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QUALITY CONTROL MANAGER SELECTION BASED ON AHP- COPRAS-G METHODS: A CASE IN IRAN

Abstract

Due to the increasing competition of globalization and fast technological improvements and world markets, demands of companies to have professional human resources are increasing too. It is an important problem of an organization to select the most appropriate personnel among the candidates. Quality control manager is important personnel in organizations and it's so important to select the best candidate for this work. In this paper we proposed a personnel selection system based on Analytic Hierarchy Process (AHP) and Complex proportional assessment of alternatives with grey relations (COPRAS-G) method. At first seven criteria is identified including: knowledge of product and raw material properties, Experience and educational background, Administrative orientation, Behavioral flexibility, Risk evaluation ability, Payment and Team work and after that AHP applied for calculating weight of each criteria and finally using COPRAS- G method for selecting the best candidate for this job. This study can be used as a pattern for personnel selection and future researches.

Keywords: *Quality Control Manager, Personnel selection, Analytic Hierarchy Process (AHP), COPRAS-G method*

JEL Classification: *M12, C01, C44, C51, C61, D7, D81, J24*

1. INTRODUCTION

In the international market, modern organizations face high levels of competition. In the wake of increasingly competitive world market the future survival of most companies, depends mostly on the appropriate dedication of their personnel to companies. Employee or personnel performances such as capacity, knowledge, skill, and other abilities play an important role in the success of an organization. One of the most important goals of organizations is to seek more powerful ways of ranking of a set employee or personnel who have been evaluated in terms of different competencies. The objective of a selection process depends mainly on assessing the differences among candidates and predicting the future performance (Gungor et al., 2009).

Nowadays, quality and related topics become one the important issues for every organization. Quality is important because it ensures the viability and successfulness of a

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business. Without quality, a business may stay alive, but won't/can't reach its optimal earning potential. The quality of the product or service that is being made or presented by the company is very important for its customer's satisfaction. As you know, there are many types of processes that are carried out in the company and it is a familiar fact that the most important aspect for the success and increased demand of products is quality control. This is a major process that has to be given significance to, in order to make sure the quality of products is the best for consumer satisfaction. The professional that deals in all aspects of quality control is referred to as a quality control manager. A quality control manager is a very important person in the company and distribution chain. This expert has a precise eye for detail to determine faults in products or services and suggest methods to better them and sustain maximum quality control. Consequently selecting proper quality control manager in company can improve the production process, increase productivity and enhance system reliability. There are no studies that have looked into the method of quality control manager selection, and this is where this study hopes to fill the gap.

Personnel selection is one of the chief phases of human resources management process. Basic function of personnel selection operations is determining, among the candidates applying for specific jobs in the company, the ones having the necessary knowledge, skill, and ability in order to be able to perform the requirements of the job successfully (Kaynak, 2002). Impartiality in personnel selection depends on fulfillment of two conditions, first of which is the necessity of specifying the criteria that can properly value the qualities of the personnel needed. At this stage, the factors which are qualified to become the criteria are established. Second condition is to assess and evaluate the knowledge, skills, and abilities of an applicant in the frame of the criteria established (Dagdeviren and Yuksel, 2007).

Many potential criteria must be considered in the selection procedure of a quality control manager. Therefore quality control manager can be viewed as a multiple criteria decision making (MCDM) problem. The MCDM methods deal with the process of making decisions in the presence of multiple criteria or objectives (Shi et al., 2010). Priority based, outranking, distance-based and mixed methods could be considered as the primary classes of the MCDM methods (Önüt et al., 2008).In this research a hybrid MCDM model encompassing analytic hierarchical process (AHP) and the complex proportional assessment of alternatives with grey relations (COPRAS-G method) is used for quality manager selection. Specifically, AHP is initially used for calculating the weight of each criterion and COPRAS-G method is used for ranking and selecting the alternatives.

