Design a Fuzzy Model for Decision Support Systems in the Selection and Recruitment

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Abstract. Today's, most companies need to employ skilled and experienced stuff and have problems in identifying necessary personnel and the lack of a system was evident that able to integrate the needs of organizations in this field; Iran Khodro Company as Iran's largest car maker, always has been faced with the problem. Based on this study, in the Department of Human Resources of Iran Khodro Company Affairs as Deputy Leader in recruitment and selection plan, was implemented. Acceptable performance results from this research are considered the most important achievement was due to the study and it is used in the other parts of the company's deputy for recruitment and selection. The goal of this study is introducing a model of fuzzy decision support systems that compliance with it, Iran Khodro Company can improve the selection and hiring process. In this context, the absence of a model capable of compliance with specific restrictions on the hiring decision will be felt. Model that can develop and become a Decision Support System in the field of personnel selection and selection Therefore, this study can be good decision makers and senior management in its decision to assist a comprehensive and scientific. Also, according to environmental uncertainty, do the research phase space can be near the amount of models to more realistic situations and can cause more aspects of the situation to decide on the actual model finds expression.

Keywords: decision support system, fuzzy model, TOPSYS method, selection and recruitment.

1. Introduction

This pattern is suggested from widely used employment tests in the company that its overall framework includes five factors, medical, functional characteristics, behavioural and appearance characteristics, personality and psychological factors and science and knowledge characterized. Sub domain of each factor related have been extracted from employment tests, interviews with experts and selected documents studies [1].

Employed Applicants in Iran Khodro Company have constantly evaluated by these criteria, but this assessment has never been integrated and systemic. Therefore, in this study, we intend to use existing models and experiences in organizations and offer a Decision Support Model for Selection and Employment. Considering the importance of more and more human resources systems, each day over the last sub systems need to develop human resources, particularly recruitment and selection subsystem is felt. Given the importance of the organizations under the human resource systems have realized [2].

The importance of topic selection and recruitment and hidden costs in this organization is needed to human resources management system and operational before any other action such as planning and building subsystems and selection of personnel selection. The correct strategies for decisions are taken. Nature of the modelling process to reduce the complexity of decision making can be a major role. The criterions of the study has been collected in the pattern framework through interviews with expert human resources, experiences of Iran Khodro in selection and selection and field studies (observations of a researcher in the Department resources and human cycles of selection and recruitment). Number of collected sub domain of factors is 34

criterions in the initial research phase that are classified in five key factors. The ultimate goal of this study, providing appropriate and practical model to help identify risk factors is the recruitment and selection [2, 3].

2. The Fuzzy-TOPSIS Method

Most researches on vendor selection problem consider crisp and exact data which are usually far from real-world situations. In the real-world, the rating values of alternatives as well as importance weights of criteria usually have various types of vagueness, Careless and we cannot always use the classical decisionmaking techniques for these problems. Therefore, the fuzzy sets theory provides a precious tool for taking these realities into account. In a fuzzy multiple criteria decision making (FMCDM), linguistic variables are used to express the subjective and/or careless qualitative of a decision maker's assessments. A linguistic variable is a variable whose values are linguistic terms [4]. Just a few researchers have applied the fuzzy sets theory into supplier selection problem. Chen et al. [5] The TOPSIS method was firstly proposed by Hwang and Yoon (1981). The basic concept of this method is that the chosen alternative should have the shortest distance from the positive ideal solution and the farthest distance from a negative ideal solution [4].

Fuzzy TOPSIS method, and Chou and Chang [5] introduced fuzzy SMART approach for supplier selection. On the other hand, Kumar et al. [5] used fuzzy programming approach for vendor selection, but they didn't incorporate intangible criteria in the decision process. In recent years, TOPSIS [6] has been a favourable technique for solving MCDM problems. This is mainly for two reasons, 1) its concept is reasonable and easy to understand, and 2) in comparison with other MCDM methods, like AHP, it requires less computational efforts, and therefore can be applied easily. TOPSIS is based on the concept that the optimal alternative should have the shortest distance from the positive ideal solution (PIS) and the farthest distance from the negative ideal solution (NIS).

Because of advantages of TOPSIS method, in this paper we propose a new fuzzy TOPSIS approach for vendor (supplier) selection problem. Chen et al. [5] introduced fuzzy sets theory to supplier selection problem, but they only investigated a three-level hierarchy problem, i.e., goal, criteria and alternatives. In this paper, to make a more detailed decision, we consider a four-level hierarchy problem- goal, criteria, subcriteria and alternatives- furthermore we use the canonical representation of multiplication operation on three trapezoidal fuzzy numbers [6] to evaluate and rank alternative suppliers and to select the most promising one.

