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Zámečník Roman,
PhD, Vice Rector for Education, Associate Professor of the Department of Economics and Management, STING ACADEMY College (Brno, Czech Republic)

THE QUALITATIVE INDICATORS IN HUMAN RESOURCE ACCOUNTING

The paper focuses on one of the "non-traditional" fields of the Human Resources Management System – i.e. Human Resource Accounting (hereinafter referred to as "HRA"). It presents HRA as an integral part of the Human Resources Management System and an important tool for measuring Human Resources Key Performance Indicators (hereinafter referred to as "HR KPIs") in an enterprise. The focal point of this paper is the analysis of the possibilities of using the qualitative indicators of HRA in a selected industrial enterprise. The measurement of these qualitative values and their enumeration is one of the main problems of HRA, e.g. motivation, employees' satisfaction, the quality of individual employees' competencies, or performance assessments of employees can be ranked among such instruments. Therefore, the paper discusses problems related with the use of the mathematical-statistical analysis methods for measurement of these qualitative values that have been chosen very carefully. The fundamental tool used in this process is a cluster analysis and its use when preparing motivational programmes. The paper will also deal with an outline of motivational factors analysis methods in a selected industrial enterprise.

Keywords: human resource accounting, human resources management, key performance indicators, analysis of motivational factors, cluster analysis.

Formulation of the problem generally. Nowadays, there is a significant shift in the approach to human resources and human resources management. Human resources management is becoming part of strategic management within the organization, and decision making regarding human resources has been shifting much more to line managers. On the other hand, companies face the problems of productivity stagnation, employees´ unfavourable attitude towards the organization and the work duties, law morals, and poor motivation. In general, companies search for such approaches and tools of human resources management enabling them to coordinate their employees´ interests as well as the ones of individual groups within the organization and their targets. In other words, they want to improve their employees´ attitude to the organization itself in order to make their work performance better. Naturally, the performance is then to be rewarded adequately – to ensure the link within the reward system and thus, to motivate workers in appropriate way. The objective measurement and assessment of work performance through the indicators selected is one of the cardinal problems of Human Resources Management. One of approaches to solve this problem is also Human Resource Accounting.

What to measure? How to measure it? Where to measure? When to measure? These questions make measurement of human resources value difficult. The following statement: "What cannot be measured cannot be managed" may be therefore considered to be the starting proposition for the issue of qualitative indicators in human resource accounting.

Analysis of recent researches and publications. There have been many attempts made by accountants, economists and organization experts to capture and reflects HR's value to organization. Sumod [54] offers an outline of the existing HR Measurement Models:

– Human Resource Accounting;

– Human Resource Metrics;
– HR Scorecards;
– The HC BRidge® Framework;
– LAMP,

The contribution concentrates on a historically oldest and in the literature, most described model, which is HRA.

As Inekwe [35] states over the years the accounting profession has been criticized for non-inclusion of human resource in the financial statements. This has become an issue of controversy and debate among accountants and non-accountants alike. It could be seen in a number of outbursts by different writers. For instance, Wood & Sangster [58] contended that one of the main limitations of normal financial accounting is the lack of any inclusion of the 'value' of the workforce of an organization. In the same vein, Appleby [3] stated that normal accounting information does not give any indication of the value of personnel in the firm [35]. Ebersberger [17] added that people in the business world today cite human resources, or people, as the company's greatest asset. However, the employees´ value is rarely reported on the balance sheet. HRA is an attempt to solve this problem.

Discussions regarding the existence and role of accounting in the field of human resources management have been an issue in the literature for more than 50 years. So, HRA is not a new issue in economics.

Johanson et al. [38] declare to measure human value as a part of goodwill, HRA was introduced into the accounting literature in the 1960s [21], although support for the idea of accounting for human resource values can be found much earlier [37; 51]. In 1964, Hermansson [27] published a pioneer work concerning the valuation of human assets, and in 1968 Brummet et al. [9] used the term 'human resource accounting' for the first time. Thereafter, a large bulk of articles has been published in the area. In 1973, American Accounting Association's Committee on Human Resource Accounting defined HRA as "the process of identifying and measuring data about human resources and communicating this information to interested parties" [21]. It provides information about human resource costs and values serves to facilitate decision-making and motivates decision-makers to adopt a human resource perspective [51]. Gröjer & Johanson [25] express the management orientation of HRA even more clearly in the assertion that HRA concerns the management of human resources. Despite the management orientation of the concept, HRA may also be used externally. The idea of measuring human resources for managerial purposes stems not only from accountants; psychologists and sociologists (e.g., [40]) has also proposed that the financial utility of different activities in the field of human resource management ought to be measured. In 1965, both Cronbach & Glaser [14] and Naylor & Shine [44] developed models for estimating the financial utility of personnel selection. They used the concept "utility analysis" (UA). To embrace both HRA and UA, Gröjer & Johanson [25] suggest the concept Human Resource Costing and Accounting (HRCA) [38].

