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AND POWER INDUSTRY IN AGRICULTURE
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Volume XD

DECISION SUPPORT SYSTEM FOR BRIDGE CRANES DIAGNOSTICS ON THE BASIS OF CASES

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Summary. Case-based reasoning (CBR) diagnosic system of bridge cranes is suggested. The stages in diagnosing faults and the elements of the CBR decision support system (DSS) are considered. The model of case and block diagram of the diagnostic DSS are offered. Diagnostic DSS of bridge cranes has been developed.

Key words: case-based reasoning, bridge crane, fault diagnosis, domain ontology, knowledge management.

INTRODUCTION

Construction of diagnostic systems is one of means to optimize reliability and availability of equipments. Indeed, diagnosis is an intelligent act which is hardly programmable with classic techniques. Several studies have been made for the development of the diagnosis methods based on artificial intelligence (AI) methods and techniques. Expert systems [1] provide a useful means to acquire diagnosis knowledge directly from key personnel (experts) and transform their expertise into production rules. However the knowledge acquisition and verification processes are difficult and complicated and sometimes experienced technicians even have no idea of how to express their strategies explicitly and accurately. Rule induction and neural network [2] are the means that can be applied to find out fault classification knowledge using previous known examples. These methods are demonstrated robust but requires a sufficiently large training set to ensure promising outcome. Case based reasoning (CBR) [3-5] offers another alternative to implement systems of intelligent diagnosis for real applications. This alternative is motivated by the idea that the similar situations lead to similar outcomes. The main strength lies in the fact that it enables directly reusing concrete examples in history and consequently eases the knowledge acquisition bottleneck. It also creates the opportunity of learning from experiences but skipping the step of data training.

REUSING OF EXPERIENCE FOR DIAGNOSIS AND TROUBLESHOOTING

Diagnosis is the identification of the root cause of abnormal or defective behavior in a system by means of the exposed symptoms, the system state, the system's general specifications and the operating environment. It links the observable system behavior to a disease or a problem condition pertinent in the system and thereby explains it. Troubleshooting, as a next step, takes the result of this diagnosis and provides a remedy to restore normal system operation.

When human beings diagnose systems and troubleshoot problems, they use their experiences with similar, previously solved problems extensively. Rather than deriving new solutions from scratch every time a problem is observed, they prefer to reuse existing experience and adapt it to the new circumstances. As such, diagnosis and troubleshooting are excellent application areas for the development of case-based systems. Existing applications range from IT help-desk support to web self-service, from on-board troubleshooting of technical products to medical diagnosis and treatment planning [6-12].

Reusing problem solving experiences to diagnose and troubleshoot new failures allows one to fix faults much faster and more consistently. Since case-based reasoning (CBR) is a learning process, the system fills the gaps in its knowledge over time and enables companies to retain and share experiences across the entire organization. First call resolution increases drastically. Case-based diagnostic and troubleshooting applications are also very useful for training new, inexperienced personnel and ensure that the collective knowledge of the experts is instantaneously accessible to whoever needs it.

THE CASE-BASED REASONING CYCLE

The general procedure when applying CBR, is commonly described by Aamodt and Plaza [3] (see fig. 1-a).

The problem solving cycle of CBR consists of four major processes:
1. Retrieving: most similar past experience cases retrieved for similar problem.
2. Reusing: the cases from past retrieved cases by integrating and copying.
3. Revising: the proposed solution from attempt to solve of new problem or adopt new proposed solution.
4. Retaining: when the new solution was confirmed then new proposed solution was retained.

The whole process of CBR cyclic in this order that new problem is solved by retrieving past experienced cases, by reusing the pervious case revising the *solution*, and *retaining* the new solution of experience in to existing knowledge system. As shown in the fig. 1-b that from collection of *previous cases,* the new case is used RETRIEVES. The *retrieved* case is combined with the new case by reuse in to *solve case* and with the REVISE procedure the solution is also tested. In the RETAIN, useful experience is retained for future reuse, and existing case bases or updates with this case.
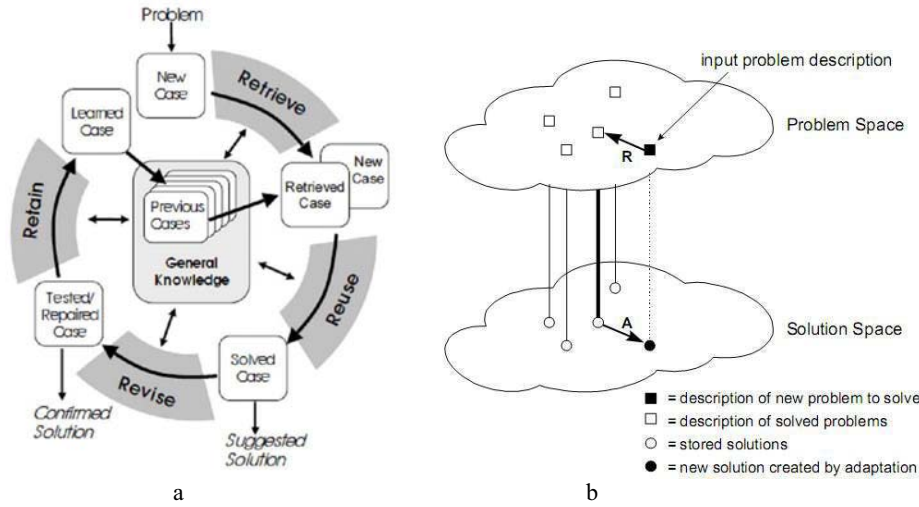
Fig. 1. CBR Cycle

Retrieving. The first step is the retrieval of one or several cases considered to be useful to support solving the current problem. The hope is to retrieve one or several cases that contain solutions that can be easily reused in the current problem-solving context. Because it is usually very unlikely that the case base already contains a problem description that matches the new problem exactly, a method to estimate the *utility* of available cases is required. The concept of *similarity* is used here. This means, the task of the retrieval phase is to select cases whose problem descriptions are similar to the current problems' description.

To realise this retrieval task, CBR systems employ special *similarity measures* [13] that allow the computation of the similarity between two problem descriptions. Because the interpretation of this similarity strongly depends on the particular domain, similarity measures are part of the *general knowledge* of the system.

Depending on the size of the case base, the information amount contained in single cases, and the complexity of the used similarity measure, the retrieval step is often a challenging task with respect to computation time. In order to manage this complexity, a large number of different retrieval strategies have been developed [14, 15].

Reusing. After selecting one or several similar cases, the reuse step tries to apply the contained solution information to solve the new problem. Often a direct reuse of a retrieved solution is impossible due to differences between the current and the old problem situation. Then the retrieved solution(s) have to be modified in order to fit the new situation. How this *adaptation* is performed strongly depends on the particular application scenario.

In general, adaptation methods require additional general knowledge about the application domain. Because this leads to additional knowledge acquisition effort, many CBR systems used today do not perform case adaptation automatically, but leave this task to the user. Then, of course, the quality of the retrieval step influences the problem-solving capabilities of the entire CBR system primarily. Even if automatic adaptation is

provided, the quality of the retrieval result will strongly influence the efficiency of the system due to its impact on the required adaptation effort.

After adapting the retrieved case automatically or manually to fit the current situation, a *solved case* is obtained containing a *suggested solution* for the current problem.

Revising. Depending on the employed adaptation procedure, the correctness of the suggested solution often cannot be guaranteed immediately. Then it becomes necessary to revise the solved case. How such a revision is performed, strongly depends on the particular application scenario. For example, it might be possible to apply the suggested solution in the real world to see whether it works or not. However, often a direct application of an uncertain solution is impossible due to the corresponding risks (e.g. medical diagnosis systems). Then the revision has to be performed manually by a human domain expert or by alternative methods such as computer simulation.

If the revise step fails, the case has to be repaired or a new attempt to generate a valid solution has to be carried out. This new attempt can be realised in different ways. One possibility is to apply another adaptation alternative (if existing). Other possibilities are adapting another retrieved case or executing a new retrieval in order to obtain hopefully more useful cases.

Usually, the focus of the revise phase lays on the detection of errors or inconsistencies in the suggested solution and the initiation of further problem-solving attempts. Unfortunately, up to now less research has been carried out to enable CBR systems to recognise the reasons for failed problem-solving processes. If the system would be able to detect these reasons, it could react and, for example, adapt its internal knowledge resources in order to avoid similar failures in the future.

Retaining. If the solved case has passed the revise step successfully, a tested/repaired case will be available representing a new experience that might be used to solve similar problems in the future. The task of the CBR cycle's last step is to retain this new case knowledge for future usage. Therefore, the new case may be added to the case base. However, it has been shown that a general storage of all generated cases is not always useful.

USING THE JCOLIBRI2 FRAMEWORK

Fig. 2 contains an UML diagram with the main elements of the architecture of the jColibri 2 framework [16, 17].

These elements are:

• Organization into persistence, core and presentation layers. However, these layers are implemented in a different way through Java EE technologies. Persistence is again managed by connectors. Connector in fig. 2 access the persistence media and load the cases into different in-memory organizations (CBRCaseBase). The core contains the same basic classes that were defined in the previous version, but there are no presentation methods to keep the core independent of the user interface.

• Organization of the applications into precycle, cycle and postcyle. Moreover, new stages can be defined to be executed at different execution points. This add-on enables the development of maintenance or evaluation procedures. This organization is defined by the StandardCBRApplication interface shown in fig. 2.
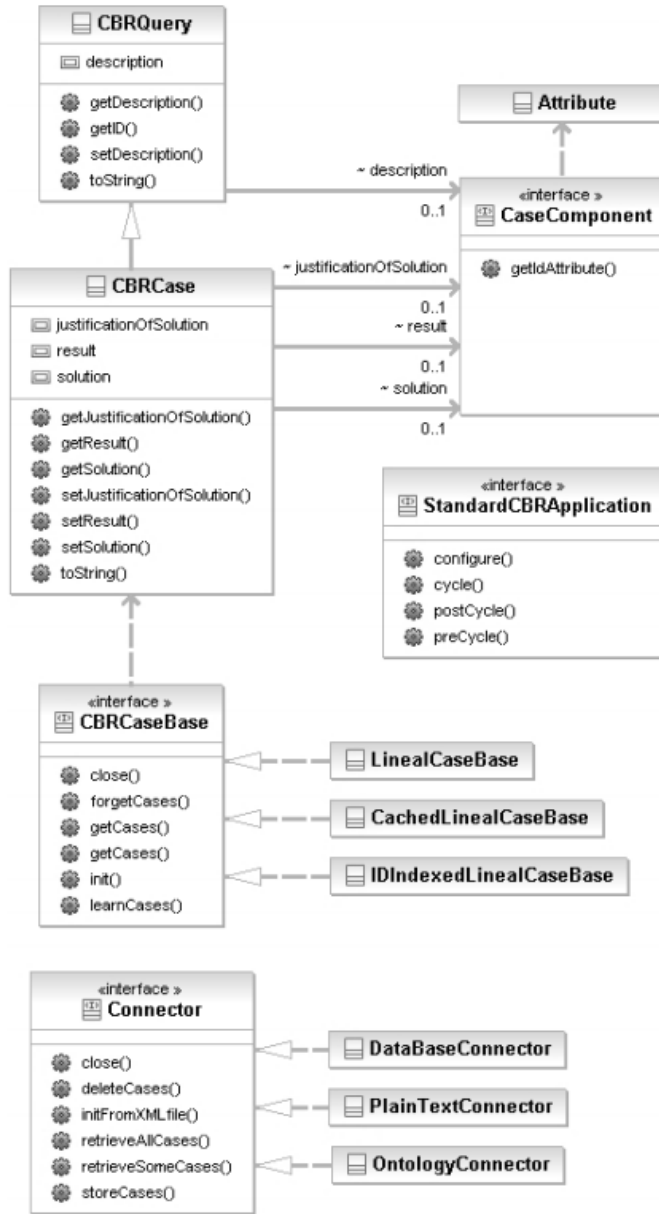
Fig. 2. UML diagram with main elements of jColibri 2

• Case structure. The structure of description, solution and result is extended with the justification of solution component after a revision of several works found in

the CBR literature. This structure is defined by the CBRQuery, CBRCase and CaseComponent clases shown in fig. 2.

The most important change in the architecture of jColibri 2 is the representation of the cases. This new representation modifies the way of storing cases in the persistence media and the behavior of the methods when accessing their attributes. jColibri 2 represents the cases using Java Beans. A Java Bean is any class that has a get() and set() method for each public attribute. Its modification and management can be performed automatically using a Java technology called Introspection (which is completely transparent for the developer thanks to the Attribute class shown in fig. 2). Using Java Beans in jColibri 2, developers can design their cases as normal Java classes, choosing the most natural design [18].

This simplifies programming and debugging the CBR applications, and the configuration files became simpler because most of the metadata of the cases can be extracted using Introspection. Java Beans also offer automatically generated user interfaces that allow the modification of their attributes, and direct persistence into data bases and XML files. It is important to note that every Java web application uses Java Beans as a base technology, so the development of web interfaces is very straightforward. Moreover, Hibernate – the library used to develop the data base connector in jColibri 2 – uses Java Beans to store the information in a data base. Java Beans and Hibernate are core technologies in the Java Enterprise Edition platform that is oriented to business applications.

THE STRUCTURE OF CASE LIBRARY FOR DIAGNOSTIC SYSTEM

The case library for diagnostic system should join in itself the cases concerning a particular subsystem of complex object, and also contain the information on each parameter which is used for the description of cases (parameter type and range) [19, 20].

Besides, the case library should include such adjustments, as:
− the significance of parameter;
− a threshold value of similarity;
− a value which limits quantity of considered cases.

It is necessary to emphasize, that the case library can be formed on the basis of [21]:
− the experience, accumulated by the expert;
− analysis of the system archive;
− the analysis of emergencies;
− operative instructions;
− technological requirements;

The case library can be included in the structure of the knowledge base of diagnosis system or act as a separate component of the system. Case structure is presented in fig. 3-a, and the structure of case library in fig. 3-b.
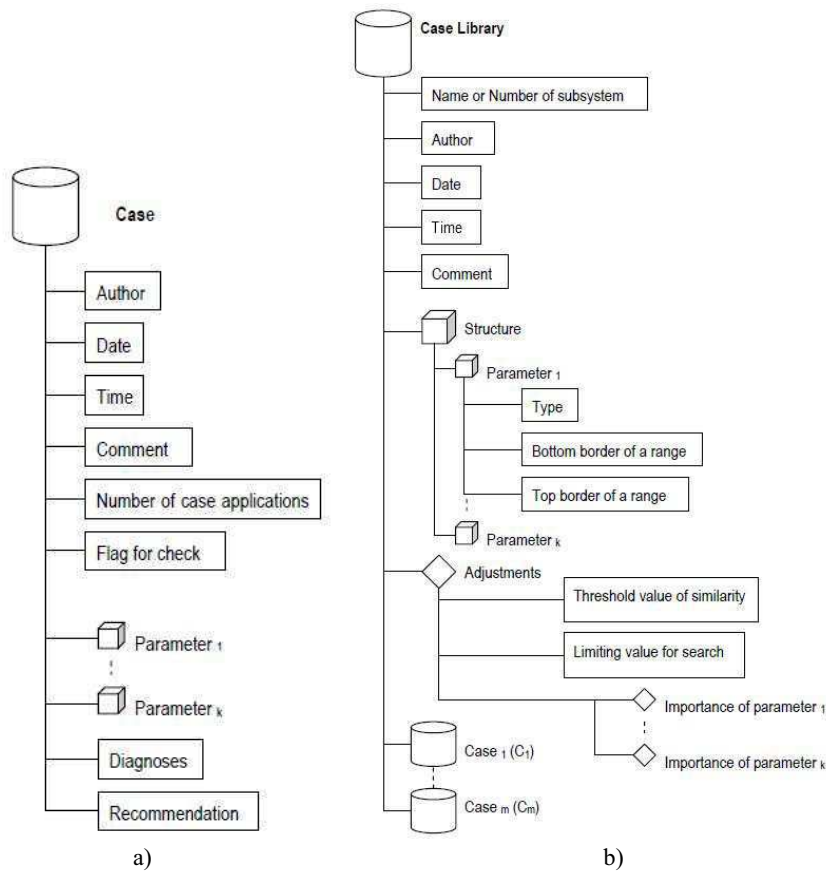
Fig. 3. The case and case library structure

APPLICATION OF CASE-BASED REASONING
FOR DIAGNOSTICS OF BRIDGE CRANES

We shall understand a bridge crane which has a complex architecture with various interrelations, with a lot of controllable and operated parameters. As a rule, such complex objects as the bridge crane are subdivided into technological subsystems and can function in various modes (in regular, emergency, etc.).

For the description of such complex object and its subsystems, the set of parameters is used. The state of object is characterized by a set of concrete values of parameters.

In the operative mode reading of parameters values from sensors for bridge crane is made by the system of controllers. Service personnel may also read diagnostic parameters. It is necessary to give out to the DMP (decision making person – DSS operator) the diagnosis and the recommendation on the developed situation (fig. 4) [19].
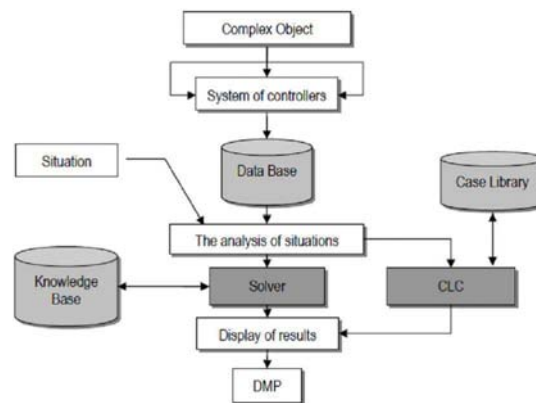
Fig. 4. The scheme of functioning for bridge crane diagnostic system

Diagnosing and detection of faults is carried out on the basis of expert knowledge, technological requirements and operative instructions. The developed software (Case Libraries Constructor – CLC) can be applied to the decision of the specified problems.

Basic components of CLC are:
− module for storage and loadings case libraries and for data import;
− a subsystem of visualization for browsing the structure of case libraries;
− a subsystem of editing and adjustment of case libraries;
− a module of new cases check;
− a subsystem of case library testing and case-based reasoning.

CLC prototype (fig. 5) was implemented with myCBR tool [22].

