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SELECTION OF THE MOTIVATION STRATEGY FOR EMPLOYEES IN THE MINING INDUSTRY USING THE GRA METHOD

Abstract

Human resources in an organization are one of the most important resources. Their motivation and satisfaction is a tool in achieving and retaining the organization's competitive advantage. The motivation of employees motivation is one of the main goals of the human resource management, since it has a direct impact on the performance itself, productivity of employees and the overall organizational performance. The aim of this paper is to propose an approach to the selection of motivation strategy for employees based on the multi-criteria decision-making. The approach is based on the GRA method, i.e. gray relational analysis. An illustrative numerical example was carried out in this paper. The proposed approach, based on the gray relational analysis, was successfully applied for selection the motivation strategy for employees in the mining industry.

Keywords: VKO, GRA, motivation, performance, mining industry, motivation strategies

INTRODUCTION

The most important resources of every organization are employees. They are a resource through which an organization achieves a competitive advantage and business success; they are a resource whose work results directly depend on their motivation. Employees are often, not only the most valuable, but also the most expensive organizational resource, so managing them must be a long-term and strategically well planned process.

One of the key issues gaining momentum in recent times is the motivation of employees. The organizations pay a great attention to this problem, because motivation and employees' satisfaction affect performance of an organization. Therefore, the motivation of employees and creation the conditions for their satisfaction are the most important tasks of management aimed to create a su-

ccessful organization [13]. Motivation is a process through which it is possible not only to achieve the organizational goals, but also to provide the employees with the opportunity to satisfy their needs through work. The process of motivation is affected by a variety of factors, external and internal, such as: the individual characteristics of an employee, the characteristics of the job that an individual performs, management styles, organizational culture, social and economic development, as well as the external social environment. The motivational factors include job, progress and responsibility. These factors are related to the positive feelings of an individual toward the work itself and to content of that work, achievements, recognition and responsibility.

Since motivation is a very complex and dynamic factor of successful business, it is

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necessary to establish an adequate motivation system for the proper management of human potential in order to achieve better performance and higher productivity. One of the biggest problems of the motivation system is the resistance of the workers themselves, who often do not believe in the system of stimulating rewards, in its objectivity and justice. Therefore, it is essential to gain the confidence of employees in this system.

The motivation system should be designed to provide three important steps: attracting employees while securing their staying with the organization, employees performing tasks and responsibilities appropriately and employees' self-development in the field of innovation and creativity. A large number of business problems arise as a result of an ineffective system of motivation. Decreased employees' interest, poor response of the candidates in the recruitment process, inefficient trainings, poor interpersonal relationships, high fluctuation percentage and inefficient cooperation within different sectors are the result of the unregulated HR processes. The reason for these unregulated conditions may also be the failure to comply with the basic principles of business ethics, as well as the application of inadequate motivation strategies [4].

Managers have the possibility to use various types of strategies, techniques and methods for motivating employees in the company. Each strategy is aimed to achieve the organization goals, and to meet the employees' needs. Managers can apply the material motivation strategies, non-material motivation strategies and integrated ones, i.e. combined strategies of motivation. The strategy managers will apply depends exclusively on identification the employees' needs. Urošević et al. [13,14] point out that the motivation of employees depends partly on the managers' skills, their competencies to foster motivation and ability to create such organizational climate that will ultimately result in the employees' satisfaction.

The aim of this paper is to propose an approach for selection a motivation strategy for employees in the mining industry based on the multi-criteria decision-making. This approach is based on the use of gray relational analysis. Accordingly, the paper is structured as the following: Section 1 represents the introductory considerations; Section 2 offers the key elements of motivation; Section 3 specifies the employees' motivation in the organizations of the mining industry; Section 4 shows the applied methodology, i.e. gray relational analysis; Section 5 suggests an illustrative numerical example. Finally, the last section represents the conclusion of this paper.

CONCEPT OF MOTIVATION

Researchers and managers have always been interested in motivators that drive employees and elements that affect the employees' motivation. The answer to that question is significant from the aspect of better employees' performance and better productivity.