2. LITERATURE REVIEW

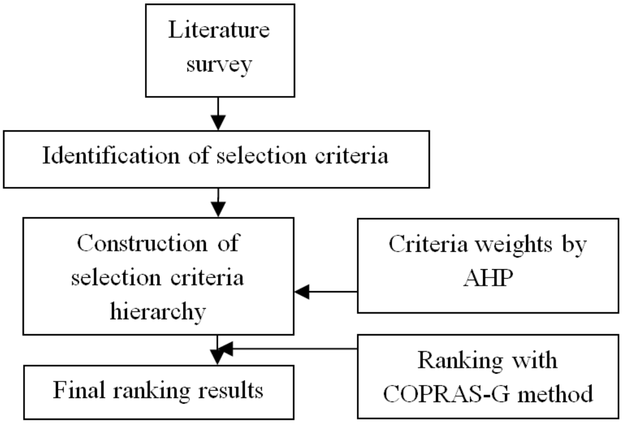
In literature, there exist numerous studies conducted with the aim of performing personnel selection within the boundaries of objective criteria (Dagdeviren and Yuksel, 2007). Gargano et al. (1991) combined genetic algorithm and artificial neural networks for the purpose of selecting the personnel to be employed in finance sector. In this study, fundamental criteria were personality, social responsibility, education level, economics knowledge, finance knowledge, and experience factors. On the other hand, Miller and Feinzig (1993) suggested the fuzzy sets theory for the personnel selection problem. Liang and Wang (1994) developed an algorithm which also uses the fuzzy sets theory. In this algorithm, subjective criteria, such as personality, leadership, and past experience, along with some objective criteria, such as general aptitude, and comprehension were made use of Karsak et al. (2003) modeled personnel selection process by using fuzzy multiple criteria programming and evaluated qualitative and quantitative factors together via membership functions in this model. Capaldo and Zollo (2001) built up a model to improve the effectiveness of personnel selection processes in major Italian companies. First step of the study developed decision formulations and decision samples to be used on the basis of the evaluation method adopted by the companies. Second step was to build an evaluation method by utilizing fuzzy logic. Personnel selection factors taken into consideration were classified in three groups, each one of which being professional skills, managerial skills, and personnel characteristics. Multi-criteria analyses are other personnel selection methods reported in literature (Bohanec et al.1992; Timmermans and Vlek 1992, 1996; Gardiner and Armstrong-Wright 2000; Spyridakos et al. 2001; Jessop 2004). These methods can be effectively employed while evaluating a multitude of factors together in the solution of especially large and complicated problems (Dagdeviren and Yuksel, 2007). Roth and Bobko (1997) reviewed some of the issues surrounding the use of multi-attribute methods in human resources management. Hooper et al. (1998), however, developed an expert system named BOARDEX. American army has used this system to employ its personnel. Personnel selection factors, such as grade, military education level, civilian education level, height, weight, and assignment history are incorporated in this expert system.

Some of the recent applications of MCDM method in personnel selection are listed below:

- Dagdeviren and Yuksel (2007) used ANP for personnel selection.
- Boran et al. (2008) used ANP for personnel selection.
- Gungor et al. (2009) used fuzzy AHP approach to personnel selection problem.
- Kelemenis and Askounis (2009) used fuzzy TOPSIS for personnel selection.
- Vainiunas et al. (2010) used AHP and ARAS for personal selection.
- Kersuliene, Turskis (2011a) fuzzy AHP and ARAS for architect selection.
- Kersuliene, Turskis (2011b) fuzzy AHP and ARAS for selection financial accountant offices.

Quality is the most important aspect of every organization in order to be successful; therefore quality control manager has a tremendous impact on quality of products being processed within the organization. Today's market environment is so competitive that quality of products has to meet the customers' expectation. Besides, the market is saturated with many products and the customer is looking for the best product in the marketplace. MCDM approaches deal with evaluation and selection problems with respected to qualitative and quantitative criteria. For these reasons, Quality control manager selection can be viewed as a MCDM problem. The purpose of this study is using AHP and COPRAS-G methods for evaluating and selecting quality control manager (Figure 1).

