“Evaluating elasticity of costs for employee motivation at the industrial enterprises”

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EVALUATING ELASTICITY OF COSTS FOR EMPLOYEE MOTIVATION AT THE INDUSTRIAL ENTERPRISES

Abstract

Employee motivation at the industrial enterprises is one of the most important principles of modern management. The practice of production and commercial activities of domestic enterprises speaks for essential modifications in the approaches to identifying the methods of employee motivation.

In the meantime, at many industrial enterprises, motivational modules are limited to the level of salary payment. Therefore, the search for approaches to the formation of effective methods of employee motivation and the analysis of their classification peculiarities require implementing the complex scientific research and determine the relevance of the chosen topic. The purpose of the article is to adapt the notion of function elasticity to increase the employee motivation effectiveness at the domestic industrial enterprises. Increasing the effectiveness of employee motivation at an industrial enterprise is the object of the research.

The research findings are obtained using the theory and practice of expert methods and system analysis, whereby 26 basic (key) motivational measures were determined, which were divided into six block-modules: jurisdictions, effectiveness, social and psychological, indirect financial influence, and direct financial influence.

The weight of each of the motivational factors is determined and they were also classified according to this indicator. The notion of motivation elasticity is proposed, which makes it possible to assess the motivational measures performance both for every block-module and for every employee, team, production department or enterprise.

Motivation elasticity ratio for ten employees of Kharkiv Machine Engineering Plant FED is calculated. Recommendations for further research on the paper's subject are proposed.

Keywords motivation, factors, expert evaluations, motivation elasticity, Ukrainian industrial enterprises

JEL Classification J08, J33

INTRODUCTION

Formation of socially-oriented market policy in Ukraine requires new methodological approaches to efficient utilization of labor resources through their activation and powerful motives in the personnel management system at the industrial enterprise. Enterprise is a subject of economic relations; its production and commercial purpose is above all to achieve economic profits. This purpose is achieved by high-skilled staff which is the most significant competitive edge for the modern enterprise. Creation, development and support of effective motivational system at the enterprise is a critically important task.

Symbiotic relations between the employee and the enterprise based on the efficient perception of the enterprise's motivational policy are a basis for increasing the efficient labor resources utilization.

Maintaining the necessary level of productive and functional efficiency of an employee and increasing the efficiency of work are based on the perception and sensitivity of the individual to the motivational measures and factors proposed by the enterprise. Developing tools to assess the motivational measures effectiveness and their impact on the employee's productive achievements on a systematic basis enables the management of a modern enterprise to more effectively manage human resources, maintain a level of profitability at an acceptable or desirable level. Therefore, carrying out scientific research in this direction is an important and actual task.

1. LITERATURE REVIEW

Many economists studied the problems of production personnel motivation at the enterprises and organizations. Lawler (1973), McClelland (1985), and Herzberg (2003) formed the theoretical basis for motivation and explored in depth the system of human needs as a primary element and when it is affected by means of motivating factors, it is possible to achieve the intended effect. Maslow (1943) – one of the famous scientists in the sphere of motivation and psychology – developed a motivation management theory which is based on the following prerequisites: people have a lot of things to do; people emphasize some extremely intense needs which can be combined into separate groups; groups of needs are placed in a hierarchical way to one another; needs, if they are not satisfied, make people act. Maslow's hierarchy of needs is used extensively in staff management, however, for production management needs, it is necessary to adapt it to the motivation factors of production personnel.