A positive ideal solution is a solution that maximizes the benefit criteria and minimizes cost criteria; whereas, a negative ideal solution maximizes the cost criteria and minimizes the benefit criteria. In the classical TOPSIS method, the weights of the criteria and the ratings of alternatives are known precisely and crisp values are used in the evaluation process. However, under many conditions crisp data are inadequate to model real-life decision problems. Therefore, the fuzzy TOPSIS method is proposed, in which the weights of criteria and ratings of alternatives are evaluated by linguistic variables represented by fuzzy numbers to deal with the deficiency in the traditional TOPSIS [6].The related algorithm can be described as follows [6]:

Step 1: A committee of the decision-makers is formed. Fuzzy rating of each decision is maker. Step 2: Criteria evaluation is determined. Step 3: After that, appropriate linguistic variables are chosen for evaluating criteria and alternatives. Step 4: Then the weight of criteria are aggregated. Step 5: Then the fuzzy decision matrix is constructed. Step 6: The above matrix is normalized. Step 7: Considering the different weight of each criterion, the weighted normalized decision matrix is computed by multiplying the importance weights of evaluation criteria and the values in the normalized fuzzy decision matrix.

3. Selection Process

The selection process, include clear steps of decision about the selection process and hire the best applicants from available applicants. This process provides job applicant that starts and ends with the hiring decision. However, in many cases, the final decision is with the selection and recruitment relevant supervisor or manager, but the role of human resource units is to confirm applicants according to their potential merit. This process includes steps that require careful evaluation that adds time and complexity to the hiring process. At different steps, managers and human resources personnel employment units aligned the needs of the

organization with each other. In many organizations, units combine finding and selection process and it is called employment operation. In large organizations, employment is one of the responsibilities of employment management, while in small organizations is personnel management's task. Since the selection process is an important function in the human resources, so employment is often the main cause of company, and it would not be exaggerating to say that if the selection is considered basis of organization's successes or even a single [7].

As can be seen in Figure 2, the selection operation is assisted by three factors that include job analysis information, which contains job description, person specification and performance standards in every job, the human resources' programs that identify empty jobs and possible improvements to the selection in an effective way, and finding that creates a set of the applicants troubleshooting force and employees are selected from them. The employment is known as a source of other human resource management activities. Without employment process, the nature of human resource management as well as other activities will be at risk.

4. Population Research and Information Provider

Population study of all managers and professionals in the Department of Human Resources is composed of Iran Khodro Company. Study population represents information including experts; managers are active in the field of human resources.

5. Data Collection Methods and Tools

Human resource issues have different methods for gathering information, but the most important method of data collection methods, is interviews with experts and experienced people in this area. Also in this study, these tools and group interviews have been used to collect basic data. For completing the literature, we had tried to use library, related sites and areas of human resources-related magazines in systems that using appropriate recruitment and selection are done in them. Furthermore, using a field study (direct observation systems in the current selection and recruitment of human resources) we tried to know the influence elements within the recruitment selection and employment tests [7, 8].

6. Steps in Problem Solving Based on Fuzzy TOPSIS Method

In this article we want to determine the priority applicant. Accordingly, in the main model, factors affecting recruitment and selection are in first level, in the second level, criterions of research and in third level, applicants' research. In this model, weights and measures of factors is calculated by the geometric mean method that is one of the approximate methods in weight computing of hierarchical analysis [4, 9]. For Fuzzy-TOPSIS method describing, we require to know some basic definitions of fuzzy sets, fuzzy numbers and linguistic variables are checked [9].

Ã fuzzy sets that every x of X, the numerical range [0 1] when compared to a fuzzy subset of X is called. In Function $\mu_{\tilde{A}}$ (x), closing to 1 shows more belonging to x set. Therefore, fuzzy sets and membership functions are indicator functions and generalized definite set [1].

Relation 1:

$$\mu_{\tilde{n}}(x) = \begin{cases} 0, & x < n_1, \\ \frac{x-n_1}{n_2-n_1}, & n_1 \leqslant x \leqslant n_2, \\ 1, & n_2 \leqslant x \leqslant n_3, \\ \frac{x-n_4}{n_3-n_4}, & n_3 \leqslant x \leqslant n_4, \\ 0, & x > n_4. \end{cases}$$

In this study each of the seven linguistic variables that have been used to convert linguistic variables to fuzzy numbers of the following form is used.