In the paper, "A Review of Human Resource Accounting and Organizational Performance", Cherian & Farouq [33] refer that in the past decade, there are several studies on human resource accounting (HRA) that focused on wide and diverse range of research concerns. For an instance, researchers have linked a HRA measures with firm or organizational performance [2; 36; 39; 41; 46; 49; 57; 61]. Few others have focused on the valuation or measurement of HRA [5; 6; 11; 12; 13] while some addressed the issues of regulations, standards or reporting of HRA [7; 13; 15; 50; 62]. Although several articles have been debated the importance of accounting HR in the organizational performance but still

research are not conclusive that HR assets are important in creating value of organizations [33].

Bullen & Eyler [10], state that HRA involves accounting for expenditure related to human resources as assets as opposed to traditional accounting which treats these costs as expenditures that reduce profit. Woodruff [59] defined Human Resource Accounting as the identification, accumulation and dissemination of information about Human Resources in dollar or Naira term. He further explained that Human Resource Accounting is the systematic accumulation of information about changes in investments made in human resources and reporting back that information to operating managers to assist them to make better decisions than they would have been able to make without such additional information.

Raghav [48], states that Human Resource Accounting is a method of measuring the effectiveness of personal management activities and the use of people in an organization.

The American Accounting Association (1970) defines HRA as "the human resources identification and measuring process and its communication to the interested parties" [45].

Enyi & Akindehinde [18] use various definitions from above to make their own definition of HRA – "HRA in simple term is accounting for the value of people in organization to enhance information for decision making by the users of financial information".

Johanson et al. [38] links the concept of Human Resource Costing and Accounting (HRCA) with the concept of Balanced Scorecard (BSC) to measure and report intangible assets.

There are several methods and approaches regarding HRA (see below). However, many of them focus on enumeration of *quantitative indicators*, more or less based on costs – e.g., acquisition costs and learning costs [20]. Stanko et al. [53] categorized methods of HRA into two main categories – cost approaches (Historical Cost Method, Replacement Cost Method, Competitive Bidding Method, Standard Cost Method and Cost Benefit Method) and value approaches (Jaggi and Lau Method, Economic Value Method, Lev and Schwartz Method, Expense Model). At present, there are favourite indicators of profitability and value added, e.g. HC ROI or HRVA.

Each of these methods and models has its own advantages and disadvantages, but the purpose of this paper is not to make a detailed comparison of these methods.

In the paper," Human Resources Key Performance Indicators", Gabčanová [24] suggests that organizations try to measure performance per the financial drivers but in the recent period top leaders attempted to find new performance indicators (indices) which would take the "wind from sail" to their rivals in the market.

According to Gabčanová [24], one of these competitive advantages is human capital. As the Tootell et al. [55] stated "since 1980s there has been an increasing emphasis on the importance of HR measurement." Yeung & Berman [60] declared that "HR measures should be impact rather than activity orientated, forward looking than backward looking, and should focus on the entire HR system not just on individual practices" [24].

Toulson & Dawe [56] defined three problems in measuring HR: lack of HR experience and precision and difficulties in measurement. Historically, a variety of HR measurement methods are developed and used to demonstrate the effectiveness of HRM. Srimannarayana [52], offered a brief summary of invented methods to evaluate HR capital:

– multiple constituency approach to evaluate the effectiveness of HR department was suggested by Tsui;

– human resource accounting system to measure HR contribution was proposed by Flamholtz;

– McConnel identified 16 categories to be measured in HR auditing;

– return of investment methodology for measuring the bottom-line effect of employee performance was proposed by Fitz-Enz;

– Balanced Scorecard (BSC), a measurement framework that helps management to translate strategic goals into operational objectives was developed by Kaplan and Norton;

– Ulrich has showed how HR practices relate to BSC through productivity, people and process indicators;

– methodology of behavioural costing to measure the financial impact to HR activities was proposed by Cascio and Boudreau;

– HR development audit system, for evaluating human resource function for business improvement was designed by Rao;

– HR Scorecard model was outlined by Becker, Huselid and Ulrich.

As has already been mentioned hereinabove, HRA tools and instruments can be primarily subdivided into the *quantitative and the qualitative*. We rank economic indicators (e.g., wage/salary costs, cost for the individual personnel processes, etc.), and socio-economic indicators (i.e. absenteeism, fluctuations, etc.), among the quantitative tools. Among the tracked qualitative indicators are things like employee motivation and satisfaction, the quality of the various competencies of the individual employees, or evaluations of their performance. Quantitative HRA indicators can be relatively easily compared and measured. However, the measuring of qualitative indices (the so-called "soft" tools) ranks as one of the core problems facing HRA and not even in the available literature is it devoted sufficient attention. This is confirmed by Zámečník [64], who states that – during the evaluation of the results of human endeavours, it is necessary to take into consideration the unique character of working with human resources. And, since in comparison with controlling oriented on other enterprise activities, there continues to be a lack of adequate models, and it is necessary to learn to exploit existing quantitative quanta and to suggest appropriate ways and means of measuring qualitative quanta. The question of effectiveness and efficiency evaluation of HRM is mentioned by, e.g., Bilivičiene et al. [4], Hitka et al. [31], Hunko [32], Merková et al. [42] or Chromjaková [34] in their pieces of work. Hunko [32] outlines measurement and evaluation of employees´ satisfaction through a questionnaire survey in his scientific paper, yet by using arithmetic mean only.

