



## **The Development of Management System of Intellectual Work for Increasing Energy Efficiency of Companies**

**Ludmila Nikolaevna Deputatova<sup>1</sup>, Eugeniia Rinatovna Mukhina<sup>2\*</sup>, Anna Valerevna Marinina<sup>3</sup>, Vladimir Pavlovich Postnikov<sup>4</sup>, Eugeniia Andreevna Lazukova<sup>5</sup>**

<sup>1</sup>Perm National Research Polytechnic University, Prospect, 29, Perm, Komsomolskiy, 614990, Russia, <sup>2</sup>Perm National Research Polytechnic University, Prospect, 29, Perm, Komsomolskiy, 614990, Russia, <sup>3</sup>Perm National Research Polytechnic University, Prospect, 29, Perm, Komsomolskiy, 614990, Russia, <sup>4</sup>Perm National Research Polytechnic University, Prospect, 29, Perm, Komsomolskiy, 614990, Russia, <sup>5</sup>Perm National Research Polytechnic University, Prospect, 29, Perm, Komsomolskiy, 614990, Russia. \*Email: [scancens@rambler.ru](mailto:scancens@rambler.ru)

### **ABSTRACT**

In modern terms, interesting creative work in the close-knit team is becoming a major factor determining the choice of a good specialist. Provision of this factor in the enterprise becomes an important issue in the intellectual work management system. The activity of modern enterprises is connected with intellectual work. The features of intellectual work should be taken into account in the management and motivation of employees of industrial enterprises. The article presents the elements of the control system of intellectual work and their focus on the formation and maintenance of the company's values. Creating conditions for self-development and self-realization, the formation of team spirit, employee training system allows activate the human potential of the company. The article suggested the concept of intelligent control system as a set of interrelated forms of incentives and organizational and motivational mechanisms to facilitate activation of knowledge workers. Continuous improvement techniques and technologies defined structural changes in the labor management system of the organization workers. The authors developed and implemented a method of estimating intellectual work management efficiency in order to improve energy efficiency. It included the method of determining the level of efficiency and a method of imaging evaluation. The proposed method gives a possibility to establish ways to improve the management system in intellectual work for further improving energy efficiency. This article has experimental character.

**Keywords:** Energy Efficiency, Management System of Intellectual Work, Motivation, Evaluation Method

**JEL Classifications:** O34, J53, Q40

### **1. INTRODUCTION**

The improving of energy efficiency is a worldwide problem. For many countries, the problem of energy policy is actual since 1970s. Today, the industrial sector includes almost 40% of annual world consumption of primary energy (Juriova, 2015). Besides, we can say about the same share of the world's carbon dioxide emissions. The energy efficiency is the rational use of energy resources for buildings or processes in manufacturing.

GDP energy in Russia more than 2.5 times higher than in the US, it 3.5 times higher than in Western Europe and 6 times higher

than in Japan. We have low energy prices, but the cost of fuel and energy in the production of industrial products and transport services are very high. It is almost one-sixth of the total cost. This fact negatively affects the competitiveness of production. Such factors as cold climate (especially in the northern areas of the country), the current outdated energy-intensive structure of the economy, long transport routes influence on higher energy intensity of the Russian economy.

In order to implement measures to optimize the use of energy resources in the enterprise we should develop and implement technological solutions (Martin, 2014). Furthermore, we should also adapt the control system.

The development of labor intellectualization leads to changes in the approaches to the motivation and management. Intellectual labor is a special kind of work. It included creative and physical labor. The creative component of labor required to find new solutions in order to obtain new products or products with new properties. The workers look for ways and tools to accomplish the task.