Fig. 5. Bridge cranes diagnostic system prototype

Implementation of case libraries with use of CLC for systems of expert diagnosing is subdivided into the following main stages:
- − Creation of case libraries for subsystems of bridge crane;
- − Adjustment of the created case libraries;
- − Addition of cases in case libraries;
- − Check of the added cases;
- − Testing of the filled case libraries using case-based reasoning;
- − Reservation of the created case libraries for their subsequent transfer to operative maintenance.

CONCLUSIONS

The system described above, along with many other operational case-based diagnostic systems, demonstrate the applicability of case-based reasoning to problem diagnosis and troubleshooting. By distilling information relating to the cause of a problem from example problem cases, the need for defining the link between symptoms and causes necessary in purely rule-based diagnosis systems is removed. By providing different options for the represention of cases and methods of user interaction, case-based reasoning provides a flexible foundation for the efficient and accurate generation of solutions in the bridge cranes diagnosis domain.

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СИСТЕМА ПОДДЕРЖКИ ПРИНЯТИЯ РЕШЕНИЙ ДЛЯ ДИАГНОСТИКИ МОСТОВЫХ КРАНОВ НА ОСНОВЕ ПРЕЦЕДЕНТОВ

Виталий Ульшин, Сергей Климчук

Аннотация. Предложена прецедентная система диагностики мостовых кранов. Рассмотрены этапы диагностики неисправностей и элементы системы поддержки принятия решений на основе прецедентов. Предложена модель прецедента и структурная схема СППР диагностики. Разработана СППР диагностирования мостовых кранов.

Ключевые слова: вывод на основе прецедентов, кран мостового типа, диагностика неисправностей, онтология предметной области, управление знаниями.

THE ADAPTIVE SYSTEM ON THE BASIS
OF ARTIFICIAL NEURON NETWORKS

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Sammory. In this work, we have considered the method of organization of algorithms and structures of data, which are used within the adaptive control system, provided the initial mathematical model of the controlled object is unknown. A possibility of practical realization of the considered method for the control of a static nonlinear object in the real-time mode is shown; some estimation of calculation expenses is given.

Key words: neuron network, adaptive control system.

INTRODUCTION

The decision of the control tasks with the help of various technical objects has to be done very often provided the mathematical model of the controlled object is known not completely, and its parameters and the environment of functioning change widely. Very often, these circumstances stipulate a number of problems related to safety and efficiency of exploitation of such objects. In such cases, engineers and researchers search a decision in the class of the adaptive systems allowing automatically determining the necessary law of control by means of the analysis of dynamics of the object at the current control. However, the synthesis of the adaptive systems is often accompanied by the problems of technical realization of the required algorithms of adjusting and adaptation. As a result, development of new methods of realization of the algorithms of the synthesis of the mathematical models and development of algorithms of adaptive control are actual. In this work, a possible realization of elements of the adaptive control system and also features, advantages and drawbacks of the offered method are considered.

THE FORMULATION OF THE TASK

As a general view, the task of adaptive control consists of search of knowledges about the properties of a system, so-called «object-surrounding environment», selection of useful knowledges and the use of them for an expedient behavior [Zhdanov, 2008].

By virtue of objective necessity, developers of control systems aim to formalize knowledge about the controlled object as mathematical models, because it allows them to decide the tasks of forecast of dynamics of the systems relatively easily or to explore them, not conducting real experiments. Taking into consideration that the synthesis of models for many applied tasks is a problem, the wide popularity belongs to methods of modeling, based on the description of a studied object as a structure called artificial neuron network (ANN).

However, the use of the ANN as a model in control systems, which work in the real scale of time, is connected with a number of objective difficulties, in particular with the problems of quality and speed of teaching of the ANN.

Indeed, the task of the synthesis of a neuron network may be considered as a task of optimization of some special-purpose function [Egupov 2004, Galushkin 2000, Gorban 1999, Borisov, Kruglov, Fedulov 2007, Terekhov, Efimov, Tyukin 1999, Haykin 2005, Pupkov, Egupov 2004, Malinetsky 2005, Ulshin, Yurkov 2009, Widrow 1990]. We may use a minimum of teaching error ε as this function. It depends on the W_t current network state:

$$\varepsilon = \sum_{j=1}^{k}\left[F(W_t, \mathbf{x}_j) - v_j\right]^2 , \qquad (1)$$

where: k – the number of examples in the teaching set; v_j – the required value of the output for j example; $\mathbf{x}_j$ – the input vector for j example; $F : \mathbf{x} \Rightarrow v$ – synonymous reflection realized by ANN.

A considerable number of weight coefficients of the neuron network model and the slow convergence of the gradient methods of optimization hamper the use ANN, which realize an F arbitrary reflection, in the real scale of time. Besides, in some cases, the use of algorithms and structures of data, which can be easily realized at hardware level with the use of the simplest elements, is desirable. It allows to create compact and reliable control systems.

In this work, in order to decide the task of synthesis of model of an control object, it is suggested to use the ANN on the basis of radial basis functions with some features about which will be said later. In the classic variant, which is described in the monograph [Haykin 2005] in details, the method of synthesis of ANN on the basis of the radial basis functions is based on the choice of the F function having the following kind:

$$F(\mathbf{x}) = \sum_{i=1}^{k} w_i \varphi\left(\|\mathbf{x} - \mathbf{x}_i\|\right), \qquad (2)$$

where: $\left\{\varphi\left(\|\mathbf{x} - \mathbf{x}_i\|\right) \mid i = 1,2,...,k\right\}$ – the set of k arbitrary functions called RBF functions (radial basis functions); $\|\cdot\|$ – Euclid norm. In practice, functions having the following kind are often used. $\varphi(\mathbf{x}) = \exp(-\|\mathbf{x} - \mathbf{x}_i\|^2 / 2\sigma^2)$, and the known points from the teaching set $\mathbf{x}_i \in \Re^m$, $i = 1,2,...,k$ are chosen as the centers of the RBF functions. Using such an approach, the task of interpolation is actually decided in multidimensional space because $F(\mathbf{x}_i) = v_i$, where v_i -the observed value of the

variable which an researcher is interested in. However, in many practical meaningful cases, the standard interpolation procedure is unacceptable (for example, because of a huge teaching selection or presence of noise). As a result, the limited number of the RBF functions is very often used in a network structure. The task of search of the w_i coefficients and the parameters of the functions, under which the minimum of sum of squares of errors is achieved, is decided:

$$\varepsilon = \sum_{j=1}^{k}\left[v_j - \sum_{i=1}^{N} w_i \varphi_i(\mathbf{x}_j) \right]^2 , \qquad (3)$$

where: k – the number of experimental data; N – the number of neurons in the RBF network.

The search of an extremum-minimum of the function of error (3) can be carried out by different methods, for example, by gradient methods or with the use of evolutional algorithms. However, as a rule, the large number of weight coefficients of neuron network model and the slow convergence of these methods hamper their use in the systems working in the real-time mode. As a result, from the point of the practical use within an adaptive control system, it is expedient to do the process of synthesis of an ANN as simpler and easier realized as possible, that is defined as the purpose of this work.

THE DECISION OF THE TASK

Taking into account objective difficulties connected with the search of optimum values of the coefficients of a neuron network model, the authors of this work apply other approach which is more expedient from their viewpoint. Obviously, if the parameters of used RBF functions are known, the task of optimization can be decided as the system of linear equations in relation to the w_i coefficients in the expression (3). Indeed, the w_i values are determined from the condition of a minimum of the function (3). It is necessary to equate the private derivatives of the ε function on each coefficient, i.e.:

$$\frac{\partial \varepsilon}{\partial w_1} = 0 , \ \frac{\partial \varepsilon}{\partial w_2} = 0 , \ \dots , \ \frac{\partial \varepsilon}{\partial w_N} = 0 . \qquad (4)$$

The expression for the i private derivative is as follows:

$$\frac{\partial \varepsilon}{\partial w_i} = 2 \sum_{j=1}^{k}\left[v_j - \sum_{l=1}^{N} w_l \varphi_l(\mathbf{x}_j) \right] \cdot \varphi_i(\mathbf{x}_j) = 0 . \qquad (5)$$

Calculating the private derivatives on each w_i coefficient, we get the system of N linear equations. Solving this system, we solve the task of teaching of an ANN on the basis of RBF functions but only provided the parameters of the RBF functions are known.

However, such an approach can be realized difficultly in a number of cases. Let's consider a static object whose state is described by the scalar $S(\mathbf{x})$ value depending on controlling parameters designated by the $\mathbf{x}$ vector. The purpose of the control is to

make the S vary according to the $S = u(t)$ law. Also suppose there is no other information about the controlled object and its mathematical model is unknown.

This function is unknown if the mathematical model of the controlled object is unknown. If the requirements to the accuracy of approximation are high and especially in case the **x** vector has a great dimension, the RBF network must consist of a great number of neurons. It results in solving the system of linear equations of a great dimension and hampers all the system to function properly in the real scale of time.

Taking into account the above mentioned, other approach is expedient. Assume the values of the controlling parameters are equal to $\mathbf{x}_1$ at the t_1 moment of time. Suppose the value of the $S(\mathbf{x}_1)$ function does not correspond to the required value, consequently, it is necessary to make a controlling influence (a change of the controlling parameters) which provides the better value of $S(\mathbf{x})$. The better value can be found on the basis of local approximation of the $S(\mathbf{x})$ function in the limited area with the center in the $\mathbf{x}_1$ point. Having transformed the values of the parameters, it is possible to continue the search of the better value of the $S(\mathbf{x})$ function, but, already in relation to the new values of the controlling parameters. Obviously, the continuation of such sequence of operations is possible until the target is achieved.

Such an approach results in the necessity to form an RBF network for the local area every time, that requires the permanent calculation of the coefficients of the matrix and the column of results in the system of equations (4), but allows to use the ANN with the considerably less quantity of neurons ($N_0 << N$). Obviously, this operation is a very resource consumption one from the calculation point of view, even provided the amount of experimental data in the local area is $k_0 << k$. Besides, such an approach requires the presence of a database for storage of the experimental data for every state of the system, in which it was during all the term of functioning. Also obviously, the size of this database can be very large. In addition, it is necessary to select points belonging to the investigated local area that is also a resource consumption operation.

Nevertheless, if these problems may be solved, it is possible to get the considerable winning in the speed of teaching of an ANN due to the decision of the system of linear equations of a less dimension.

To decide the above mentioned problems the following method is offered. Let's consider a task in which the v_i observed output at the i moment of time depends on the $\mathbf{x}_i$ input vector:

$$v_i = S(\mathbf{x}_i) + \xi_i, \qquad i = 1,2,...,M , \qquad (6)$$

where: $S(\mathbf{x}_i)$ – smooth surface; ξ_i – one of the realizations of process of the white noise with the zero average and σ^2 dispersion. The task is a task of nonlinear regression and consists of the restoration of the $S(\mathbf{x}_i)$ model on the basis of experimental data. As the grounded estimation of the $S(\mathbf{x})$ unknown function, it is possible to choose the average on observations (the values of the v output signal) in

the environment of the **x** point. Obviously, the less the environment of the **x** point, the more precise estimation of the sought function is.

The use of the estimation of the $S(\mathbf{x})$ function allows organizing the following presentation of experimental data. Assume there are limitations for the values of the components of the **x** vector. These limitations are stipulated by practical considerations or possible modes of functioning of the system. Let's designate the minimal possible value of j component of the **x** vector as $x_{\min,j}$, and its maximal possible value as $x_{\max,j}$. Then every j segment of $\left[x_{\min,j}, x_{\max,j} \right]$ can be divided into m_j intervals. In the future, to simplify the interpretation without the loss of community of considerations, let's accept $m_j = m_0 = const$ for any value of j. In this case, the size of the minimal segment of r_j for j component of the **x** vector is calculated as:

$$r_j = \frac{x_{\max,j} - x_{\min,j}}{m}. \qquad (7)$$

In this case, all the region of acceptable values of the **x** vector can be divided into hypercubes with the size of j side of r_j, and the estimation of the $S(\mathbf{x})$ function is calculated for the center of the hypercube which **x** belongs to.

Such a presentation of experimental data has considerable advantages for achievement of the purpose that is the minimization of time on the process of teaching of a RBF network. Indeed, the current estimation of the $S_T(\mathbf{x})$ unknown function as the average on observations (the values of the V output signal) in the G environment of the **x** point at the T moment of time is calculated as:

$$S_T(\mathbf{x}) = \Omega_T(\mathbf{x}) / k_T, \quad \Omega_T(\mathbf{x}) = \sum_{t=0, \mathbf{x}_t \in G}^{T} v_t(\mathbf{x}_t), \qquad (8)$$

where: v_t – the observed output at the t discrete moment of time at the $\mathbf{x}_t$ parameter values at the same moment of time; k_T – the amount of experimental data received for the G area for the amount of T of intervals of observation. Suppose the sum of values of $\Omega_{T-1}(\mathbf{x})$ of the observed output till the $T-1$ moment of time inclusively is known, then the expression for $S_T(\mathbf{x})$ is possible to write down as:

$$S_T(\mathbf{x}) = \frac{\Omega_{T-1}(\mathbf{x}) + v_T(\mathbf{x}_T)}{1 + k_{T-1}}. \qquad (9)$$

Thus, the estimation of the unknown function is possible to be found for the G area, knowing its value at the previous moment of time. For this purpose, the system needs a database containing Ω and k values for every possible G area determined by the proper hypercube. The presence of such a database considerably reduces the time of calculation of the coefficients of the matrix and the column of results of the system of the equations (4) because it considerably reduces the amount of experimental data

necessary for adding up. To do it, it is enough to use the estimation of the sought $S_T(\mathbf{x})$ function at the present moment T of time according to the formula (9). It is possible to estimate the size of the database at a set m_0 value . Assume the dimension of the $\mathbf{x}$ vector is equal to d . Then, having experimental data for every possible hypercube, the general K amount of records in the database is calculated as:

$$K = (m_0)^d . \tag{10}$$

If we accept $m_0 = 10$ and $d = 5$, we will get the maximal possible volume of the database which is $K = 100000$. Modern database control systems can handle even a greater amount of records. Taking into account the fact that real objects in practice realize the limited set of the states (for example, the motions of a manipulator are continuous as a rule), the expression (10) may be estimated as a hypothetical border of the size of the database.

Using the described approach to keep the experimental data, it is not a problem to search the data belonging to the set G area of an arbitrary size. Indeed, it is possible to identify any of possible hypercubes with integers. Their amount coincides with the dimension of $\mathbf{x}$ vector. The g_j value of the j coordinate of the center of the hypercube may be calculated as follows:

$$g_j = x_{\min, j} + n_j r_j + 0.5 r_j , \tag{11}$$

where: n_j – the number of hypercube according to the j coordinate.

In this case, this set of numbers is necessary to be considered as the fields with the unique index in the database, that practically results in a search in the assorted list and increases its speed several times. In addition, the identification of the hypercube with integers allows to quickly define all nearby areas, also presented by hypercubes, because its neighbours have the number value equal to one unit greater and one unit less on each co-ordinate. It is possible to define all neighbours, which are located more than one unit from the current hypercube, analogously .

Thus, the described method of organization of the base of experimental data in the combination with the local approximation allows to considerably decrease time expended on the search of necessary managing influences within the system of adaptive control.

THE PRACTICAL IMPLEMENTATION

To illustrate the possibilities of the described method, let's consider possibilities of the adaptive system on a simple example - control a nonlinear stationary object with an unknown mathematical model. Its structural diagram is shown in fig.1.

In fig. 1 we have defined the following denotations: u – the initial influence; $\mathbf{x}_u$ – the managing influence formed by the neuron network regulator; $\mathbf{x}_r$ – the real value of managing parameters supported by the executive device; v – the observed

output of the system; ξ – a random value stipulated by hindrances at measurements. Thus, only real values of the managing parameters of $\mathbf{x}_r$ and the v observed output of the system are accessible for measuring. In order for the system to function correctly, it is necessary to know the $S(\mathbf{x})$ unknown function in the expression (6), which is realized by the controlled object.
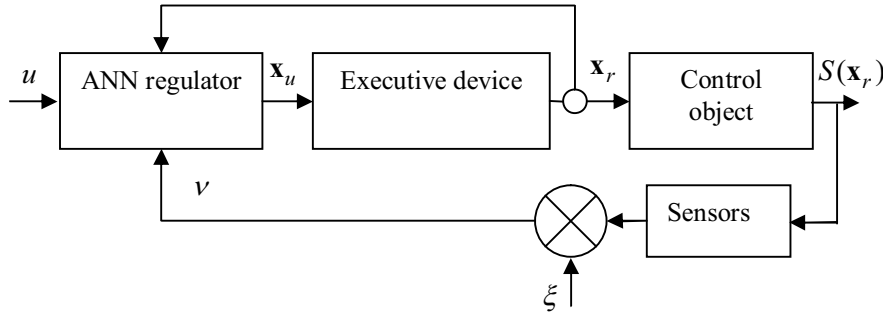
Fig. 1. The structural diagram of the system

To model the work of the system, the following functional dependence will be used in the future:

$$S(\mathbf{x}) = C - p\|\mathbf{x} - \boldsymbol{\mu}\|^2, \tag{12}$$

where: C, p – the coefficients; $\boldsymbol{\mu}$ – the point coordinates, in which $S(\boldsymbol{\mu}) = C$. If the dimension of the $\mathbf{x}$ vector is equal to two and the ξ values are considered to be subject to the normal law of distributing with the zero mathematical expectation value and the following dispersion $\sigma^2 = 25$, one of possible realizations will look like the realization shown in fig. 2.

The use of the described method has allowed us to realize the adaptive control system working in the real-time mode. To model its work, the limits in the range of the $\mathbf{x}$ vector component are defined: - both the components have admissible changes belonging to the interval of $[0,650]$, the $\boldsymbol{\mu}$ vector is in the range of $\boldsymbol{\mu} = \{325,325\}$. The initial value of parameters is $\mathbf{x}_0 = \{640,640\}$, the sample influence changes according to the following law $u(t) = 15 + 5\sin(t)$.

The results of modeling for a case with the absence of the ξ noise component are shown in fig.3.

