



MULTI-CRITERIA DECISION MODEL FOR SELECTING THE BEST IT EMPLOYEE OF THE YEAR

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Abstract: *The aim of this paper is to propose a multi-criteria model for selecting the best IT employee of the year in IT companies in one developing country. The criteria according to which the IT employees will be evaluated are determined through a two-stage survey process. In the first stage the questionnaire contained eight criteria that were evaluated by the respondents (IT company owners, IT team leaders, employees in the HR sector of IT companies, and IT developers), and the added criteria by them (nine) were evaluated by the same respondents in the second questionnaire. All criteria that have an average grade of importance that is equal to or higher than 4, were grouped in three categories: quality of work, personal quality and knowledge and skills. Based on the categories of criteria and the determined criteria, a multi-criteria decision model was developed, i.e. an AHP model whose solution will serve the management of the IT companies as a recommendation in the process of selection of the best IT performer of the year.*

Key words: *multi-criteria decision making, analytic hierarchy process, criteria, IT companies, IT employees.*

1. INTRODUCTION

Organizations that strive to operate successfully in the global world are aware that the probability of sustainable success depends on their ability to attract and develop talents, and it is even more important to find a way to keep them in the organization and to identify with the set goals. But it would not be possible to talk about achieving organizational goals at all, unless we have motivated employees who put in maximum effort. In that direction, the question arises as to how to determine whether the employees show the desired performance? How to find out which employees are "top performers", and for whom there is a real need to increase their engagement in the workplace? The answer, of course, involves the establishment of an effective system of measurement and performance management as a requirement for the organization to be sure that it does the right things in the right way and in the right direction. Performance appraisal is used to evaluate employees' strengths and weaknesses against a set of predetermined criteria that are linked to organizational goals (Grote 2002). Human Resource Management (HRM) has the difficult task of determining appropriate criteria and assessment methods that will reflect the specificities of the work of individual categories of employees. One of the most commonly used assessment methods in practice are the following: Ranking, Graphic Rating Scale, Paired comparison method, "Checklist method", "Management by objectives (MBO)" and "360 degree review".

It is important to emphasize that performance appraisal, as a widely discussed concept, is only one aspect of performance management, which is quite important because what can not be measured can not be managed. According to Armstrong (2000), performance management is a strategic and integrated approach to delivering sustained success to organizations by improving the performance of people who work in them and by developing the capabilities of teams and individual contributors. While performance appraisal should help to obtain meaningful information on how successful employees are performing their tasks, management should focus on how best to use this information. One of the basic goals that an effective performance management system needs to achieve is to improve employee motivation and satisfaction by creating an organizational culture in which high employee contributions are recognized, valued and publicly promoted.

In this paper, the focus is on evaluating the performance of IT professionals, a workforce for which a real war is taking place in the global labor market. Considering the fact that the tech sector has the highest turnover rate, organizations are happy to maintain these high-tech profiles for more than a year. Under such conditions, HR requires a proactive role and the continuous undertaking of activities that will influence their motivation and satisfaction. To evaluate the performance of IT employees in IT companies in a developing

country, i.e. the Republic of North Macedonia, a model of one of the most well-known multi-criteria methods, the Analytic Hierarchy Process (AHP), is proposed. This method is chosen as the most appropriate, therefore it allows to include more criteria which can be both quantitative and qualitative. The model will enable IT employees that are evaluated to be ranked, and to select the one that is the best performer of the year.

2. OBJECTIVES AND RESEARCH METHODOLOGY

The overall objectives of the research are the following:

- to determine the criteria of key importance in the evaluation of the performances of IT employees in IT companies in one developing country, i.e. the Republic of North Macedonia;
- to develop a multi-criteria decision model for managerial decision-making in the process of selection of the best IT employee of the year.

The specific objectives of the paper are as follows:

- to present and analyze the results of the survey carried out on IT company owners, IT team leaders, employed in the HR sector of IT companies and IT developers;
- to develop a structure of multi-criteria decision model, i.e. an AHP model based on the determined criteria that will help the management of IT companies in the process of selection of the best IT performer of the year.

Those criteria that will have an average grade of importance that is equal or higher than 4 (described in detail in Section 4) will serve as input in the multi-criteria model.