In the following section of this paper for this reason, we orient ourselves on the possibilities of tracking and measuring selected qualitative quanta (employee motivation) under the concrete conditions pertaining to industrial manufacturing enterprises.

As Devadass [16] states scholars and practitioners care about cultivating, increasing, and maintaining work (employee) motivation. Motivation research has a long history of considering employee motives and needs (Alderfer, 1969; Maslow, 1954; McClelland, 1961). Interest in these areas peaked in the 1970s and early 1980s, and the last fifteen years has seen little empirical or theoretical research. According to Moorhead & Griffin [43] is employee performance frequently described as a joint function of ability and motivation, and one of the primary tasks facing a manager is motivating employees to perform to the best of their ability. Pinder [47] cited in Devadass [16], describes work motivation as the set of internal and external forces that initiate work related behaviour, and determine its form, direction, intensity, and duration. Work motivation is a middle range concept that deals only with events and phenomena related to people in a work context. The definition recognizes the influence of both environmental forces (e.g., organizational reward systems, the nature of the work being performed) and forces inherent in the person (e.g., individual needs and motives) on work-

related behaviour. An essential feature of the definition is that it views work motivation as an invisible, internal, hypothetical construct [16].

Motivation, delegation of powers gets its importance now as well. Authors Foot & Hook [22], Armstrong [1] cited in Gabčanová [23], unanimously agree upon the fact that the management of the performance is the process by which the performance of the organization, team and individual improve and is used by the leaders for managing. Hall [26] clearly declares that the very best way for managers to improve employee performance is to set clear expectations and hold regular business reviews to those expectations. The scientists try to discover the dependence between working performance and motivation. However, the answer is not unequivocal in all cases [23].

Unsolved issues as part of the problem. To manage the various and varied human resources processes, HRA requires a variety of measurement indicators and quantities. One of the most fundamental questions HRA seeks to answer is the establishment of relevant measurement quanta and indicators. Among the key problems faced by HRA, are those of the question of measuring the so-called "soft" factors and that of the measurement of the results of the human resources management process. In contrast to the quantitative indicators, the measurement of these qualitative values is more difficult and their enumeration is one of the main problems of HRA, e.g., motivation, employee satisfaction, the quality of the competencies of individual employees, or performance assessments of employees can be ranked among such instruments. There is no universal guide for estimating these values in specialized literature. Due to this fact, we tested a methodology for the measurement of these qualitative values by means of some selected statistical methods in carefully-chosen Czech and Slovak industrial enterprises. These problems and issues are covered in the following chapters.

The primal aim of this paper is the analysis of the possibilities of using qualitative indicators for HRA purposes in a selected industrial enterprise. We have divided our paper into four parts. In the first part, we characterise the basic HRA principles. In the following part, we introduce the HR KPIs in their quantitative and qualitative forms. In the third part of the paper, possibilities regarding use of mathematical-statistical methods for quantification of the qualitative indicators are outlined. The final section deals with an outline of motivation factor analysis methods in a selected industrial enterprise.

Basic material. The following parts of the paper present selected research results. These types of research have been going on continuously since 2001. They focus on the issues connected with using quantitative as well as qualitative indicators within the area of human resources management. The research sample is a target group of 45 Czech and Slovak manufacturing companies. These are mainly from wood processing industry and furniture industry. However, there are also representatives from engineering, chemical, textile, rubber, plastic, and automotive industry. The author of this paper has been a member of the scientific team in the period mentioned. He has worked on methodology, data collection and a statistical evaluation of the data collected.

At present, the research primarily concentrates on the problem of measuring and evaluating the qualitative indicators that are suitable for efficient human resources management by using selected methods of mathematical-statistical analysis. The following methods have been used for the purpose mentioned:

– correlation analysis;
– one-factor analysis of variance (ANOVA);
– factor analysis;

– cluster analysis;

– spearman's correlation coefficient.

The use of correlation analysis, one-factor analysis of variance and factor analysis when analysing motivational factors is described for instance by Zámečník [63]. The authors such Hitka et al. [30], Hitka & Štípalová [29] and Zámečník [64] deal with the issue of cluster analysis application in their pieces of work. The possibilities regarding the application of these methods within the field of employees´ work motivation management have been discussed many times in the authors´ publications mentioned above.

Then, in the paper, principal characteristic and possibilities of using the selected mathematical-statistical methods when quantifying the qualitative indicators of personnel management (Human Resources Management) are presented. These are connected with employees' work motivation.