From fig. 3, we can see that the law of change of the observed value fully repeats the managing influence in time without substantial rejections, i.e. the adaptive system «has learned» to manage a nonlinear object. The same case but with the presence of the ξ noise component with the above described parameters is shown in fig. 4.
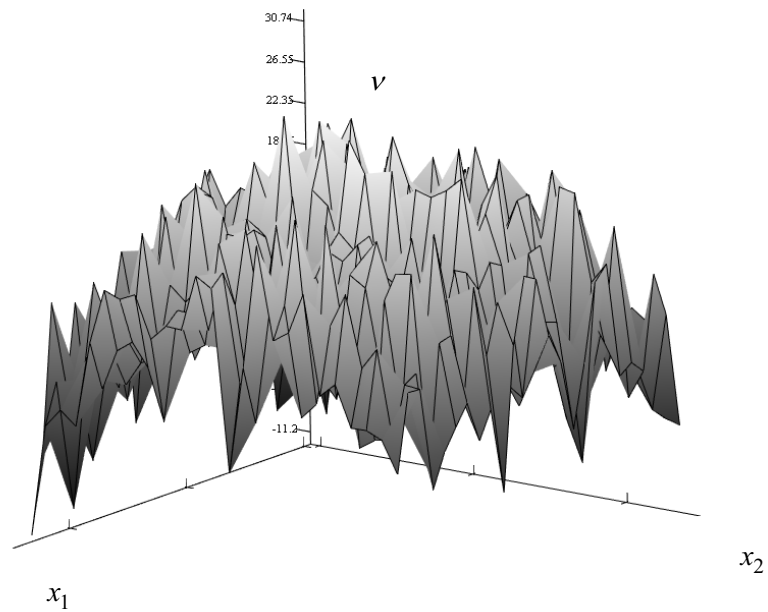
Fig. 2. A possible realization of the observed signal in the area
of the **x** parameters provided $C = 20$; $p = 0.0001$
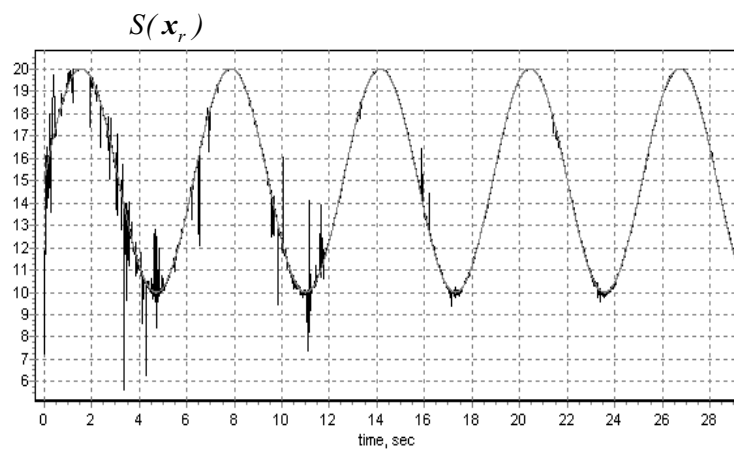
Fig. 3. The results of modeling of the work of the system with the absence
of the ξ noise component

The analysis of the results shown in fig. 4 shows that it is necessary considerably more time on teaching of the system if noise is present, but in the end, the control of the system becomes possible.

$S(\mathbf{x}_r)$
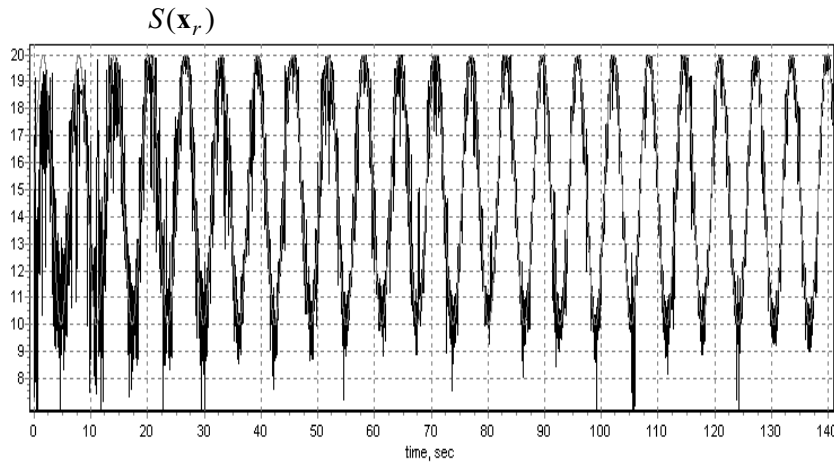
Fig. 4. The results of modeling of the work of the system with the presence
of the ξ noise component

CONCLUSIONS

1. The use of the average according to the observations as the estimation of the $S(\mathbf{x})$ unknown function in some environment of the $\mathbf{x}$ point allows to organize a compact storage of experimental data with a high-rate of access, that allows to execute approximation of the sought function by a RBF network for a local area in the real-time mode.

2. The expressions for the highest border of the amount of records in the database with the defined quantity of managing parameters and the size of the environment of the $\mathbf{x}$ point are received, that allows to estimate calculation expenses necessary for functioning of the control system.

3. A possibility of a practical realization of the adaptive control system on the basis of the considered method for the control of a nonlinear object in the real-time mode is shown, that confirms the rightness of the received results.

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АДАПТИВНАЯ СИСТЕМА НА ОСНОВЕ ИСКУССТВЕННЫХ НЕЙРОННЫХ СЕТЕЙ

Виталий Ульшин, Дмитрий Юрков

Аннотация. Рассмотрен метод организации алгоритмов и структур данных, используемых в рамках адаптивной системы управления при изначально неизвестной математической модели управляемого объекта. Показана возможность практической реализации рассмотренного метода для управления статическим нелинейным объектом в режиме реального времени, приведены некоторые оценки вычислительных затрат.

Ключевые слова: нейронная сеть, адаптивная система управления.

RELIABILITY PARAMETERS OF RAILWAYS ROLLING-STOCK FUNCTIONING RESEARCHING DURING ITS EXPLOITATION

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Summary. In the article are presented researches of changing reliability parameters results of railway rolling-stock. There are system basic refuses origin terms marked in the article. Basic mathematical letups are conducted here for determination parameters point characteristic.

Key words: rolling-stok, railway, system failure, intensity, probability.

INTRODUCTION

A railway transport on the modern stage is most claimed at implementation of mass loads and passengers transportations. This phenomenon specially characterized for the industrially developed districts, where a lot of enterprises, productive certain family product with subsequent delivery his user in the places of exploitation and use, and also largeness of settlements providing high population traffic flow to job functions. The basic structural elements of railway vehicular process are an aggregate of railway rolling-stock (locomotives, carriages) and railway way. Exactly co-operation of these constituents results in the performance of the put transport objective.

RESEARCH OBJECT

For continuous work realization a railway transport have been used with the purpose to decline the economic expenses on transportation, objects which are included in a general complex, have to provide whole system functioning reliability. An objects refuses minimum is supported by complex planned preventive repairs application of rolling-stock and by regular state of railway permanent way verification. It is an actual task now to increase objects functioning reliability of railway transport not only with the purpose of sudden refuses amount diminishing but also to increase it's service and longevity term and for prognostication of the test subject state at any period moment. This is in the end will tell at economic and moral level, that will promote an attractiveness for investors, customers and partners in the use of railway transport, as a basic transportation facilities.

In this article will consider only one of railway transport systems because both from them are equivalent them. So it is a rolling stock. In future it will be named as «system», and its component details as «object».

We will describe the cycle of rolling-stock unit work in transportations from the point of reliability theory basic concepts. So, a research object is reparable object, unrefurbishable in the application process. In addition, into system unit objects work appears as refurbishable system with backuping (light-weight reserve).

RESULTS OF RESEARCH

The state of the system can be expressed two types of refuses, oriented in case of refuses origin: suctive and reflecting. For the first case the task of searching for work reliability is taken to find of faultless probability system work, work mean time between refuses. The conduct of such system is described by the next differential equalizations system:

$$\begin{cases} p_j(t) = \Lambda_{j-1}p_{j-1}(t) - (\Lambda_j + M_j)p_j(t) + M_{j+1}p_{j+1}(t) \\ \sum_{j=0}^{n+1} p_j(t) = 1 \\ \Lambda_{n-1} = \Lambda_{n+1} = M_0 = M_{n+1} = M_{n+2} = 0 \end{cases},$$

where: $p_j(t)$ - probability that system in the moment of time (t) is able H_j.

Λ_j - is an intensity of the system transition from the state which it have been j defective elements in the state in which it will be on one incorrigible element anymore (one good condition elements refuse)

M_j - renewals transition intensity.

In same queue Λ_j expressed for a complete time domain $[0;t]$, for rolling-stock as:

$$\Lambda(t) = \lim_{\Delta t \to 0} \frac{\sum_{n=1}^{\infty} n P_n(t;t+\Delta t)}{\Delta t}, \tag{1}$$

where: $P_n(t;t+\Delta t)$ probability of the system appearance (transition) on an interval $(t;t+\Delta t)$.

To characterize the system stream transition in conformity with rolling-stock time argument t we will substitute by the race size L, then a formula (1) will be transformed to the kind as:

$$\Lambda(L) = \frac{\sum_{i=1}^{N} m_i(L+\Delta L) - \sum_{i=1}^{N} m_i(L)}{N \cdot \Delta L} = \frac{\Delta m}{N \cdot \Delta L},$$

where: N - is a locomotives amount, executing operating work.

$m_i(L + \Delta L)$ and $m_i(L)$ refuses accumulated number i locomotive for a race $(L + \Delta L)$ and L.

Δm -locomotives refuses number.

Probability of the system faultless work after the proper transformations looks like:

$$P(t) = \sum_{i=0}^{n} P_i(0) \prod_{j=1}^{n} \Lambda_j \sum_{k=1}^{n+1} \frac{e^{-x_k^{(n+1)} \cdot t} \prod_{m=1}^{i} \left(x_m^{(i)} - x_k^{(n+1)} \right)}{x_k^{(n+1)} \prod_{\substack{e=1 \\ l \neq k}}^{n} \left(x_l^{(n+1)} - x_k^{(n+1)} \right)}, \qquad (2)$$

where: $p_i(0)$- object refuse probability in i state of the system,

x -frequency of object refuses origin is in the probed period of the system state.

Accordingly formula (2) for the system beginning to work in the in good condition state, i.e. $p_0(0) = 1;$ $p_i(0) = 0;$ $1 \leq i \leq n+1$, transformed to the kind:

$$P^0(t) = \Lambda_0 \cdot \Lambda_1 \cdot ... \cdot \Lambda_n \sum_{i=1}^{n+1} \frac{e^{-x_i^{(n+1)} \cdot t}}{x_i^{(n+1)} \prod_{\substack{s=1 \\ s \neq i}}^{n+1} \left(x_s^{(n+1)} - x_i^{(n+1)} \right)}.$$

For the system, going out from the state of refuse, i.e. $p_n(0) = 1;$ $p_i(0) = 0;$ $i = 0, 1, ..., n-1, n+1$:

$$P^n(t) = (-1)^n \Lambda_n \sum_{i=1}^{n+1} \frac{\Delta_n \left(-x_i^{(n+1)} \right) \cdot e^{-x_i^{(n+1)}}}{x_i^{(n+1)} \prod_{\substack{s=1 \\ s \neq i}}^{n+1} \left(x_s^{(n+1)} - x_i^{(n+1)} \right)},$$

where: $\Delta_n \left(x_i^{(n+1)} \right)$- system intensity determinant characterizing the pass to consisting with the refuse of elements amount to $n+1$ in n.

Equalization general view is time hit determination of the system in the suctive state:

$$T = \sum_{j=0}^{n} \frac{\pi_j(0) \sum_{l=0}^{j} \Theta_l}{\Lambda_j \Theta_j}, \qquad (3)$$

where: $\pi_j(0) = \sum_{i=0}^{j} p_i(0)$; $\Theta_j = \frac{\Lambda_0 \cdot \Lambda_1 \cdot ... \cdot \Lambda_{j-1}}{M_1 \cdot M_2 \cdot ... \cdot M_j}$; $\Theta_0 = 1$.

Equalization (3) will be transformed, on condition of counting time out from the functioning beginning, to the kind:

$$T^{(0)} = \sum_{j=0}^{n} \frac{\sum_{l=0}^{j} \Theta_l}{\Lambda_j \Theta_j} , \qquad (4)$$

mean work time on a refuse from the input object is begun to exploitate.

Then as it applies to rolling-stock, substituting time by the size of run, formula (4) has transformed to the kind:

$$L^{(0)} = \frac{l^{(0)}}{m_{cp}\left(l^{(0)}\right)} ,$$

where: $m_{cp}\left(l^{(0)}\right) = \frac{1}{N} \sum_{i=1}^{N} m_i(L)$ - increasing number of refuses from the beginning of

object exploitation.

In most cases burn-time rolling-stock begins to count out from a moment the exit of locomotive from a depot after repair. Then equalization (3) will be transformed to the next kind:

$$T^{(n)} = \frac{\sum_{l=0}^{n} \Theta_l}{\Lambda_n \Theta_n} ,$$

or as it applies to a railway transport and locomotives race

$$L^{(n)} = \frac{L_2 - L_1}{m_{cp}(L_2) - m_{cp}(L_1)} ,$$

that attitude of races difference toward the difference of refuses number in the flow of the executed races L_1 and L_2.

It is find out the readiness coefficient for the system reflecting state. The general view of the differential equalizations system will be accepted by a kind:

$$\begin{cases} p_n(t) = \Lambda_{n-1} p_{n-1}(t) - (\Lambda_n + M_n) p_n(t) + M_{n+1} p_{n+1}(t) \\ p_n(t) = \Lambda_n p_n(t) - M_{n+1} p_{n+1}(t) \\ \sum_{j=0}^{n+1} p_j(t) = 1 \end{cases} .$$

The readiness coefficient of this system in a general view is determined by dependence:

$$K = \left(1 + \frac{\Theta_{n+1}}{\sum_{i=0}^{n} \Theta_i} \right)^{-1} ,$$

it is transformed to the kind for hauling rolling-stock (HRS) as:

$$K_{\varepsilon} = \sum_{i=1}^{N} t_{pi} \frac{1}{\sum_{i=1}^{N} t_{pi} + \sum_{i=1}^{N} t_{\varepsilon i}},$$

where: t_{pi} - stay time in i unit of HRS is in the working state capable,

$t_{\varepsilon i}$ - renewal capacity time i -that unit of HRS in a that period of time.

Interval estimations are based on the whole points of determination reliability of rolling-stock hauling indexes by selection drafting from the indexes row. Then the functions construction is driven out on the probed parametres.

CONCLUSIONS

Thus, on the base on the conducted researches it is possible to do a next conclusion. Railway HRS behaves to the repaired objects, unrefurbishable in the application process. Accordingly for determination of one or another reliability indexes it is possible to utillize the state of refuse both suctive and reflecting, getting the readiness coefficient value in the total, work on a refuse and between refuses. It is possible to prognose an indexes interval values construction for the work life cycle of rolling-stock unit in an Ukrainian trackage.

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ИССЛЕДОВАНИЕ ПАРАМЕТРОВ НАДЕЖНОСТИ ФУНКЦИОНИРОВАНИЯ ПОДВИЖНОГО СОСТАВА ЖЕЛЕЗНЫХ ДОРОГ ПРИ ЕГО ЭКСПЛУАТАЦИИ

Евгений Варакута, Юрий Белецкий, Никита Брагин

Аннотация. В статье представлены результаты исследований изменения параметров надежности тягового подвижного состава железных дорог. Определены основные виды отказов системы. Представлены основные математические выкладки для определения параметров точечных характеристик.

Ключевые слова: подвижной состав, железная дорога, отказ системы, интенсивность, вероятность.

RADIATION BACKGROUND OF THE DUMPS
OF SOME DONBASS COAL MINES

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Summary A degree of the negative influence of materials of waste banks on environment and health of population, lived in the tested region, is discussed. For determination of the specific effective activity of natural radionuclide a laboratory method was used. Utilizing the spectra dosimetry setting of «РИТМ-С», power of equivalent dose, specific activity, specific effective activity are determined, and the class of radiation parameters of materials of the probed waste banks is determined. Table. 3. Fig. 1. Ref. 4.

Key words: radiation background, dumps of coal mines, gamma-spectrometry.

INTRODUCTION

For 200 years of industrial history of Donbass about 12 billion tons of coal was mined. Exstraction made on depths to 1226 m, including by 228 mines on a depth 550 – 1000 m and 24 mines 1000 m deeper [Gavrilenko 2004, Maydukov 2008, Rud'ko 2006]. Statistical information show that delivery of rock from the Donbass mines continues remain to high (more than 300 t on 1000 t of coal). From all of the rock got in a mine on a surface 72,6% is delivered and only 27,4% takes a place under ground. [Koshel 2001, Shpak 2002, Arapov 2007].Thus a mine rock is approximately 80-85% from all of volume of rock, placed in dumps, and - 15-20% from enriching of coal obtained [Baklanov 1985, Kusch 1999, Tret'yakov 2006, Kurulenko 2007, Surgay 2008].

In Donbass coals and containing them rocks uranium kipped. Its maintenance changes depending on composition of rocks and fluctuated in limits from 2 to $2,6 \cdot 10^{-4}$ % [Gerasimovskiy 1963]. Radioactivity of dump rocks is explained violation of the state of equilibrium in them because of change of oxide-restoration situation [Smirnyy 2005, Pruss 1970]. To determination of radiation background of dumps of coal mines, study of composition of radioactive elements, entering in the complement of dump rocks and establishment of class of radiation parameters of materials of the tested waste banks this work is devoted.

METHOD

To determination of power of equivalent dose (PED) the dosimeter of „РИТМ-1М" was used; to determination of specific activity and specific effective activity of natural radionuclides a gamma-spectrometry system of „РИТМ-С" was used [Volkov 1990, Voylov 1999].

The objects of researches were become by the dumps of some coal mines of the Lugansk region. Power of equivalent dose on area of mine dumps in nZw/hour was measured [Kozlov 1991, Makhnev 2006,]. For determination of PED of mine dumps the probed waste banks were broken on local areas with a step 10x10 m on all of the described contour for each of waste banks. In same queue, for simplification of process of researches, waste banks parted on 4 geographical sides: north, south, western, east. Error of exposure each of local areas made $\Delta = \pm 20$ м ^{2}. The error of measurings of power of equivalent dose up to 14 %.