3. QUESTIONNAIRE DESCRIPTION AND RESPONSE

To achieve the set objectives in the research, a questionnaire was created, consisting of questions related to the IT company's location, professional status of the respondents, their gender and age, and there were given 8 criteria by the authors of this paper (ability to meet given deadlines, ability to set priorities when working with numerous projects, ability to work under pressure, creative approach to problem-solving, ability to work in a team, level of technical knowledge, desire and openness to acquire new knowledge, "eye" for details and the ability to identify possible problems) that the respondents needed to evaluate on the scale of 1-5 (1 - the lowest grade, 5 - the highest grade) according to their view of importance in the process of selection of the best IT employee of the year. Also, if they think that there is another criterion (or criteria) they need to add, in this case a list of new criteria will be selected, afterwards sent to the same respondents again to evaluate their importance.

The questionnaire was sent to IT companies in the Republic of North Macedonia and it was stated that it needed to be filled by one person (IT company owner, IT team leader, an employee in the HR sector of an IT company or other (IT developer)). The questionnaire was not anonymous because there had been given the opportunity for criteria to be added, which were not given but are important for the respondents when selecting the top IT performer of the year. If there are new criteria, there will be a two-stage survey process, i.e. the first questionnaire will consist of the given criteria by the authors, and the second questionnaire will consist of the added criteria by the respondents. The second questionnaire will be sent to the same respondents.

The period to fill in the questionnaire with the given criteria by the authors of this paper was the first two weeks in April 2019. The total number of received complete questionnaires was 38. According to the obtained results that are analyzed in the next section there were new criteria added, so the second questionnaire was created and sent to the same respondents at the beginning of the last week of April, and they had two weeks to complete and send the questionnaire.

4. ANALYSIS OF THE RESULTS OF THE SURVEY

Based on the obtained results from the 38 questionnaires, all IT companies are located in Skopje, the capital of the country. Based on gender, 21 respondents (or 55%) are female, while 17 (45%) are male; according to age, most of the respondents (84%) are between 25 and 45 years old, and on the basis of their professional status, 16 are IT team leaders, 11 are employed in the HR sector of IT companies, 8 are in the category Other (IT developers), and 3 are IT company owners. (Figure 1).

The highest average grade of importance regarded the criterion ability to meet given deadlines ($\bar{X} = 4.74$), followed by the ability to work in a team ($\bar{X} = 4.66$), ability to set priorities when working with

numerous projects ($\bar{X} = 4.53$), desire and openness to acquire new knowledge ($\bar{X} = 4.39$), “eye” for details and the ability to identify possible problems ($\bar{X} = 4.24$), level of technical knowledge ($\bar{X} = 4.21$), while the following two criteria: creative approach to problem-solving and ability to work under pressure have the same average grade of importance ($\bar{X} = 4.13$). (Table 1).