Figure 1. Process of quality control manager selection



Source: Author calculation

3. METHODOLOGY

Over the past decades the complexity of economic decisions has increased rapidly, thus highlighting the importance of developing and implementing sophisticated and efficient quantitative analysis techniques for supporting and aiding economic decision-making (Zavadskas and Turskis, 2011). Multiple criteria decision making (MCDM) is an advanced field of operations research, provides decision makers and analysts a wide range of methodologies, which are overviewed and well suited to the complexity of economical decision problems (Hwang and Yoon, 1981; Zopounidis and Doumpos, 2002; Figueira et al., 2005). Multiple criteria analysis (MCA) provides a framework for breaking a problem into its constituent parts. MCA provides a means to investigate a number of alternatives in light of conflicting priorities.

Over the last decade scientists and researchers have developed a set of new MCDM methods (Kaplinski and Tupenaite, 2011; Kapliński and Tamosaitiene, 2010; Tamosaitiene et al., 2010). They modified methods and applied to solve practical and scientific problems.

3.1. ANALYTIC HIERARCHY PROCESS

Analytic hierarchy process (AHP), proposed by Thomas L. Saaty in 1971, is a multiple criteria decision making method, applying to overcome problems that are under uncertain conditions or need to take several evaluation criteria into account for decision making, aiming to provide the decision maker a precise reference for adequately making decision and reducing the risk of making wrong decision through decompose the decision problem into a hierarchy of more easily comprehended sub-problems, each of which can be evaluated independently. The elements of the hierarchy can relate to any aspect of the decision problem such as tangible or intangible, carefully measured or roughly estimated, well- or poorly-understood; that is, anything at all that applies to the decision at hand. It has been well utilized in several fields (Saaty, 1980) that requires the chosen of alternatives and the weight exploration of evaluation indices like business (Angelou and Economides, 2009), industry (Chen and Wang, 2010), healthcare (Liberatore and Nydick, 2008), and education.

During the past, there were 13 major conditions that have discovered to well fit the utilization of AHP such as setting priorities, generating a set of alternatives, choosing a best policy alternatives, determining requirements, allocating resources, predicting outcomes, measuring performance, designing system, Ensuring system stability, optimization, planning, resolving conflict, and risk assessment (Saaty,1980). Besides, recent conditions encompass to reduce the influence of global climate change (Berrittella et al., 2007), to quantify the quality of software systems (McCaffrey, 2005), to choose university faculty (Grandzol, 2005), to decide the location of offshore manufacturing plants (Walailakand McCarthy, 2002), to evaluate risk in conducting cross-country petroleum pipelines (Dey, 2003), and to manage U.S. watersheds (De Steiguer et al., 2003) and so on.

The recent applications of AHP method in shortly are listed below (Table 1):

Table 1. Recent applications of AHP

Reference	Considered problem
Amiri *et al,* 2010	Evaluating ICT business alternatives
Gungor *et al.* 2009	Personnel selection problem
Gumus, 2009	Forest road evaluation form
Chen and Wang, 2010	Information service industry
Sun *et al,* 2010	Assessment of sustainability
Kim, 2009	Surface of Spatial Urban Growth
Martinez *et al,* 2010	Optimal emplacement in buildings
Medineckiene *et al,* 2010	Sustainable construction
Podvezko, 2009	Application of AHP technique
Podvezko *et al,* 2010	Evaluation of contracts
Maskeliunaite *et al,* 2009	Quality of Passenger Transportation
Sivilevicius, 2011a	Modeling of Transport System
Sivilevicius, 2011b	Quality of technology
Sivilevicius and Maskeliunaite, 2010	Quality of transportation
Fouladgar *et al.,* 2011	Prioritizing strategies
Park, 2011	Soil erosion risk

Source: Author calculation

The calculation of AHP is adopted ratio scale for developing pair-wise comparison matrix. It typically can be categorized into 5 sub-scales based on different levels of importance: Equal importance, somewhat more important, much more important, Very much more important, and absolutely more important. There are still 4 sub-scales with each level of importance between above 5 major sub-scales. Therefore, there is an amount of nine sub-scales. The ratio values from 1 to 9 are given to each sub-scale as we summarized in Table 2.