From the methods stated, the authors mentioned above have, for the time being, mostly worked out the use of cluster analysis within the area of motivational factors´ analysis. The use of factor analysis together with cluster analysis seems interesting because some authors such as Brown [8] or Fabrigar & Wegener [19] strongly recommend to use factor analysis on the correlated data first and consequently, some of the methods generating empirical typology (in this case, it is the cluster analysis).

The factor analysis is a multi-dimensional statistical method explaining the relation of mutual dependencies of the variables studied. Its task is to reduce the number of original variables to a lower number of factors as well as to detect the structure of these factors based on the relations of original variables. The factor analysis thus offers a potential possibility of reducing the number of motivational factors analysed in the questionnaire to a lower number, which could make the analysis itself faster. Its aim is to describe the latent features of the structure within the set of variables through a low number of mathematically set characteristics. These general mutually independent non-correlated characteristics identified by the cluster analysis are called factors or are known by the term dimension. In our pieces of work, such characteristics are called factor dimensions in order not to confuse these with motivational factors, which are represented by particular variables. The factor analysis is thus based on the existence of correlations between the variables studied. Moreover, there are also independent dimensions (factors) contributing to the existence of correlations within these variables. Its main idea is to reduce the excessive duplicate information within several correlated variables. From the facts stated, the factor analysis provides a statistical model of data economically reproducing correlations between the variables through general dimensions. These dimensions greatly contribute to variability of the sets of variables.

In fact, a part of this variability is still inexplicable by the dimensions. Therefore, this analysis has been used rarely and, more or less, through experiment in our researches so far. Its better use, which is expected, is in the phase of analyses and preparations. One of the intended uses of the factor analysis is its application with the aim to make a complementary analysis of motivational factors´ structure. The goal of it is to find out whether except primary identified motivational factors chosen for the questionnaire also other hidden, not visible or even latent factors motivating employees towards the work performance of a good quality for an organization exist. In other words, to use the factor analysis in order to make the interpretation of motivational factors´ clusters found within the cluster analysis easier to be presented.

The cluster analysis was developed outside the field of statistics, above all, pedagogy, biology and psychology. The statisticians became part of the cluster analysis approximately

30 years ago. Due to this, the cluster analysis has been being developed as a non-theoretical field for many years using the ad hoc method. More models that are mathematical have been developed for the existing techniques and the knowledge when introducing a theoretical structure of this field has been used. Due to the fact that the system of employees´ motivation is based on division of criterions into disjunctive groups according to homogenous features, it is suitable to use the cluster analysis (cluster analysis – CLUA) for the final evaluation of employees´ groups. Particular groups can be formed by using suitable algorithms and the employees are to be divided into these.

The cluster analysis is a set of mathematical and statistical techniques to identify similar groups. Therefore, it can be used for forming groups of employees of similar motivation orientation. Its purpose is to unite the objects observed (in our case the employees) to clusters (groups, clusters) in a way to make their group as homogenous as possible. The differences between the objects from various clusters should be as great as possible. The following methods of a hierarchical cluster analysis are considered to be among the best-known ones:

1. Centroid method.
2. Nearest – neighbour or single-linkage method.
3. Farthest – neighbour or complete linkage – method.
4. Average-linkage method.
5. Ward's method.

The most often used method is the one of Ward. It was also used in our previous analyses focusing on considering the degree of similarities of individual respondents´ answers – this was done by using a very simple method of so-called the Euclidean distance – a geometrical distance within a multi-dimensional space defined by:

$$(x,y) = \sqrt{\sum_{i=1}^{n}(x_{1i} - x_{2i})^2}, \tag{1}$$

where x_1 – object 1; x_2 – object 2; i – i-variable; n – a number of variables.

In addition, it is possible to use the Euclidean distance raised to the power:

$$(x,y) = \sum_i (x_{1i} - x_{2i})^2, \tag{2}$$

which does not change the distance between the points, but progressively adds the importance of more distant objects.

In the first analytical phases of the research (2001-2002), not only the Ward's method but also other hierarchical methods of clustering were used such as the Single linkage method. In this case, the objects are being added to already existing clusters. However, non-hierarchical methods such as the k-mean were tested as well. Based on the pieces of work published and the knowledge gained, we have concluded that the Ward´s method is the most suitable and most used one as a tool within the cluster analysis enabling employees´ formation according to their motivation.

Moreover, as we have not used the system of high degree of uncertainty, we consider the Ward´s method as a suitable type of analysis for a real level of motivation that can confirm or prove the truth of respondents' answers. The cluster analysis was based on the data received via questionnaire survey. A functional principle of hierarchical agglomerative procedures was used. This means a progressive clustering of groups of the same elements – first, the closest

ones and then, more distant ones.

Since the work motivation is not part of quantitative data but of qualitative ones (motivational factors' order), it is possible to use Spearman´s correlation coefficient, which is often used when evaluating statistical dependencies of the qualitative data, to evaluate a statistical correlation dependency between various groups (in our case, these are companies from wood processing industry and companies from other types of industries).