7. Conclusion

In this study, we have used only points of the Department of Human Resources' because the most important in completing of paired comparisons questionnaire is being experts to prevent diversion of results. Thus, for the first questionnaire, a sample of 40 experts in Human Resources Department of Iran Khodro Company and for the second questionnaire, sample size is four very certified individuals of Human Resources Department. As mentioned, three job applicants of the Department of Human Resources who had priority were evaluated by the four experts. Finally, with help of the MATLAB program, software were prepared and run for determining priorities of different individuals that the both of their results shows that those are same.

Weight of different criterions in Research shows that in order to personality psychological, medical, and scientific and knowledge, functional and the appearance and behaviour has been in priorities of Human Resources Department for Employment and selection. Weight of different criterions in each factor does not have a significant difference. But the relative priority of each criterion in each factor is caused by more attention of experts. In medical Factor, psychological criterion is in priority to physical health. In The functional characteristics, high-skill has high-priority to. In the behaviour and appearance factor, be polite has a priority to balance in behaviour. In Psychological of personality factors, criterions of creativity, integrity, emotional intelligence, be practical have priority in order. In the science and knowledge factor, relevant education to the job has a priority to researching soul.

As was explained in the previous parts , the final results of Tapsys Respectively fuzzy person C, A and B were employed in preference based on those results also output content C, A and B were the priorities that the findings indicate equality in TOPSYS and programs are subject.

Suggestions of research are from the results of this study, we hope that these are used in Iran Khodro and other organizations. The suggestions are as following:

- More and more attention to employment testing and screening applicants, and determining minimum necessary for entry to the next steps of assessment
- Using linguistic variables and fuzzy logic in qualitative evaluation of individuals
- Enter values in the designed model in the MATLAB software
- Compare the results obtained by different people, and selection and hiring top of them

8. References

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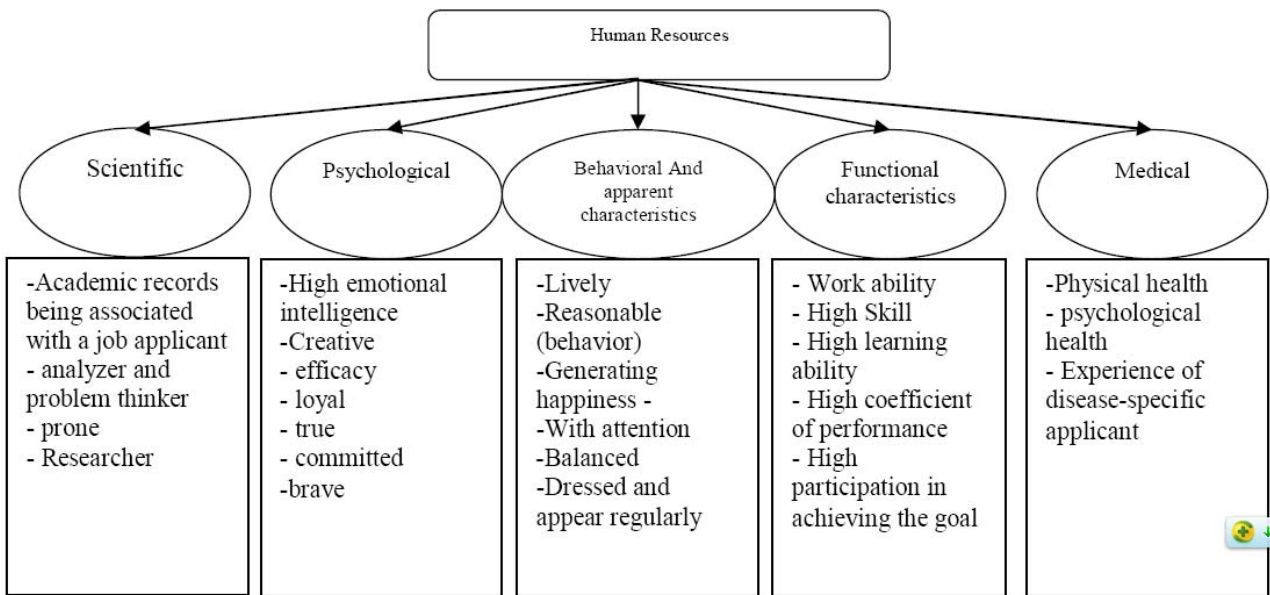[9] P.G. Keen .decision support systems: an organization perspective. Reading:Addison welsley Pub co. 1978.