Kositski (2010), Hladenko (2010), and Honcharova (1989) analyzed practical aspects of motivation at the industrial enterprises and to some extent document special aspects of using the motivational measures in Ukraine. These authors were first who used expert methods to identify the significance of motivation factors, explored monitoring of timeliness of motivational measures implementation, and run diagrams development. Doronina (2009), Kobielieva (2016), Kolot (2006), Makarova (2017), Safakli (2007), and Kosenko (2008) dealt with a problem of forming the systems of financial and non-financial motivation, developing the factors of correlation between the level of motivational measures and results of production and commercial activities of an industrial enterprise. These scientists' developments make it possible to determine different classifications of motivational measures, to form separate block-modules of influence on work performance. However, the problem of management motivation is not examined properly by the above mentioned authors in terms of enterprise's strategic management, while practical aspects of management dictate new terms for industrial enterprises development which are connected with their adaptability (elasticity) and competitive strength.

Pohorielov (2007), Plotnikov (2010), Poberezhna (2012), and Sladkevych (2001) analyzed in detail the methodology of using the economic and mathematical modelling of employee motivation built using expert estimations. The proposed models are successfully used both by industrial enterprises and theorists who study personnel management.

Management through motivation, as emphasized by Kolot (2006), can be a patent example of organizing the production personnel management at the industrial enterprises on the basis of social priorities. Within this scientific approach, Kolot (2006), Poberezhna (2012), and Kobielieva (2016) developed motivational models which are practically applied at the machine-building enterprises to control personnel and are now considered effective to an adequate degree. However, the scope of motivational management under lingering economic crisis must be expanded through developing and implementing the employee motivation system with high elasticity of motivational measures.

Estimating the elasticity of motivational measures costs was first considered by Gutsan (2013), Starostina (2009), and Tovazhnianskyi (2010). But the analysis of the very notion of motivation elasticity does not allow for its practical use. There is an urgent need to develop methodological tools for the quantitative assessment of costs elasticity

impact on motivation. The most important (key) motivational measures that must be taken into account while quantifying the motivation elasticity should be also identified.

Different opinions among scholars regarding the definition of the essence of motivation and its place in the production management of an industrial enterprise, performance evaluation and applications suggest that this is indeed a complex process which depends on the efficiency of the entire industrial enterprise. Every employee at every enterprise has, to some extent, different priorities and needs. Therefore, there is a need to scientifically substantiate measures of financial and non-financial motivation, depending on what kind of motivation is more efficient for employee to improve his work performance. A more objective evidence of the relationship between job performance and rewards received will allow industrial enterprises to remove tension in society and will contribute to overcoming the negative consequences of the systemic crisis in Ukraine.

The article aims at developing theoretical provisions and practical tools to form qualitative and quantitative assessment of the employee's sensitivity to motivation factors' influence by using elasticity.

2. METHODS

An analysis of research on motivational management shows that there are two main methods, namely empirical (descriptive) and explanatory (conceptual) ones. Within the empirical method, the dynamics of motivational factor values at the industrial enterprises for several years are studied; in addition, their influence on the work results of separate workers and the various kinds of groups (team, field, department, enterprise) are determined by using the collective expertise technique. Within the conceptual approach, the possibility to use elasticity in order to estimate the motivational measures performance at the industrial enterprises is theorized.

The empirical and conceptual approaches are combined based on the integrated systemic approach. A systemic approach in the domestic staff management is a recognized methodological platform, its main principles and regularities are widely used in the theory and practice of management. From the system approach perspective, in the article, special attention is paid to links between individual motivational measures, as well as to determining the power of their influence on work performance.

3. KEY RESEARCH FINDINGS

The variety of motivational mechanisms and factors of influence on the employee are due to current conditions of industrial and commercial activities of industrial enterprises, and theoretical and practical experience as well, factors like susceptibility and sensitivity, and considering them as motivational and valuable result in the effective implementation of the enterprise labor potential.

The analysis of existing approaches to the formation and use of employee motivation factors allows to conclude that there is no unified and integrated approach regarding the motivation factors allocation. Methods that are recommended for practical use depend on the point of view towards factors motivating specific researcher, top management representatives are not well organized and call for development.

