i)$ value.

The PROMETHEE method has significant advantages over the other MCDM approaches, e.g. multi-attribute utility theory (MAUT) and AHP. The PROMETHEE method can classify the alternatives which are difficult to be compared because of a trade-off relation of evaluation standards as non comparable alternatives. It is noteworthy to mention here that PROMETHEE methodology may only be applied if the decision maker can express the importance of various criteria on a ratio scale. Therefore a decision maker must be able to supply such quantitative criterion importance with the necessary accurateness.

The PROMETHEE methods are quite popular in the world of outranking methods. One of the reasons for this popularity is the existence of the very user-friendly software, called PROMCALC - PROMethee CALCulation. More and more practitioners are using PROMCALC to handle their multiple criteria problems.

3. PROBLEM DESCRIPTION

A group of voters have to select a candidate among a set of contesting candidates. Each voter has a personal ranking of the candidates according to his/her preferences. The problem of the selection or the ranking of alternatives submitted to multi criteria evaluation is a controversial task. Usually there is no optimal solution as no alternative is the best one on each criterion.

Problem is to rank the candidates according to their credibility on a set of weighted judgment criteria.

The development of a ranking procedure requires a consensus on a set of criteria for evaluation, upon which the selection of candidates will be based.

Potentially large number criteria are to be judged on a valid scale
that is acceptable to all the participants. The most critical phase in designing the selection process model is to structure the decision problem. The main goal is to select the best candidate, according to a set of criteria for evaluation.

As conflicting views may arise among different communities in determining the most important criteria of evaluation in a given decision making setting, a general survey was conducted to develop the main criteria, sub criteria and categories for each sub criteria for achieving the goal. Figure 1 shows the developed hierarchical structure.