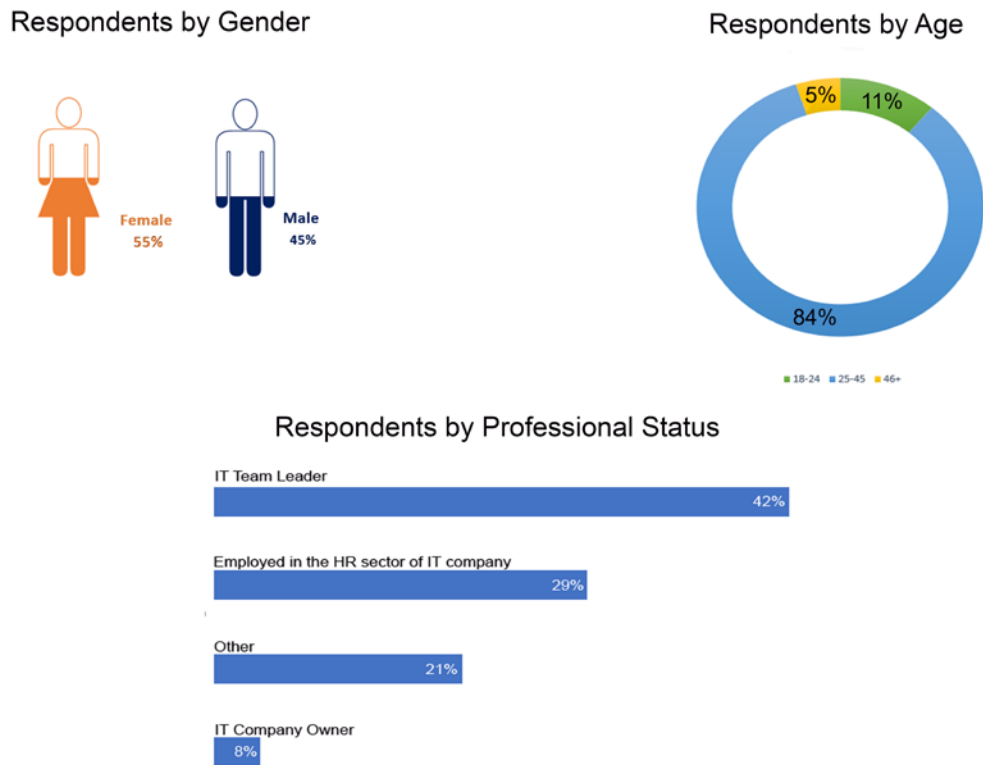


Figure 1. Respondents by gender, age, and professional status

Table 1: The results of the survey – importance of the given criteria

No.	Criteria	Average grade of importance
1.	Ability to fulfill given deadlines	4.74
2.	Ability to work in a team	4.66
3.	Ability to set priorities when working with numerous projects	4.53
4.	Desire and openness to aquire the new knowledge	4.39
5.	“Eye“ for details and the ability to identify possible problems	4.24
6.	Level of technical knowledge	4.21
7.	Creative approach to problem-solving	4.13
8.	Ability to work under pressure	4.13

In addition to these 8 criteria, the respondents added the following 9 criteria: persistence, desire to take on initiative, communication, business logic, leadership, adjustment to changes, budget control, commitment, and the ability to organize. Based on this state, the survey was conducted as a two-stage approach, so in the second stage the second questionnaire was created, consisting of the abovementioned 9 criteria, and the same 38 respondents needed to evaluate them on a discrete scale (1 to 5, where 1 is the lowest grade of importance, and 5 is the highest) in the process of selection of the top IT performer of the year. The questionnaire was sent to them at the beginning of the last week in April 2019 and they were given two weeks to fill it in. According to the estimated average grades of importance of these new criteria, they all have an average grade under 4 and will serve as input in the multi-criteria decision model (AHP).

5. MULTI-CRITERIA DECISION SUPPORT METHOD AHP

Being one of the most important and fastest growing fields of the discipline of management science (MS), multi-criteria decision making (MCDM) is about making a decision in the presence of multiple criteria that in most cases are conflicting among themselves. A detailed review of this field of MS, from its beginning to the present can be found in Koksalan *et al.* (2011). Mardani *et al.* (2015) have made a literature review of the MCDM techniques and their applications. In this review there are considered 393 papers published in more than 120 international peer-review journals, published in the period 2000-2014, and they are extracted from the database Web of Science (Cvetkoska and Savic 2017). According to this review, the most used MCDM method is AHP (128 papers).

AHP was developed in the late seventies of the XX century by Thomas L. Saaty (Saaty 1977, 1980), and it enables a complex problem of MCDM to be decomposed to goal, criteria, sub-criteria (if any) and alternatives that are represented as a hierarchy (goal on the top, while the alternatives on the bottom). Cvetkoska and Begicevic-Redzep (2016, pp. 343-344) give an explanation of the four steps of the application of this MCDM method. Also, AHP allows to check the consistency in pairwise comparisons of the elements of the hierarchy by computing the consistency ratio (CR), so that if CR is smaller or equal to 10% (0.01), the inconsistency is accepted, details can be found in Cvetkoska and Iliev (2017, p. 96). Based on the literature review of Emrouznejad and Marra (2017) about the development of AHP, where 8441 published works are considered, extracted from ISI WoS, published in the period 1979-2017 (up to January), the number of publications has increased in the last 10 years, and in the period 2013-2015 there have been identified more than 800 published works.

The use of AHP method in the area of HR can be found in (Rangone 1996, Albayrak and Erensal 2004, Saaty *et al.* 2007, Omrani 2012, Chen *et al.* 2014, Jurik and Sakal 2015). In this paper an AHP model is proposed for selection of the best IT employee of the year. Based on the existing literature it was found that Norddin *et al.* (2015) developed an AHP-based model in order to select the best employee of the year. This model consists of goal, 4 criteria (quality of work, personal quality, knowledge and skills, and external factors), 22 sub-criteria and as alternatives there are used 5 employees. Mittal *et al.* (2009) regarding a case study of Indian IT companies evaluate the performance of employees by using AHP. In the first survey they have obtained a list of criteria that are important for the promotion of employees, and then in another survey they ascertain the criteria for determining three employees for promotion and evaluating their relative weights by AHP.

In our paper the criteria determined and identified through the two-stage survey are grouped in three categories: quality of work, personal quality, and knowledge and skills, and this model is original (described in detail in the next section).

5.1 AHP-based model for selection of the best IT employee of the year

In order to select the best IT performer of the year, employed in an IT company, this paper proposes an AHP model. The hierarchy structure of this model consists of: goal: select the best IT employee of the year; 3 categories of criteria: quality of work (QW), personal quality (PQ) and knowledge and skills (KS); criteria in each category; and as alternatives will serve employees that will be evaluated (their number will be 7 ± 2). Description of the categories (based on Nordinn *et al.* (2015, p.73) and the criteria that belong to each category is given in Table 1.