Table 2. The ratio scale and definition of AHP

Intensity of importance	Definition	Description
1	Equal importance	Two factors contribute equally to the objective.
3	Somewhat more important	Experience and judgment slightly favor one over the other.
5	Much more important	Experience and judgment strongly favor one over the other.
7	Very much more important	Experience and judgment very strongly favor one over the other. Its importance is demonstrated in practice.
9	Absolutely more important	The evidence favoring one over the other is of the highest possible validity.
2,4,6,8	Intermediate values	When compromise is needed

Source: Saaty (1990)

The calculation steps of AHP are presented as follows (Saaty, 1990):

Step1. Establish the pair-wise comparison matrix A by using the ratio scale in Table1. Step 2. Let $C_1, C_2, \cdots, C_n$ denote the set of elements, while a_{ij} represents a quantified judgment on a pair of elements C_i, C_j. This yields an n-by-n matrix A as follows:

$$A = [a_{ij}] = \begin{array}{c} \\ c_1 \\ c_2 \\ \vdots \\ c_n \end{array} \begin{array}{c} \begin{array}{cccc} c_1 & c_2 & \dots & c_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix} \end{array} \tag{1}$$

Where $a_{ij} = 1$ and $a_{ij} = \frac{1}{a_{ij}}$, $i = \overline{1, n}$ and $j = \overline{1, n}$

In matrix A, the problem becomes one of assigning to the n elements $C_1, C_2 \ldots C_n$ a set of numerical weights $W_1, W_2, \ldots W_n$ that reflects the recorded judgments. If A is a consistency matrix, the relations between weights W_i and judgments a_{ij} are simply given by $\frac{w_j}{w_i} = a_{ij}$

($for = \overline{1, n}$ and $j = \overline{1, n}$). Saaty (1990) suggested that the largest eigenvalue λ_{max} would be

$$\lambda_{\max} = \sum_{j=1}^{n} a_{ij} \frac{w_j}{w_i} \tag{2}$$

If A is a consistency matrix, eigenvector X can be calculated by

$$(A - \lambda_{\max} I) X = 0 \tag{3}$$

Saaty proposed utilizing the consistency index (C.I.) and random index (R.I.) verify the consistency of the comparison matrix (consistency ratio, C.R.). C.I. and C.R. are defined as follows (Saaty, 1990):

$$CI = \frac{\lambda - n}{n - 1} \quad (4)$$

$$CR = \frac{CI}{RI} \quad (5)$$

Where the R.I. represents the average consistency index, which is also named as the random index, was computed by Saaty (1997) as the average consistency of square matrices of various orders n which he filled with random entries. Average consistency values of these matrices are given by Saaty and Vargas (1991) as provided in Table 3. If the C.R<0.1, the estimate is accepted; otherwise, a new comparison matrix is solicited until C.R<0.1.

Table 3. Values for RI

n	2	3	4	5	6	7	8
RI	0.00	0.52	0.90	1.12	1.24	1.32	1.41

Source: Saaty and Vargas (1991)

3.2. COPRAS-G METHOD

In order to evaluate the overall efficiency of a project, it is necessary to identify selection criteria, to assess information, relating to these criteria, and to develop methods for evaluating the criteria to meet the participants' needs. Decision analysis is concerned with the situation in which a decision-maker has to choose among several alternatives by considering a particular set of criteria. For this reason Complex proportional assessment (COPRAS) method (Zavadskas and Kaklauskas, 1996) can be applied. This method was applied to the solution of various problems in construction (Tupenaite et al., 2010; Kaklauskas et al., 2010; Zavadskas et al,. 2010). The most of alternatives under development always deals with future and values of criteria cannot be expressed exactly. This multi-criteria decision-making problem must be determined not with exact criteria values, but with fuzzy values or with values in some intervals. Zavadskas et al. (2008) presented the main ideas of complex proportional assessment method with grey interval numbers (COPRAS-G) method. The idea of COPRAS-G method with criterion values expressed in intervals is based on the real conditions of decision making and applications of the Grey systems theory (Deng, 1982; Deng, 1988). The COPRAS-G method uses a stepwise ranking and evaluating procedure of the alternatives in terms of significance and utility degree.

