Recruiters Selection Strategy and its Effectiveness: An Analysis of Soft Set Approaches

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Abstract- Recruiters are the opportunity providers for young professionals and given them initial entry into the corporate sector. This become a driving force for new employees to start-up their career and help to achieve long term sustainability and growth of the organization. The recruitment process not only define career development of young masses but also allow them to work in an environment which is best suited as per their qualification, expertise & area of interest to work. To reach long term objectives of organization, recruiter decisions are vital and also force them to map the candidates as per organization guidelines and also use their own intelligence or mental calculator for best suit of the organization. The selected professionals when justify their requirements in the organization, which enhances the recruiter capabilities and encourages in choosing the next slot of candidates in best possible manner. Such decision making capabilities uses certain parameters as per job description and number of candidates going to be selected for the organization. But a well define approach always help the recruiters to bring accuracy in collection of data on different parameters and to take final decision for selection. Sometimes predefined parameters are not sufficient to take accurate decisions and hence allow the recruiters to revise (addition/subtraction) some of the parameters of the existing set to reduce time, cost as well as to select the best professionals. A well define computational analysis helps the recruiters to overcome the said difficulties and use them to implement efficient policies to bring consistency in the selection process. The study discussed in the paper is focused on fuzzy soft set, literature and well define models like Weighted Matrix Approach Selection (WMAS), Pyramid Approach Selection (PAS) and Weighted Ratio Approach of Selection (WRAS) for best selection of candidates.

Keywords – Fuzzy Soft Set, Parameters, Recruiters, Selection, Mental Calculator, Computational Analysis

I. INTRODUCTION

Selection is the process of picking individuals who can most successfully perform the job from the pooled of relevant qualified candidates available for recruitment. To meet this goal, the corporate houses are matched jobs with profile of candidates. The most suitable person is then picked up after eliminating unsuitable candidates through successive stages of selection process. It is also necessary to focus how well an employee is matched to a job because it directly affects the amount and quality of employees work. Any deviation to above can cost a great deal of money, time and trouble in terms of training and operating cost. Sometimes employee may find the job distasteful and leave in frustration and spread negative information about the organization causing harm in the long run. Hence effective selection demands constant monitoring of the fit between person and the job.

During the analysis, different parameters and their values allow decision makers to take right decision at right time from list of best options available. The decision making process involves series of activities to draw final conclusion from listed data available for analysis. A preplanned decision process might not help to conclude an analysis rather it forced to add other parameters in the existing analysis process to derive an effective solution to a specific problem. It is sometimes difficult to draw a conclusion related to vagueness and uncertainty aspects like partial definition, lack of information, having less time to think, etc. Therefore classical mathematics is not very effective in dealing with such problems.

Expanded tools and theories of probability, fuzzy set, rough set etc. have tried to resolve the problems but all these techniques do not consider parameterization tools; therefore the above concepts are unable to solve the problems of uncertainties. The soft set concept overcome all these problems and posses rich potential of solving certain decision making problems like customers preference for product selection, fund sources problem, man power recruitment problem etc.

The paper described fuzzy soft set and use different methods to solve decision making problems. The practical aspects used in selection of best candidates from the lists is to make the selection process more comfortable, accepting low cost selection and consuming less time are discussed in the study. Most of the Recruiters would find difficulties in selection of candidates based on certain circumstances due to too many characteristics and involvement of various parameters. It is also difficult to find all sorts of satisfaction in all the required parameters and therefore there is a need to use recruiters own thought process from earlier practical experience for selection of candidates.

II. PROPOSED ALGORITHM

2.1 Preliminaries–

Soft set theory is a generalization of fuzzy set theory that was proposed by Molodtsov in 1999 to deal with uncertainty in a non-parametric manner. A soft set is a parameterized family of sets - intuitively, this is "soft" because the boundary of the set depends on the parameters. Formally, a soft set, over a universal set X and set of parameters E is a pair (f, A) where A is a subset of E, and f is a function from A to the power set of X. For each e in A, the set f(e) is called the value set of e in (f, A).

The basic notion of all soft theory and some useful definition from Maji et al. (2002;2003) are discussed here, where U to be an initial universal set and E to be a set of parameters of A,B C E.