RESULTS AND DISCUSSION

Table. 1. **Presents the experimental date on power of equivalent dose for materials of the tested mine dumps**

№	Height from top dump, m	Results of measurings of PED on the dump sides			
		western, nZw/h	south, nZw/h	north, nZw/h	east, nZw/h
dump of mine №68					
1	10-27	147-172	150-170	145-177	140-160
dump of mine №13/1					
2	1-40	189-205	180-195	183-189	158-173
dump of mine №13/2					
3	10-25	166-170	173-196	170-200	187-200
dump of mine №13/3					
4	1-10	225-240	190-205	193-236	196-213
dump of mine №67					
5	1-5	260-290	265-295	198-262	173-240
dump of mine №63					
6	1-20	162-215	160-190	172-188	175-180
dump of mine №1-2					
7	1-40	197-208	183-228	194-235	190-207
dump of mine №42					
8	1-5	180-247	160-184	181-250	188-246
dump of mine №42/1					
9	1-5	331-348	332-351	185-339	262-342

It sould noted that there are places on the surface of waste banks of mine dumps, where PED is to high, in limits from 240 to 350 nZw/hour Places with the promoted radiation background, have mainly the view of the baked rocky formations of the red burnt rock.

Spectrometer-dosimeter of gamma-radiation of «РИТМ-C» software, gives possibility to carry out treatment of power spectrums of sources of radiations, make the calculations of activity and specific activity of radionuclides, and also to define activity of such natural radionuclides as ^{40}K, ^{226}Ra, ^{232}Th, ^{137}Cs. Figure 1 presents the example of one gamma-radiation spectra. In X-axis energy, MeV.

The probes of materials of 4th waste banks of 1 liter volume each, were placed in the Marinelli vessel and investigated on the gamma-spectrometry setting of „РИТМ-C" . The values of specific activity, specific effective activity of natural radionuclides of the tested probes was obtained. It is possible to present the results as protocols of measurings (according to a measuring method for the laboratory method of determination of specific effective activity in build materials, waste banks).

Testing the probes of materials of waste dumps the spectrometry setting of «РИТМ-C» on a presence of natural radionuclides and other sources of gamma-radiation, in the got spectrums were found out different peaks [Gusev 1988]. To authentication of radionuclides:^{40}K , ^{226}Ra, ^{232}Th, ^{137}Cs this peaks was ised. The example of the proper protocol in table. 2 is presented.

Fig. 1 NaI(Tl) gamma-spectra of a waste sample

Table 2. **Protocol of treatment of spectrum for dump of mine № 41/1**

№	Nuclid	Activity		Specific activity		Error
		Bk	μKu	Bk/kg	μKu/кg	of activity,%
1	^{232}Th	60.9	0.0016	57.2	0.0015	16.4
2	^{226}Ra	73.3	0.002	68.9	0.0019	21.1
3	^{40}K	830.1	0.0224	779.4	0.0211	10.2
4	^{137}Cs	21	0.0006	19.7	0.0005	60.7
Volume of probe,sm^3		Mass of probe, kg		SEA, Bk/kg		Exposition, s
1000		1.065		210.1		1505

Table 3 presents the example of protocol for determination of specific effective activity.

Table 3. **Specific effective activity of the tested dumps**

№	Dump of mine	Specific activity, Bk/kg				SEA, Bk/kg
		^{232}Th	^{226}Ra	^{40}K	^{137}Cs	
1	mine 1-2	56.8	67.4	836.2	13.8	212.9
2	№ 13/3	63.6	101.3	841.2	20.3	256.1
3	№ 67	57.8	62.2	778.4	-	204.1
4	№ 41/1	57.2	68.9	779.4	19.7	210.1

According to information presented in a table. 1 it is possible to state that a mean value PED for the tested waste dumps exceed the norms of radiation safety of Ukraine НРБУ-97, set for persons from a population – 110 nZw/h [NRBU-97].

Coming from information presented in a table. 3 it is possible to draw a conclusion, that the tests probes of materials of waste dumps, correspond to the class 1 of radiation parameters for build materials.

It was also discovered during treatment of results, that at moving downward from the top of waste banks the power of equivalent dose is increased . Explain this dependence is possible as follows:

At oxidization of brazil (FeS_2) among with sulfates and hydrates of oxides of iron sulphuric acid appears participating in creation of new minerals: $2FeS_2+7O_2+H_2O=2FeSO_4+H_2SO_4$. Appearing sulphuric acid translates uranium minerals in a moving form, that in solution. Dissolution of uranium results to increase of radioactivity in the bottom of waste dumps.

As a result of water migration (fall of precipitations, melting of snow cover) there is washing off of heavy metals and radionuclides to the bottom of dumps. There is an increase of concentration of radionuclides, moved downward on a flow to the bottom of waste banks.

CONCLUSIONS

1. On an average, the power of equivalent dose of waste banks exceed the value according to norms of radiation safety of Ukraine (НРБУ-97), set for a population .

2. At moving from the top of waste banks to bottom, PED of simples is increased.

3. From the energy spectrums of gamma-radiation of the test probes follows that radioactive isotopes of ^{232}Th, ^{226}Ra, ^{40}K, ^{137}Cs are responsible for activity of waste. Most a deposit on specific activity brings in the element of ^{40}K, the least - ^{137}Cs. Probes accord to the class 1 of radiation parameters for build materials.

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РАДИАЦИОННЫЙ ФОН ОТВАЛОВ НЕКОТОРЫХ УГОЛЬНЫХ ШАХТ ДОНБАССА

Сергей Воробьев, Сергей Креденцер, Василий Кудленко

Аннотация. В работе обсуждается степень негативного воздействие материалов породных отвалов на окружающую среду и здоровье населения, проживающего в исследуемом регионе. Для определения удельной эффективной активности естественных радионуклидов применялся лабораторный метод. Используя спектро-дозиметрическую установку «РИТМ-С», определена мощность эквивалентной дозы, удельная активность, удельная эффективная активность и установлен класс радиационных параметров материалов исследуемых терриконов.

Ключевые слова: радиационный фон, отвалы угольных шахт, гамма-спектрометрия.

APPLICATION OF SYNERGETIC PRINCIPLES IN DESIGNING MACHINE-TOOLS AND DEVICES WITH ANNULAR OPERATING ELEMENTS

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Summary: The constructions of machines with direct drive have been analyzed. The application of methods of mechatronics for raising their performance standard has been considered. New potentialities of machines with annular operating elements when functions of the secondary element of the electric motor and of the technological tool are synergetically joined have been shown.

Key words: the electric motor; the technological; synergetica; mechatronics; the constructions of machines.

INTRODUCTION

The engineering development of machines with direct drive of the tool or the operating element and the computer control of the motion parameters is one of the prospective tendencies in modern machine – and device making. This fully conforms to principles of mechatronics as it is based on the synergetical joining up of units of fine mechanics and electronic, electro technical and computer elements. Kinematic circuits are considerably reduced due to eliminating traditional mechanical transmission, reduction gears, spindles and other similar units in the design. As result weight, dimensions and power consumption of the machines have been reduced, precision and dynamic stability values have increased, the machines have become more reliable and durable. [1].

The direct drive is favorably different from standard drives as it directly transforms electromagnetic energy into linear and rotary motion. This research is aimed at improving the technological characteristics of machines and devices with the direct drive of annular operating elements.

OBJECTS AND PROBLEMS

At present induction cylinder-shaped motors are widely used in machines with the direct drive of the operating element as they are simple in design, adaptable to manufacture and have low cost due to their mass production. The decision to produce a new electrical machine on industrial scale is usually taken provided the new production uses the present technology, that is, the technological continuity is an obligatory requirement.

However, the disadvantages of cylinder-shaped induction motors are well known:

- the wastes of electro-technical steel in stamping the sheets of the stator and rotor of the induction motor, which cannot be technologically renewed, come to 40-50% [3];
- during the process of electromechanical transformation of energy the teeth-and-grooves zone of the stator which is the most electromagnetically stressed is only 60% used because of strong saturation of the teeth.
- the insulation–winding work which accounts for one-third of the working hours in the in the production of induction motors is the sequence of operations on the ready magnetic circuit. The magnet wire and its insulation are subjected to uncontrollable deformations. As a result the stator winding is not suitable for maintainability which leads to future faults. In particular, up to 90% of induction motors faults are caused by damage to the stator winding, 35% of them take place during the so–called "running-in" period.

In this connection it is necessary to develop nontraditional designs of induction motors to be used in machines with direct drive such as disc induction motors. They have a good advantage of requiring little space as the electric motor is located closer to the operating mechanism, that is, the constructive schemes of the mechanism and the actuating electric motor are joined.

The short axial length of disc induction motors ensures the constructive compatibility with some mechanisms which makes them compact, easy to assemble and maintain.

The direct drive motor is an electromagnetic system inducing a magnetic field which is developed on the rectangular and cylindrical coordinates.

It is possible to achieve the displacement in any complex trajectory by controlling the forces of magnetic interaction of the field of the movable system element with the field of the static elements.

However, in spite of its advantages the direct drive of the rotating operating elements has a shaft which transmits the torque and bearings as mechanical supports. This involves a number of traditional technological restrictions and problems in operation and maintenance.

At present there exit a lot of devices and machines with operating elements in the form of a flat ring rotating about the axis of symmetry, for example, rotors of gyroscopes, operating wheels of dynamic pumps, disc saws of metals-working machine-tools. Traditionally, an annular operating element (AOE) is driven to rotate and is maintained in space. It also takes up useful loads and resistance forces through a spindle unit or a shaft. The latter is rotated by a separate electric motor, in most cases this is done through an intermediate gearing.

A direct drive and noncontact supports are used to raise the performance standard of machines and devices. A direct drive is known to partially eliminate an intermediate gearing but still keeps a spindle or a shaft in the construction. Noncontact supports allow an increase in operating speed and service life of machines reduces friction losses. However the number and weight of rotating parts are still the same, Power consumption remains at the same level, while the overall weight, dimensions and cost of machines tend to increase.

A considerably more clever approach is to raise the performance standard of machines and devices by means of the synergetical joining up of the functions of the operating element and of the secondary element of the electric machine. This principle is achieved [papers 5, 6] owing to noncontact transmission of torque to AOE and maintaining it in space by the rotating magnetic field forces. The operating element becomes the secondary element of a special electrical machine. Any mechanical connection in the power circuit is eliminated, which allows to reduce the number of the rotating parts, to increase reliability, to reduce the cost of the machine, its weight and power consumption.

The serviceability and reliability of machines and devices with AOE depend on the stability of rotation of the operating element and its ability to take up external loads. In general, the annual rotor is acted on by electromagnetic and resistance forces. Their joint action can make both stabilizing and destabilizing effects on the rotor.

Papers [7, 8] demonstrate the investigation of the displacement of the centre of masses of AOE by means of differential equations which take into account the medium resistance force, whose value is directly proportional to the speed of its displacement.

The conception of the stable motion of the annular rotor in the rotating magnetic field was formulated in papers mentioned above. The criterion determining the allowed values of parameters which ensure that stable motion was derived. This criterion takes into account the influence of: the rotor weight, its radial dimensions and width, slip, electrical resistance, the medium resistance, the distribution of magnetic induction in the running clearance.

The AOE of such a machine is not to have any winding [9] as it directly interacts with the working medium, for example, it can be a working wheel of a centrifugal pump or an annular cutting tool. The rotor to be made of para- or diamagnetic material, for example, aluminum or copper. The AOE is located in the running clearance between two stators or the stator and the additional magnetic circuit. Such is the construction of a disc induction motor (DIM).

Papers [10-12] demonstrate machine-tools for cutting semiconductor ingots with inner diameter [ID] diamond cutoff wheels and centrifugal pumps on the basis of DIM. Neither the machine – tool nor the pump has any spindle or shaft. As a result not only all the advantages of the direct drive remain, but there appear new ones.

Thus, the spindleless machine –tool for cutting with inner diamond cutoff wheels (ID) [11]can be used without any limitations for a thorough –feed cutting of large semiconductor ingots both into slices and blanks of required size. The cutoff wheel has neither mechanical supports nor electrical contracts, it can freely pass through a crystal . The width of the cutoff wheel can be much less diameter of the monocrystal. The ingot diameter is only limited by the inner diameter of ID.

In cutting monocrystal the required rotation frequency and the torque of the tool are provided by frequency-phase power source with the latest electronics which are controlled by microcontrollers or other computing devices. The stability of the inner diameter diamond cutoff wheel is provided by the introduction of feedback in correspondence with its rotation frequency. The developed machine-tools for cutting can be a typical example of the mechatronic system [13].

The suggested design of the cutting machine does not have an expensive and massive mechanism for tensioning a tool which makes it possible to reduce the dimensions and weight of the machine – tool 6-10 times, power consumption can be reduced 3-4 times.

Such a method of cutting semiconductor materials involves changing the construction of the machine, expends its technological potential and raises its performance standard. For example, as compared with the traditional cutting with the help of the inner diameter diamond cutoff wheel the new method of cutting improves the quality of the slices cut, reduces the width of the saw cut, which cuts the loss of expensive materials 5-7 times.

Our site (http: //www. elmach. com) demonstrates video of the operating models ,as well as computer animated models of machine –tools for cutting monocrystals into slices and blanks of the required size .

Two centrifugal pumps with the operating wheel without mechanical supports CNS-1 and CNS -1 have been designed and made on the basis of the investigations mentioned .

The operating wheels of the centrifugal pumps are axis symmetrical ,the technological load is also symmetrical and taken up along the whole surface. The useful work is done under conditions of the speed of rotation .Thus, the main requirements for providing the stable rotation of operating wheels without mechanical supports have been met.

The centrifugal pump CNS -1 (fig.1) has a spiral for carrying liquid away and the pump CNS -1 (fig.2) is made with the aligned casing.

Fig.1. Centrifugal pump CNS -1   Fig.2. Centrifugal pump CNO -1

The pumps are the assemblies which have both the centrifugal pump and the motor in one case. They have neither a shaft nor bearings. The operating wheels of the pumps are made of non –magnetic current-conducting material.

Shaftless centrifugal pumps have leak-tight cases and, consequently, a number of advantages such as: the possibility of pumping over especially poisonous, aggressive, cryogenic liquids and the like; the simplicity of the construction, high reliability, the reduced weight and dimensions, low cost [12].

During the tests under working conditions the experimental models of the centrifugal pumps CNS -1 and CNO-1 having cutoff operating wheels without mechanical supports proved that they were serviceable, had leak-tight cases and a low noise level.

CONCLUSIONS

1. The analysis of the constructions of machines with the direct drive of the tool has been made and has shown up that the performance standard of those machines could be raised by means of the synergetic joining of the functions of the secondary element of the electric motor and of the technological tool.

2. Much consideration has been giver to the advantages of the new construction of the disc induction motor having the annular rotor without any mechanical supports. Such a motor has neither a shaft nor bearings. The rotor of the electric machine is maintained in space and driven to rotate by the magnetic field forces.

3. New potentialities of the machines for cutting large monocrystals designed on the basis a disc induction motor with the joined functions of the rotor and of the diamond cutoff wheel have been demonstrated. The new method of cutting raises the possibility of lifting restrictions on the diameter of the monocrystal to be sliced, of decreasing the weight and dimensions of a machine, of improving the quality of blanks cut, and of reducing the loss of expensive materials.

4. It has been demonstrated that joining the functions of the operating wheel and of the rotor of the disc induction motor in centrifugal pumps expands the field of their application. The operating wheel of such pumps has no mechanical supports which ensures high leak-tightness of the case. There fore it is possible to use them for pumping over chemically active liquids.

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ПРИМЕНЕНИЕ СИНЕРГЕТИЧЕСКИХ ПРИНЦИПОВ ПРИ КОНСТРУИРОВАНИИ СТАНКОВ И ПРИБОРОВ С КОЛЬЦЕВЫМИ РАБОЧИМИ ОРГАНАМИ

Сергей Ерошин

Аннотация: Приведен анализ конструкций машин с прямым приводом. Рассматривается применение методов мехатроники для повышения их эффективности. Раскрыты новые возможности машин с кольцевыми рабочими органами при синергетическом объединении функций вторичного элемента электрического двигателя и технологического инструмента.

Ключевые слова: мехатроника; эл. машина с кольцевым рабочим органом; эл. машина с прямым приводом.

NUMERICAL SCHEME FOR RESEARCH OF PROCESSING PROCEDURES IN MICRO AND NANO ELECTRONIC DEVICES

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Summary. The article introduces elements of theory, describes basic concepts, notions and definitions, there are also a number of postulates related to formalism in analysis and development of industrial multifunctional systems, namely systems for fabrication of plates for micro and nano electronic devices, are stated here.

Key words: numerical scheme, system; technology, fine mechanics, single crystals wafer cutting; diamond-slitting annular wheel.

INTRODUCTION

As a result of works for fabrication of plates for micro and nano electronic devices there appeared an idea of developing a numerical scheme of generalized technology based on fine wafer cutting of semiconducting and other functional materials. It turned to be one of the main challenges of increase in functional efficiency of self-adjusting adaptive cutting systems for the industry [1].

The wafer cutting being the initial stage of manufacturing semiconductor devices (SDs) and integrated circuits (ICs) makes a great influence on the process economy in general. The conditions for conducting this operation define the performance characteristics and efficiency of the would-be devices. Within the last 25 years the technology of wafer cutting has been successfully used for a wide range of industries. Compared to others this processing technology, schemes of which are described in this work, ensure substantial productivity, the lesser thickness of wafers, acceptable accuracy and surface quality parameters for the would-be plates.

Development of an effective numerical scheme is one of the main problems to be solved to ensure the efficiency of development of modern technological units. At the same time during the development of such a scheme it is the most important to define how the achieved scheme meets the reality. As is well known it can often lead to an unjustified idealization of a scheme at the level of technological operations and processes when applying deterministic mathematics due to the lack of extensive statistic information and need for accounting of a great number of interrelations between the

elements of real technological systems when developing the scheme. Thus, as a rule, the traditionally developed schemes of technological units characterize in a low efficiency of controlling them.

This works aims to develop a numerical scheme of the processing procedure by the example of wafer cutting of semiconductors.