The recent developments of decision making models based on COPRAS methods are listed below:

- Datta et al. (2009) solved problem of determining compromise to selection of supervisor;
- Bindu Madhuri et al. (2010) presented model for selection of alternatives based on COPRAS-G and AHP methods;
- Uzsilaityte and Martinaitis (2010) investigated and compared different alternatives for the renovation of buildings taking into account energy, economic and environmental criteria while evaluating impact of renovation measures during their life cycle;

- Chatterjee et al. (2011) presented materials selection model based on COPRAS and EVAMIX methods;
- Zavadskas et al. (2011) assessment of the indoor environment;
- Podvezko (2011) presented comparative analysis of MCDM methods (SAW and COPRAS).

The procedure of applying the COPRAS-G method consists in the following steps (Zavadskas et al. 2009):

1. Selecting the set of the most important criteria, describing the alternatives.
2. Constructing the decision-making matrix $\otimes X$:

$$\otimes X=\begin{bmatrix} [\otimes x_{11}] & \dots & \dots & [\otimes x_{1m}] \\ [\otimes x_{21}] & \dots & \dots & [\otimes x_{2m}] \\ \vdots & \dots & \ddots & \vdots \\ [\otimes x_{n1}] & \dots & \dots & [\otimes x_{nm}] \end{bmatrix} = \begin{bmatrix} [\underline{x}_{11};\overline{x}_{11}] & [\underline{x}_{12};\overline{x}_{12}] & \dots & [\underline{x}_{1m};\overline{x}_{1m}] \\ [\underline{x}_{21};\overline{x}_{21}] & [\underline{x}_{22};\overline{x}_{22}] & \dots & [\underline{x}_{2m};\overline{x}_{2m}] \\ \vdots & \vdots & \ddots & \vdots \\ [\underline{x}_{n1};\overline{x}_{n1}] & [\underline{x}_{n2};\overline{x}_{n2}] & \dots & [\underline{x}_{nm};\overline{x}_{nm}] \end{bmatrix}; j=\overline{1,n}, i$$ (6)

Here $\otimes x_{ji}$ is determined b $\underline{x}_{ji}$ (the smallest value, the lower limit) and $\tilde{x}_j$ (the biggest value, the upper limit).

3. Determining significances of the criteria q_i, q_i.

4. Normalizing the decision-making matrix $\otimes$X:

$$\underline{\tilde{x}} = \frac{\underline{x}_{ji}}{\frac{1}{2}\left(\sum_{j=1}^{n}\underline{x}_{ji}+\sum_{j=1}^{n}\overline{x}_{ji}\right)} = \frac{2\underline{x}_{ji}}{\left(\sum_{j=1}^{n}\underline{x}_{ji}+\sum_{j=1}^{n}\overline{x}_{ji}\right)}, \overline{\tilde{x}} = \frac{\overline{x}_{ji}}{\frac{1}{2}\left(\sum_{j=1}^{n}\underline{x}_{ji}+\sum_{j=1}^{n}\overline{x}_{ji}\right)} = \frac{2\overline{x}_{ji}}{\sum_{j=1}^{n}\left(\underline{x}_{ji}+\overline{x}_{ji}\right)}; j=\overline{1,n}; i=\overline{1,m} \quad (7)$$

In formula (7) $\underline{x}_{ji}$ is the lower value of the i criterion in the alternative j of the solution; $\overline{x}_{ji}$ is the upper value of the criterion i in the alternative j of the solution; m is the number of criteria; n is the number of the alternatives, compared. Then, the decision-making matrix is normalized:

$$\otimes\tilde{X}=\begin{bmatrix} [\underline{\tilde{x}}_{11};\overline{\tilde{x}}_{11}] & [\underline{\tilde{x}}_{12};\overline{\tilde{x}}_{12}] & \dots & [\underline{\tilde{x}}_{1m};\overline{\tilde{x}}_{1m}] \\ [\underline{\tilde{x}}_{21};\overline{\tilde{x}}_{21}] & [\underline{\tilde{x}}_{22};\overline{\tilde{x}}_{22}] & \dots & [\underline{\tilde{x}}_{2m};\overline{\tilde{x}}_{1m}] \\ \vdots & \vdots & \ddots & \vdots \\ [\underline{\tilde{x}}_{n1};\overline{\tilde{x}}_{n1}] & [\underline{\tilde{x}}_{n2};\overline{\tilde{x}}_{n2}] & \dots & [\underline{\tilde{x}}_{nm};\overline{\tilde{x}}_{nm}] \end{bmatrix} \quad (8)$$