## 2. METHODS

The intellectual work requires a special approach to management. The key aspect of intellectual work management system is motivation of employees (Drucker, 1993). The organization creates the conditions (material and psychological). Such conditions are necessary for the motivation of staff. Therefore, a knowledge worker has two possible motives:

1. An interesting creative work in a close-knit team;
2. A fair remuneration for work.

The knowledge workers aim to take a proactive stance, aim to self-development, self-fulfillment, creativity. Mutual understanding and accounting of individual need lead to the establishment of a system of relations. The organization takes an employee as a person, and a person perceives his/her activities in the organization as a partnership. In a modern organization, main functions of the head are the following: Employees motivation (especially using the moral forms of stimulation), organization and coordination of staff and performance appraisals (Wicher, 2014).

The main reasons for the intellectual worker should be linked with the aim of company. The company's goal is the development and maintenance of competitive advantages. Motivation of the employees at quality intellectual work promotes the creation of innovations in technology and management processes of the company. Such employee provides continuous and coordinated work of business process (Table 1).

The harmonization of mutual expectations of employees and the organization depends on understanding and accounting of the individual needs. Mayo studied non-material needs and socio-psychological methods. He studied their influence on employees. McClelland considered the needs for the achievement, the need for the implication and in the power as organizational and individual needs (Shishlova, 2010). People with a high need for achievement readily accept the difficult tasks and behave like professionals in their field. Company employees with a high need for achievement have the status of professionals (Castells, 2001). People with a high need for involvement are especially concerned about establishing and maintaining good relations with others. Such workers are characterized by responsiveness, they cannot tolerate conflicts. Such people work fine in the team, in spheres of active social interaction. People with a high need for power take the initiative, they are personally responsible for their decisions; they efficiently react in extreme conditions, in the conditions of uncertainty and risk.

The modern concept of organizational growth by Litvin, Stringer has been developed on the basis of the theory of McClelland. The authors determined the influence of factors of the psychological climate of organization on the need for knowledge worker (Table 2).

The practical application of this model allows harmonizing the mutual expectations of the individual and the social organization as a system. The knowledge workers felt each of this needs (Grant, 1993). Some needs have a great impact on worker's behavior. The factors of psychological climate in the organization have influence on staff in different ways. Such factors as responsibility, heat relationship, support, reward and prestige have a positive effect on the motivation of knowledge workers. Structural constraints, competition, risk can have unpredictable effects on employees. We need to control these factors.

Based on the duality of motivation of intellectual work, we can specify the elements of intellectual work management system. We think that the intellectual work management system is the interaction of such elements as organizational and motivational mechanism and incentive system of employees (Mingaleva and Mirskikh, 2009).

Organizational and motivational mechanism creates conditions for an interesting creative work in team. Analysis of the literature and practical experience of the authors of the article have shown the distribution of the core values of the company on the elements of intellectual work management system. The basic values which formed the organizational and motivational mechanism are the

**Table 1: The motives of knowledge worker**

The description	The first condition	The second condition
The motive of the employee	Interesting creative work in the close-knit team	Equitable remuneration
The evaluation by the control system	Current estimate	Periodic estimate
The purpose of the organization	The search for new technological solutions, new products, development of the company	Business continuity
Competitive advantages	The creation of new advantages	The reservation of new advantages

**Table 2: The impact of psychological factors in the climate of organization to the needs of knowledge worker**

Factors psychological climate in the organization	Higher requirements of knowledge worker		
	Need for achievement	Need for involvement	Need for power
Structural constraints	Decreases	Decreases	Increases
Responsibility	Increases	Is not recognized	Increases
Warmth of relations	Increases	Increases	Is not recognized
Support	Increases	Increases	Increases
Reward	Is not recognized	Increases	Increases
Competition	Increases	Decreases	Increases
Performance standards	Increases	Is not recognized	Is not recognized
Prestige	Increases	Increases	Increases
Risk	Is not recognized	Decreases	Increases

development team, initiative and confidence. The system of incentives is aimed to the formation of an atmosphere of honesty between the employee and the employer. The formation of values and norms of behavior in intellectual work management system is shown in Table 3.

