

# APPLICATION OF ANALYTIC HIERARCHY PROCESS METHOD IN THE EVALUATION OF MANAGERS OF INDUSTRIAL ENTERPRISES IN SLOVAKIA

Lukáš Jurík, Peter Sakál

## INTRODUCTION

Competencies are a part of human capital that businesses can use to human development and growth and thus intellectual capital. In modern enterprise, the evaluation of employees is considered as important basis for improving its operation. Performance evaluation is the most important activity of management of work performance and it is inconceivable without the measurement and evaluation of the results of performance in comparison with planned objectives. In addition to indicators of performance itself, however, it is also aimed at the evaluation of the fact, to what rate the performance was achieved through effective usage of competencies of employees. In the evaluation, it is important to understand the performance in terms of outputs – the achievement of quantitative objectives. But the performance is not only what people achieve, but also how they achieve it, through which competencies (Kachaňáková, 2001).

In practice, the effort to use all possibilities to evaluate the results of work is usually developing and to suitably add them about the evaluation of behaviour and skills of employee. The evaluation on the basis of results of the work is easier and customary in the case of workers' categories of employees. The evaluation of behaviour and particular abilities is typical for managerial positions (Koubek, 2007).

## 1 THE METHOD OF ANALYTIC HIERARCHY PROCESS

Thomas L. Saaty, whose is author of this method, is American professor of mathematics. He developed theory of analytic hierarchy

process into a practical tool for decision support and verify it on a series of practical decision making problems (Ramík, 2000). The method allows preparing effective decisions in complex situations, simplifying and speeding up the natural process of decision making. Software implementation of the AHP method is called Expert Choice that we used for the application of AHP method in the area of Human Resource Management.

### Decision by the method of AHP uses three principles of analytical thinking (Ramík, 2000):

1. The principle of hierarchical structure.
2. The principle of setting priorities.
3. The principle of logical consistency.

### The general procedure of a solution (Leitner, 2010):

- 1 Realization of the pairwise comparison of criteria and comparison of variants by individual criteria - the obtaining of matrices.
- 2 Determination of the own value (own number) of each matrix:
  - a) Obtaining the characteristic polynomial
  - b) Determination of the roots of the characteristic polynomial, and from them obtaining own number
- 3 Acquisition of the values of the own vector of matrix
- 4 Transformation of the own vector of matrix to normed own vector, whose components determine the weights of each criteria and weights of variants according to fulfillment of the requirements of individual criteria.

- 5 The final evaluation and determination of the order by means of a weighted sum.

**The problem can be solved in two ways:**

- 1 Software Expert Choice (EC), whose procedure will be described.
- 2 The classical numerical method.

**The solution of the problem by software EC rests in the following steps:**

1. The determination and inscription of the objective, criteria and variants of the decision problem.
2. The assignment of the weights to individual criteria through pair wise comparison of criteria.
3. The evaluation of the variants of solution by pair wise comparison in individual criteria.
4. The evaluation of the optimal variant of solution, eventually the sequence of individual variants.

During our scientific-research activities and in processing the above mentioned grants we have accumulated theoretical and practical experience of the issue. Therefore, in this paper, we will deal only with the applications of AHP method in the competency approach in three industrial enterprises (Jurík, 2013; Rauchová, 2014; Schiffel, 2014).

## **2 THE APPLICATION OF AHP METHOD IN COMPETENCY APPROACH IN INDUSTRIAL ENTERPRISES**

**AHP method has in the field of personnel management following options of utilization (Ramík, 2000):**

1. **In the selection of candidates** - the application of AHP method in the selection of candidates for a particular job position will be described in the next part.
2. **In the development of employees** - it is possible to measure the development of individual competencies, but also the development of level of the total set of required competencies of employees after completion of the courses and thereby to measure their contribution to the development of competencies.

3. **In the evaluation of employees and subsequently also in their remuneration** - the option of evaluation on the basis of the desired level of set of competencies, in the case of comparison with other employees and subsequently a connection of the evaluation with the remuneration system, specifically a connection with the variable component of wage.

**By us formulated methodology can be applied to two tasks:**

1. Selection of candidates for the working position.
2. Evaluation of employees for the assessment of their quality and performance.