Definition 2.1 (Soft Set)

A pair of (E,f) is called a soft set over if and only if F is a mapping of E into the set of all subsets of the set U. In order words, the soft set is a parameterized family of subsets of the set U. Every set F(e), e ϵ E, from this family may be considered as the set of e-approximate elements of the soft set.

Definition 2.2 (Operation with Soft Sets)

Suppose a binary operation denoted by *, is defined for all subsets of the set U. Let (F, A) and (G, B) be two soft sets over U. Then the operation * for the soft sets is defined in the following way: (F, A) * (G, B) = (H, A x B), where H (α, β) = F (α) * G (β), α ϵ A, β ϵ B and A x B is the Cartesian product of the sets A and B.

Definition 2.3 (NOT Set of a Set of Parameters)

Let E= {e1,e2,e3……en} be a set of parameters. The Not set of E denoted by ⅂E and is defined by ⅂E={e1,e2,e3…..en}, where ⅂e_i =not e_i for all i. It may be noted that ⅂ and ⅂ are two different operations.

Definition 2.4 (Complement of a Soft Set)

The complement of a soft set (F, A) is denoted by $(F, A)^c$ and is defined by $(F, A)^c = (F^c, ⅂A)$, where F^c: ⅂A→P(U) is a mapping which is defined by $F^c(\alpha) = U-F(⅂\alpha)$, for all αϵA.

Definition 2.5 (Relative Complement of a Soft Set)

The relative complement of a soft set (F, A) denoted by $(F, A)^r$ and is defined by $(F,A)^r=(F^r,A)$, where F^r:A→P(U) is a mapping given by Fr(α)=U-F(α), for all αϵA.

Definition 2.6 (NULL Soft Set)

A soft set (F, A) over U is said to be a NULL soft set denoted by ϕ, if for all εϵA, F(ε)=ϕ (null set).

Definition 2.7 (Relative NULL Soft Set)

A soft set (F, A) over U is said to be a NULL soft set with respect to parameters set A denoted by ϕ A, if ε ϵ A, F(ε)=ϕ (null set).

Definition 2.8 (Relative Whole Soft Set)

A soft set (F, A) over U is said to be a relative whole soft set with respect to parameters set A denoted by UA, if for all ε ϵ A, F(ε)=U.

Definition 2.9 (Absolute Soft Set)

The relative whole soft set U(E) with respect to the universe parameters E is called the absolute soft set over U.

Definition 2.10 (AND Operation on Two Soft Sets)

If (F, A) and (G, B) be two soft set then (F, A) AND (G, B) denoted by (F, A) ∧ (G, B) and is defined by (F, A)(G, B)=(H, A x B), where H(α, β) = F(α) , G(β) for all (α, β) ϵ A x B.

Definition 2.11 (OR Operation on Two Soft Sets)

If (F, A) and (G, B) be two soft set then (F, A) OR (G, B) denoted by (F, A) (G, B) and is defined by (F, A)(G, B)=(O, A x B), where $O(\alpha, \beta) = F(\alpha)$, $G(\beta)$ for all $(\alpha, \beta) \epsilon A \times B$.

2.2 Literature Review:

Firstly, Zadeh in 1965 proposed Fuzzy set theory, which become a very important tool to solve problems and provides an appropriate framework for representing vague concepts by allowing partial membership. Fuzzy set theory has been studied by both mathematicians and computer scientists and may applications of fuzzy set theory have arisen over the years, such as fuzzy control systems, fuzzy automata, fuzzy logic, fuzzy topology etc. Beside this theory, there are also theories of probability, rough set theory, which deal with to solve these problems. Each of these theories has its inherent difficulties as pointed out in 1999 by Molodtsov who introduced the concept of soft set theory which is completely new approach for modeling uncertainty.

The origin of soft set theory could be traced to the work of Pawlak [1982; 1982A] in 1993 titled Hard sets and soft sets [Pawlak, 1994]. His notion of soft sets is a unified view of classical, rough and fuzzy sets. This motivated by Molodtsov in 1999 titled soft set theory; first result, thee in, the basic notions of the theory of soft sets and some of its possible applications were presented.