The honesty and trust are the most important values of the company. Every single employee must share them. Other values such as the development of team and the initiative of the employee do not have to be shared by everyone. Nevertheless, our task is to pick up the employees with a maximum set of values correlated with the company's values.

Organizational and motivational mechanism includes organizational culture, knowledge management systems and personnel management. Organizational culture unites values and norms inherent to the organization, style and management procedures, and the concept of the technological and social development (Yıldız and Özcan, 2014). The basic values among employees are the development team and the initiative. The system of training and staff development, team building system, self-development and self-organization of the structure reflect those values. The training system and staff development motivated employees for training, promotion, and career. Team building is aimed to creation of equal groups of experts of various specializations, collectively responsible for the results of operations and on an equal basis by the division of labor within the team. Teambuilding system focused on three processes: The introduction of team management; the formation of team spirit, the support for informal relationships with colleagues and employees of the organization. Support of all types of staff communication and co-operation is very important. All these activities can generate smooth and uninterrupted operation of the team. Each member of the team will be thinking about a common goal - development of the organization.

**Table 3: The values and norms in intellectual work management system**

The description	Organizational and motivational mechanism	Incentive system
The basic values	The development, team, initiative, trust	The honesty
The norms of behavior	The training, teamwork, responsibility for decisions	The responsibility for some indicators

**Table 4: Description of the elements of the organizational culture**

Elements of organizational culture	Learning systems	Teambuilding	Self-development and self-organization	“The right to make mistakes”
The components of organizational culture under the control of the control system	The method of identifying the employee skills, ways of learning, training, coaching	Team management, team spirit, team building, development and maintenance of databases	Quality circles, communications system, support for the initiative, informal connections	The absence of negative form of motivation
The value	The development	The team	The initiative	The confidence
The main motivator	Personal development	Sense of belonging	The interest and the challenge	Safety
The components of organizational culture perceived employee	Responsibility, a new experience, an opportunity for learning, feedback	Access to information, shared decision-making, effective communication, the ability to represent the company	Interesting projects, developing expertise, increasing responsibility, progress toward goals	The responsibility for the decision making, the opportunity to correct the error

Description of organizational culture elements is shown in Table 4.

The formation of values and norms of the problem is quite complicated because we must not only take care about the reflection of the company's values in daily activities, but also to control the interpretation of these actions on the part of employees.

Intellectual work management system should take into account the need to achieve the goals of life of employees (Castells and Himanen, 2002). Elements of intellectual work management system should support the development of values such as team, initiative, trust and honesty.