Let us use an active developing multisubject approach – synergetics – when considering universal properties of complex mechanical systems, processes of self-organization and controlling such systems and researching new properties of such systems. In this context let us demonstrate several paradigms that have a general scientific meaning. Today science methodologists separate three great paradigms that have a special implication for understanding the unity of scientific knowledge – they are the system approach, the general theory of information and the new concept of self-organization which appeared as a part of synergetics – the paradigm of complexity which is applied for designing of intellectual objects as well as for creation of the new generation technologies. These are micro machines and nano technologies. And they will mean new materials, opportunities of "growing complex systems molecule by molecule", "repairing" of separate molecules and the new generations of computing systems. The principal novelty of these technologies concerns the elements base, algorithm and problem definition themselves [1,2,3,4,7,8]. The last of the paradigms showed that it can be used in different sciences, and although postulates of synergetics are not universal for all the sciences it gives a methodological basis and analytical apparatus for researching of processes in the technology of nano devices creation [5,6]. As long as this very paradigm characterizes the "new science" let us discuss it in details.

Ukrainian and foreign electronic industry manufactures the plates by mechanical processing of bulk single crystals (so called boules) [10]. The boules are divided into fine slices that are called wafers. To achieve the required accuracy and quality of the surface the wafers are lapped, polished and chemically treated. This method of IC plates fabrication allows achieving the required accuracy and surface quality but it is related with a great amount of wastes of expensive materials. Physical processes that are connected with the work of SDs and ICs flow in the layer of a single crystal which is 15 -20 μm deep. The rest part of the silicon ensures the mechanical strength of the device and removes heat which is released during its work. As the finished chip is installed on the crystal-holder the great part of the crystal thickness could be decreased. Thus the plates' thickness is defined by their strength and technological possibilities. The operations of lapping and polishing cannot change the macro geometry of the plate. It is the cutting operation that defines the quality of the would-be plates due to the process heredity [10].

OBJECTS AND PROBLEMS

The work aims to select general rules, principles and methods of methodological base for development of the numerical scheme of general process of wafer cutting as a dynamic system. As the analysis shows it all the practical researches can identify the x-state or a range of states of a certain dynamic system with a set having the definite numerical scheme [13]. For example, the state of wafer cutting is conveniently

described with a set divided into intersecting classes where the elements of the set are the elements of cutting schemes that create the process of cutting, and the break down classes are functional abilities of the cutting schemes [13,14]. Further on the main postulates of the general theory will be described by the example of the wafer cutting technology.

Aspect 1. Introductory remarks. Let us use the general systems theory (GST) with its logic, formal language and means of rational methodological basis [1,13,14,16] with regard to the numerical scheme development. Let us lay emphasis on the fact that the development of any system (material system as in our case) is a technological process. If technology as a method of processing allows designing different machines and devices or processes then the formal development of technological algorithms (schemes) allows disclosing general patterns of the technology, prerequisites and possible results. Let us use the ideas described in [11,12].

Let us introduce a definition. Suppose U is a set of elements. Let us call as a fuzzy set $A \subseteq U$ the following population of pairs) $(u, \mu_A(u))$, де $(u \in U : \mu_A(u) : U \rightarrow [0,1])$ - that is the function which is called the membership function:

$$\mu_A(u) = \begin{cases} 1, & u \in A; \\ 0, & u \notin A. \end{cases}$$

The set A is a multitude of initial objects of a material nature (for example, components of some unit of a mechanical system), let us call them the basic elements. $\mathbf{R}$ is a multitude of operations on the basic elements [8]. The membership function $\mu_A(u)$ allows structuring fuzzy states of basic elements and/or operations on them in the best way.

Let us assume that the schemed technological process is defined by the population of fuzzy sets $P(U) = \{X_1, ..., X_n\}$ on U and the population of fuzzy sets $P(V) = \{X_1, ..., X_n\}$ on V, in this case $X_i = \{(x, \mu_{X_i}(x))\}$; where U andi V are the ending input and output spaces of the scheming object.

Let us show the defined technological process as a fuzzy equation:

$$Y_i = X_i \circ \mathbf{R}, \ i = \overline{1, n}, \tag{1}$$

or

$$\mu_{Y_i}(y) = \max_x \min \left\{ \mu_{X_i}(x), \mu_R(x, y) \right\}, \tag{2}$$

where: $\mathbf{R}$ is the matrix of fuzzy relations with elements $r_{ij}, i = \overline{1, n}; j, j = \overline{1, m}$ $r_{ij}, i = \overline{1, n}; j = \overline{1, m}$ (r_{ij} - value within the range of, $[0,1]$, characterizing the range of influence i - and whence j - of its results) on ; $U \times V$; $\circ$ - operation $max - min$ of the composition [16,17].

Let us select the elementary objects and means of their variability or structural principles [9,18,26] at the initial stage.

Aspect 2. Let us disclose the principle of optimization and generalization – the extremum principle. Let us make a preliminary remark that in the theory based on the extremum principle the postulation of a function or a functional, search of the extremum for which is made by methods of variational calculus, leads to describing the development of technology as a dynamic system under investigation [18,19,21,23].

The scheme describes the selection of technology with a non-renewable resource. The scheme can serve as a pre-image of some dynamic systems, for example, systems for selection of a cutting scheme technology and then adaptive wafer cutting with diamond-slitting annular wheel. Then the non-renewable resource acts as a value of deformation of the cutting edge. Taking into account the fact that the selection of technology is defined not only by the deformation value of the cutting edge but also by the bend thickness of the plate, vibration level etc, let us state the following numerical scheme:

• let us simulate a technological process of cutting schemes where the schemes differ in requirements of a continuous resource (these can be changes of deformation of the cutting edge, tensions, sharpening, cutting strength divided by the influence groups). It is convenient to describe such a process with a set with n elements (schemes) broken down into w of intersecting classes (by kinds of movement and position of cutting tools and a single crystal which is being cut) with a number of elements in the class $n_i (i = \overline{1, w}; \sum\limits_{i=1}^{w} n_i = n)$, in other words with a set with a break down. So the break down classes correspond to the cutting schemes. A set classifications value for the kinds of movement and position $\vec{n} = \{n_1, n_2, \ldots, n_w\}$ will be called the system state.

Let us postulate the extremum principle.

Postulate 1. Processing procedure as a dynamic system comes from the given state into the state which is defined by the extremum structure and allowable by the kinds of movements and positions of the cutting tool in the system. It is required to foresee the final steady state of the system which is run out of resources (tension of the diamond-slitting annular wheel, sharpening etc).

Conclusion: the systems turns to be in the state with the most extremum structure within the limits allowed by the resources.

The scheme of the processing procedure is characterized by the variety of possible selection of variants of its state. These characteristics can be called the entropy of the scheme. Usually a numerical scheme allows several definitions of the notion ***state*** and each definition corresponds to each measure of entropy [15,20]. To tell it precisely the state is a possible mode or means of use of the scheme. As per Boltzmann entropy is defined as a logarithm of a number of scheme states, and this way the entropy measure of the scheme depends on the definition of the state. Let us define the entropy as a logarithmic measure $H(\vec{n})$ of a number of states defined for this scheme N [26]:

$$H(\vec{n}) = \log N \qquad (3)$$

It is argued in favour of this measure of entropy the same as in classic works of Boltzmann, Shannon and Kolmogorov. The main feature is that entropy for a population of two independent schemes equals to the sum of their entropies [26].

The search of the real states of the system among all the possible ones in this methodology demands ordering of states and selecting the extremum state in the achieved order. Let us call such search the principle of extremum structure. So there appears a numerical function of state – number of allowable transformations. The number of transformations allowed by the system depends on two characteristics of the structured set: number of elements in it and the set structure. Then instead of the general number of allowed transformations their specific number shall be used – it is a number that is proved for one element of the multitude of all the transformations. The value reciprocal to the specific invariant equals to the number of non-equal transformations.

In this case the specific invariant of the structure of break down sets is defined as:

$$N(\vec{n}) = \frac{n^n}{\prod_{i=1}^{n} n_i^{n_i}},$$

then (3) shall be read as the generalized entropy:

$$H(\vec{n}) = \ln N(\vec{n}) = -n \sum_{i=1}^{w} \frac{n_i}{n} \ln \frac{n_i}{n}. \tag{4}$$

Based on the mentioned above let us state the following:

Statement 1:
o   Any open variable systems use some resource (to be more exact, a class of open systems).

Statement 2:
o   Allowed variations of the system are always limited by the deficit of some resource.

Conclusion.
o   The extremum shall be always conditional in the extremum principle created by the law of variation.

Let us re-write Postulate 1 in the following way.

Postulate 2. The processing procedure as a dynamic system comes from the given state into the state which is defined by the extremum structure and allowable by the kinds of movements and positions of the cutting tool in the system for which the generalized entropy is maximum in the limits that are set by the allowed resources in the system.

Conclusion: the unconstrained maximum of entropies leads to the homogeneous distribution of characteristics of the system (The principle of entropy increase).   The conditional extremum of the entropy for open but limited in resources systems draws inhomogeneous break downs. The level of inhomogeneity is certain depending on the components of the system under investigation.

The requirement for maximum of generalized entropy when the resources are limited equals to the requirement of minimum consumption of these resources by the

system with the limitation that the structuredness degree of the system shall be not lower than a certain level [24].

Postulate 3. The processing procedure as a dynamic system comes from the given state into the state which is defined by the extremum structure and allowable by the kinds of movements and positions of the cutting tool in the system for which the consumption of resources limited to increase is minimum in limits, that must be a required condition of the structured system.

Aspect 3. The principle of the maximum entropy [22,25,26] became widely used in researches of such systems. The main problem in applying this principle is in the lack of obvious procedures for comparison of the system under research with the adequate to its nature entropy functional $H(\vec{n})$. That is why when working with the maximum entropy principle it is the general practice to postulate for our system some similarity of the formula (3), for example, it is the formula (4). Most sequentially the mentioned tendency is shown in the Jaynes' formalism [21], namely:

- compare the allowed states of the system (technology or processing method) to some values of fidelity (or uncertainty) of their implementation;

- state the limits for macro parameters of the system as equations (for example, accuracy of measurement tolerances that are valid for real sizes of parts that are to be adaptively assembled);

- find the balanced state of the system (technology or processing method) by Lagrange method of multipliers as a solution of the problem for the conditional maximum in the form, for instance, of Shannon's entropy.

It is important to solve the problem of the adequate choice of limits to its extremum when proving the entropy functional, as before the task is solved it is not known for which parameters the limits in the form of strict rules [16] shall be executed.

Let us state a variational problem to the conditional extremum (Postulate 2):

$$
\begin{cases}
H\left(\vec{n}\right) = \left(\sum_{i-1}^{w} n_i\right) \ln\left(\sum_{i-1}^{w} n_i\right) - \sum_{i=1}^{w} n_i \ln n_i \quad \rightarrow \quad \max; \\[2mm]
\sum_{i=1}^{w} q_i^k n_i \leq L^k, \qquad\qquad k = \overline{1, m}; \\[2mm]
n_i \geq 0; \qquad\qquad i = \overline{1, w},
\end{cases}
\tag{5}
$$

where: n_i - is the final schemes of cutting for each of non-intersecting classes i, that shall be found; q_i^k - is a number k- of a resource of non-intersecting classes i; m-general number of the resources; w- general number of classes for the cutting schemes; L^k - initial value of resource k.

Solution of problem (5) for any vector $\vec{L} \in \mathbf{R}^m = \left\{ \overrightarrow{L \in \mathbf{R}^m} \mid \vec{L} > 0, k = \overline{1, m} \right\}$

$$
n_i = n \exp(-\vec{\lambda}, \vec{q_i}), \quad i = \overline{1, m},
\tag{6}
$$

where: $\overrightarrow{q_i} = \left(q_i^1, q_i^2, ..., q_i^m \right)$ - number of allowed by kinds of movements and positions of the cutting tool in the system (resource), and the general number of cutting schemes $n = \sum\limits_{i=1}^{w} n_i$ and vector $\overrightarrow{\lambda} = (\lambda^1, ..., \lambda^m)$ is the solution of the system of algebraic equations

$$\begin{cases} \sum\limits_{i=1}^{w} \exp(-\overrightarrow{\lambda}, \overrightarrow{q_i}) = 1; \\ \lambda^k (n \sum\limits_{i=1}^{w} q_i^k \exp(-\overrightarrow{\lambda}, \overrightarrow{q_i} - L^k) = 0, \quad k = \overline{1, m}; \\ \lambda^k > 0, \quad k = \overline{1, m}. \end{cases} \tag{7}$$

CONCLUSIONS

The elements of the theory have been developed, the basic concepts, definitions and notions have been discussed, and a number of theorems related to the formal technological approach to the analysis and designing of industrial multifunctional systems, namely systems with a discrete-continuous organization of the process of fabrication of plates for micro and nano electronic devices, has been stated and proved.

The suggested approach is based on the even introduction of objects operations and operations on these objects for production process that allows, according to one of the main Bertalanffy postulates, effectively adapting and transfering various organization-structural solutions from one processing area to another, for example, from the area of numerical schemes, which is well developed, into the area of discrete-continuous processing procedures.

The system simulation for the wafer cutting process is based on the selection of the numerical structure with a possibility to operate the classes of structured sets. The system state, which is described by the numerical structure, can be ordered by the degree of its structuredness. It is postulated that the dynamics of the system is defined by the principle of the maximum structure, namely the system comes from the set state to the state the structure of which is maximum in the limits of the allowed kinds of movements and positions of the cutting tool in the system.

The suggested method which allows balancing of each system state to a numerical function the value of which is steady to the degree of the structured state and can serve as its measure function. The value of this function is calculated through the number of the allowed by the system non-equivalent transformations. This function shows the generalization of the statistic entropy and is defined as the structural entropy which is achieved with the use of notions of the fuzzy logic and without probabilistic notions.

The principle of maximum structure is stated as the principle of the maximum structural entropy, its usage to open systems gives the required demand of limits within the allowed kinds of movements and positions of the cutting tool in the system.

The obtained results allow suggesting a formal numerical description of the system scheme on the basis of the extremum principle as the principle of the maximum structural entropy. This formalism develops Jaynes' formalism.

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МАТЕМАТИЧЕСКАЯ МОДЕЛЬ ИССЛЕДОВАНИЯ ТЕХНОЛОГИЧЕСКИХ ПРОЦЕССОВ МИКРО- И НАНОЭЛЕКТРОННЫХ ПРИБОРОВ

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Аннотация. Представленные элементы теории, рассмотренные базовые концепции, понятия и определения, а также сформулированный ряд постулатов, связанных с формальным подходом к анализу и проектированию технологических процессов на примере многофункциональных систем промышленного назначения, в частности - систем подготовки подкладок микро- и наноэлектронных приборов.

Ключевые слова: математическая модель, система; технология, точная механика, резание монокристаллов; алмазный отрезной круг с внутренней резательной кромкой.

INCREASING OF SENSITIVITY OF RELAY PROTECTION FROM EARTH FAULT OF PHASE IN NETWORKS 6-10 KV WITH INSULATED NEUTRAL

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Summary. Improving of relay protection from the earth faults of phase in networks 6-10 kV at the expense of the additional control of active component of current of zeroing sequence at the using of the automatic bridging of the damaged phase is offered in the article. The control of the indicated component is in all connections and in bridging breaker. In the case of reaching this component the threshold value in any connection its breaker is disabled. After subsequent decreasing of controlled component in the circuit of bridging breaker of the preset threshold, in the presence of voltage of zeroing sequence, this breaker is disabled.

Key words: automatic phase shunting, detection of damage feeder, earth faults.

INTRODUCTION

Electric networks with isolated or resonance-earthed neutrals are in widespread adoption in the systems of power supply. Providing of selective protection in these systems of power supply, in many cases, is exaggerated by insufficient sensitivity of current protections. [Andreev V.A., 2006, Bazilevich M.B., 2000, Borukhman V.A., 2000, Dudarev L.E., 1978, Shabad M.A., 1999, Shalin A.I., 2005, Vaynshteyn R.A., 1998]. Sensitivity enhancement of this protections become complicated by small values of currents of the earth fault [Popov I. N., LachuginV. F., Sokolov G. V. 1986, Shabad M.A., 2003, Shalin A.I., 2006.], which amplitude and phase errors, errors of transformer of current of zero-sequence are considerably multiplied [Gusenkov A. V., 2005, Kuz'menko D.I., 2007, Shalin A., 2008.].

Application of automatic bridging(shunting) of phase at the earth fault at the systems of power supply of 6-10 kV, known at present [Il'enko O.C., 1977, Shchutskiy V.I., 1986.] makes possible to transfer arcing fault to hollow[Krasyans'kiy V.M., 1997], and also to increase safety of maintenance of electrical equipment, [Plashchinskiy L., 1982], but it's functional possibilities are used not in full measure, that's needs it's future improvement. So, development of the automatic bridging of the damaged phase in the direction of increasing of sensitiveness of relay protection is an actual task, the

solution of which can promote of rising of reliability of functioning of the systems of power supply of 6 -10 кV.

OBJECT OF RESEARCH

Objects of researching are process at the systems of power supply 6-10 kV with isolated neutral with not extensive cables, air or mixed circuits of electricity transmissions with the currents of the earth-fault not exceeding 5-10A. And also processes in the systems of power supply with resonance-earthed neutral with the extensive circuit of electricity transmissions at the adjusted in resonance arc-suppressing reactor. At such adjusted of reactor considerable diminishing of currents in the place of the earth fault is present. Their values can be less than 1A.

PURPOSE OF RESEARCH

To carry comparative researches of estimation by influence of bridging of the damaged phase on character and parameters of researching process, as in damaged and in the undamaged feeders during totals and arc earth faults. Researches must be carrying at the different modes of operations of network in the conditions of changing the workload of feeding transformer and value of resistance in the place of fault.

RESULTS OF RESEARCH

In the under study systems of power supply the cases of mistaken working of relay protection [Shalin A.I., 2005] in case of occurring of monophase damage often take place. Such working of relay protection as a rule leads to appearance of double earth faults and additional damage of other equipment of network.

A mathematical model was build for the carrying out of researching the processes, followings at the described higher the objects of power supply during the appearance of monophase earth faults. Dependences of influences of bridging commutator(breaker) on steady-state process and transients in a network were taken into account the researches on this model were taken place. Influences on the indicated processes of value of bias voltage of neutral (from 0 to 15 % Unom), removing the place of damage from the buses of supply substation (from 0 to 100%), the workload of the damaged feeder (from 10 to 100%) were taken into account the carrying out of researching was taken place.