Each of the members of the Committee from each analyzed IT company that will select the best IT employee of the year, will need to compare the three categories in pairs by using the intensity of importance scale (Cvetkoska & Iliev 2017, p. 95) to assign the appropriate intensity of importance. From the individual judgments for each category, a group judgment will be drawn out (detailed in Cvetkoska & Savic (2017, p. 10), which will be entered in the matrix of pairwise comparisons. Then it will be calculated: the normalized matrix, the weight of each category and consistency ratio. Analogously, for the criteria belonging to each category, a pairwise comparisons matrix will be compiled, and the normalized matrix, the weights for the criteria and the consistency ratio will be calculated; then the employees among who the selection will be made are to be evaluated, and a total priority will be calculated on the basis of which they will be ranked (details of the procedures can be found in Norddin *et al.* (2015, pp. 73-75). From the 38 IT companies compiling the sample for analysis one was selected in which three members (who will comprise the selection committee for the best IT employee of the year) were compared in pairs for the categories and criteria within each category, and the calculated weights are shown in Table 2.

Table 1: Description of categories and criteria

Categories	Description	Criteria
Quality of work (QW)	the ability of the employee to manage multiple projects, maintain high standards and complete the work accurately and on time.	<ul style="list-style-type: none"> ▪ Meet given deadlines ▪ Set priorities when working with numerous projects ▪ Work under pressure ▪ Commitment ▪ Budget control
Personal quality (PQ)	the employee should be able to cooperate with others, make constructive suggestions, share ideas	<ul style="list-style-type: none"> ▪ Creative approach to problem-solving ▪ Work in a team ▪ Persistence ▪ Desire to take initiative ▪ Organize
Knowledge and skills (KS)	the level of technical knowledge of the employee, skills (communication, change management, problem management), and showing interest to upgrade existing knowledge and gain new knowledge.	<ul style="list-style-type: none"> ▪ Level of technical knowledge ▪ Desire and openness to acquire new knowledge ▪ “Eye” for details and the ability to identify possible problems ▪ Communication ▪ Business logic ▪ Leadership ▪ Adjustment to changes

The consistency ratio for the matrix of pairwise comparisons of categories and criteria in categories 1, 2, and 3 respectively is: 0.0136, 0.0880, 0.0858 and 0.0863, thus confirming the consistency. At the end of 2019, the Committee for selection of the best IT employee of the year will evaluate the IT employees of this company in order for their overall priorities to be calculated, and accordingly a ranking of IT employees will be made. Each IT company can apply this model and estimate its own weights and overall priorities according to which the IT employees will be ranked. The employee with rank 1 will serve as a recommendation in the process of selection of the best IT performer of the year. The benefits of using the proposed AHP model in IT companies in our country will be explained in the next paper.

Table 2: Weights of categories and criteria

Categories		
Quality of work (0.0755)	Personal quality (0.5907)	Knowledge and skills (0.3338)
Criteria		
<ul style="list-style-type: none"> ▪ -Meet given deadlines (0.0593) ▪ -Set priorities when working with numerous projects (0,4302) ▪ -Work under pressure (0.0599) ▪ -Commitment (0.2818) ▪ -Budget control (0.1689) 	<ul style="list-style-type: none"> ▪ -Creative approach to problem-solving (0.0860) ▪ -Work in a team (0.1542) ▪ -Persistence (0.2072) ▪ -Desire to take initiative (0.3148) ▪ -Organize (0.2378) 	<ul style="list-style-type: none"> ▪ -Level of technical knowledge (0.0404) ▪ -Desire and openness to acquire the new knowledge (0.0946) ▪ -“Eye” for details and the ability to identify possible problems (0.0939) ▪ -Communication (0.2000) ▪ -Business logic (0.1646) ▪ -Leadership (0.0692) ▪ -Adjustment to changes (0.3374)

6. CONCLUSION

The most important resource in every organization is its employees. The potential for its growth, productivity, efficiency, and profitability depends on the knowledge and skills of the employees. Management should motivate employees to give their maximum to achieve the goals of the organization. A good manager leads by example, evaluates employee performance and directs them to improve, creates a rewarding system that is fair and consistent, and all that leads to success.