Maji et al., (2001) presented the combination of fuzzy and soft set theories, fuzzy soft set theory is a more general soft set model which makes descriptions of the objective world more general, realistic, practical and accurate in some cases of decision making. In 2003 again presented soft set theory with some implementation in their work. Roy & Maji (2007) presented a novel method of object recognition from an imprecise multi observer data in decision making problem. Pei & Miao (2005) have discussed the relationship between soft sets and information systems. It is showed that soft sets are a class of special information systems. After soft sets are extended to several classes of general cases, the more general results also show that partition type soft sets and information systems have the same formal structures, and that fuzzy soft set and fuzzy information systems are equivalent. Xiao et al., (2005) in his paper, an appropriate definition and method is establishing the information table based on soft sets theory and at the same time the solutions are proposed corresponding to the different recognition vectors.

In Mushrif et al., (2006) studied the texture classification via Soft Set Theory based in a classification Algorithm. In Aktas & Cagman (2007) have int5roduces the basis properties of soft sets and compare soft sets to the related concepts of fuzzy sets and rough sets. In the same year, Kovkov et al., have presented the stability of sets given by constraints is considered within the context of the theory of soft sets.

Yao et al., (2008) presented the concept of soft fuzzy set and its properties. Xiao et al., (2008) in his paper data analysis approaches of soft sets under incomplete information is calculated by weighted average of all possible choice values of the object and the weight of each possible choice value is decided by the distribution of other objects. In Ali et al.,(2009) gives some new notion such as the restricted intersection, the restricted union, the restricted difference and the extended intersection of two soft sets. Herawan et al.,(2009) proposed an approach for visualizing soft maximal association rules which contains for main steps, including discovering, visualizing maximal supported sets, capturing and finally visualizing the maximal rules under soft set theory.

Theories that been proposed for dealing with such housing selection problems in an efficient way (Behzadian, 2010). However, all the theories that associated with limitation of inherent which possibly due the inadequacy of the parameterization associated tools with them (Maji, 2002). The concept of soft set as new mathematical tool for dealing with the uncertainties which is free from the above difficulties (Molodtsov, 1999). As a practical problem is faced for a particular property, whether all the parameters in the parameters set is always necessary to preserve this property (Maji, 2002). By using the entire parameters set for describing the property which is consuming the time and the constructed rules may be finding difficult to understand, apply or verify. To deal with this problem, reduction of attribute required. Reduction objectives are to reduce the number of attributes, and at the same time, preserve the property of the information. Mapping from parameter to crisp subset of universe is the soft set (Herawan, 2010). Data analysis and decision support systems we may see it structured of a soft set.

2.3 Methods of Selection

2.3.1 Weighted Matrix Approach of Selection:

Algorithm:

To analyze the best possible solution in Weighted Matrix Approach of Selection (WMAS) algorithm the following steps are to be used.

1. Define population with minimum eligible criteria for selection.
2. Define sequence parameters which are to be analyzed one after another.
3. Assign weightage for each level as per performance of candidates. For example weighted may be considered as >=90%, weightage=1, >=70%, weightage =.7, >=50%, weightage =.5, >=30%, weightage =.3, <30%, weightage =.1
   (The value of weightage may depend upon the researcher and this may same for all level or may vary from level to level.)
4. The next step is to start the selection process and carry all candidates to the next level and keep their weight.
5. The process will continue until all the parameters are successfully verified.
6. Finally add the weights of all parameters and then select the candidates as per their weightage.

In the above algorithm the process of selection is easy but it is time consuming because weights of all candidates are to be considered for next round. Finally totaling of weights of each level for all candidates are calculated and as per available vacancies required numbers of candidates are selected as per ranking of total weights from top to bottom.

2.3.2. Pyramid Approach of Selection:

Algorithm

The following steps are to be followed to analyze the best possible solution in Pyramid Approach of Selection (PAS).

1. Define population with minimum eligible criteria for selection.
2. Define level of priority of each parameter as per maximum importance to less importance criteria of selection in bottom –up manner just like pyramid structure.
3. The next step is to start the selection process and carry those candidates to the next level who have successfully completed in the present round.
4. The process will continue until to reach the top most eligibility criteria of selection.
5. Finally those who are able to reach the top most parameter are the eligible candidates for corporate.