At researches the damaged feeder was designed by the cable circuit W2, outgoing from buses of distribution substation with supplied transformers T, with power from 2,5 to 63 MVA (fig.1). In researching parameters of line were accepted, taking into account, the most extended in electric networks 6-10 kV cables with cross section of 70-240 mm^2 and length to 2,5 km.
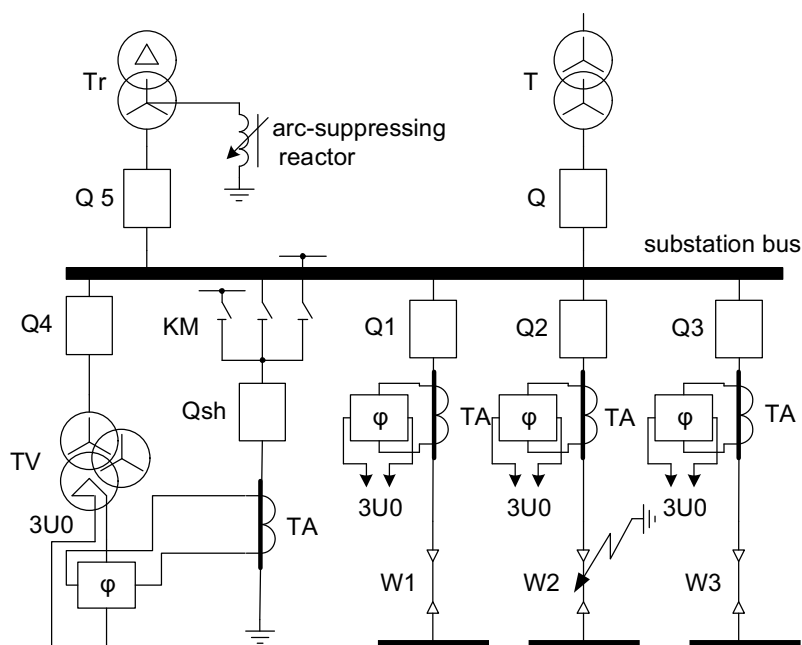
Fig. 1. Scheme of modeling network

As an example for circuitry, that's is on fig.1, the next equipment was chosen:

a) Transformer of main substation:

TRDNS - 63000/115, /6,3/6,3 кV;

b) Cable feeders W1, W2, W3, which consists from cables with cross section of 240 мм^2 and length 2,5 km;

c) Monophase bridging breaker Qsh;

d) Vacuum per phase controlled contactor;

e) Arc-suppressing reactor, connected to neutral of transformer Tr.

It is suggested to use bridging of the damaged phase for increasing of sensitiveness of relay protection by increasing of value of current of a zero sequence in the presented paper.

As be said before, by the main reason of incorrect operation of the relay protecting from the monophase faults in networks 6-10 кV is complication of rebuilding of these protections from the currents of a zero sequence of the undamaged feeders in connection with the constantly changing parameters of networks, considerable phaseamplitude errors of transformers of current of a zero sequence in zone of small currents.

In connection with the higher mentioned problems, the correctness of actuation of relay protection is decreasing at the expense of the low sensitiveness of existent methods of construction of relay protection.

To raise the sensitiveness of relay protections is possible at the expense of using the method of bridging, that will result increasing the amplitude of current of a zero

sequence and changing of phase of this current comparatively voltage of zero sequence. It takes place due to passing of part of current of loading of the damaged phase on a circuit from bridging breaker to a place of damage.

An analysis of the gotten calculations showed, that removing the place of damage from supply substation near 10% (that makes a 0,27 km), the current of a zero sequence in the damaged feeder, compensated by arc-suppressing reactor is increasing from 0,3 A at a power-off bridging comutator to 2A, at its switching on (fig. 2). Thus currents of zero sequence of the undamaged feeders after switching on of bridging breaker were not changed.

The further removing of place of fault from the buses of substation results in growth of current of a zero sequence, that increases the sensitiveness of relay protection. This distance is characterized at the most value of resistance of place of total earth-fault and the most workload of the damaged feeder.

The calculation of current of a zero sequence depending on the distance to the place of damage shows on the increasing of sensitiveness of relay protection with diminishing of value of resistance in the place of fault, and considerably reduces the zone of insensitivity.

Fig.2. Chart of changing of current of a zero sequence of the damaged feeder, in lack and availability of bridging comutator, from the distance between the place of bridging of comutator and place of the monophase total fault

Dependences of currents of a zero sequence at the switched on bridging comutator and resulting resistance between the place of fault and bridging breaker Rz=0,5 Ohm, Rz=1 Ohm, Rz=5 Ohm, Rz=10 Ohm accordingly are shown on fig.2 and fig.3 lines 1, 2, 3, 4., and line 5 is a current of a zero sequence in lack of bridging comutator.

The analysis of dependence of current of a zero sequence of the damaged feeder from the power of loading of this feeder (fig.3) showed, that at the maximal value of resistance Rz and maximal removing the place of damage, efficiency of actuation of relay protection is increases at the values of power of loading more than 10% Sn (130 кVA). Complete power of loading equal Sn=1,3 MVA conforms to the value 100% Sn.
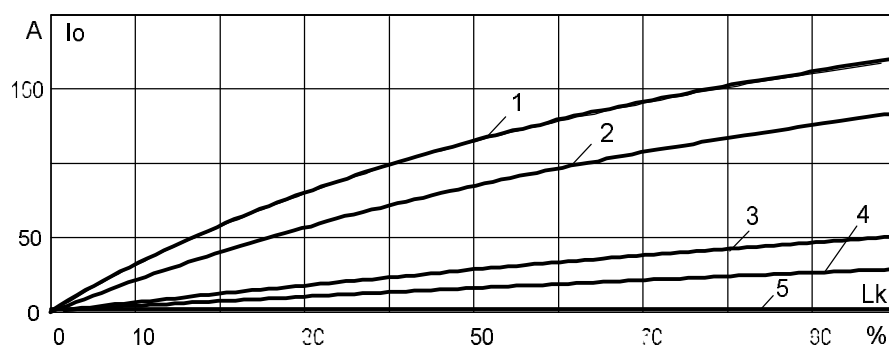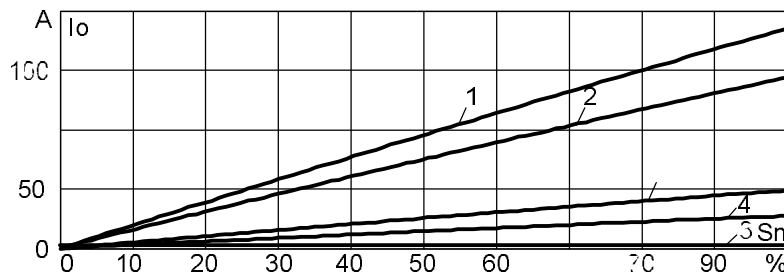
Fig.3. Chart of changing of current of a zero sequence of the damaged feeder, in lack
and availability of bridging comutator, from feeder of loading of this feeder

Luck of increasing of current of a zero sequence, at the using of method of
bridging of the damaged phase, will mean, that a place of damage is in the immediate
vicinity of buses of substation or being in the network an flash arc, which will go out
after switching on of shunt.

In connection with that the increasing of value of current of a zero sequence is
conditioned by flowing of part of current of loading of the damaged phase, which
carries active-inductive character, then the phase of the controlled current will
considerably differ from a value near to 90^0 measured relatively voltage of a zero
sequence. Thus appearance of active component in the place of fault after switching on
of bridging breaker can be used by determination by relay protection of presence of
damage in feeder.

For verification of results of mathematical modeling an experimental bench
(Unom=220V) was created, the chart of which conformed fig.1.

Comparison of gotten by experimental way data with the results of mathematical
modeling (parameters of model correspond to the values of parameters of experimental
bench) is shown on fig.4. High convergence of results confirms efficiency of the
developed measures. These curves show dependences of power of a zero sequence (Po)
of the damaged feeder at the using of the automatic bridging of the damaged phase.
Dependence of Po at the arc-suppressing reactor, adjusted in resonance, gotten by
calculation way is shown by dotted graph on this picture, and '+' are shown the values
of measuring on an experimental bench. Analogical dependences at a reactor, outputted
from the resonance state (considerable undercompensation) is shown by continuous line
and 'x'.

The gotten dependences show on an increasing of power of a zero sequence of
the damaged feeder at a minimum workloading in 4 times, that does effective using of
bridging of the damaged phase, at a total earth-fault, for the increasing of sensitivity of
relay protection.
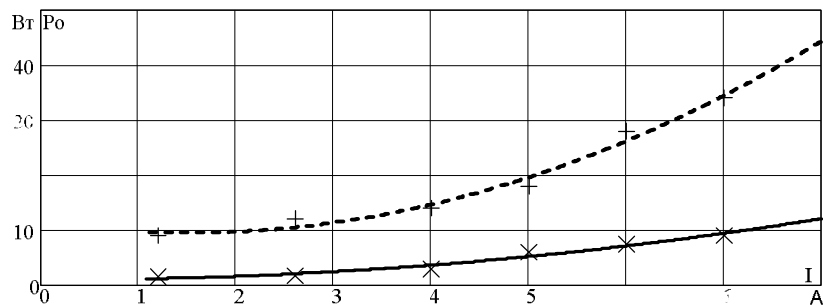
Fig.4. Dependence of power of a zero sequence Po from loading of line

The charts of dependences of the only damaged feeder are used in the article. In the parameters of the undamaged feeders there are not similar changes, associated with the using of bridging device. In the circuit of bridging breaker there are analogical dependences, showed on fig. 2-4.

CONCLUSIONS

Carried out researches showed that at bridging of the damaged phase with a total earth-fault on a circuit bridging breaker - the place of fault flows part of active-inductive current of loading of the damaged feeder, that allows to use this effect for the increasing of sensitivity of relay protection.

Carried out researches of influence of position of bridging breaker on processes, arising at the monophase faults, showed, that in character of current in the circuit of bridging breaker, after its switching on, it is possible to evaluate the type of damage. In cases, if after switching on the shunt, a phase of current in its circuit will be excellent from 90^0, so it will mean a presence in the network of the total fault, otherwise, when the phase of this current is near to a 90^0- presence arc fault, going out after bridging.

Gotten from researches dependences of influence of removing the place of fault and workloading of the damaged connection at the phase of current of bridging device shows on efficiency of actuation of relay protection at the values of transitional resistance, not exceeding Rz=20 Om and at the values of power feeder of loading and remoteness of damage, exceeding 10%.

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ПОВЫШЕНИЕ ЧУВСТВИТЕЛЬНОСТИ РЕЛЕЙНОЙ ЗАЩИТЫ ОТ ЗАМЫКАНИЙ ФАЗЫ НА ЗЕМЛЮ В СЕТЯХ С ИЗОЛИРОВАННОЙ НЕЙТРАЛЬЮ

Александр Захарчук, Дмитрий Кузьменко, Светлана Яременко

Аннотация. В статье предложено усовершенствовать релейную защиту от замыканий фазы на землю в сетях 6-10 кВ за счет дополнительного контроля активной составляющей тока нулевой последовательности при использовании автоматического шунтирования поврежденной фазы. Контроль указанной составляющей производится во всех присоединениях и шунтирующем выключателе. В случае достижения этой составляющей порогового значения в любом присоединении отключают его выключатель. После последующего снижения контролируемой составляющей в цепи шунтирующего выключателя заданного порога, при наличии напряжения нулевой последовательности, отключают этот выключатель.

Ключевые слова: автоматическое шунтирование фазы, определение поврежденного присоединения, однофазное замыкание.

ELECTROCHEMICAL-MECHANICAL RUNNING IN OF THE MAIN ENGINE′S CONJUGATIONS

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Summary. In the article the results of theoretical researches of the electrochemical - mechanical running in (grinding in) of basic conjugates of engines are presented. Influence of different factors on efficiency of running in is rotined.

Key words: electrochemical - mechanical running in (grinding in), engines, basic conjugates

INTRODUCTION

Problem of reliability and longevity of auto-tractor engines most sharply tangible in the branch of repair production, because term of service of the capitally repaired aggregate considerably less than 80% term of service new one, at the high cost of repair. Reliability and probability of faultless work of auto-tractor diesels in a great deal depends on the technical state of basic interfaces, indexes of wear of bearings of crankshaft, which are determined the rejections of their form and relationship.

It is known that macrogeometry of friction units considerably differs from correct. A roughness after mechanical operation differentiate from optimum values, in many cases broken equidistance of surfaces. It results in enhanceable specific pressures in the area of contact, to the direct contact of metallic surfaces and, as a result of it, to the teasers, grasping and enhanceable wear of running in surfaces. In these terms only the high-efficiency methods of running in are able to promote quality of repair of engines with the macrogeometrical rejections of interacting surfaces of basic interfaces.

RESEARCH OBJECT

For indemnification of inaccuracies of form of details and errors of assembling mechanism expose to break-in which running in of the surfaces is going. The most effective reception of acceleration of running in is the use of the combined processes at running in surfaces. One of them is electrochemical-mechanical running in (grinding in) (ECMR(G)). The processes of ECMR(G) pass in the environment of electrolyte, which

influences on efficiency of process, mode of friction at running in pair and speed of electrochemical reactions.

Essence of ECM running in consists in the following: working motion is given the details of mechanism, between details an electrolyte and cutoff alternating electric current . Due to joint electrochemical-mechanical influence there is rapid adaptation of one surfaces to other. The most effective factor of ECMR(G) is electrochemical, at which it is easy to millining of material from the run in surface due to anodal dissolution at the hydrodynamic lubrication rate. For the increase of efficiency of ECMR(G) it is necessary to promote viscidity of electrolytes or rev up sliding, that assuredly to provide the hydrodynamic mode of greasing. However, the increase of viscidity of electrolyte results in the decline of conductivity of electrolyte film. Therefore the purpose of this work is theoretical research of influence of all of factors of ECMR(G) on efficiency of process.

RESULTS OF RESEARCHES

It is known that the basic pair of friction of machines have different character of the mutual moving. The tribounits of piston-cylinder group are working at crank motion (fig. 1), and the sliding bearing – at rotatory movement (fig. 2). Obviously, that in first case speed of the mutual moving of details changes from a zero to the maximum, determined the structural parameters of knot and frequency of rotation of crankshaft. In the second - speed depends only on frequency of rotation and on the set modes is constant.

For analytical determination of the mode of friction, presences and thicknesses of electrolyte film between the ground details apply the criterion of Sommerfeld S_m [Semenov 1991]. For running in of details of type of piston-rings in the interfaces of rings-liner (with the recurrently-forward mutual moving) it is equal:

$$S_m = \frac{\mu \cdot V}{P \cdot b},\qquad(1)$$

where: μ - dynamic viscidity of lubricating material (electrolyte), MPa·s;
V - moving speed of piston, m/s;
P - pressure of ring to the cylinder face from forces of resiliency, MPa;
b - height of ring, m.

Knowing that $S_m = 10^{-5}$ corresponds transient behavior of friction, unhardness to set the change of types of lubrication at moving of piston. For a double piston movement the detail surfaces co-operate at the different modes of friction: limiting mode, transitional and hydrodynamic.

In obedience to the hydrodynamic theory of lubricating the thickness of tape, dividing a ring and cylinder, is on a formula [Semenov 1991]:

$$h = \sqrt{S_m},\qquad(2)$$

It is possible to assert that at the hydrodynamic lubricating of running in surfaces an electrochemical reaction flows cleanly: a current passes through details, part the layer of electrolyte. Investigation of it is an etch of surface during their anodal

polarization with frequency of alternating current. The mode of limiting and transitional friction, besides other, is activating surfaces, that strengthens the effect of electrochemical reaction at a liquid friction.
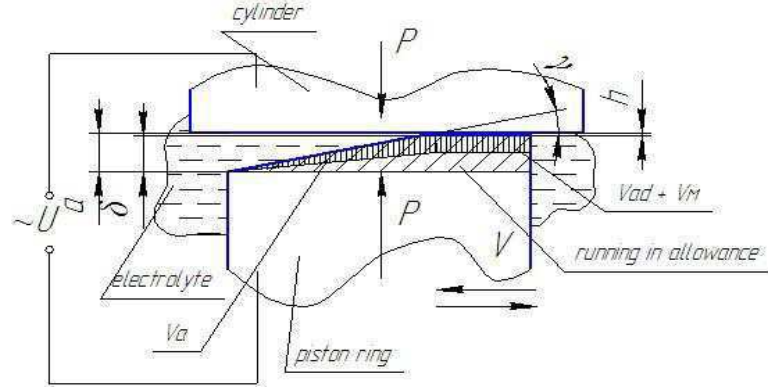
Fig. 1 . Scheme of ECMR(G) of details with reciprocal motion: δ – maximal size of a running in allowance; V_a – electrochemical etching rate of material from detail surface on a gap; V_{ad} – electrochemical etching rate of material from detail surface at mechanical activation;$V_{м}$ – mechanical wear rate from detail surface; h – radial interelectrode gap at fluid friction; γ - angle of obliquity of running in surfaces; a– joint gap, dependent on γ

Concerning of running in of sliding bearings, it is necessary to take into account frequency of rotation of shaft ω and presence of macrogeometrical rejections δ (fig. 2).
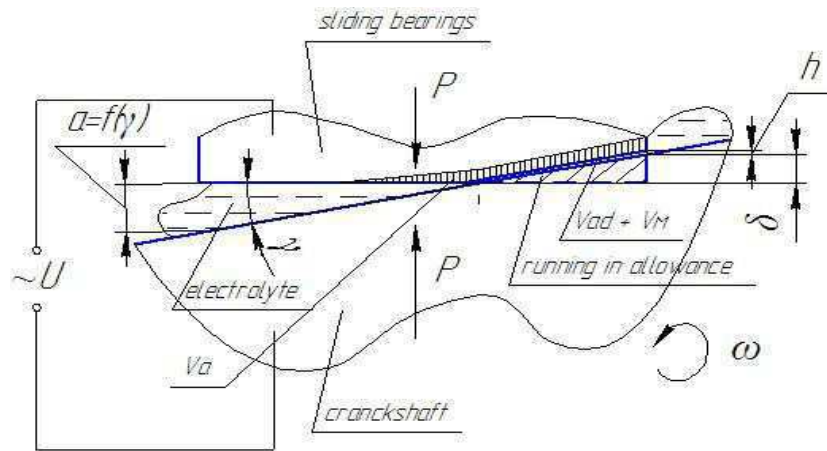
Fig. 2. Scheme of ECMR(G) of details with rotation motion

From a fig. 1 and 2 evidently, that any process macro running in of two surfaces it is possible to take to running in of surface, inclined with the corner of defect γ, in relation to other one.