In the following part, we illustrate the use of cluster analysis in the industrial enterprise selected for the reasons mentioned above.

The methodology of cluster analysis has been applied to 45 Czech and Slovak industrial enterprises stated above. For illustration, the application results in one of Czech industrial enterprises selected were described (from plastic and engineering field of industry, number of employees: 1,100). The category of blue-collar workers was the focus or research.

The principal task when analysing work motivation within an enterprise is preparing a questionnaire. The main task of the questionnaire is motivational factors analysis when an employee matches one of five degrees of importance (from 5 – most important to 1 – insignificant) to each motivational factor.

The questionnaire evaluation is done through the data matrix: number of employees x number of motivational factors. The matrix stated is an essential input enabling statistical analysis of motivational factors. Consequently, it is possible to identify through the cluster analysis groups of employees of a similar motivational structure as well as prepare motivational programmes for these groups of employees.

The first part of the questionnaire was focused on general data about the employees of the analysed enterprise – sex, age and time spent working in the enterprise. The questionnaires were distributed among 135 employees. 102 respondents filled in the questionnaire, which is a 76% return. 50 questionnaires were distributed among white-collar workers. 43 of these got back, which is an 86% return. 85 questionnaires were distributed among blue-collar workers. 59 pieces got back, which is a 69% return.

The questionnaire survey accepts findings of work motivation theory which is based on the fact that workers are motivated by their needs. These needs strongly influence their thoughts and behaviour. The study concentrating on the level of employees' work motivation is one of the steps towards having the motivational programme. The proposal of having such programme is meaningless without the knowledge of employees´ priorities and needs.

The second and third part of the questionnaire was focused on so-called work performance profile of importance and satisfaction, which describes relation between the importance of need and the degree of its satisfaction. The aim of the second part is to state twenty motivational factors that were, more or less, important for employees. These employees matched the degree of importance for each of the factors. Similarly, in the third part of the questionnaire, the respondents matched the degree of satisfaction for each of the factors.

Table1 demonstrates particular variances of weighed arithmetic means of importance and satisfaction in the category of blue-collar workers.

The optimal situation is when the motivational factor is of high value expressing its importance from the respondent´s perspective and at the same time, there is a high degree of satisfaction. On the contrary, the critical situation is when the motivational factor of high importance is connected with a low degree of satisfaction. In addition, the factors of a low degree of importance and of a high degree of satisfaction according to employees can be stated. As a result, there is no effective satisfaction regarding these factors from the enterprise perspective (the variance between importance and satisfaction is getting negative values).

Table 1 – **Evaluation of importance and satisfaction in the category of blue-collar workers** (author's own results)

Motivational factors	Importance						Satisfaction						Variance
	5	4	3	2	1	r	5	4	3	2	1	r	
1. Social aspects	10	43	6	0	0	**4,07**	6	31	18	4	0	**3,66**	**0,41**
2. Job security	42	7	4	3	3	**4,39**	5	18	18	10	8	**3,03**	**1,36**
3. Good name of the company	7	39	11	2	0	**3,86**	7	31	17	4	0	**3,69**	**0,17**
4. Relationships with colleagues	9	33	15	2	0	**3,83**	11	22	24	2	0	**3,71**	**0,12**
5. Cooperation with bosses	15	33	9	2	0	**4,03**	10	23	22	4	0	**3,66**	**0,37**
6. Use of knowledge and skills	5	22	27	5	0	**3,46**	9	27	14	9	0	**3,61**	**-0,15**
7. Fixed working hours	7	22	25	5	0	**3,53**	8	22	25	3	1	**3,56**	**-0,03**
8. Possibilities of further education	3	19	24	11	2	**3,17**	0	24	25	7	3	**3,19**	**-0,02**
9. Good pay	41	14	2	2	0	**4,59**	0	12	24	21	2	**2,78**	**1,81**
10. Results evaluation	19	29	11	0	0	**4,14**	2	19	31	7	0	**3,27**	**0,86**
11. Quality of catering services	5	25	25	3	1	**3,51**	12	22	24	1	0	**3,76**	**-0,25**
12. Working conditions	3	33	23	0	0	**3,66**	4	27	27	1	0	**3,58**	**0,08**
13. Work organization within department	11	28	16	3	1	**3,76**	7	20	25	6	1	**3,44**	**0,32**
14. Company targets presentation	4	24	27	2	2	**3,44**	0	17	28	13	1	**3,03**	**0,41**
15. Good job prospects – promotion	4	22	26	2	5	**3,31**	1	11	33	12	2	**2,95**	**0,36**
16. Independence when decision making	8	22	26	3	0	**3,59**	2	22	26	8	1	**3,27**	**0,32**
17. Information about the company	11	21	24	2	1	**3,66**	1	16	24	16	2	**2,97**	**0,69**
18. Making use of particular workplaces	8	21	27	3	0	**3,58**	2	16	33	5	3	**3,15**	**0,42**
19. Time for private life	12	25	18	4	0	**3,76**	6	24	27	2	0	**3,58**	**0,19**
20. Time off according to individual needs	9	26	21	3	0	**3,69**	9	19	27	4	0	**3,56**	**0,14**

Figure 1 below depicts a mutual relation between importance and satisfaction with the work done within the category of blue-collar jobs.