5. Calculating the weighted normalized decision matrix $\otimes\hat{X}$. The weighted normalized values $\otimes\hat{x}_{ji}$ are calculated as follows:

$$\otimes\hat{x}_{ji}=\otimes\tilde{x}_{ji}\cdot q \text{ or } \underline{\hat{x}}_{ji}=\underline{\tilde{x}}_{ji}\cdot q_i \text{ and } \overline{\hat{x}}_{ji}=\overline{\tilde{x}}_{ji}\cdot q_i \quad (9)$$

In formula (9), q_i is the significance of the i –th criterion.

Then, the normalized decision-making matrix is:

$$\otimes\hat{x} = \begin{bmatrix} [\otimes\hat{x}_{11}] & [\otimes\hat{x}_{12}] & \cdots & [\otimes\hat{x}_{1m}] \\ [\otimes\hat{x}_{21}] & [\otimes\hat{x}_{21}] & \cdots & [\otimes\hat{x}_{2m}] \\ \vdots & \vdots & \ddots & \vdots \\ [\otimes\hat{x}_{n1}] & [\otimes\hat{x}_{n2}] & \cdots & [\otimes\hat{x}_{nm}] \end{bmatrix} = \begin{bmatrix} [\underline{\hat{x}}_{11};\overline{\hat{x}}_{11}] & [\underline{\hat{x}}_{12};\overline{\hat{x}}_{12}] & \cdots & [\underline{\hat{x}}_{1m};\overline{\hat{x}}_{1m}] \\ [\underline{\hat{x}}_{21};\overline{\hat{x}}_{21}] & [\underline{\hat{x}}_{22};\overline{\hat{x}}_{22}] & \cdots & [\underline{\hat{x}}_{2m};\overline{\hat{x}}_{2m}] \\ \vdots & \vdots & \ddots & \vdots \\ [\underline{\hat{x}}_{n1};\overline{\hat{x}}_{n1}] & [\underline{\hat{x}}_{n2};\overline{\hat{x}}_{n2}] & \cdots & [\underline{\hat{x}}_{nm};\overline{\hat{x}}_{nm}] \end{bmatrix} \quad (10)$$

6. Calculating the sums P_j of criterion values, whose larger values are more preferable:

$$P_j = \frac{1}{2}\sum_{i=1}^{k}\left(\underline{\hat{x}}_{ji} + \overline{\hat{x}}_{ji}\right) \quad (11)$$

7. Calculating the sums R_j of criterion values, whose smaller values are more preferable:

$$R_j = \frac{1}{2}\sum_{i=k+1}^{m}\left(\underline{\hat{x}}_{ji} + \overline{\hat{x}}_{ji}\right); i = \overline{k,m} \quad (12)$$

In formula (12), (m- k) is the number of criteria which must be minimized.

8. Determining the minimal value of R_j as follows:

$$R_{\min} = \min_j R_j; j = \overline{1,n} \quad (13)$$

9. Calculating the relative significance of each alternatively Q_j the expression:

$$Q_j = P_j + \frac{\sum_{j=1}^{n} R_j}{R_j \sum_{j=1}^{n} \frac{1}{R_j}} \quad (14)$$

10. Determining the optimally criterion by K the formula:

$$K = \max_j Q_j; j = \overline{1,n} \quad (15)$$

11. Determining the priority order of the alternatives.

12. Calculating the utility degree of each alternative by the formula:

$$N_j = \frac{Q_j}{Q_{\max}} \times 100\% \quad (16)$$

Here Q_j and Q_{max} are the significances of the alternatives obtained from equation (14).