The hydrodynamic theory of friction talks that the thickness of tape between a shaft and journal bearing depends on frequency of rotation of crankshaft. Except for it, important parameters are properties of lubricating environment and geometrical parameters of journal bearing. The laws of the hydrodynamic lubricating allow to describe the minimum thickness of oily tape of the freely rotated crankshaft. It is on a formula:

$$h_{\min} = \frac{d^2 n \eta}{18,36 k S c},$$ (3)

where: d – diameter of shaft, mm;
n – frequency of rotation of shaft, min^{-1};
η – dynamic viscidity of oil, Pa·s;
k – loading on a shaft, Pa;
S – зазор, мм;
c - amendment of Glyumbel.

By a formula (3) it is possible to define the minimum thickness of electrolyte layer at ECMR(G) in the area of direct contact of the running in surfaces of shaft and bearing without the account of macrogeometrical rejections (Fig.2).

Let′s will select factors, influencing on the change of size the error of form of detail $d\delta/dt$ and relation of speed of electrochemical output on an area with the depassivation of surface to speed of output on an area without a depassivation V_{dl}/V_a. Let′s will suppose that material of detail on the area of the mechanical activating is taken off as microvolumes of metal, then:

$$V_{dl} = V_{\text{м}} + V_{ad},$$ (4)

where: $V_{\text{м}}$ - speed of mechanical output;
V_{ad} - speed of anodal dissolution of metal at mechanical depassivations.

Constituent V_{ad} it is possible to express coming from laws Faradey and Ohm [Lyubimov 1983] taking into account the periodic breaking of anodal dissolution in the examined point of surface of ring because of pickoff at the mechanical activating (in the areas of limiting friction mode):

$$V_{a\partial} = 0,5 \cdot (1 - \kappa) \frac{c}{\rho} \cdot \eta_{a\partial} \frac{(U - \varphi_{a\partial} + \varphi_{\kappa})}{h} x,$$ (5)

where: $0,5$- coefficient, taking into account an alternating current;
κ - coefficient, taking into account the limiting friction mode ($S_m < 10^{-5}$) in general time of cycle (one turn of crankshaft);
U - working voltage, V;
φ_{ad} - anodal potential at mechanical activation, V;
φ_k - cathode potential, V;
η_{ad} - anodal current output at the mechanical activating, %;
χ - specific conductivity of electrolyte, Om^{-1}·cm^{-1};
ρ - density of material, g/cm^3;
c - electrochemical equivalent of material of anode, g/A·h;
h - a radial gap in the area of liquid friction, cm.

By analogy with expression (5) speed of output of metal will make on the area of anodal dissolution:

$$V_a = 0,5 \cdot (1 - \kappa) \frac{c}{\rho} \cdot \eta_a \frac{(U - \varphi_a + \varphi_\kappa)}{(h + \delta)} x, \qquad (6)$$

where: η_a - anodal current output, %;

φ_a - anodal potential, B;

δ - maximal size of running in allowance, см.

Putting (5), (6) in (4), will get (7)

$$\frac{d\delta}{dt} = V_M + 0,5 \cdot (1 - k) \frac{c}{\rho} \cdot \frac{\chi}{h} \left[\eta_{a\partial}(u - \varphi_{a\partial} + \varphi_k) - \eta_a \cdot \frac{1}{(1 + \delta / h)} (u - \varphi_a + \varphi_k) \right], \quad (7)$$

It is clear, that speed of diminishing of running in allowance depends, except for mechanical (V_M), geometrical (δ) and from electrochemical factors, such as specific conductivity χ, values of anodal potentials $\varphi_{a\partial}$, φ_a and outputs on a current $\eta_{a\partial}$, η_a. The mechanical activating is reduced by anodal potential [Kadaner 1971], and confirmation that an anodal output on a current increases as a result of periodic mechanical influence, present in [Economikos 2004, Shuo-Jen Lee 2003].

Thus, the choice of the modes of ECMR(G) can be carried out on the basis of information about sizes $\varphi_{a\partial}$ and φ_a, η_{ad} and η_a at the certain conditions of running in . Diminishing of coefficient k is accelerating the running in details. The coefficient k depends on the criterion of Sommerfeld S_m

Thickness of layer h is the function of piston speed V also and dynamic viscidity μ, however increase h will result in the increase of transitional resistance of layer of electrolyte. It is concordantly (7) necessary for the increase of speed of running in details, that size h it was minimum, but the terms of the hydrodynamic lubricating would be provided here. Decline of bearing strength of electrolyte, with the purpose of diminishing h, possibly due to gasification. At electrochemical-mechanical running in (grinding in) electrolyte is filled gas bubbles due to electrochemical processes, flowings on the surfaces of pair of friction. It is known that gasification depends on current parameters. A gas stream with a liquid possesses the high degree of compressibility, that can be used for diminishing h in the process of running in with the use of ECMR(G). The several of gas bubbles will be useful in localization of process of anodal dissolution, which is widely used in many processes of electrochemical size treatment of details of machines [Peter J. Blau 2005, Canhua Li 2004, Yuan– Long Chen 2003, Alan S. Brown, 2005, Samuel B. Emery 2005, Goonetilleke P. 2005, Mellier M. 2007, Guanghui Fu 2001, Seok J. 2003, Okumu Ouma D. 2002, Dick de Roover 2004, Yung– Fu 2007].

The evident picture of terms of transition of one mode of friction of f in other gives diagram of Gersi, in which the coefficient of friction is related to the parameter μV/P. This parameter is named description of the bearing mode. On diagram line *aa*, passing through the point of a minimum of coefficient of friction, divides the areas of friction at a liquid and other types of lubricating [Semenov 1991] (fig.3).

As be obvious from a fig. 3, diminishing of macrogeometrical form defection $d\delta/dt$ due to a mechanical wear V_M possibly only at the dry and limiting types of friction.

Thus, than more surface is divided the layer of lubricating, the less than influence of mechanical wear on the process of improvement of macrogeometry of details surface. The mechanical factor is absents at a liquid friction.
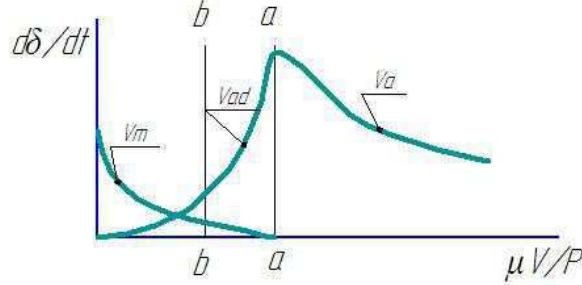
Fig.3. Speed of diminishing of macrogeometrical error of form of detail at ECMR(G)

Influence of electrochemical factor increases with the division of the running in surfaces the layer of electrolyte (V_{ad} increases at a limiting friction). However, it is necessary to provide a minimum gap, because resistance of layer of electrolyte grows with its increase, that results in deceleration of electrochemical reactions (V_a goes down at a liquid friction with growth of thickness of electrolyte layer). Experimental confirmation of improvement of tribotechnical descriptions of friction surfaces at ECMR(G) is presented in [Zamota 2010]. The use of this high-efficiency method of forming of surfaces of details allows considerably to increase their resource.
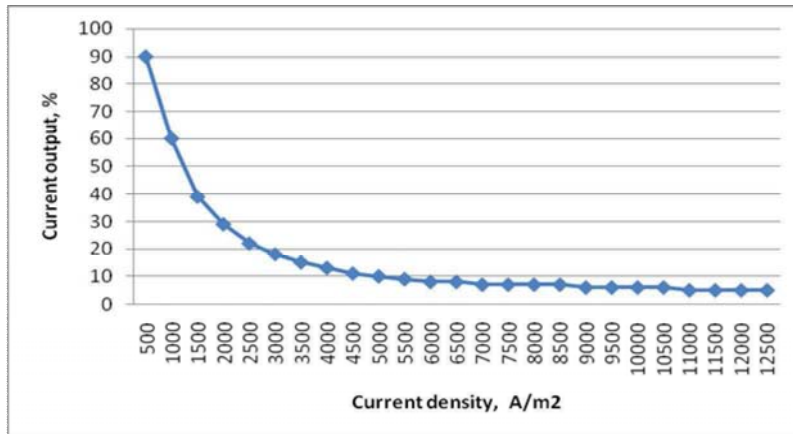
Fig. 4. Influence of current density on a current output η_{ad} at ECMR(G)

Research of anodal output on a current η_{ad} in the pair of friction with the rotatory mutual moving present in [Zamota 2009]. Most intensively process of ECMR(G) tribosystem shaft and journal bearing will be flows at outputs on a current η_{ad} near to 100%. Such values were observed at the closenesses of current less

$1000 A/m^2$. At the high-current density (fig. 4) efficiency of process is minimal, a wear takes a place due to a mechanical factor and an output on a current does not exceed 10%.

CONCLUSIONS

1. ECMR(G) of the basic conjugations of engines is the high-efficiency process of running in of the running in surfaces: except for mechanical influence, characterized V_M, the process of running in is accelerated due to electrochemical processes.

2. Acceleration macro running in   possibly due to the selection of optimum composition of electrolyte. It must possess low conductivity, passivatings properties, and also to provide the hydrodynamic mode of friction.

3. There is possibility to control the processes of running in due to the change of speed index are frequencies of crankshaft rotation and current parameters I and U. The mode of ECMR(G) must provide a high output on a current η_{ad} and minimum gap h.

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ЭЛЕКТРОХИМИКО-МЕХАНИЧЕСКАЯ ПРИРАБОТКА ОСНОВНЫХ СОПРЯЖЕНИЙ ДВИГАТЕЛЕЙ

Тарас Замота, Александр Кравченко

Аннотация. В статье представлены результаты теоретических исследований электрохимико-механической приработки (доводки) основных сопряжений двигателей. Показано влияние различных факторов на эффективность приработки .

Ключевые слова: электрохимико-механическая приработка (доводка), двигатели, основные сопряжения

INCREASE OF COVERAGE PROTECTIVE PROPERTIES ON THE BASIS OF POLYSTYROL BY MODIFICATION OF CORROSION INHIBITORS

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Summary. The basic requirements, produced to inhibitors intended for introduction into paint coat coverage are marked. Inhibitors, entered into paint coat materials are parted in groups. The results of tests on the research of different inhibitors and SAM influence on stationary potentials and closeness of passivative current of composition are resulted.

Key words: inhibitor, superficially active matters, passivation, paint coat coverage, polystirol.

INTRODUCTION

Among presently wide application of construction metallic materials with the high durability and exploited in the tense state, prevailing form of corrosion is local corrosion - corrosive cracking, pitting, intercrystalline corrosion and its other types. The losses of metal in these cases are not great, but its mechanical durability gets worse, and equipment breaks down quickly [Ulig 1989].

The effective mean of fight against corrosion are paint coat coverage. The majority of metallic constructions and equipment is protected with the help of this coverage which differs by comparatively low cost, simplicity of causing and easy restoring after damage [Shluger 1981]. Their protective properties can be considerably promoted by introduction of different pigments, superficially active matters, inhibitors of corrosion into its content. Introduction of paint coat coverage of inhibitors into content is the most economical and universal method that promotes corrosive defense of metals [Altsibeeva 1968].

The protective actions of inhibitors are related to the change in a state of surface of protected metal and in kinetics of private reactions, lying in basis of corrosive process [Solodkina 1974]. Thus speed of corrosion, due to introduction of inhibitors, can be reduced in many times, and degree of defense can be maximal.

PUBLICATIONS ANALYSIS

Information, touching modification of paint coat coverage by inhibitors of corrosion is very limited. Among scientists, engaged in this subject it is possible to select Rozenfel'd I., Antropov L., Chankova E., Pogrebova I., Loshkarev M. However, often there is presented only on-side approach in most researches without any discussions.

Such situation can be explained by two reasons - at first, existences of enormous nomenclature of inhibitors both on the basis of inorganic and organic connections, having, in most cases, complicated chemical composition and showing protective properties in different environments of electrolytes; secondly, most companies that produce inhibitors of corrosion, do not report their composition, therefore, often it is difficult to find out information about it compounds or functional groups in complicated connections or mixtures that execute protective functions. It is обуславливает actuality of research with the purpose of understanding of mechanism of defense of metal ингибиторами. Stated reasons stipulate actuality of research with the purpose of understanding of metal inhibitors defense mechanism.

OBJECTS AND PROBLEMS

The research purpose is improvement of anticorrosion composition protective properties by introduction of corrosion inhibitors and superficially active matters (SAM).

RESULTS OF RESEARCH

Use of inhibitors is one of the most progressive directions which is explained by their high protective properties and economy of defense as compared to other methods and means that are use nowadays [Rozenfel'd 1987].

Until present times corrosion inhibitors for paint coat coverage practically did not find any application. Research of protective properties increase of polymeric coverage possibility by inhibitors resulted in creation of new facilities of anticorrosion defense as thin inhibitor tapes, which are able to reliably protect metals and wares from corrosion in the process of production, transporting and storage [Isaev 1996].

Thin paint coat coverage do not present serious obstacles for diffusion through water, oxygen and aggressive ions, necessary for flowing of electrochemical reactions [Sukhotin 1989]. Besides in course of time because of penetration of electrolytes in tape influence of temperature over fall and sun radiation their barrier properties get more relaxed [Antropov 1999]. Therefore defense by paint coat coverage was founded, mainly, on introduction of passivative pigments that provided the reliable saving of metal and also when corrosive-active reagents penetrated through polymeric tape [Gol'dberg 1972]. However in most situations most perspective are inhibitors of corrosion. With their help it is possible in wide limits to regulate the concentration of passivative agent [Korolev 1973]. Obviously, when entering certain corrosion inhibitors

in the complement of paint coat coverage, then during penetration through it electrolytes of passivate anions, and separating due to hydrolysis or dissociation, must also prevent corrosive process [Rozenfel'd 1988].

At seeming simplicity of idea its realization is attended with considerable difficulties. It is explained that inhibitiors as well as SAM, can co-operate with film-creating matter, losing its protective properties [Skorchletti 1973].

In addition, during introduction of inhibitors into such multifunction systems, as paint coat materials, their co-operation of film-creating matters can make to creation of products which can differ by aggressive or protective properties in relation to metals, to genatilization, etc. [Chernova 1993].

Therefore it is not always easy to pick up needed inhibitor for film-creating matter.

The basic requirements, asked to inhibitors, intended for introduction into paint coat coverage, consist in the following:

1. In the offered external environments, inhibitor must protect metal on which the coverage is being inflicted [Petrova 1965].

2. Inhibitor has to be combined with film-creating matter, not worsening its physical, chemical, mechanical and technological properties of paint coat material and coverage on its basis [Grigoriev 1978].

3. Inhibitor must not co-operate with pigment [Ukhnevich 1998].

4. Inhibitor has to be undeficit and cheap.

It is possible to divide all inhibitors entered into paint coat materials to the followings groups [Togt 1967]:

1) amines;

2) salts of amines with inorganic acids (carbonates, nitrates, chromates, phosphates);

3) complicated ethers of organic acids;

4) salts of organic (benzol, olein, antralyne) and inorganic acids;

5) products of systematic fat acids rectification;

6) phenols and ohenyls.

The next organic-basis corrosion inhibitors consonant with polystyrol were chosen for the research: salt of cyclogeksilamyne and synthetic fat acids of faction С10-С11 (М-1 (0,1%, 0,5%)), hexametylenamyn ГМИ-9(0,5%, 1%), pentachlorphenole (ПХВ (0,5%, 1%)). Xanthane hydrohen was introduced into the composition as an inhibitor of light-senescence (1%, 1,5%, 2%,) [Feiman 1972].

Except for inhibitors special SAM was introduced into composition which when adsorbed on the surface of pigments and fillers change its nature and so influence on co-operation of basic components, film-creator and filler. As a SAM next neonols were entered into composition: АФ-9-4; АФ-9-10 in an amount of (0,5, 1%), and for the improvement of hydrophoby - alkibenzyldimetyl ammonium chloride of synthetic fat acids of faction С17-С20 (chloride АБДМ of ammonium) and ДОН-51Д – dialkylbenzyl chloride of synthetic fat acids of faction С17-С20 in an amount of (0,5, 1%) [Machevskaya 1971].

Being arctic, chloride АБДМ-ammonium and ДОН-51Д is adsorbed on metal, covered with aquatic tape, thus long hydrocarbon ends of their molecules are oriented outside. At causing of composition, containing a chloride АБДМ ammonium and ДОН-

51Д, on a wet surface moistened of metal is getting better with the help of composition [Tomashev 1973].

Selection of inhibitors and SAM is carried out by speed-up electrochemical method [Feiman 1972]. At first electrode potential of standard without coverage was measured, then with coverage by anti-corrosion composition without addition of inhibitors and with SAM and then with additions of inhibitors and SAM.

Next inhibitors were added into anti-corrosion composition for conduction of electrochemical researches: M-1 in an amount of 0,1%, 0,5%; ГМИ-9-0, 5%, 1%; pentachlorphenol-0,5%; 1%; КВ-1%, 1,5%, 2%; SAM: АФ-9-4-0,5%, 1%, АФ 9-10-0,5%, 1%; chloride АБДМ of ammonium -0,5, 1%, ДОН-51Д-0,5%, 1%.

On table 1, 2, 3 results of research tests a on influence of different inhibitors and SAM on stationary potentials and closeness of passivative current of composition are presented.