This determines the need to develop sequential activities, which will result in the company's ability to generate, evaluate and rank the motivational factors according to their priority. As a result, there is the possibility of effective practical use of motivational influences on a particular employee. Figure 1 provides the methodical approach to formation, evaluation and ranking of motivational factors.

In order to improve motivational factors management, it is recommended to use the modular approach, which is based on a combination of motivational factors based on their motivational impact relationship. While investigating Kharkiv industrial enterprises performance (public company "Turboatom", Kharkiv Machine Engineering Plant FED, Private Joint Stock Company "Kharkiv electrical engineering plant "Ukrelektromash"), 93 motivational factors were emphasized and proposed as the key ones to 30 experts.

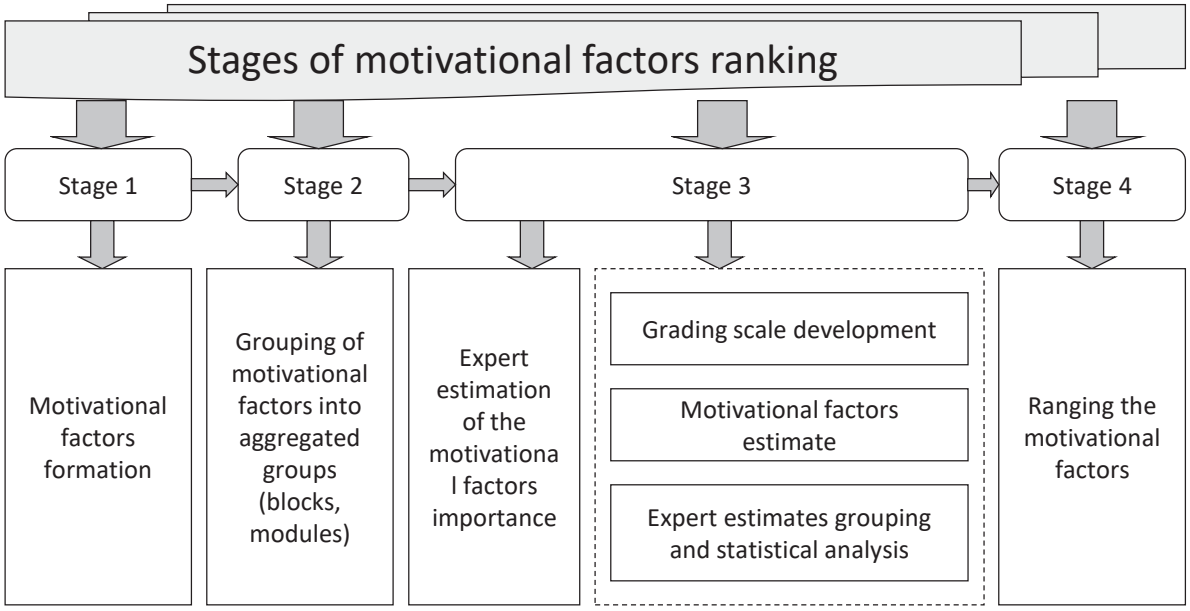


Figure 1. Essence of the methodological approach to motivational factors' formation, evaluation and ranking

Table 1. Classification of key motivational factors according to their influence on the employee performance

Motivational factor	Average rank	Factor's rank
Creative and independent nature of the staff's activities	1,33	1
Complexity of work and related labor actions	1,35	2
Wages	1,80	3
Change in employee's status	2,63	4
Plan realization as to total of output	3,24	5
Professional skills application in working activity	3,30	6
Advanced knowledge in working activity	4,67	7
Premium rate	4,70	8
Profitability of an enterprise	6,23	9
Educational level	6,33	10
Qualification	6,80	11
Payments timeliness	6,83	12
Additional payments	6,83	12
Complete and timely reporting on the decisions made	7,17	13
Status symbols	7,17	13
Premiums	7,23	14
Recognition and praise	7,33	15
Increase in production levels	7,80	16
Length of service at the enterprise and in the position	7,80	17
Social and psychological comfort and environment	7,93	18
Medical support and infrastructure	7,93	18
Compensation bonuses	7,93	18
Experience	8,10	19
Work safety	8,27	20
Provident funds	9,00	21
Health measures	9,00	21