The adequate evaluation of the performances within the organizations and the promotion of the high contribution of the employees plays an important role in the improvement of their motivation and the total organizational success. In this paper an AHP model for selection of the best IT employee of the year is proposed. In the direction of determining the criteria of key importance that should be included in the IT

employees' evaluation process, a two-stage survey was conducted. According to one of the IT companies included in the study, the criteria of utmost importance are: set priorities when working with numerous projects, desire to take initiative and adjustment to changes. The obtained results from the developed AHP model will serve as recommendation in the managerial decision-making when selecting the employee of the year. By application of this model the accuracy of the process of selection gains in value. The employee that will be selected as a top performer will serve as a model for other employees in order to improve their performances.

REFERENCES

- [1] Albayrak, E., & Erensal, C.Y. (2004). Using analytic hierarchy process (AHP) to improve human performance: An application of multiple criteria decision making problem. *Journal of Intelligent Manufacturing*, 15(4), 491-503.
- [2] Armstrong M., (2000), *Performance Management, Key Strategies and Practical Guidelines*, Second Edition, UK, Kogan Page Limited.
- [3] Chen, C., Zhang, Z., Chen, L., & Lv, Y. (2014). An effective human resource management mode via analytic hierarchy process. *Computer Modelling & New Technologies*, 18(12C), 1309-1314.
- [4] Cvetkoska, V., & Begicevic-Redzep, N. (2016). Applying the analytic hierarchy process to rank city-branches. In O. Jasko & S. Marinkovic (Eds.), *Book of Proceedings of the XV International Symposium SnYMORG 2016: Reshaping the future through sustainable business development and entrepreneurship* (pp. 241-252) Belgrade: University of Belgrade, Faculty of Organizational Sciences.
- [5] Cvetkoska, V., & Iliev, F. (2017). How to choose your next top salesperson: Multiple-criteria approach. *Business Systems Research*, 8(1), 92-112.
- [6] Cvetkoska, V., & Savic, G. (2017). Efficiency of bank branches: Empirical evidence from a two-phase research approach. *Economic Research-Ekonomska Istrazivanja*, 30(1), 318-333. doi: <http://dx.doi.org/10.1080/1331677X.2017.1305775>
- [7] Emrouznejad, A., & Marra, M. (2017). The state of the art development of AHP (1979–2017): A literature review with a social network analysis. *International Journal of Production Research*, 55(22), 6653-6675. doi: 10.1080/00207543.2017.1334976
- [8] Grote, R. C. (2002). *The performance appraisal question and answer book: A survival guide for managers*. New York: American Management Association.
- [9] Jurik, L., & Sakal, P. (2015). Application of analytic hierarchy process method in the evaluation of managers of industrial enterprises in Slovakia. *Trendy v podnikani – Business Trends*, 5(3), 28-35.
- [10] Koksalan, M., Wallenius, J., & Stanley, Z. (2011). *Multiple criteria decision making: From early history to the 21st century*. Singapore, SG: World Scientific Publishing Co. Pte. Ltd.
- [11] Mardani, A., Jusoh, A., Nor, M.D.K., Khalifah, Z., Zakwan, N., & Valipour, A. (2015). Multiple criteria decision-making techniques and their applications – A review of the literature from 2000 to 2014. *Economic Research-Ekonomska Istrazivanja*, 28(1), 516–571. doi: 10.1080/1331677X.2015.1075139
- [12] Mittal, K. C., Goel, A. K., & Mohindru, P. (2009). Performance Evaluation of Employees using Analytical Hierarchical Process: A Case Study of Indian IT Industry. *Asia Pacific Business Review*, 5(4), 119–127. <https://doi.org/10.1177/097324700900500410>
- [13] Norddin, N. I., Ahmad, N., & Yusof, Z. M. (2015). Selecting the best employee of the year using analytical hierarchy process. *Journal of Basic Applied Scientific Research*, 5(11), 72-76.
- [14] Omrani, A. (2012). *Analytic hierarchy process and its application in human resource management*. Master thesis. Warmoesberg: Hogeschool-Universiteit, Faculty of Economics & Management.
- [15] Rangone, A. (1996) An analytical hierarchy process framework for comparing the overall performance of manufacturing departments. *International Journal Operations and Production Management*, 16(8), 104–119.
- [16] Saaty, T.L. (1977). A scaling method for priorities in hierarchical structures. *Journal of Mathematical Psychology*, 15(3), 234-281.
- [17] Saaty, T.L. (1980). *Multicriteria decision making: The analytic hierarchy process*. Pittsburgh, PA: RWS Publications.
- [18] Saaty, T.L., Peniwati, K., & Shang, J.S. (2007). The analytic hierarchy process and human resource allocation: Half the story. *Mathematical and Computer Modelling*, 46 (7-8), 1041-1053. <https://doi.org/10.1016/j.mcm.2007.03.010>