Fig1. Human Resources

Human Resources → Scientific | Psychological | Behavioral And apparent characteristics | Functional characteristics | Medical

Scientific
- Academic records being associated with a job applicant
- analyzer and problem thinker
- prone
- Researcher

Psychological
- High emotional intelligence
- Creative
- efficacy
- loyal
- true
- committed
- brave

Behavioral And apparent characteristics
- Lively
- Reasonable (behavior)
- Generating happiness -
- With attention
- Balanced
- Dressed and appear regularly

Functional characteristics
- Work ability
- High Skill
- High learning ability
- High coefficient of performance
- High participation in achieving the goal

Medical
- Physical health
- psychological health
- Experience of disease-specific applicant

Fig1. Part of Total number of benchmark research of experts

Fig2. The selection operation

Human Resource Activities

Briefing Training
Education
Development
Evaluation

Compensation
Management

Future career plans
Collective action

Human Resource Activities ← Selection process ← Challenges ← Data

Data
- Job analysis
- finding·
- Human Resources Programs

Fig2. The selection operation

Fig3. Fuzzy variables graph

Very Poor   Medium Poor   Medium Good   Very Good
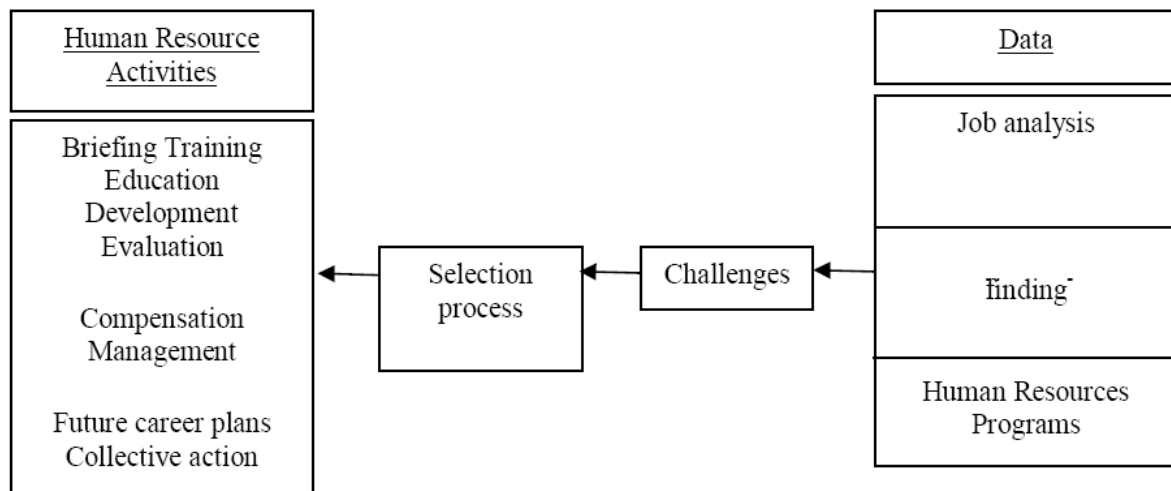
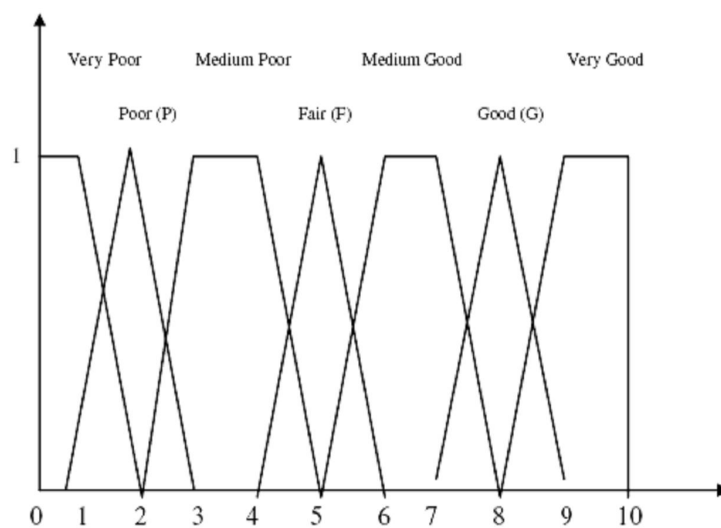Poor (P)   Fair (F)   Good (G)

0 1 2 3 4 5 6 7 8 9 10

Fig3. Fuzzy variables graph

Table1. Corresponding values of trapezoidal fuzzy linguistic variable

Row	Linguistic variables	A trapezoidal fuzzy number
1	Very good	(8,9,9,10)
2	Good	(7,8,8,9)
3	Somewhat good	(5,6,7,8)
4	Average	(4,5,5,6)
5	Somewhat weak	(2,3,4,5)
6	Weak	(1,2,2,3)
7	Very poor	(0,1,1,2)