The obtained results of expert evaluation of motivational factors importance are presented as systematic ranked list. The average ranking of the i-th motivational factor R_i is carried out using the following relationship:

$$R_i = \frac{\sum_{j=1}^{n} \beta_{ij}}{n}, \quad (1)$$

where $\sum_{j=1}^{n} \beta_{ij}$ is the overall estimation of expert ranks $(j = 1 \ldots 30)$ according to i-th factor; n is the number of experts.

This examination resulted in 26 most important (key) motivational factors (Table 1), which, according to experts, stimulate employees to the greatest extent.

With the estimated average ranks in ascending order, we will classify key motivational factors according to their influence on the employee performance.

Quantitative factors are due to 26 rankings of motivational factors importance proposed to the expert group. Therefore, the number of key motivational factors may vary depending on an appropriate number of their importance rankings.

The most important motivational factors of employees at the industrial enterprises (Table 1) were aggregated into six separate block-modules taking block-module approach to classifying motivational factors into account (Table 2).

Expert estimation of some motivational factors' influence on employees' performance makes it possible to generate some important provisions.

First, as motivational factors have different value for an employee, this forces the enterprise to use different motivational factors that will produce different economic results. Second, complex hierarchical structure of motivational factors shows that it is necessary to take it into account when developing the enterprise motivational policy. Third, given the numerical terms (see Table 2) of indicated motivational factors (taking block-module approach into account), "Skills set" and "Direct financial influence" factors have the strongest motivational influence, they contain most (six in each block-module) elements which are valuable in motivational terms. Fourth, "Performance" block-module is least in number (three motivational factors), which indicates that average employee at the industrial enterprise is not enough stimulated in terms of adequate factor level, and the importance of factors presented is not sufficiently high to him.

The study presented the existing variety of motivational factors of influence, but it did not answer the question as to what mechanisms help to evaluate them in both qualitative and quantitative

Table 2. Block-module classification of key motivational factors

Skills set	Direct financial influence
Complexity of work and related labor actions	Wages
Professional skills application in working activity	Premium rate
Advanced knowledge in working activity	Additional payments
Educational level	Premiums
Qualification	Length of service at the enterprise and in the position
Experience	Compensation bonuses
Performance	Social-psychological block-module
Plan realization	Creative and independent nature of the staff's activities
Profitability of an enterprise	Recognition and praise
Increase in production levels	Social and psychological comfort and environment
Indirect financial influence	Organizational block-module
Status symbols	Change in employee's status
Medical support and infrastructure	Payments timeliness
Provident funds	Complete and timely reporting
Health measures	Work safety

terms. This makes it necessary to investigate the mechanisms and motivational factor estimations available in great detail.

Identification of key motivational factors has been the basis for calculating block-module $(i\text{-th})$ motivational ratio $K_{bm_i}^{mot}$:

$$K_{bm_i}^{mot} = \sum_{j=1}^{n} \gamma_{ij} \cdot F_{ij}, \qquad (2)$$

where F_{ij} is meaning of the j-th indicator of employee's motivational factors of the i-th block-module in the corresponding period of time; γ_{ij} is weight of the j-th estimate ratio of i-th motivational factors block-module; n is number of key motivational factors in the i-th block-module.

Total motivational coefficient (certain employee, team, production department or enterprise in general) $K_{bm_i}^{mot}$ is calculated as follows:

$$K_{bm}^{mot} = \sum_{j=1}^{6} K_{bm_i}^{mot} \cdot \alpha_i, \qquad (3)$$

where α_i is weight of i-th motivational factors block-module.

In our opinion, using an employee's susceptibility to motivational measures and factors offered by the enterprise and increase in motivational measures cost are a very important aspect of further increase in employees' motivation.