Motivation represents the process of initiating and directing the human behavior in a certain direction. Most authors [8,12], agree that the motivation is primarily a psychological process of the inner feelings or incentives. Luthan (1998) defines the motivation "as a process that begins with the physiological disadvantages or with the need to activate the certain behaviour", in other words it is "the goal of stimulating the goal" [12]. According to Minner, Ebrahim and Watchel (1995), the motivation is characterized by three elements: needs, movement and rewards [12]. In other words, an unmet need creates tension, motivates an action and meeting of that need.

Theories of motivation have developed, as the result of the process of determining the different needs, the causes and mechanisms that initiate the human activity. The first group of theories is focused on disco-

vering the needs and motives that drive people in an organization. The most important theories regarding the content of motivation are: Theory of Hierarchy of Needs by Abraham Maslow; Theory X and Y by McGregor; Alderfer's ERG Model of Motivation; Herzberg's Two-Factor Theory; McClelland's Theory of Needs. The second group of theories seeks to discover the motivation process making people to take a certain action. The most important theories of the motivation process are the following: Goal Setting Theory, Theory of Equality and Theory of Expectations.

There are three dimensions of motivation necessary for understanding its essence and its impact on the employees' performance. They include direction, intensity and persistence. In order for the employee to be motivated in the right way, his/her motivation must have a certain direction. People in an organization can be motivated in the wrong direction, too. The intensity of motivation determines the amount of effort that someone will invest in an amount of time required to meet their needs. If the motivation intensity is higher, the employees will put more effort into achieving their tasks and their performance. Finally, the stability of motivation shows the time and a certain level of effort invested in a particular direction. For example, one can be motivated at an extremely high level in a short period of time, while another employee can be motivated with lower intensity, but for a longer period of time [5].

Motivation has a direct impact on the performance of employees. Therefore, the performance of the employees depends on the employees' ability to do the job, on their competencies, the appropriate work conditions and motivation. It may happen that an employee has competencies for a particular job and that the organization provides the necessary conditions, but if he/she is not motivated, the results will be lacking. In order to maximize the employees' productivity, the managers need to know what the

employees' needs are. We are all different and we all have different needs. The diversity of human nature is the reason why someone is more oriented towards the career and some is more interested towards the securing material resources. Therefore, it is extremely important to identify the needs of each employee.

MOTIVATION OF THE EMPLOYEES IN THE MINING INDUSTRY ORGANIZATIONS

Working in the mining industry organizations is difficult, often unhealthy and unsafe. Employees in the mining industry organizations face risks specific only to this profession. The aggravating circumstances may include poor working conditions, poor management, lack of skilled personnel, inadequate equipment, outdated technology and unsustainable tools, lack of training, exposure to extreme temperatures, biological and chemical agents, noise, radiation and stress, which increase the risk of accidents, possible in the mining industry. In addition to poor working conditions, if there is a partial and unfair system of rewarding and an ineffective motivation system, the workers will not be motivated to work. The absence of employees' motivation implies the reduced performance and employees' productivity, which definitely reflects on the business success of the organization, on attracting the new and retaining the existing staff. In order to increase the productivity of employees, it is necessary to provide a motivational system based on the fair system of valuation and rewarding. In addition, the managers must create trust of the employees in the motivation system. In order to determine the correct motivation system or, in other words, to select the best motivation strategy that will give the biggest effect in productivity, it is necessary firstly to determine the needs of employees. All the motives and needs of the employees can be classified into four categories:

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- Material motives (material rewards, bonuses, salaries, scholarships for education, paid life insurance);
- Non-material motives (praises and acknowledgments, the possibility of career advancement, the possibility of education through training programs, achievement and personal success);
- Work related motives (dynamic and challenging job, good working conditions, job security, clearly set goals and objectives, modern work equipment, acceptance of responsibilities, participation in decision-making and goal setting processes, feedback on achieved results);
- Motives related to the work environment (good relationship with the manager, good interpersonal relationships, respect from colleagues and management).

Motives related to work and motives related to the work environment represent the subcategories of non-material motives.

Managers can apply different motivation strategies:

- Material strategy of motivation (managers apply the different material incentives according to the ranked identified motives);
- Non-material motivational strategies (managers apply the different non-material incentives according to the ranked identified motives);
- Integrated or combined motivation strategies (managers apply a combination of various material and non-material incentives according to the ranked identified motives).