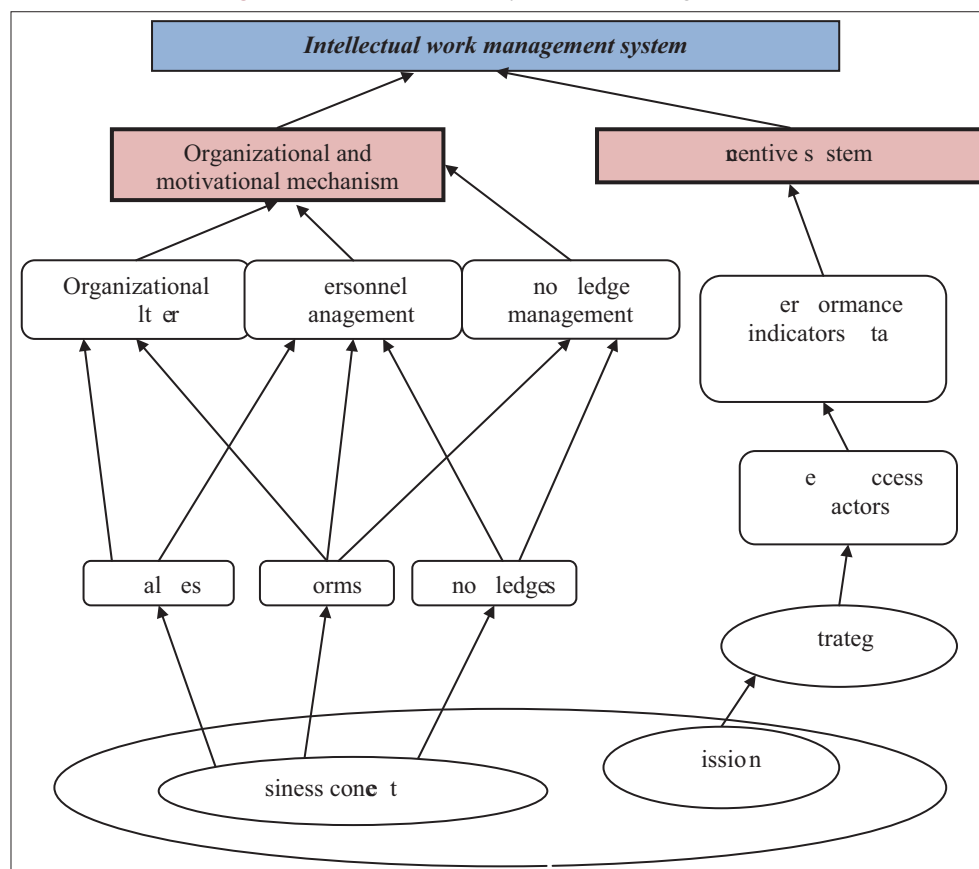
### 3. RESULTS

Based on detailed analysis of the various approaches to motivation and stimulation of employees, and the definition of intellectual work the authors proposed the concept of knowledge workers management system. Therefore, the knowledge workers management system is a set of interrelated forms of incentives and organizational and motivational mechanisms to facilitate activation of knowledge workers. The elements of control of intellectual work of employees are shown in Figure 1.

The basic elements of each management system are the business concept and the mission of the organization. The business concept includes the basic values of the company and their relationship with the customer values, norms of behavior with customers and employees, and knowledge capacity of the organization. The mission or the main sense of existence is customer satisfaction through value creation.

Organizational and motivational mechanism allows creating a competitive advantage by enhancing the intellectual capital of the organization (Danilina and Mingaleva, 2013). The authors have proposed the following elements of organizational and motivational mechanisms: Organizational culture, human resource management and knowledge management. Organizational culture is the most important component of this mechanism.

Organizational culture is a system of norms, rules and values, which regulates the relationship between the members of the organization. That determines the success of its operation, survival and development in the long term (ISO/IEC 2382: 2015 (en)).

**Figure 1:** The control circuit system of knowledge workers

The basic values are development of team and the initiative. Team building is aimed to creation of equal groups of experts of various specializations, collectively responsible for the results of its operations and on an equal basis by the division of labor within the team (Gareth, 2010).

The components of team building process are the following (Ellinger et al., 2013):

1. The formation of team spirit (team spirit), the establishment of informal relations between employees;
2. The formation and development of teamwork skills (team skills), which are the basis of implementation of the system of command management;
3. The team Building is mechanical action on selection, team structure optimization and functional-role distribution.

The structure of self-development is an important element of company's management. The self-development is the process of changing the organization through internal processes. These internal processes can be spontaneous and may be subject to conscious control (Komarov, 2013). Creating conditions for self-organization of processes is an important task in intellectual work management system.

Support of all types of staff communication and co-operation is very important. Thus, self-developing, self-organizing systems can support the initiative of employees and create innovations in the company.

The main objectives of knowledge management in the enterprise are the generation of ideas and the creation of new knowledge. The knowledge management is a set of measures aimed to creation of an effective system providing new knowledge in order to increase the productivity of intellectual labor (Mingaleva and Mirskikh, 2013).