Based on the developed key motivational measures and influences, an employee estimates degree of their importance. After such estimation, he decides to realize certain production-functional actions at the given level of efficiency thereby showing the certain level of susceptibility to the motivational measures. The importance of proposed motivational factor increases with the level of susceptibility to the motivational influence, consequently resulting in increase in performance of employee's production-functional actions.

To that end, we introduce a concept of elasticity of costs for motivational measures as an assessment tool for utilization efficiency. The function elasticity is often used to analyze economic processes and to solve applied problems. Studying different economic questions, such as determining dynamics of product demand at the change of its price or personal income, researching range of production resources interchangeability, determining the efficiency of any given costs, forecasting change of enterprise's income influences by different factors, as well as solving many other problems require clarifying the scope of one value under increase of the other value by one percent. The task of this research is to estimate the elasticity of costs for employee motivation. The following definition of "motivation elasticity" is proposed to use.

Employee motivation elasticity (team, department or enterprise) is a measure of sensitivity to proposed motivational factors influence which is evident as change of production performance and characterizes proportional change of production and functional return from the motivation subject under changing the costs for motivational measures.

While shaping the motivational and adapted concept of costs elasticity for motivational measures one should take into account that proposed motivational factors (X- direction of motivational factors that can be estimated by using block-module $(i\text{-th})$ motivational coefficient $K_{bm_i}^{mot}$ and material costs to achieve it) are the main indicators impacting the production behavior of motivation subject, and performance indices (return) of motivation subject (Y- direction of motivational factors – performance, income, sales, etc.) are dependent indicators.

Economic essence of elasticity of motivational measures costs is reflected by the elasticity ratio value. The value of elasticity ratio of motivational measures $E_X(Y)$ is proposed to identify as follows:

$$E_X(Y) = \frac{\Delta Y}{Y} \Big/ \frac{\Delta X}{X} = (\Delta Y / \Delta X) \cdot (X / Y), \qquad (4)$$

where ΔY is change in value of operating result Y (performance, income, sales, etc.), achieved due to change in cost ΔX at the employee motivation factor X.

Using specific value of output, block-module motivational ratio $K_{bm_i}^{mot}$ and material expenses MV

for its provision makes it possible to calculate elasticity ratio of costs for motivational measures for all possible modes of motivation. For example, while determining motivation elasticity ratio as the main indicator of performance it is recommended to take an enterprise's profit indicator – PP. When this occurs, dependence (3) takes the following form:

$$E_{MV}(PP) = \frac{\Delta PP}{PP} \Big/ \frac{\Delta MV}{MV} = \\ = (\Delta PP / \Delta MV) \cdot (MV / PP), \quad (5)$$

where ΔMV are additional expenses for motivational measures; ΔPP is additional income of the enterprise obtained due to additional costs for motivational measures ΔMV.

The value of elasticity ratio of motivation subject can change significantly. Therefore, to narrow down values of elasticity ratio of costs for motivational measures $E_X(Y)$ in Table 3, we propose motivational-adapted scale of elasticity ratio values $E_X(Y)$.

TProposed elasticity ratio of costs for motivational measures makes it possible to determine susceptibility level of individual employee (team, field, department or enterprise) to motivational policy and motivational block-modules based on the developed scale of elasticity ratio levels $E_X(Y)$ with the following interval values:

- $E_X(Y) > 5$ – very high susceptibility level;
- $4.99 > E_X(Y) > 1$ – high level;
- $0.99 > E_X(Y) > 0.01$ from 0.01 to 0.99 – satisfactory level;
- $0.01 > E_X(Y) > -0.99$ – unsatisfactory level;
- $-0.99 > E_X(Y) > -4.99$ – very low level;
- $E_X(Y) < -5$ – critical susceptibility level.