4. PERSONNEL SELECTION MODEL BASED ON AHP AND COPRAS-G METHOD

4.1. CRITERIA SELECTION AND DATA SURVEY

The aim of this study is to utilize a new hybrid model of MCDM methods in quality manager selection. A case company is Kalleh Company, the oldest and the most famous companies in food, meet and disposable containers industrials, in Iran. Kalleh Company tends to select one quality manager among $A_1, A_2 and A_3$; they are three alternatives that thecompany wants to select one of them as a quality manager. This study, used seven criteria that theliterature and the senior manager of Kalleh company were determined, all the criteria presented in Table 4.Based on the nature of seven evaluation criteria, optimization directions for each evaluation criterion is determined as follows: $\otimes x_{1,2,3,4,5,7} \overrightarrow{optimaldirection(Max)}$ $\otimes x_6 \overrightarrow{optimaldirection(Min)}$

Table 4. Criteria for quality manager selection

	Criteria	References
$\otimes x1$	Knowledge of product and raw material	Company managers
$\otimes x2$	Experience and educational back ground	Gargano *et al.* (1991)
$\otimes x3$	Administrative orientation	Boran *et al.* (2008)
$\otimes x4$	Behavioral flexibility	Boran *et al.* (2008)
$\otimes x5$	Risk evaluation ability	Boran *et al.* (2008)
$\otimes x6$	Payment	Company managers
$\otimes x7$	Team work	Boran *et al.* (2008)

Source: Author calculation

4.2. PRIORITIZATION CRITERIA FOR QUALITY MANAGER SELECTION

For pair wise comparison decision making in AHP, a questionnaire was sent to a group of 5 experts that are the senior manager of company, because they were responsible for quality manager selection. Information about experts is shown in Table 5:

Table 5. Background Information of Experts

Variable	Items	NO	Variable	Items	NO
1)Education background	Bachelor Master Ph.D.	2 2 1	3)Sex	Male Female	4 1
2)Service Tenure	6-10 11-20	2 3	4)Age	31-40 41-50	4 1

Source: Author calculation

Paired comparison matrix criteria is one of the matrices which were completed with information of experts is shown in Table 6. AHP method is then used for prioritizing. After all comparisons and weighing processes are done, the overall weights of each criterion are obtained (Table 6).

Table 6. Criteria paired comparison matrix

	Criteria								Weights
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	
Criteria	x_1	1	2	1/2	3	2	3	3	0.208
	x_2	1/2	1	1/3	1/2	3	2	1/2	0.105
	x_3	2	3	1	3	2	5	3	0.287
	x_4	1/3	2	1/3	1	4	3	1	0.147
	x_5	1/2	1/3	1/2	1/4	1	3	2	0.105
	x_6	1/3	1/2	1/5	1/3	1/3	1	1/2	0.048
	x_7	1/3	2	1/3	1	1/2	2	1	0.100
	C.I. =0.125			*C.R. = C.I./R.I.=0.094*					

Source: Author calculation

According the weights in table 5, $x_3, x_1,$ and x_4 were three of the most important considering criteria.

4.3. SELECTION OF THE BEST ALTERNATIVE

At this stage of the application, the group of experts evaluated each candidate according to each criterion and Table 7 developed. It indicates initial decision making matrix, with the criterion values described in intervals. For the weight q_i of criteria we used of weights in Table 6.

The initial decision making matrix, has been normalized first as discussed in section 2.The normalized decision making matrix is presented in Table 8.Using equations (11) to (16) for all the persons. These are furnished in Table 9.

Table 7. Initial decision making matrix with the criteria values described in intervals

	$\otimes x_1$	$\otimes x_2$	$\otimes x_3$	$\otimes x_4$	$\otimes x_5$	$\otimes x_6$	$\otimes x_7$
opt	max	max	max	max	max	min	max
q_i	0.208	0.105	0.870	0.147	0.105	0.048	0.100
Person	$\underline{x}_1, \overline{x}_1$	$\underline{x}_2, \overline{x}_2$	$\underline{x}_3, \overline{x}_3$	$\underline{x}_4, \overline{x}_4$	$\underline{x}_5, \overline{x}_5$	$\underline{x}_6, \overline{x}_6$	$\underline{x}_7, \overline{x}_7$
A_1	60 95	70 80	80 90	50 70	50 80	60 80	90 95
A_2	80 90	50 70	50 70	70 90	90 95	60 90	60 70
A_3	40 60	70 95	70 80	60 80	60 70	80 90	70 80