The primary knowledge management measures must be measures for the creation and transfer of personal codified, competency and knowledge materialized. Taking into account the classification of the forms of knowledge by Nonaka and Takeuchi, we support 4 ways to transform knowledge (2003):

- Articulation is the transformation of personal knowledge implied in the expression of knowledge, realized in organizations every day;
- Socialization is the acquisition of tacit knowledge competency based on codified knowledge;
- Combination is the transformation competency knowledge to explicate material knowledge;
- Internalization is the process of converting knowledge materialized in personal knowledge.

Knowledge management system is a component of intellectual work management system. It should ensure the activation of knowledge workers in the enterprise by creating favorable conditions (Mukhina and Deputatova, 2015).

For equitable distribution of remuneration among employees and maintenance of the smooth operation of all divisions of the



company, we recommended to introduce a system of incentives in key performance indicators. Key performance indicators (KPI) are indicators of activity units (enterprises). They help the organization achieve strategic and tactical (operational) goals. KPI are one of the main instruments for implementing the strategy. Michael Armstrong and Angela Baron considered the control of the natural productivity as the process, contributing to effective management of individual staff and teams and aimed to achieving the highest level of efficiency of the organization. Therefore, the company formed a common understanding of the objectives to be achieved and the approach to the organization of work and staff training to ensure the achievement of these goals.

For the development of KPI, first we must define the strategic goals of the enterprise. By using strategic objectives, we can define the key success factors. The key success factors are the common industry factors. Their implementation offers the prospect of improving their competitive position (Armstrong and Barom, 2011). Key success factors and responsibilities of departments are the basic elements of management, necessary to establish the responsibility of the matrix units. By using responsibility matrix units, we can define performance indicators for departments. Performance Indicators Units and responsibility matrix for business processes allows as defining performance indicators for functions in the enterprise department. By using the processes and the key success factors, we can define the company's KPI of departments and each employee (Salah, 2015). World practice proves that the implementation of KPI system increases the company profit by 10-30%. It orients employees to work for the result, and increasing the motivation and loyalty of staff.

Intellectual work management system consists of the elements of incentive systems, knowledge management, human resource management and organizational culture.

#### 4. DISCUSSION

With the positions of system analysis, we have developed the technique of intellectual work of management systems assessment. The first stage of this technique involves evaluation purposes, determination of production characteristics, hierarchical structures, an analysis of guidance documents, document analysis, questioning the staff. This step is necessary for the diagnosis of existing intellectual work management system. The second stage includes the analysis of profiles in terms of the average value of evaluation and visualization of intellectual work management. In the third stage, the methodology assesses the state of elements of intellectual work management system and proposes measures for improving. We have proposed the following gradation levels (Table 5).

By using proposed interconnection elements intellectual work management system (including organizational culture, human resource management, knowledge management and incentive system) the authors have developed a questionnaire. It allows make the collection and evaluation of the system of motivation and stimulation of intellectual labor. Questions from 1 to 4 allow to

**Table 5: Levels of performance elements in intellectual work management system**

The number of points	Level	Recommendations
<5	Ineffective	Structural changes of the element in intellectual work management system
5-6	Relatively effective	Special control and attention on the part of management requires significant changes
6-8	Mostly effective	Monitoring, evaluation of dynamics
8-9	Effective	Observation without much intervention
10	Absolutely effective	Observation without much intervention

evaluate the knowledge management system, from 5 to 7 - give an estimate of the management staff, from 8 to 10 - give an estimate of the organizational culture, 11, 12 provide rapid assessment of the incentive scheme for intellectual work.

All issues take into account the strategic goal of energy reduction company. Table 6 presents a profile that allowed the company give assessment of intellectual work of management system.

Analysis of intellectual work management system was carried out in a Russian energy distributing company. It is a one of the largest firm on the territory of Perm Krai. At present, this company transmits electricity through distribution grids 0.4-110 kV. The total number of employees of company about 4.9 thousand people. The enterprise provides power supply of industrial enterprises and the population on the territory of the total marea of 160 thousand km<sup>2</sup> with a population of 2,820 thousand people. The company has 360 substations with a voltage of 35-110 kV, 12,784 transformer substations and distribution points with a total installed capacity of more than 11,000 MVA, 45.827 thousand km of transmission lines of different voltage.