The motivation strategy managers will choose to apply depends on identifying the employees' needs, because the basic starting point for creating the employees' motivation is meeting the different needs.

The theory of gray systems was proposed by Deng (1989) with the aim to model non-deterministic systems in situations where information is incomplete, unreliable and insecure. Within this theory, it was developed the gray relational analysis (GRA). The gray relational analysis is suitable for solving many problems characterized by uncertainty, which include discrete data and incomplete information, multi-criteria problems and optimization problems. As Lin & Lin (2002) [7] emphasize, gray relational analysis can be applied to solve effectively the complex interrelations between the multiple performance characteristics.

The justification for application the gray relational analysis lies in a fact that the method has been so far used, and successfully applied to solve various problems, such as: investigation the human error factors of civil aircraft pilots based on the gray relational analysis [3], selection of the mining tourism development strategy [9], measuring the quality of web sites in the hotel industry using the gray relational analysis [11], and others.

Mathematical interpretation of the gray relational analysis can be shown in the following way [9,11]: may $A = \{A_1, A_2, \dots, A_m\}$ be discrete set of alternatives, $C = \{C_1, C_2, \dots, C_n\}$ set of criteria and $w = \{w_1, w_2, \dots, w_n\}$ vector of weight, where is $w_j = [0,1]$ and $\sum_{j=1}^n w_j = 1$. After that,

there is a determination of the most acceptable alternative using a gray relational analysis through the following steps:

Step 1: Determination of the ideal solution. An ideal solution (reference point) is a solution that maximizes the revenue and minimizes the expense criteria, and it can be determined applying the following formula:

$$A^* = \{r_1^*, r_2^*, \dots, r_n^*\} = \{(\max_i r_{ij} \mid j \in \Omega_{\max}), (\min_i r_{ij} \mid j \in \Omega_{\min})\}, \quad (1)$$

In the equation A^* is an ideal solution, r_j^* is j coordinate of the ideal solution, r_{ij} is normalized rating of the i alternative to j criteria, $\Omega_{\max}$ and $\Omega_{\min}$ are sets of the natural and expense criteria.

Step 2: Calculation of the gray relational coefficient. In the second step, it is necessary to calculate the gray relational coefficient for each alternative of the ideal solution using the following formula:

$$\xi_{ij} = \frac{\min_i \min_j |r_j^* - r_{ij}| + \zeta \max_i \max_j |r_j^* - r_{ij}|}{|r_j^* - r_{ij}| + \zeta \max_i \max_j |r_j^* - r_{ij}|}, \quad (2)$$

In the equation, ξ_{ij} is the gray rational coefficient of the i alternative to j criteria, ζ is coefficient of the difference and $\zeta \in [0.1]$.

Step 3: Calculation of the gray relational grade. In this step, the gray relational grade is calculated for each alternative from the ideal solution using the following formula:

$$G_i = \frac{1}{n} \sum_{j=1}^n w_j \xi_{ij}, \quad (3)$$

In the equation G_i is gray rational grade from i alternative, w_j is weight of the j criteria.

Step 4: Ranking alternatives and choosing the best one. In this step, it is necessary to rank the considered alternatives and choose the best one in accordance with G_i . The alternatives with higher G_i are better ranked and alternatives with G_i are the most acceptable/desirable.

ILLUSTRATIVE NUMERICAL EXAMPLE

In order to show, in the best way possible, the justification, efficiency, effectiveness and usability of the proposed approach based on the use of the gray relational analysis, this section will show an illustrative numerical example: the selection of motivation strategies for employees in the mining industry. For the suggested motivation strategies in our case the alternatives are: A_1 – material motivation strategies; A_2 – non-material motivation strategies and A_3 – integrated motivation strategy. For the evaluation of these strategies, it will be applied four criteria of equal assigned weight of 0.25. Criteria for evaluating the strategy are as following: C_1 – feasibility of strategy implementation, C_2 – strategy implementation speed, C_3 – compliance of strategy with mission and vision of the organization and C_4 – acceptability of strategy by the employees.

Therefore, let us assume that the HR manager should decide on an adequate motivation strategy from the three offered, designated as A_1 , A_2 and A_3 in relation to the four evaluation criteria designated as C_1 , C_2 , C_3 and C_4 .