The algorithm ensures that the recruiters will use a larger pool of candidates and help to select only those candidates who are beneficial to the organization. This is again not beneficial to the organization because it requires more time to get the needful candidates and sometimes selected candidates are more as compared to available vacancies.

2.3.3 Weighted Ratio Approach of Selection:

Algorithm:

The following steps are to be followed to improvise the existing solution in Weighted Ratio Approach of Selection (WRAS).

1. Define population with minimum eligible criteria for selection.
2. Define level of priority of each parameter as per maximum importance to less importance criteria of selection in bottom –up manner just like pyramid structure.
3. Assign weight for each candidate for each parameter (which will same for all parameters) and ratio for each level, so that required numbers of candidates are to be selected from one level to next level of selection. For example weighted may be considered as >=90%, weightage=1, >=70%, weightage =.7, >=50%,

weightage =.5, >=30%, weightage =.3, <30%, weightage =.1
(The value of weightage may depend upon the researcher and this may same for all level or may vary from level to level.)

4. The next step is to start the selection process and carry those candidates as per ratio to the next level.
5. The process will continue till to reach the top most eligibility criteria of selection by repeating step-3.
6. Finally those who are able to reach the top most parameter their weights are calculated as per parameter wise and accordingly eligible candidates are selected.

The proposed algorithm bridges the gap in the earlier algorithm (mentioned 4.1) and fulfills the requirement of identifying suitable candidates from a pool. It also overcomes time delay and tries to reduce the mismatch between vacancies and selected candidates available for selection.

III. Experiment and Result

3.1. Research Design

The proposed study is implemented in an institution for different recruitment drives. Every selection process includes 240 candidates (few candidate information used in selection procedure to justify the practical work) and the population includes same branch students of different reputed institutions. Recruiter wants to select best candidates within the lot who met the eligibility criteria but how many candidates they will select is depend upon the vacancies or some cases they may select more if matching candidates are available in the pool.

The criteria of selection includes ready to work with company profile (RTW-Ready to Work), ready to move outstation as when required (RTM-Ready to Move), good communication skill (GCS - Good Communication Skill), presentable (P) and I/Q to solve the problem (IQ). Basically the company informs the candidates about job profile and told jobs are many but we need those candidates who are ready to work as per need of organization. This is first criteria because its shows who are interested to work for the organization. The second criteria indicates when a candidate is asked to go outstation to sorted out any problem then the candidate will go for that or not because it is a service based organization where customer satisfaction and quality matters. Company also knows communication skill is an important and a key criteria for service based organization but it become third priority due availability of good numbers of well spoken candidates in the organization. The role of selected candidates is to coordinate them to carry out the work. The next step is to identify presentable candidates because such candidates are generally less but if they are available, they will be selected first and also they will support the organization in many ways. At last there is a need to select intelligent candidates because they will effectively implement managerial activities in the organization but company given lowest importance to them due to unavailability of such candidates in larger manner. They will adjust in different level of organization hierarchy or to be worked as manager to control over organizations activities.

As per algorithm 2.3.1, the following matrix is prepared to know the selected candidates in the pool.

Table 3.1: Weighted Matrix Approach of Selection

Sl. No.	RTW	RTM	GCS	P	IQ	Weight	Rank
1	1.0	0.7	1.0	1.0	0.7	4.4	2
2	0.7	0.7	0.5	1.0	1.0	3.9	3
3	1.0	0.5	0.5	0.7	0.7	3.4	4
4	1.0	1.0	1.0	0.7	1.0	4.7	1
5	0.7	1.0	0.5	0.5	0.7	3.4	4
. n	W_a	W_c	W_d	W_b	W_c	$W_a + W_c + W_d + W_b + W_c$	R_n

As per algorithm 2.3.2, a pyramid structure is formed as per performance of the candidates. As the algorithm defines only the selected candidates will move to the next round and others shall be rejected. The table shows pyramid approach of selection in the following table.