Using relationship (5), motivation elasticity ratios are calculated according to different block-modules of motivational factors for 10 employees of Kharkiv Machine Engineering Plant FED (KhMEP FED) according to their 4-year performance and motivation. Calculation data of motivation elasticity ratios for "Skills set" block-module are presented in Table 4.

Table 4 depicts efficiency of costs for some employee's motivation and their susceptibility to motivational factors. For example, motivation elasticity indicators for employee N 1 speak for significant changes in his susceptibility: motivation elasticity decrease from "high" to "unsatisfactory" is observed, which reflects slow decrease in the motivational measures impact on employee performance and some changes from employee's logical behav-

Table 3. Scale of elasticity ratio values of motivational measure costs $E_X(Y)$

Value	Motivation elasticity ratio characteristics	
	Name	General motivational characteristics
$5 > E_X(Y) > 1$	Elastic motivation	Change in financial costs of an enterprise for motivational measures by 1% results in more than 1% change of returns on these additional costs. Motivational costs in this case are effective to some extent. Support for motivation available is proposed
$E_X(Y) < 1$	Inelastic motivation	Returns on additional costs for motivational measures decreases in a less degree than resources invested, in other words, 1% change in motivational resources results in change in motivational return from the motivation subject by less than 1%. Motivational costs in this case are ineffective to some extent. Critical motivation system rebuilding is suggested
$E_X(Y) = 1$	Unitary motivation elasticity	Change in financial costs of an enterprise for motivational measures by 1% results in the similar change in returns on its production and commercial activities (they also change by 1%). Motivational costs in this case are directed at keeping existing state of affairs at the enterprise. Complete motivation system rebuilding in some block-modules is suggested
$E_X(Y) > 5$	Very elastic motivation	Even slight change in financing motivational measures at the enterprise results in significant transformation in motivational return from motivation subject. Motivational costs in this case are very efficient
$E_X(Y) = 0$	Very inelastic motivation	Motivational measures do not result in any production-commercial transformations. Motivational costs in this case are very ineffective. Revolutionary motivation system rebuilding is suggested

Table 4. Calculation data of motivation elasticity ratio of KhMEP FED for "Skills set" block-module

Years	Employees									
	N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8	N 9	N 10
2013	4.201	–0.167	0.153	0.161	1.164	–0.003	2.255	0.224	1.097	0.500
2014	1.933	0.894	0.506	0.185	0.096	–0.187	–0.407	2.135	0.188	1.500
2015	0.634	3.657	1.064	0.920	6.029	–0.176	2.450	3.424	5.585	3.149
2016	–0.586	–0.302	0.632	1.001	1.370	–0.289	–0.167	1.275	0.306	1.181

ior (employee responds to motivational costs increase by increasing the return) to illogical behavior (employee responds to motivational measures increase by decreasing the return). Employee N 6 has no issue with motivational measures from top management and demonstrates low susceptibility to motivational measures. Employees N 9 and N 10 take top management's motivational measures in a good sense, their susceptibility to the stimulation level is quite high.

CONCLUSION

The study conducted has made it possible to adapt the elasticity function to the employee motivation at the industrial enterprises. To identify the function, using the group expert assessment, the most important motivational measures are determined which were aggregated into six classification groups (block-modules). For each block-module, motivational ratio was determined, which makes it possible to calculate motivation elasticity ratio.

Motivation elasticity ratio proposed to be used at the industrial enterprises allows to clearly define the costs efficiency for employee motivational measures based on the employee (team, field or department) return and his motivation costs ratio. This coefficient provides for awareness of employee's definitive motivational response and possibility to measure it numerically. Actual use of this indicator as a background for systematic analysis of employee-enterprise relationship is logical and well-judged.

In order to identify motivational level, motivational monitoring is proposed to be used at the machine engineering enterprises. This will make it possible to find changes in costs efficiency for staff incentive and be receptive to employees' susceptibility dynamics to motivational measures.

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