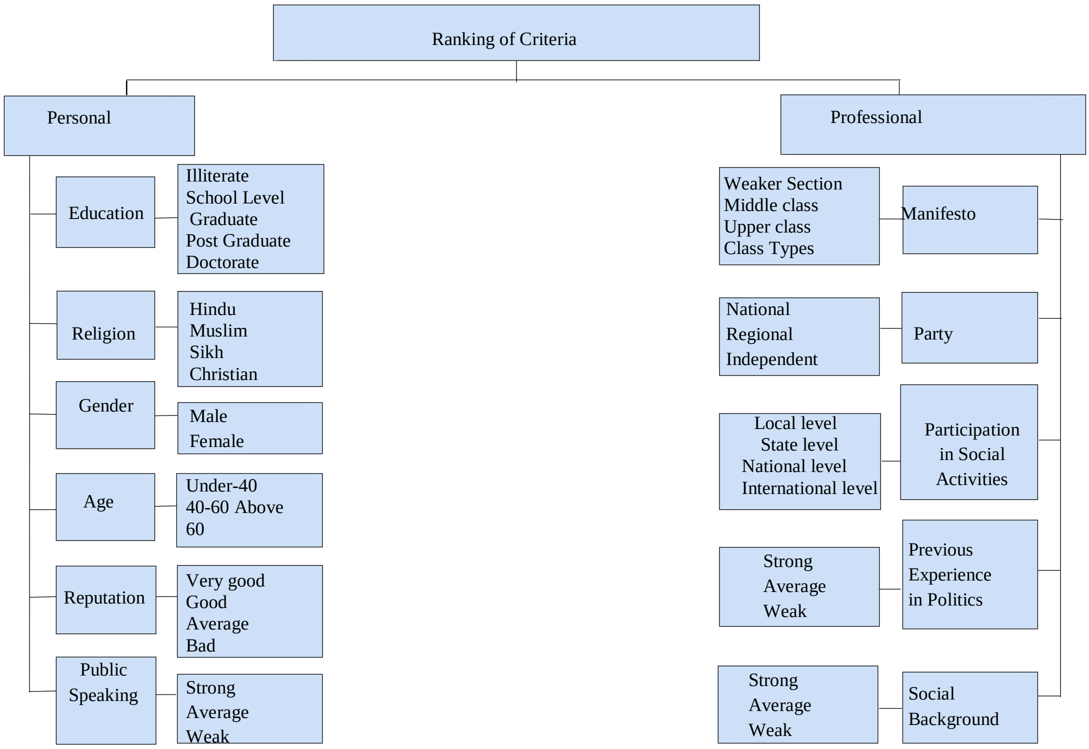

Fig. 1 Hierarchy

4. SOLUTION PROCEDURE

4.1 Allotting Weights Using AHP:

The scenarios for this survey analysis were crafted after a study of the responses from our previous surveys and of the predictions made to workout the hierarchy using AHP. To evaluate the hierarchy (Fig 1), various surveys were conducted to rate each attribute to others in a series of pair wise comparisons using a scale from 1 to 9 (Table 1). The study scrutinized Indian citizens above eighteen years of age from all communities. For this purpose, sixty one responsible people

representing all categories like doctors, teachers, professionals, politicians house wives etc. were asked to rate various attributes in the prepared questionnaire forms based on 9 point scale given in Table 1. An approach of Analytic Hierarchy process (explained in section 2.1) is applied to find out the weights of each criterion at different levels of hierarchy. Survey results were analyzed for each level of hierarchy and reciprocal matrices were generated. An aggregated reciprocal matrix was developed for each set of matrices having (C.R<0.2) by taking geometric mean of corresponding values for further calculations.

MATLAB 7 was used to accomplish the results. The local priority weights were derived from a series of pairwise comparisons involving all the nodes. AHP software by CGI was used to work out these priority weights. We rank each of the criterion in the final set by evaluating it with respect to upper level attributes separately. The evaluation process finally generates the global weights for each requisite criterion of interest. Table 4 shows calculations of weights for personal and professional criteria at level 1. As already mentioned, a_{ij} entries in the matrix are geometric mean of all values form similar matrices having (C.R<0.2).

Table4. Relative Importance of Criteria At Main Level

Ranking	Personal	Professional	**Local Weights**
Personal	1	1.4353	**0.589373**
Professional	0.6967	1	**0.410627**

$\lambda_{max} = 2, \quad C.I. = 0, \quad C.R. = 0$

Table 5 and 6 respectively show calculations of criteria weights at level 2 of hierarchy.

Table 5 Relative Importance of Sub Criteria at Personal Level

Personal	Education	Religion	Gender	Age	Reputation	Public Speaking	**Local Weights**
Education	1	3.624	4.0418	3.9936	0.9919	1.6736	**0.279918**
Religion	0.2759	1	1.7172	1.8616	0.2474	0.3238	**0.0830463**
Gender	0.2474	0.5823	1	0.9600	0.1911	0.2169	**0.05466470**
Age	0.2504	0.5372	1.04167	1	0.1802	0.2145	**.05428260**
Reputation	1.0082	4.0420	5.2329	5.5494	1	1.4700	**0.303579**
Public Speaking	0.5975	3.0883	4.6104	4.6620	0.6803	1	**0.224509**

$\lambda_{max} = 6.05699, \quad C.I. = 0.0113977, \quad C.R. = 0.0092$

Table 6 Relative Importance of Sub Criteria at Professional Level

Professional	Manifesto	Party	Participation In Social Activities	Previous Experience In Politics	Social Background	**Local Weights**
Manifesto	1	0.2683	0.2571	0.2966	0.2114	**0.0594166**
Party	3.7272	1	1.1675	1.7207	0.9881	**0.26234**
Participation In Social Activities	3.8895	0.8565	1	1.7934	1.1129	**0.256984**
Previous Experience In Politics	3.3715	0.5812	0.5576	1	0.6147	**0.162607**
Social Background	4.7303	1.0120	0.8986	1.6268	1	**0.258653**

$\lambda_{max} = 5.02858$, $C.I. = 0.00714548$, $C.R. = 0.0064$

Similar matrices are worked out for all the criteria at level 3. Also global priority weights for each criterion are calculated by multiplying its local weight by its upper level criterion's global priority weight. Figure 2 shows local and global priorities of the criteria and its sub criteria calculated using AHP software CGI and MATLAB. Here global priority weights for each one are preceded by an asterisk (*) symbol to differentiate them from local priority weights.