The company has ossified system of incentives. Monetary compensation has a salary and bonus; in fact, everyone has always paid the same sum every month. The salary is indexed every year by 8%. The team consists of young professionals mainly. The management encouraged training. There is a continuous learning system in the company (certification, delivery on electrical group). The main corporate event is day of energy worker (it is celebrated throughout the company). The staff of the company also celebrated the New Year. There is a hall of fame on the main street of the city and on the internal server. It is updated every 6 months.

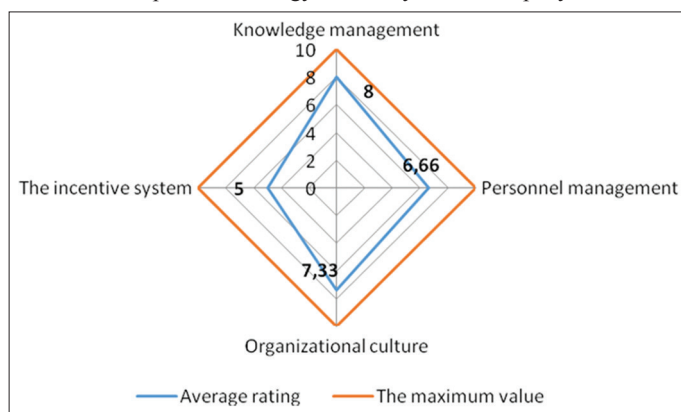
Based on these data we can establish the estimate of each component of the intellectual work management system. Visual assessment of the control of intellectual work to improve the energy efficiency of the company is shown in Figure 2.

Based on intellectual system analysis of work management the authors have done the following conclusions. We should:

1. Develop the employees of performance indicators aimed to improving energy efficiency;

**Table 6: Questionnaire for management system assessment of intellectual work to improve the company's energy efficiency**

Direction of intellectual work management	No	Question	Evaluation	Average rating direction
Knowledge management	1	Assess the level of training methods to improve energy efficiency	8	8
	2	Assess the level of database management, knowledge base in the field of energy management	10	
	3	Assess the level of employee engagement in issues of rational use of energy resources	7	
	4	Assess the level of transmission of information on means and methods of energy production	7	
Personnel management	5	Rate the level the use of moral forms of motivation of employees for the purpose of rational use of energy	8	6.67
	6	Rate the quality of the measurement of employees performance indicators aimed to improving energy efficiency	5	
	7	Rate the level of organization of employees in order to increase energy efficiency	7	
Organizational culture	8	Rate the quality of personnel training system techniques and methods to reduce energy costs	4	7.33
	9	Assess the level of cohesion of the collective decisions of the rational use of energy problems	10	
	10	Assess the level of functionality of quality departments aimed to energy-saving production	8	
Incentive system	11	Rate the system of monetary incentives for workers, aimed at reducing energy costs	8	5.00
	12	Rate other forms of incentives for workers to help improve energy efficiency	2	

**Figure 2:** Visual assessment of intellectual work management to improve the energy efficiency of the company

2. Change the system of training of techniques and methods for reducing energy consumption;
3. Develop other forms of incentives for workers, promoting energy efficiency.

## 5. CONCLUSIONS

For improving the rational use of energy production at enterprises we should do the following activities. First, we need to develop the performance indicators of employees based on the matrix of responsibility and the key factors of success of the company. Then we should carry out the systematization of techniques and methods to reduce energy consumption based on business processes and the introduction of data in the employee training system. Besides, we should develop and implant other forms of incentives for workers to help improve energy efficiency.

Our concept of building intellectual work management system will allow increasing the satisfaction of employees. Thanks to the unique position to intellectual work management system the method of intellectual work management evaluation has been developed. The methods of evaluating the effectiveness of management of intellectual work allows identifying problem areas in the management system.

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