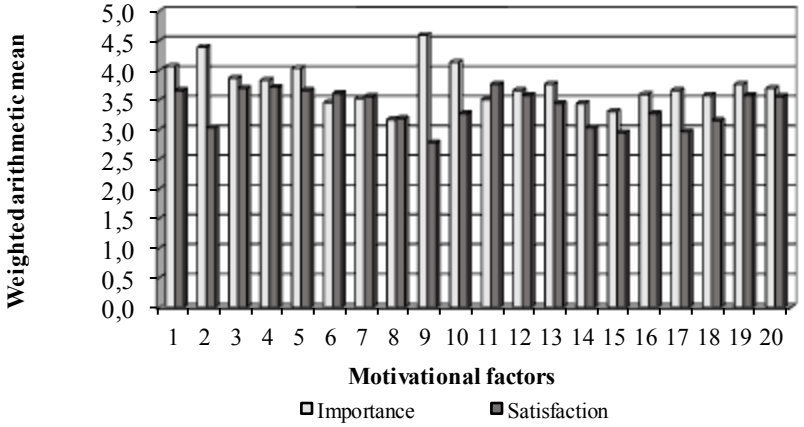

Figure 1 – **Category of blue-collar workers: the profile of importance and satisfaction with the work done** (author's own results)

Figure 2 below shows crucial motivational factors identified by the profile of importance and satisfaction with the work done by blue-collar workers.

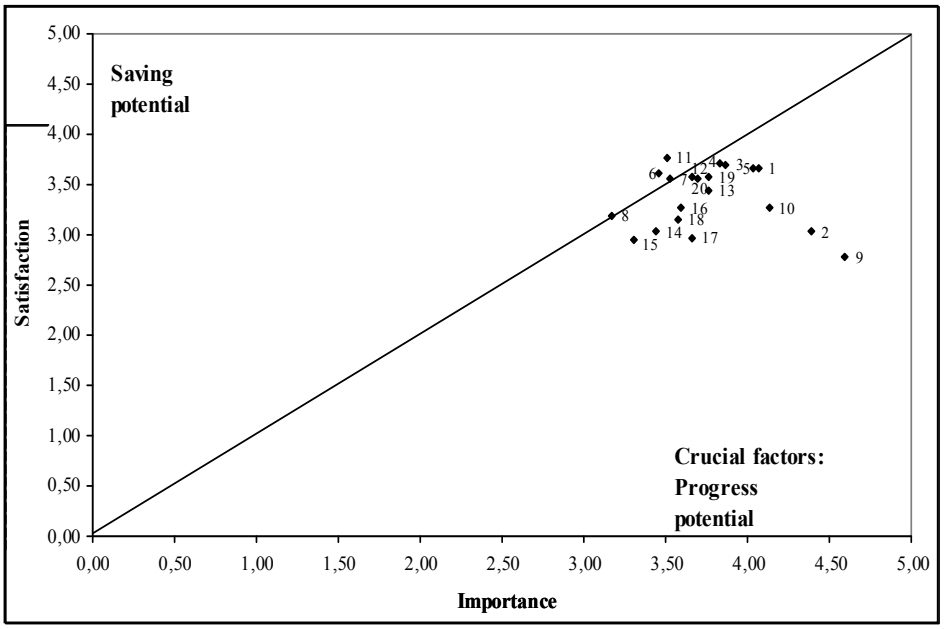

Figure 2 – **Category of blue-collar workers: graphical representation of crucial motivational factors** (author's own results)

The optimal situation is thus when the variance between the degree of importance and satisfaction regarding motivational factors is low. Figure 2 shows the optimal factors and these are illustrated close to the diagonal. Above the diagonal, the factors of a higher degree of satisfaction than importance are illustrated (having savings potential) – see Table 2. On the contrary, below the diagonal, the factors of a higher degree of importance than satisfaction with these are illustrated. The discouraging influence of these factors rises with an increasing distance from the diagonal.

Table 2 – **Category of blue-collar workers: motivational factors having a low degree of importance as well as high degree of satisfaction** (author's own results)

	Motivational factor	Variance between importance and satisfaction
8	Possibilities of further education	-0,02
7	Fixed working hours	-0,03
6	Use of knowledge and skills	-0,15
11	Quality of catering services	-0,25

The crucial motivational factors within the category of blue-collar workers are stated in Table 3. These reach a high degree of importance, but a low degree of satisfaction.

In the Table 3, there are motivational factors between which the variance between importance and satisfaction is the highest, i.e., they are placed furthest from the diagonal.