### **2.1 MODEL FOR THE SELECTION OF CANDIDATES BY USING THE AHP METHOD IN INDUSTRIAL ENTERPRISE NO. 1**

The role of personnel selection is to assess the assumptions of candidates for a specific job position and their prospective use in enterprise and decision about selection the most suitable candidate. Within this range the choice of employees strategic HR activities, because it affects the quality of an employees of enterprises, the quality of human capital. Enterprises use competencies, competency model to selection of employees (Jurík, 2013).

In the selection process of a new employee enters the stage of deciding on the suitability of a specific candidate more criteria and requirements for the vacant position, so the process is a multicriteria problem. This section describes application of the method in selecting the candidate for position in specific industrial enterprise No. 1.

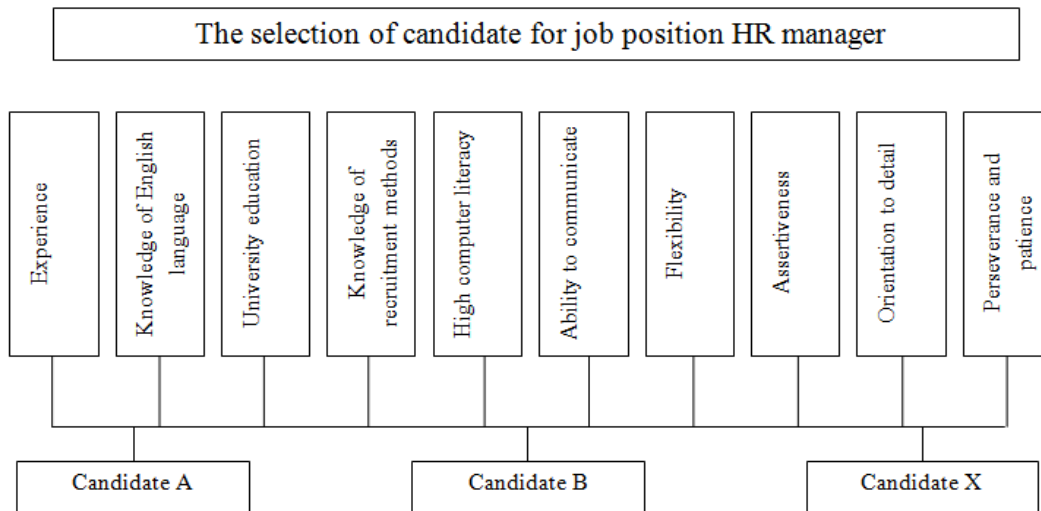
**Proposal of solution alternatives:** Alternative solutions are presented by candidates themselves for a job position. Shortlisted selection were 6 candidates - the candidate A, candidate B, candidate C, candidate D, candidate E and candidate F.

**Proposal of criteria for evaluation of alternatives solve:** Proposal criteria for the evaluation of options represent the next step for the application of AHP method. In this case,

they are competencies - qualification requirements. An important step of application

AHP method is a creation of hierarchical structure (Fig. 1).