Table 3.2: Pyramid Approach of Selection

									1f	1l									
								1f	0h	1l	0t								
						0d	1f	0g	1h	1l	0q	1t							
				0a	1d	0e	1f	1g	1h	0j	1l	0n	0p	1q	1t				
1a	0b	0c	1d	1e	1f	1g	1h	0i	1j	0k	1l	0m	1n	0o	1p	1q	0r	0s	1t

As per algorithm 2.3.3, a pyramid structure is formed as per performance of the candidates and the ratio that have been finalized for selection. As the algorithm defines the selected candidates will move to the next round as per ratio and their weight and others shall be rejected. The table shows weighted ratio pyramid approach of selection in the following table.

Table 3.3: Weighted Ratio Approach of Selection (Ratio for each Parameter Level – 2/3)

Wt.→	4.7	4.2	.5	1.5	1.9	4.1	3.5	4.1	.5	1.5	.5	4.4	4.4	1.5	1.9
L-5	1	1				1		.7				1	1		
L-4	1	.5				.7	.5	.7				.7	1		
L-3	.7	1			.5	.7	1	1				.7	1		.5
L-2	1	1		.5	.7	.7	1	1		.5		1	.7	.5	.7
L-1	1	.7	.5	1	.7	1	1	.7	.5	1	.5	1	.7	1	.7
Candidate	a	b	c	d	e	f	G	h	i	j	k	l	m	n	O

The above design carries a particular ratio from one parameter to another. According to the weight value of parameter required numbers of candidates are selected to the next level. Sometimes ratio shows less but higher numbers of candidates are selected to the next level due equal weights of candidates. If less candidates are available as per value of ratio then only that number of candidates move to next level. Hence the algorithm is faster and some allow the recruiters to carry maximum candidates for final round that may be back-up candidates. Recruiters may reduce the value of ration to carry more candidates for final selection.

3.2. Result

From the above experiments conducted at different requirement drives the following results have been obtained to draw conclusion regarding best selection process among set of algorithms.

In the first experiments with weighted matrix approach of selection (WMAS), it was found that it is easier to implements for any recruiters. It is suitable for less number of candidates and also allows every candidate to participate at all level of selection parameters. After calculating weights of each parameter, total weight is calculated for all candidates and then ranked them in ascending order. The selected candidates were chosen from top of the list as per ranking. If the recruiter wants to see three candidates in the final round then 4th, 1st and 3rd candidates are chosen for final selection as their ranking is better than others. The difficult part of this algorithm is that all candidates are to be considered for all level of parameters which is a lengthy process.

Similarly, the second experiment used pyramid approach of selection (PAS) where the selected candidates of a level were move to the next level. At the end, those candidates reached the final level were selected by recruiter. In the selection the candidates were selected are f and l. Hence it shows that if more vacancies exist then only those candidates are in the final round are available for selection.

In the third experiment, the weighted ratio approach of selection (WRAS) weights calculated for each candidate at each level of parameter and then a ratio of 2/3 were moved to the next round. Sometimes one or more candidates were moved to the next level due to availability of same weight at a particular level. The process was continued at same ratio to the next level and at the end of final round total weight each finalized candidate is calculated. At last maximum weights were considered for selection. In this method three candidates i.e. a, l and m were selected and also two other candidates are available for waiting list i.e. b and h, where their weights are close to the chosen candidates. This experiment is not only reduce time of selection and create a list of reserve candidates but also suitable to chose required candidates from a large pool.

All those experiments are suitable for selection candidates but they vary according to the size of candidates, efficiency & opportunity for candidates and cost involved in the selection.

IV.CONCLUSION

Selection of candidates is not an easy task but the best procedure followed at each level of parameter bringing efficiency in the selection, which might justify recruiters or the agency that they have done the right work to choose the candidates. The algorithms applied in the study not only describe different process of selection but also allow the recruiters to do the selection as per availability of size of candidate pool. It uses qualitative and quantitative data for decision making which encourage the recruiters to carry out their work efficiently. It also ensures that the time spent on the selection is minimized to a large extent by automating the level of selection process. The fuzzy set has done its basic in the selection process and it can be enhanced by implementing additional techniques of fuzzy soft set. Future research can be made to implement expert knowledge system at every level, so that emotional decisions can be avoided as much as possible.

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