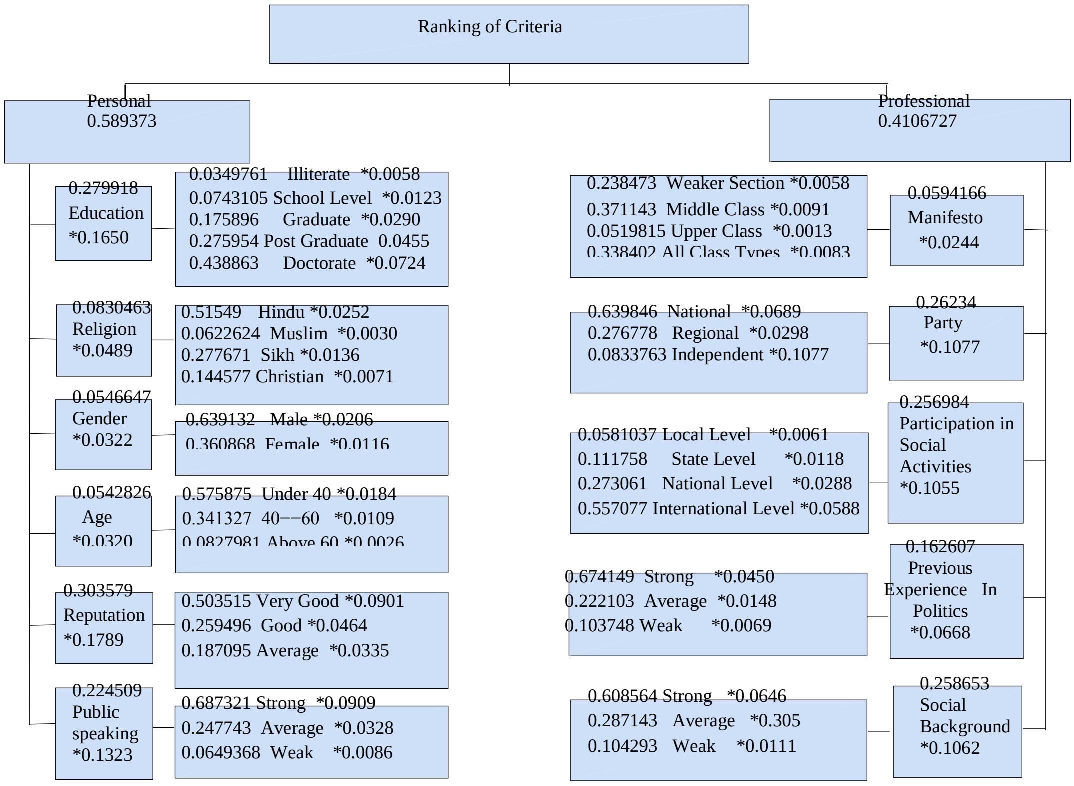

Fig. 2 Local & Global Priority Weights for Criteria at Each Level

Above exercise provides a structure to implement the survey analysis. However AHP can be further extended to another level to allocate priority weights to various decision alternatives. Yet tedious comparisons at an advanced level due to large number of criteria can be supplemented by using PROETHEE II methodology to trim down the calculations to a moderate level.

4.2 Ranking of Alternatives Using PROMETHE II Methodology

After having weight allocations to the set of perceived criteria via AHP, the problem of selection of suitable candidate is submitted to PROMETHEE II methodology for a pertinent ranking, explained explicitly in section 2.2

Alternatives A_i , (i = 1,….,m), criteria C_j , (j = 1,…,n) and weights W_j , (j = 1,….,n) are sited in matrix form similar to that of Table 3. An evaluation x_{ij} corresponding to every $f_j(A_i)$ is taken as crisp score for each alternative corresponding to the respective criterion. It is conspicuous to mention that instead of using any standard scale, we are using local priority weights calculated via AHP for each evaluation as crisp scores.

Each column of the decision matrix is normalized using equation 3 as all the criteria considered here are beneficial criteria.

In order to take the deviations and the scales of the criteria into account, a preference function is associated to each criterion. For this purpose, a preference function $P_j(A_i, A_i')$ is defined, representing the degree of the preference of alternative Ai over A_i' for criterion C_j. Preference functions for all the pairs of alternative are evaluated using equations 5 and 6. Global intensity preference function between the couples of alternatives defined by $\pi(A_i, A_i')$ is found out to associate weights with each preference function as given by equation 7 in section 2.2.