Table 3 – **Category of blue-collar workers: crucial motivational factors**
(author's own results)

	Motivational factor	Variance between importance and satisfaction
9	Good pay	1,81
2	Job security	1,36
10	Results evaluation	0,86
17	Information about the company	0,69

The multi-dimensional cluster analysis was used in the situation when fifty-nine blue-collar workers formed the set of objects. Nineteen features (variables) of each object were monitored. These variables were represented by three questions of the first part of the questionnaire (sex, age, number of years spent working in the enterprise) and by sixteen questions of the fourth part of the questionnaire. The evaluation of this research part was done through matrix when the numbers 1 – 19 were assigned to questions of the questionnaire (columns of matrix).

Questionnaires represented rows of matrix, and according to a number of possible answers from 1 – 5, the numbers were assigned to particular answers. Therefore, we obtained two matrixes for each category of workers individually. The matrix for white-collar workers was of dimension *43x19* and for blue-collar workers of *59x19* (*43, 59* are numbers of the questionnaires received and *19* is a number of questions). The hierarchical agglomerative cluster analysis was used to make the analysis of similarity of particular blue-collar workers´ motivational profiles.

Figure 3 below illustrates the results. It presents similarities in respondents' answers. The horizontal axis defines particular respondents (C_1 up to C_59). The vertical axis represents the variance of their replies.

From the figure, it is evident that having rather same structure of replies to the questionnaire questions was typical for some respondents, e.g. C_6 and C_15, C_57 and C_43, C_29 and C_44, C_10 and C_21, C_39 and C_41, C_13 and C_24, C_7 and C_8, C_37 and C_59, and so on. For instance, the worker C_3 does not belong to any groups mentioned according to the motivational profile. It is getting closest to the group 1 – C_6 and C_15. The ideal solution when preparing a motivational programme would be to make an individual one for this worker.

However, this is not possible to do so in such a large enterprise as the one analysed is. In the diagram, we can identify a large number of workers of a very similar structure of answers: C_1, C_3 up to C_11, C_13 up to C_17, C_20 up to C_22, C_24, C_26, C_29 up to C_32, C_35 up to C_37, C_39 up to C_45, C_47, C_48, C_51 up to C_53, C_57 up to C_59 (42 workers). The workers C_2, C_12, C_18, C_19, C_23, C_25, C_27, C_28, C_33, C_34, C_38, C_46, C_49, C_55, C_56 can form another group of respondents having similar motivational profiles. Therefore, it is possible to prepare a motivational programme for groups of workers of a similar motivation orientation.

Except this, the cluster analysis was used to check the structure in more detail as well as to state the importance of motivational criterions, see e.g. Hitka & Sirotiaková [28] or Zámečník [64].

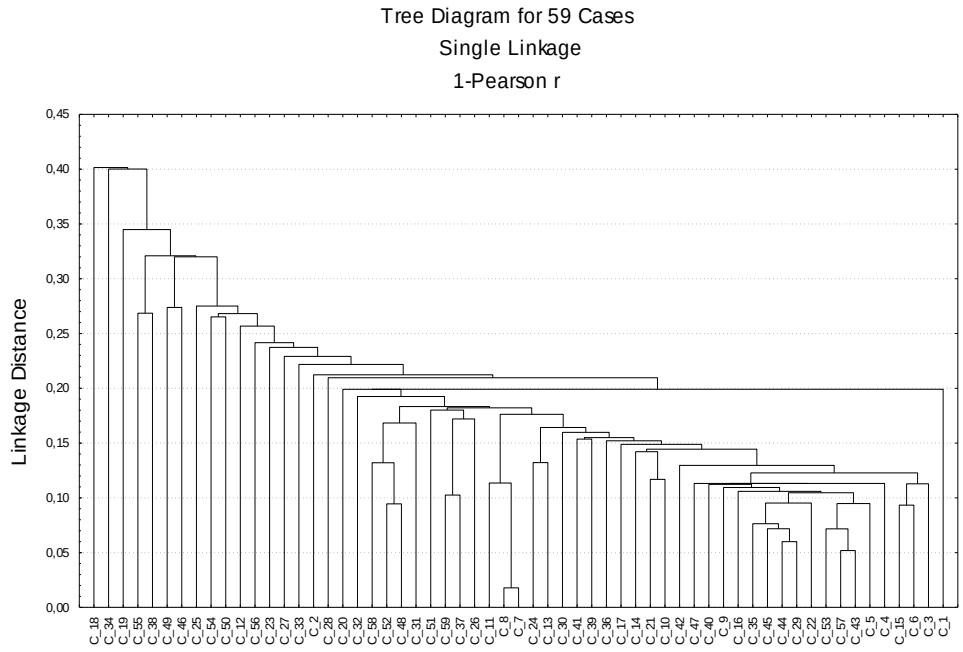

Figure 3 – **The hierarchical cluster analysis of particular blue-collar workers' motivational profile** (author's own results)

Limitations. In the literature sources available, various limitations of HRA are mentioned, e.g.:

– there are no specific and clear cut guidelines for 'cost' and 'value' of human resources of an organisation. The present valuation systems have many limitations;

– The human resource accounting may lead to the dehumanization in the organisation. If the valuation is not done correctly or the results of the valuation are not used properly;

– the valuation of human assets is based on the assumption that the employees are going to remain with the organisation for a specified period. However, this assumption is wrong because employee mobility is very high;

– the life of a human being is uncertain. So, its value is also uncertain.