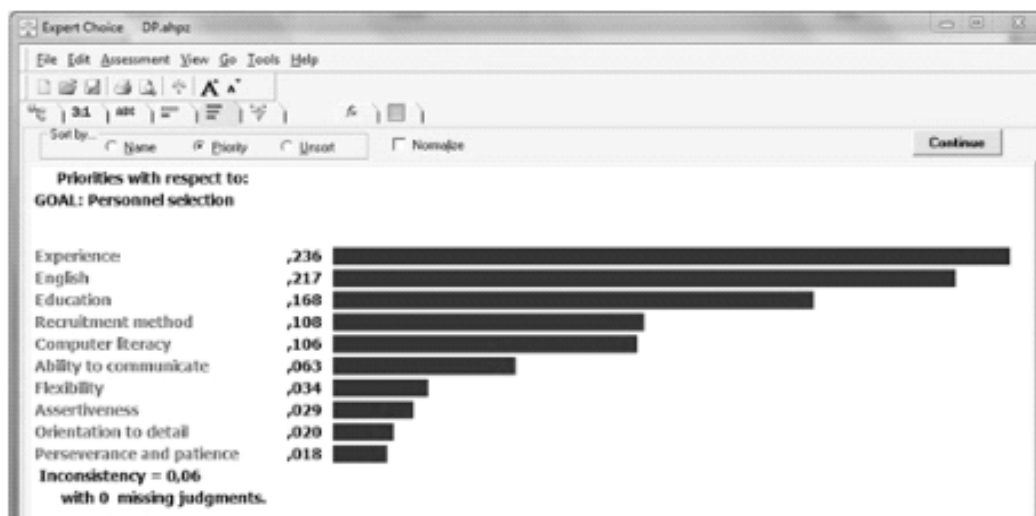
Fig. 1: Hierarchical structure of AHP



Source: Jurík, 2013

**Solving the problem:** The first step is determination weight to individual criterions. The criteria are compared on the basis of a rating scale in the comparison matrix. The weights of individual criteria were calculated based on pairwise comparison in EC (Fig. 2).

Fig. 2: Calculating of individual criteria priorities

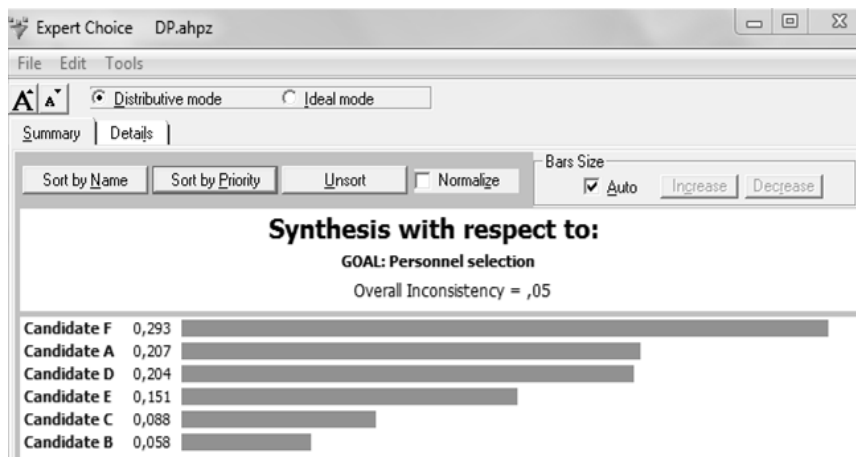


Source: Jurík, 2013

Alternatives are assessed in the same manner as the criteria. As a result of application software EC is a table shown in Fig. 3, which describes the order of candidates. The order of candidates is determined by the values calculated by EC. And finally, we can eliminate

the less favorable alternative and rank them. In AHP method, the best candidate will be candidate F and he was followed by candidate A, candidate D, candidate E, candidate C and candidate B.

Fig. 3: Calculating of individual candidates priorities



Source: Jurík, 2013

## 2.2 MODELS FOR EVALUATING EMPLOYEES THROUGH AHP METHOD IN INDUSTRIAL ENTERPRISE NO. 2 AND NO. 3

For the application of AHP method for the evaluation competencies of managers in enterprise No. 2, we used the software Expert Choice to evaluating a competency model for managers.

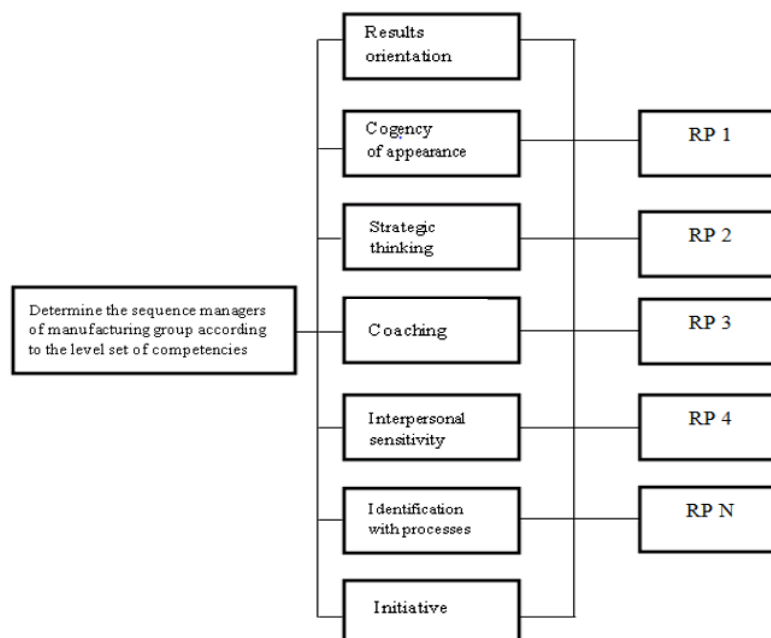
**Determination of objective decision-making:** The aim of the decision is „determine the

sequence of managers by level of set of competencies”.