Now the precedence flows represented by $\varphi^+(A_i)$ and $\phi^-(A_i)$ are determined using equations 8 and 9 to conceptualized the net outranking flow given in equation 10.

Particularly user-friendly software, called Decision Lab has been developed in collaboration with the Canadian company Visual Decision to assist all kinds of decision-makers.

Strengthening PROMETHEE with ideas of AHP:

In the present text, some ideas of AHP have been applied in the PROMEETHE methodology viz. level 2 criteria global weights given by hierarchy in Figure 2 are being taken as normalized criteria weights to ascertain their adaptability to the condition $\sum_{j=1}^{n} w_j = 1$. Also instead of using any arbitrary scale to convert the ratings of various alternatives with respect to different criteria to crisp scores, we are using local priority weights of level 3 criteria calculated via AHP as requisite x_{ij} measures.

5. ILLUSTRATION

We will now illustrate the proposed methodologies via an example in which three candidates say A_1, A_2 and A_3 are contesting an election. The important criteria at personal as well as professional levels were probed. We have identified eleven criteria to be used in choosing the fitting person as already discussed in section 3. Reputation is the highest weighted criteria followed by education and public speaking. Candidate's political party is also prominently weighed proceeded by social background and participation in social activities as indicated in Fig.2 of hierarchy. Summary of this inquisition is shown in Table 7.

Table 7 Specification of Candidates

Criteria (Level 2) ↓	Alternatives→		
	A_1	A_2	A_3
Education	Doctorate (D)	Graduate (GR)	School Level (SC)
Religion	Sikh (S)	Hindu (H)	Hindu (H)
Gender	Male (M)	Male (M)	Female (F)
Age	68 (60A)	55 (40-60)	39 (40U)
Reputation	Very Good (VG)	Good (G)	Bad (B)
Public Speaking	Average (A)	Strong (S)	Weak (W)
Manifesto	Middle class (MC)	All Class Types (AL)	Weaker Section (WS)
Party	National (N)	National (N)	Regional (R)
Participation In Social Activities	International Level (IL)	National Level (NL)	State Level (SL)
Previous Experience in Politics	Strong (S)	Strong (S)	Average (A)
Social Background	Average (A)	Strong (S)	Weak (W)

5.1 Ranking using PROMETHEE II:

Now to rank the alternatives using PROMETHEE II, crisp evaluation x_{ij} corresponding to every $f_j(A_i)$ is accessed using local priority weights calculated via AHP. Also criteria weights (w_j) are their global priority weights calculated via AHP incorporating survey analysis as shown in Table 8.

Table 8 Objective Data for Ranking Procedure

(Ai) ↓	Education	Religion	Gender	Age	Reputation	Public Speaking	Manifesto	Party	Part. in Soc. Act	Pre. Exp. in Pol.	Social Background
	.1650	.0489	.0322	.0320	.1789	.1323	.0244	.1077	.1055	.0668	.1062
A_1	D .4389	S .2777	M .6391	60A .0828	VG .5035	A .2477	MC .3711	N .6398	IL .5571	S .6741	A .2871
A_2	GR .1759	H .5155	M .6391	40-60 .3413	G .2595	S .6873	AL .3384	N .6398	NL .2731	S .6741	S .6086
A_3	SC .0743	H .5155	F .3609	40U .5759	B .0499	W .0649	WS .2385	R .2768	SL .1118	A .2221	W .1043

Now calculating normalized value r_{ij} against each x_{ij}, using equation 3. $r_{11} = (0.4389 - 0.0743)/(0.4389 - 0.0743) = 1$.

Similarly other r_{ij}'s are calculated. Table 9 depicts the normalized decision matrix hence obtained

Table 9 Normalized Decision Matrix

(Ai) ↓	Education	Religion	Gender	Age	Reputation	Public Speaking	Manifesto	Party	Part. in Soc. Act.	Pre. Exp. in Pol.	Social Background
	.1650	.0489	.0322	.0320	.1789	.1323	.0244	.1077	.1055	.0668	.1062
A_1	1	0	1	0	1	.2937	1	1	1	1	.3625
A_2	.2787	1	1	.5242	.4621	1	.7534	1	.3622	1	1
A_3	0	1	0	1	0	0	0	0	0	0	0

The preference function $P_1(A_1,A_2) = r_{11} - r_{21}$, *as* $r_{11}>r_{21}$. Likewise $(P_{A_i}, P_{A_{i'}})$'s are worked out for all possible pairs of alternatives and are given in Table 10.