Source: Author calculation

Table 8. Normalized weighted decision making matrix

	$\otimes x_1$	$\otimes x_2$	$\otimes x_3$	$\otimes x_4$	$\otimes x_5$	$\otimes x_6$	$\otimes x_7$
Opt	max	max	max	max	max	min	max
Person	$\underline{x}_1; \overline{x}_1$	$\underline{x}_2; \overline{x}_2$	$\underline{x}_3; \overline{x}_3$	$\underline{x}_4; \overline{x}_4$	$\underline{x}_5; \overline{x}_5$	$\underline{x}_6; \overline{x}_6$	$\underline{x}_7; \overline{x}_7$
A_1	0.059 0.093	0.034 0.039	0.316 0.356	0.035 0.049	0.024 0.038	0.013 0.017	0.039 0.041
A_2	0.078 0.088	0.024 0.034	0.198 0.277	0.049 0.063	0.042 0.045	0.013 0.019	0.026 0.030
A_3	0.039 0.059	0.034 0.046	0.277 0.316	0.042 0.056	0.028 0.033	0.017 0.019	0.030 0.034

Source: Author calculation

Table 9. Evaluation of utility degree

Person	P_j	R_j	Q_j	N_j
A_1	0.561	0.015	0.578	100%
A_2	0.477	0.016	0.493	85.335%
A_3	0.497	0.018	0.512	86.506%

Source: Author calculation

Based on the results of Table 9, the ranking of the three persons is $A_1 \succ A_3 \succ A_2$. Hybrid approach results indicate that A_1 is the best candidate with the highest degree and is the best persons for quality manager.

5. CONCLUSION

In this age of increased competitive markets, the notion of the personnel selection problem has an enormous interest and future survival of most companies, depends mostly on the appropriate dedication of their personnel to companies. Select a quality control manager is a very important problem for the companies and distribution chain and is a MCDM problem. In our case of Iran, Kalleh Company is one of the oldest and the most famous companies that are working internationally and quality problem is very important for it. Therefore the selection of quality manager is thus especially critical for Kalleh Company to acquire competitive advantages. The aim of this study is to utilize a hybrid model of MCDM method in personnel selection using Kalleh Company as a case. We used AHP to weight the seven evaluation criteria and COPRAS-G method for evaluating the performance of three persons of Kalleh Company with adopting weighted evaluation criteria. Based on the result of COPRAS-G method, the best person for Kalleh Company is thus verified. Besides, owing to our case is focusing on an international company, the personnel selection model that we proposed can also be a guide for other foreign companies for their personnel selection with efficiency in decision-making process of top managers.

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ODABIR MANAGERA KONTROLE KVALITETE NA OSNOVI AHP-COPRAS-G METODA: SLUČAJ U IRANU

Sažetak

S obzirom na rastuću konkurentnost u globalizaciji te brzim tehnološkim napredovanjem na svjetskom tržištu, zahtjevi kompanija za profesionalnim kadrom se također povećavaju. Vrlo je važno za organizaciju biti u mogućnosti odabrati najbolji i najprimjereniji kadar među ponuđenim kandidatima. Manager kontrole kvalitete je važan kadar u bilo kojoj organizaciji tako da je iznimno važno za taj posao odabrati najbolje kandidate. U ovom radu predlažemo sustav odabira kadra zasnovan na analitičkom hijerarhijskom procesu (AHP) i kompleksnoj proporcionalnoj evaluaciji alternativa sa sivim odnosima (COPRAS-G). Isprva je identificirano sedam kriterija uključujući: znanje o proizvodu i svojstvima sirovine, iskustvo i obrazovanje, snalaženje s administracijom, fleksibilnost u ponašanju, sposobnost procjene rizika, plaćanja i timski rad te je zatim primijenjen AHP za izračunavanje težine svakog kriterija te je naposljetku korištena COPRAS-G metoda za odabir najboljih kandidata. Ova studija se može koristiti kao predložak za odabir kandidata i buduća istraživanja.

Ključne riječi: *Manager kontrole kvalitete, odabir kadra, analitički hijerarhijski proces (AHP), COPRAS-G metoda*