**Alternatives of solution:** Alternatives are managers (identified as RP 1 to RP 26).

**Proposal of criteria for evaluation of alternatives solve:** The competence of competency model for managers are the criteria. The output of the decision-making is a hierarchical structure, which is shown in Fig. 4.

Fig. 4: Calculating of individual candidates priorities



Source: Schiffel, 2014

**Result of evaluation:** The first step is to assign weights to each criterion. In the fig. 5 is calculated weight of each criterion.

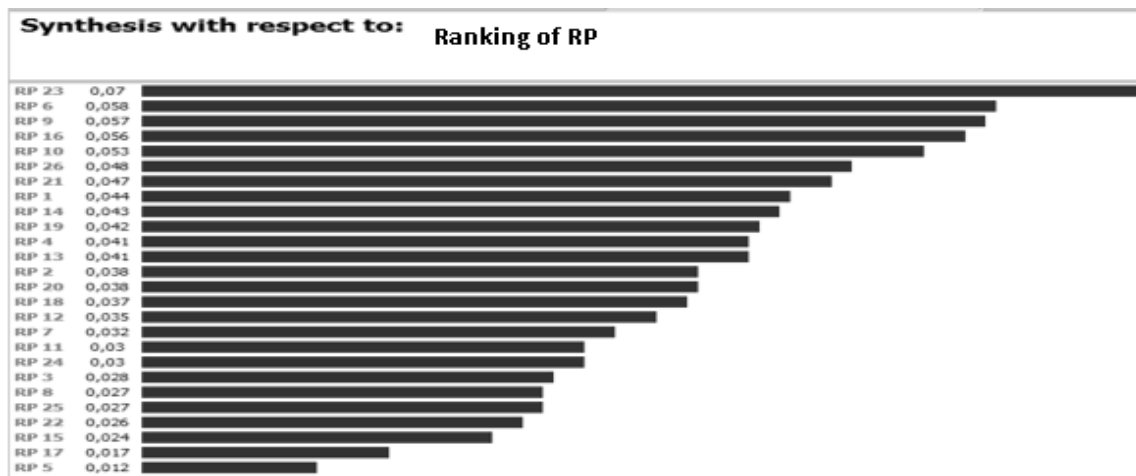
Fig. 5: Calculated weight criteria



Source: Schiffel, 2014

Fig. 6 determine the sequence of managers of industrial enterprise. Based on the results, it was found that the RP 23 reaches the highest value of set of competences Above-average values reported RP 6, 9 RP, RP 16 and RP 10.

Fig. 6: Final overall evaluation of the significance managers



Source: Schiffel, 2014

**The application of AHP method for the evaluation competencies of managers in enterprise No. 3**

**Determination of objective decision-making:** Evaluation of managers in individual operations in industrial enterprise.

**Alternatives of solution: Managers of the individual operations:** A – Head of design and

technology, B – Head of sales, C – Head of MTI, D - Head of metal production and E – Head of technical control.

**Proposal of criteria for evaluation of alternatives solve:** Required competencies for managers shows Tab. 1.

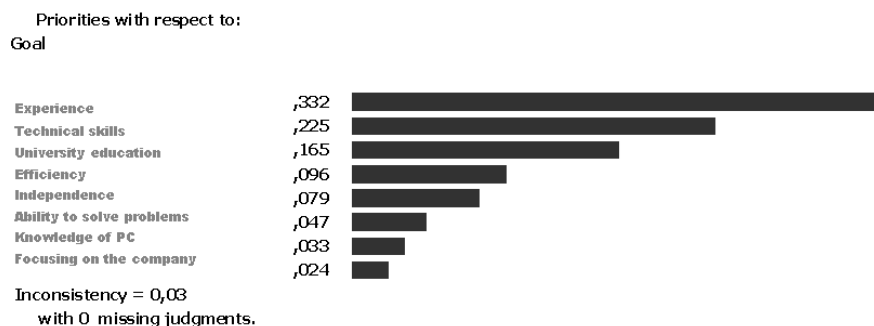
Tab. 1: The competency model No. 1 and competency model No. 2