At the very beginning of the evaluation, the HR manager conducts an evaluation of the strategies in relation to the four evaluation criteria. The grades of considered alternatives are shown in Table 1.

Table 1 *Grades of the considered strategies*

	C_1	C_2	C_3	C_4
A_1	3	4	3	4
A_2	4	3	4	4
A_3	5	5	5	4

Then, we approach to determination the ideal point applying formula 1. The ideal point A^* and the distance of the alternative to the ideal point is shown in Table 2.

Table 2 *The ideal point and the distance between the alternative and ideal point*

	C_1	C_2	C_3	C_4
A^*	5	5	5	4
A_1	2	1	2	0
A_2	1	2	1	0
A_3	0	0	0	0

In the next step, applying formula 2, the gray relational coefficient is calculated for each of the alternatives to the ideal point. Table 3 shows the gray relational coefficients for each alternative to the ideal point. In this case, ζ is set to 0.5.

Table 3 *Gray relational coefficients for each alternative to the ideal point*

	C_1	C_2	C_3	C_4
A_1	0.33	0.50	0.33	1.00
A_2	0.50	0.33	0.50	1.00
A_3	1.00	1.00	1.00	1.00

Finally, using formula 3, the gray relational grade is calculated for each alternative. The gray relational grades and the order of alternatives' ranking are shown in Table 4.

Table 4 *Gray rational grades and the ranking order*

	G_i	<i>Rank</i>
A_1	0.54	3
A_2	0.58	2
A_3	1.00	1

Data in Table 4 indicate that the alternative designated as A_3 is the best-ranked alternative or, in our case, the best-ranked strategy.

CONCLUSION

Multi-criteria decision making greatly facilitates the decision-making process and adoption the sustainable solutions. From the illustrative numerical example, it can be concluded that the proposed application of the gray relational analysis is justified, and it was successfully used in the selection of motivation strategy for the employees in the mining industry. The best ranked alternative is the one marked as A_3 , which represents an integrated motivation strategy for employees (material and non-material motivation).

In order to achieve better performance and business success, the managers need to discover what triggers the human activity, and what the needs of employees are. When their needs are satisfied, the employees achieve better performance and higher productivity, which leads to accomplishing the organizational goals and business success. The selection of motivation strategy depends on the employees, whether they are more focused on meeting the basic existential needs or directed toward higher needs, such as improvement, career advancement, etc. The results of this research indicate that variables like the life expectancy, education, work experience and job position of respondents in the organization influence the choice of work motives. The results of empirical research indicate that the employees are focused on the material and non-material needs. That is why it is recommended to the managers to apply the inte

grated (combined) motivation strategies that involve the material and non-material stimulus.

Therefore, in order to raise the level of employees' motivation, besides the material incentives (wages, bonuses for night shifts, overtime and high performance, pension and disability insurance, private pension fund and life insurance, paid leave, etc.), which are universal motivators, and can satisfy the needs to a certain level, especially the existential ones, there are also the non-material motivators (education, praise and recognition, various forms of employees' participation in the processes, career advancement, etc.) that have a deeper and longer-term effect on motivation. An effective method of motivation can be an occasional job rotation, as well as keeping the work interesting in order to avoid the monotony and routine. Given that work in the mining industry is difficult and unsafe, the employees need to have better working conditions, more modern equipment and job security. As the process of motivation is influenced by the work results, the employees should be provided with a feedback on their work, as well as on achieving the set goals. Also, for raising the motivation level of employees in the mining industry organizations, the good examples from foreign and domestic companies practice can be used, such as: special productivity bonuses, different actions for employee, paid recreation, company's hotels, organized excursions, professional excursions, paid kindergartens for employees' children, gifts for holidays, birthdays, etc.

Application of an adequate motivation strategy can raise the employees' level of motivation and self-confidence, which leads to achieving better efficiency and effectiveness in the workplace; it keeps the existing workers in the company and attracts a new staff, which is difficult to achieve in this specific field of work. Therefore, an effective motivation system should represent an optimal combination of

the material and non-material incentives. Because of the hard working conditions in the mining industry, it is necessary to find constantly the new techniques and methods for motivating the employees, because the expectations and needs of employees change over time.

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