Despite of this fact this paper presents a theoretical framework and empirical analysis that contribute to explanation of the problem regarding measurement and quantification of qualitative indicators used in the field of HRA.

Conclusions and directions of further researches. The result of the study indicates that when solving the problems from above we can use the selected mathematical-statistical methods, or combination of these, e.g. using the factor and cluster analysis at once.

We are planning to concentrate on the following topics when working on another research in the near future:

1. The use of Spearman's correlation coefficient (evaluation of the statistical correlation importance) for the purposes mentioned below:

– comparison of employees´ motivational structure in various fields of industry;

– comparison of employees´ motivational structure in enterprises of the same field of industry - wood processing industry and furniture industry within the countries of V4 (Czech Republic, Slovakia, Poland, Hungary).

2. The use of factor analysis in order to explain the clusters of motivational factors found within the cluster analysis in a better way.

3. The use of time series analysis – the outputs of mathematical analysis of motive development by using time series will be used when planning and preparing further motivational programmes. The period of the analysis will enable us to compare as well as detect changes in employees´ motivational structure.

4. Finally, the proposal and application of a strategic system of human resources performance measurement reflecting the enterprise strategy, and combining the quantitative as well as qualitative performance indicators.

The results demonstrate that HRA is a term, which is more and more often to be found in the vocabularies of HR managers. It is associated with the growing effort by Czech and Slovak enterprises to measure the value of human capital, to direct and manage performance in line with the overall commercial strategy, and to compare its data regarding personnel practices with that of other enterprises. With the assistance of HRA, it is possible to analyse not only the economic (financial), but also the social consequences of measures which in the first instance influence performance and employee motivation within an enterprise.

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Р. Замечнік, PhD, проректор з навчальної роботи, доцент кафедри економіки та управління, Академія Стінг (м. Брно, Чеська Республіка)

Якісні показники обліку людських ресурсів

У статті розглядається один із "нетрадиційних" напрямів системи управління людськими ресурсами – облік людських ресурсів (HRA). Облік людських ресурсів представлений як невід'ємна частина системи управління людськими ресурсами і важливий інструмент оцінювання ключових показників ефективності людських ресурсів (HR KPIs) на підприємстві. Основною метою цієї роботи є аналіз можливостей використання якісних показників оцінювання HRA на конкретних промислових підприємствах. Визначено, що вимірювання якісних показників та їх підрахунок є однією з головних проблем HRA, наприклад, до таких якісних показників можна віднести мотивацію, задоволеність співробітників, якість компетенцій окремих співробітників або оцінювання результативності співробітників. У статті обговорюються проблеми, пов'язані з використанням математико-статистичних методів вимірювання якісних показників оцінювання HRA. Встановлено, що основним інструментом у цьому процесі є кластерний аналіз та його використання при підготовці мотиваційних програм. У статті також розглядаються методи аналізу мотиваційних факторів на окремих промислових підприємств.

Ключові слова: облік людських ресурсів, управління людськими ресурсами, ключові показники ефективності, аналіз мотиваційних факторів, кластерний аналіз.

Р. Замечник, PhD, проректор по учебной работе, доцент кафедры экономики и управления, Академия Стинг (г. Брно, Чешская Республика)

Качественные показатели учета человеческих ресурсов

В статье рассматривается один из "нетрадиционных" направлений системы управления человеческими ресурсами – учет человеческих ресурсов (HRA). Учет человеческих ресурсов представлен как неотъемлемая часть системы управления человеческими ресурсами и важный инструмент оценки ключевых показателей эффективности человеческих ресурсов (HR KPIs) на предприятии. Основной целью статьи является анализ возможностей использования качественных показателей оценки HRA на конкретных промышленных предприятиях. Определено, что измерения качественных показателей и их подсчет является одной из главных проблем HRA, например, к таким качественным показателям можно отнести мотивацию, удовлетворенность сотрудников, качество компетенций отдельных сотрудников или оценки результативности сотрудников. В статье обсуждаются проблемы, связанные с использованием математико-статистических методов измерения качественных показателей оценки HRA. Установлено, что основным инструментом в этом процессе является кластерный анализ и его использование при подготовке мотивационных программ. В статье также рассматриваются методы анализа мотивационных факторов на отдельных промышленных предприятий.

Ключевые слова: учет человеческих ресурсов, управления человеческими ресурсами, ключевые показатели эффективности, анализ мотивационных факторов, кластерный анализ.

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