Competency model No. 1		Competency model No. 2	
Experience	1	Experience	1
Technical skills	2	Technical skills	2
University education	3	Ability to solve problems	3
Efficiency	4	Efficiency	4
Independence	5	Independence	5
Ability to solve problems	6	Knowledge of PC	6
Knowledge of PC	7	University education	7
Focusing on the company	8	Focusing on the company	8

Source: Rauchová, 2014

**Assigning weights to each criterion:** Fig. 7 shows the ranking criteria with their associated weights.

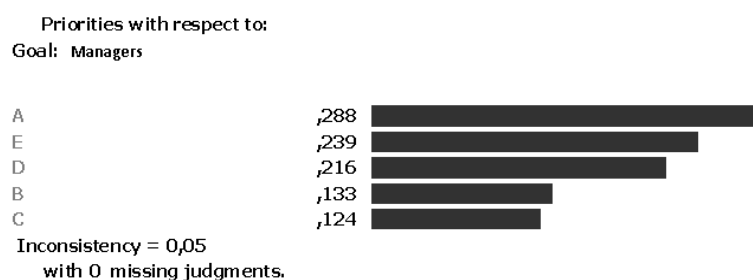
Fig. 7: Assessing the significance of criteria



Source: Rauchová, 2014

**Evaluation of alternatives:** Fig. 8 describes a sequence of variants (individual managers).

Fig. 8: The resulting evaluation of managers through competency model No. 1

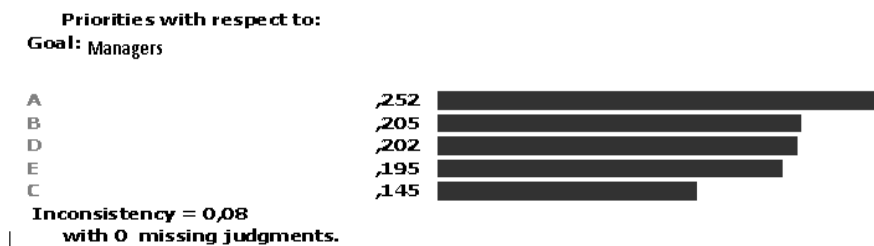


Source: Rauchová, 2014

The first evaluation was carried out according to the competency model, where the criterion - University education was in third place. After 2 months evaluation was repeated, the

importance of competence has been changed and a competency model No. 2 was created. Figure 9 shows the pairwise comparison of department heads under the new criteria.

Fig. 8: The resulting evaluation of managers through competency model No. 2



Source: Rauchová, 2014

**Result of evaluation:** According to the proposed model of competence, we found the result, where department of design and technology was the most effective. Second place with satisfactory conditions had department of metal production and then department of technical control. Worst place had department of MTI.

## CONCLUSION

The evaluation of employees plays an important role in management of the enterprise. If the evaluation is accomplished on the basis of objectively pre-determined competencies, it provides an important framework for the development of the employees themselves, but also of the enterprise or university. A major problem in the evaluation process is the

formation of competencies; therefore we recommend devoting especially to this area.

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*to determine the competency profile manager company PCA Slovakia, s.r.o in the context of SD and SCSR).* Diplomová práca. Trnava: MTF STU.

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**Abstract**

Evaluation of employees in industrial enterprises is a problem, because evaluators often make decisions based on subjective feelings. The objective approach is missing in the evaluation of employees. Objective approach during evaluation of employees can be achieved by applying the method of Analytic Hierarchy Process. We applied the method in the field of HR management in three enterprises in Slovakia.

For the first time, we used the method in an enterprise in selection process of the position of HR worker, where on the basis of the criteria, we recommended the most suitable candidate for the enterprise. The second was the application of the method in the enterprise for evaluating managers, where the enterprise needed to identify qualitative differences between managers and then determine, in which fields the employees must improve. The third application was the creation of a methodology for evaluating the competencies of managers in enterprise. In the above-mentioned enterprise, there was defined a competency model, which served as a system of criteria for evaluation, and by the application of method, quality of managers was able to be expressed by the synthetic indicator.

**Keywords:** Analytic Hierarchy Process; evaluation of employees; selection of candidates

**JEL Classification:** C44, J24, M53