Table 10 Preference Functions for All the Pairs of Alternatives

(PA_i , $PA_{i'}$) ↓	Education	Religion	Gender	Age	Reputation	Pubic Speaking	Manifesto	Party	Part. in Soc. Act.	Pre. Exp. in Pol.	Social Background
	.1650	.0489	.0322	.0320	.1789	.1323	.0244	.1077	.1055	.0668	.1062
(PA_1 , PA_2)	.7213	0	0	0	.5379	0	.2466	0	.6378	0	0
(PA_1 , PA_3)	1	0	1	0	1	.2937	1	1	1	1	.3625
(PA_2 , PA_3)	.2787	0	1	0	.4621	1	.7534	1	.3622	1	1
(PA_2 , PA_1)	0	1	0	.5242	0	.7063	0	0	0	0	.6375
(PA_3 , PA_1)	0	1	0	1	0	0	0	0	0	0	0
(PA_3 , PA_2)	0	0	0	.4758	0	0	0	0	0	0	0

Table 11 Aggregated Preference Function

Preference	PA_1	PA_2	PA_3
PA_1	-	0.2885	0.7579
PA_2	0.2268	-	0.6304
PA_3	0.0809	0.0152	-

Table 11 exhibits the aggregated preference function values for all the paired alternatives, as calculated using equation 7. The leaving and the entering flows for different alternatives are now computed using Equations 8 and 9 respectively.

$$\varphi^{+}(A_1) = \frac{1}{2}[\pi(A_1, A_2) + \pi(A_1, A_3)]$$

$$\varphi^{-}(A_1) = \frac{1}{2}[\pi(A_2, A_1) + \pi(A_3, A_1)]$$

Also net outranking flow is calculated using equation 10.

$$\varphi(A_1) = [\varphi^{+}(A_1) - \varphi^{-}(A_1)]$$

$\varphi(A_2)$ *and* $\varphi(A_3)$ are computed in the similar manner.

Table 12 shows net outranking flows for different alternatives.

Table 12 Net Outranking Flow Values for Different Alternative

Alternative↓	Leaving Flow(φ^+)	Entering Flow(φ^-)	Net Flow(φ)	Rank
A_1	0.5232	0.1538	0.3694	1
A_2	0.4286	0.1519	0.2767	2
A_3	0.0481	0.6942	-0.6461	3

6. CONCLUDING REMARKS

Prioritizing a large number of contestants can be a complicated and tedious process, particularly when traditional methods of candidate selection are employed. Due to their qualitative and subjective nature, which may allow bias, such as favoritism and stereotyping to intervene, such methods can lead to the dismissal of other important objective aspects. The above exercise indicates that the AHP is a useful decision tool to consolidate evaluation data. It provides for consistency checking simultaneously. However, as the results suggest that AHP should be used in combination with other decision tools to support because AHP is efficient only when the number of criteria and alternatives are few. Under these considerations, we have used PROMETHEE II methodology to support calculations at advanced level.

In this respect, the present study reveals that above methodology can be utilized as a valuable decision-making process to evaluate the contestants in a logical and consistent fashion for many reasons. Firstly, it is capable of allowing fair, objective, easily negotiated group decision on selected criteria and broadly acceptable outcomes by all involved representatives. Secondly, the model enables us to visualize the impact of various criteria on the final ranking and determine the level of importance of each criterion based on survey analysis. Thirdly, implementing above methodology can serve as a model for other fields for which similar models can be developed, modified and improved. A further advantage concerns this model's inherent ability to procure instant reporting of candidate selection results, where numerous subtle factors are involved. Enjoying such attributes, the use of this approach is beneficial for future prospects. In addition, the objective quality of this method keeps inconsistency of decision makers' opposing views within reasonable limits. Finally, the outcome of this study provides strong evidence for candidate selection fairness, and has the potential to re-shape and influence the way the general public perceive social justice for a legible decision.

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