Table 1. **Inhibitors influence on stationary potentials and closeness of passivative current**

Electrodes	Stationary potential, mb	Change of potential, mb	Current of anodal passivation	
			i, a/sm^2	Lg i
Unpainted electrode	-622		425.00	2.62
Electrode, painted with initial composition				
without additions	-500	+122	35.04	1.54
-"-+0,1% M-1	-460	+40	13.80	1.06
-"-+0,5% M-1	-535	-35	107.30	2.02
-"- +0,5% Г1ХВ	-478	+22	17.50	1.23
-"-+1,0%ПХВ	-522	-22	82.40	1,9.1
-"-+0Д% ГМИ-9	-513	-13	106.00	2.03
-"-+1.0% ГМИ-9	-563	-63	179.60	2.28

Table 2. **SAM influence on stationary potentials and closeness of passivative current**

Electrodes	Stationary potential, mb	Change of potential, mb	Current of anodal passivation	
			i, a/sm^2	lg i
Unpainted electrode	-622		425.00	2,62
Electrode, painted with initial composition				
without additions	-500	+122	35.04	1,54
-"- +0,5% АБДМ	-6460	+40	21,70	1,03
-"-+1,0% АБДМ	-512	-12	103,00	2,05
-"-+0,5%ДОН-51Д	-498	+2	104,00	2,07
-"-+1,0%ДОН-51Д	-550	-50	159,00	2,20
-"- +0,5% АФ9-4	-513	-13	115,00	2,12
-"- +0,1% АФ9-4	-540 -	-40	104,00	2,07
-"-+0,5%АФ9-10	-500	0	110,00	2,10
-"-+1,0%АФ9-10	565	-65	175,00	2,25

Table 3. **Inhibitor influence and SAM on stationary potentials**
and closeness of passivative current

Electrodes	Stationary potential, mb	Change of potential, mb	Current of anodal passivation	
			i, a/sm^2	lg i
Unpainted electrode	-622		425.00	2,62
Electrode, painted with initial composition				
without additions	-500	+122	35.04	1,54
"- + 0,1%M-1 + +,5%АБДМ+1%КВ	-437	+63	8,20	0,7 3
" - + 0,5%M-1 + 0,5% АБДМ+ 2% КВ	-518	-18	16,20	1,17
"- + 0,1%M-1 + 1% АБДМ+1,5% КВ	-465	+44	13,80	1,06
- " - + 0,5%M-1 + +1% АБДМ + 3%КВ	-510	-10	34,60	1,60
-"-+ 1,0%КВ	-490	+ 10	36,60	1,59

     As we can see from table 1, when adding 0,1 % of M-1 inhibitor and 0,5% of pentachlorphenol there is change of stationary potential in more positive side as compared to a standard, painted with composition without additions of ингибиторов.

     Additions of inhibitors in amount of 0,5% (М-1, ГПИ-9) and 1% (ПХВ, ГМИ-9) move stationary potentials in negative side as compared to initial composition without some additions and as compared to the first two compositions i.e. anodal process flows without braking, the closeness of current of anodal passivation do not go down, but increase vice versa. This phenomenon specifies that additions do not strengthen protective ability of the composition. Thus in case of M-1 use the effect of intramolecular synergism shows up stronger, meaning that strengthening of inhibiting properties is done due to the presence of two functional groups - phenolic and chloryde. Such inhibitors form an unregulated delicate layer on the surface of metal with alternation of separate particles of inhibitor and clusters in it.

     According to the results electrodes test, painted with initial composition with additions of SAM, table 2, it is evident that the closeness of passivative current goes down, and stationary potential is moved in a positive side only with addition of 0,5% chloride of АБДМ ammonium. All other additions of SAM move stationary potential in negative side, and the closeness of anodal passivation current is increased as compared to an electrode, painted with initial composition without additions of SAM. Consequently, protective properties of initial composition do not get better.

     From table 3, we make a conclusion that addition on SAM into in solutions of inhibitors move stationary potential and promotes increase of anodal polarization of metal, does possible flowing of oxides formation reaction. Thus oxide tape hinders corrosion, and greater part of current is outlaid on the selection of oxygen.

CONCLUSIONS

1.   Coloring of electrodes from carbon steel with anti-corrosion protective composition on the basis of wastes of polysirol production changes stationary potential, moves it into positive side, that is an evidence of sufficient protective ability of anti-corrosion composition.

2.   Introduction of inhibitor additions and SAM into initial composition improves anti-corrosion properties of coverage. The best protective properties are possessed by composition with the next content - 0,1% M-1, 0,5% АБДМ, 1% КВ.

3.   The size of stationary potential change and degree of closeness decline of passivative current can serve as a criterion for the comparative speed-up estimation of protective ability of anti-corrosion composition.

4.   Optimum amount of inhibitors and SAM, considerably promotes basic indexes of initial coverage. Composition 4 contains it with the next content - + 0,1% M-1 + 0,5% АБДМ + 1% КВ.

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ПОВЫШЕНИЕ ЗАЩИТНЫХ СВОЙСТВ ПОКРЫТИЙ НА ОСНОВЕ ПОЛИСТИРОЛА ПУТЕМ МОДИФИЦИРОВАНИЯ ИНГИБИТОРАМИ КОРРОЗИИ

Майя Жданова, Сергей Жданов

Аннотация. В работе отмечены основные требования, предъявляемые к ингибиторам, предназначенным для введения в лакокрасочные покрытия. Ингибиторы, вводимые в лакокрасочные материалы, разделены группы. Приведены результаты испытаний по исследованию влияния различных ингибиторов и ПАВ на стационарные потенциалы и плотность пассивирующего тока композиции.

Ключевые слова: ингибитор, поверхностноактивные вещества, пассивирование, лакокрасочные покрытия, полистирол.

THE REFINING OF ROLLS METAL OF NON-METALLIC INCLUSIONS DURING CENTRIFUGAL CASTING

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Summary. The paper is dedicated to working rolls for hot rolling of metals. The process of non-metallic inclusions motion in melt during centrifugal casting of massive founding has been studied. It has been showed that such method reduces pollution along the entire depth of rolls' working layer. It has been established that particles are characterized by lesser size in centrifugal casted products.

Key words: centrifugal casting, non-metallic inclusions, refining, roll, pollution, working layer

INTRODUCTION

Rolls are principal working tool in rolling production. They determine works of mill's system, quality and preset sort of output, exit of suitable products and consumption of materials. That is why the rolls must be characterized by high durability to wear, sigh-variable thermal, impact loadings, operating of bending and torsional moments [Zhizhkina, 2010].

The analysis of conditions of rolls' exploitation in sheet mills of hot rolling [Budagyants, Karssky 1983; Budagyants, Zhizhkina, Sirota, Kondratenko, Saushkin 2000; Budagyants, Zhizhkina, 2003] is showed that their purpose establish level of properties. In sheet mills of hot rolling, where there are two groups of stands roughing and finishing ones, the rolls are in completely different conditions of exploitation. Roughing stands are characterized by significant loadings at reducing and by high temperature. Their action cause crumbling and formation of grid of heat on barrel surface of rolls.

In first finishing stands a grid of cracks and following crumbling of particles form in working layer of rolls as a result of action of cooling medium, high temperature and intensive wear. The cooled sheet comes into the last (planishing) stands of finishing group. There working rolls are subjected mainly to mechanical loadings.

That is why rolls material is chosen according to exploitations' conditions. The changing of properties along depth of rolling tool has great importance for operating. There are three methods of rationalization of material of rolling tool: optimization of

existing compositions; using of supplementary alloying and modification; application of new rolls' types [Budagyants, Zhizhkina, 2002; Budagyants, Zhizhkina, Kondratenko, Dyachenko, 2003; Budagyants, Zhizhkina, 2003; Zhizhkina, Budagyants, Gutko, 2008; Zhizhkina, Kostin, 2009].

OBJEKT OF RESEARCH

Rolls casting has sufficiently simple configuration. The difficulty of process of its making is simultaneous ensuring of necessary level of properties of different part of massive casting – working layer and core. The rolling tool of such quality is made by formation massive casting of two or more multi component alloys. They distinguished by their physical and technological characteristics [Budagyants, Karssky 1983; Budagyants, Zhizhkina, Sirota, Kondratenko, Saushkin 2000; Pilipenko 2010; Ryabicheva, Tsirkin, Usatyuk 2010; Zhizhkina 2002]. The development of centrifugal casting technology made possible to use of new high-hard and high-wear-resistant materials for working layer and to ensure necessary strength of rolls' core [Zhizhkina 2002; Budagyants, Zhizhkina, Kondratenko, 2004; Budagyants, Zhizhkina, Gutko, 2009; Budagyants, Zhizhkina, Gutko, 2010].

It is known [Budagyants, Karssky 1983; Skoblo, Voronov, Rudyuk 1994] that process of layer formation of rolls casting of different compound alloyed melts consist of enough large quantity of technological stages. As a result non-metallic inclusions are observed in rolls metal. Exogen particle are carried by mechanical mode from charges materials, various alloyed and modified additives, during contact with casting form, fire-clay surfaces of melting furnaces, ladles and other elements of equipment.

Endogen particles are formed as a result of compound physical and chemical processes that have take place in rolls melt during its melting, crystallization and interaction with atmosphere. Non-metallic inclusions contribute to forming undesirable cavities and defects in body of casting, irregularity of structure and stressed state of roll. It increases considerable level of exploitations properties of rolls [Bogomolova, 1978; Ivanko, 2007; Budagyants, Zhizhkina, Gutko, 2007].

Various methods on prevention of non-metallic inclusions' forming and refining rolls melt had been developed on a base of study of their forming processes [Budagyants, Karssky 1983; Skoblo, Voronov, Rudyuk 1994]. They are: control of quality of preparation of melting equipment, casting tooling and starting materials, thorough thermal treatment of charge, duplex-process during melting, hydrodynamic action on hot metal, vacuum treatment, blowing of gases, refining and other.

Besides, the hot metal refining of non-metallic inclusions is possible on stage of casting of rolls form.

ANALYSIS OF PUBLICATIONS IN RELATION TO RESEARCH OBJECT

It is known [Yudin, Rozenfeld, Levin 1962; Ivanko 2007] that during stationary casting of rolls non-metallic inclusions are characterized by lesser specific gravity in

comparison with liquid metal and come to head of ingot under effect of hydrodynamic and gravitational forces. However such coercion is inadequate for removal from melt endogen micro particles that were formed before beginning of crystallization.

Massive rolls with working layer of high-alloyed alloys are casted on centrifugal machines with vertical axle of rotation [Balakleets, Filipov 2007]. Such casting process contributes to foundation of more favourable conditions for reduction of non-metallic inclusions' quantity in compound-alloyed melt. Hydrostatic and hydrodynamic effects arise under influence of forces of rotation. They contribute to changing of trajectory of non-metallic inclusions' motion. Such effects increase force that pushes out particle from melt. As a result speed of non-metallic inclusions' motion increases. Exogen inclusions and endogen micro particles are raised to head of casting that is taken out during mechanical treatment of item [Yudin, Rozenfeld, Levin 1962; Ivanko 2007].

Thus study of process of non-metallic inclusions' motion in multicomponent melt during formation of working layer at conditions of centrifugal casting of massive rolls is of great interest.

The aim – to study influence of centrifugal casting method on reduction of non-metallic inclusions' pollution of working layers material of rolls.

To reach this aim the following problems should be solved:

to develop mathematical model of non-metallic inclusions' motion in compound alloyed melt that rotate under the action of centrifugal forces;

to research influence centrifugal method on reduction of non-metallic inclusions' pollution of working layer of rolls.

RESULTS OF RESEARCHES

The assumptions were accepted for receipt of mathematical model of micro particles' motion in rotating flux of melt:

form and liquid metal find at relative rest. Angular speed (ω) are equal in all points of space;

speeds of all metals particles and non-metallic inclusions «instantly» reach value of speed of forms rotation;

effective coefficient of thermal conductivity discount convection's fluxes in liquid metal;

force of gravity of particle is infinitesimal in comparison with centrifugal forces of rotation of system «metal-form». That is why it is not discount;

all non-metallic inclusions have form of ball.

According to accepted assumptions the process of liquid metal motion around vertical axle is circumscribed by known equation of paraboloid of rotation [Yudin, Rozenfeld, Levin 1962]:

$$z = \frac{2\pi^2 n^2 R^2}{g} + z_0, \tag{1}$$

where: z – running coordinates of paraboloid of rotation, m; n – frequency of casting form rotation, 1/s; $g=9,81m/s^2$ – acceleration of gravity; R – radius of metals rotation, m; z_0 – center of paraboloid of rotation, m.

During stationary casting state and motion of particle in liquid metal will depend on two forces – gravity and ejection.

During centrifugal casting law of Archimedes for rotating particle and metal will take the form (2):

$$F_{R_c} = F_{c_{part}} - F_{c_m},$$
(2)

where: F_{R_c} – centrifugal force of action on particle that is imbed in metal, N; $F_{c_{part}}$ – centrifugal force of particle, N; F_{c_m} - centrifugal force of action on volume metal that is eject by particle.

$F_{c_{part}}$ is determined at formula (3):

$$F_{c_{part}} = V_{part} \cdot \rho_{part} \cdot \omega^2 \cdot R,$$
(3)

where: V_{part} – volume of researched particle, m^3; ρ_{part} – density of particle, kg/m^3; ω - angular speed of rotation of casting form, 1/s.

F_{c_m} is determined at formula (4):

$$F_{c_m} = V_{part} \cdot \rho_m \cdot \omega^2 \cdot R,$$
(4)

where: ρ_m – density of liquid metal, kg/m^3.

Consequently:

$$F_{R_c} = \frac{\pi d_{part}^3}{6} \cdot \omega^2 \cdot R \cdot (\rho_{part} - \rho_m),$$
(5)

where: d_{part} – diameter of particle, m.

However force of liquid mediums resistance (F_{resist}) prevent motion of inclusions to free surface of metal. Such force is function of speed of rising, of form and sizes' motive inclusion and character of flux that form as a result of interaction of particle and liquid metal.

According to formula Stocks force of resistance :

$$F_{resist} = 3 \cdot \pi \cdot \eta \cdot d_{part} \cdot v_{max},$$
(6)

where: η – coefficient of internal friction or viscosity of liquid melt, kg/(ms); v_{max} - maximal speed of particles' motion that is necessary to their rising.

According to formulas (2), (5), (6) model of description of non-metallic inclusions' motion in rotating liquid will take the form:

$$\frac{\pi d_{part}^3}{6} \cdot \omega^2 \cdot R \cdot (\rho_{part} - \rho_m) - 3 \cdot \pi \cdot \eta \cdot d_{part} \cdot v_{max} = 0 \ .$$
(7)

The samples were taken from centrifugal and stationary casted rolls of the same type and size for estimation of metals pollution of non-metallic inclusions. The melt for they had been prepared in the same melting unit. According to methodic of linear calculation of inclusions [Bogomolova, 1978] grinding samples are researched. Non-metallic inclusions with size up to 45 mkm are taken into account. At analyzed interval quantity and total length of inclusions were determined (table 1).

Table 1. **Results of linear calculation of inclusions in working layers metal on surface of researched rolls**

Group of inclusions	Mean value of inclusions' sizes at division of ocular scale a_i	Centrifugal casted		Stationary casted	
		quantity m_i	$a_i \times m_i$	quantity m_i	$a_i \times m_i$
1	1,00	10	10,00	42	42,00
2	3,05	5	15,25	32	97,60
3	5,05	6	30,30	17	85,85
4	7,05	2	14,10	6	42,30
5	9,05	—	—	1	9,05
6	11,05	—	—	—	—
7	13,05	—	—	—	—
8	15,05	—	—	—	—
9	17,05	—	—	—	—
Total		23	69,65	98	276,8

Pollution of metal U was determined at formula (8):

$$U = \frac{\sigma \cdot a_i \cdot m_i}{L},\qquad(8)$$

where: $\sigma = 3\ mkm$ – value of division of ocular scale; a_i - mean value of size of researched particle at division of ocular scale; m_i - quantity of inclusions; $L = 136500\ mkm$ - total length of calculation.

On the base of results of inclusions' dimensions (table 1) pollution amounted for stationary casted roll - $U_{stat} = 0,000608$, for centrifugal casted one - $U_{centr} = 0,000153$.

Thus centrifugal method of casting contributes to reduction of pollution of rolls metal at 3,97. It has been established that mean size of inclusions reach 27,15 mkm for stationary casted ingots and 21,15 mkm – for centrifugal casted rolls.

The change of quantity and sizes of non-metallic inclusions were analyzed along depth of working layer of stationary and centrifugal casted items. Quantity and sizes of particles were estimated on depth 25 mm from surface of rolls. The researchers are carried out according to methodic [Bogomolova, 1978].

Quantity and total length of inclusions were determined at analyzed interval (table 2).

On the base of results table 2 pollution of metal U was determined to formula (8). As a result table 1 and table 2 the change of metal pollution was estimated along depth of compared samples (table 3).

Table 3 is showed that centrifugal forces reduce pollution of working layer metal on surface at 3,97 and on depth 25 mm – 4,48. During centrifugal casting index of pollution increase along depth of working layer on 24,8 %. During stationary method – 40,3 %. Centrifugal casted roll has more small particles according to stationary casted ingot. Their distinction on surface of analyzed samples amount to 22 % and 30,65 % on depth 25 mm. On increase of depth maximum of mean sizes of inclusions grow in centrifugal casted rolls on 28,4 % and in stationary casted ingots – 44,2 %.

Table 2. **Results of linear calculation of inclusions in working layers metal on depth 25 mm of researched rolls**

Group of inclusions	Mean value of inclusions' sizes at division of ocular scale a_i	Centrifugal casted		Stationary casted	
		quantity m_i	$a_i \times m_i$	quantity m_i	$a_i \times m_i$
1	1,00	11	11,00	45	45,00
2	3,05	6	18,30	33	100,65
3	5,05	4	20,20	13	65,65
4	7,05	4	28,20	8	56,40
5	9,05	1	9,05	8	72,40
6	11,05	—	—	2	22,10
7	13,05	—	—	2	26,10
8	15,05	—	—	—	—
9	17,05	—	—	—	—
Total		26	86,75	111	388,3

Table 3. **The change of indexes of pollution of working layers metal along depth of researched samples**

Index	Casting method	Depth of sample h, mm		
		0	25	the change of indexes along depth, %
Pollution of metal U	stationary	0,000608	0,000853	40,3
	centrifugal	0,000153	0,000191	24,8
	coefficient of refining $$n = \frac{U_{stat}}{U_{centr}}$$	3,97	4,48	
Maximum of mean size of inclusions a_m, mkm	stationary	27,15	39,15	44,2
	centrifugal	21,15	27,15	28,4
	coefficient of reduction $$n_1 = \frac{a_{m.stat.} - a_{m.cent.}}{a_{m.stat.}} \times 100 , \%$$	22,1	30,65	

CONCLUSIONS

Inevitably the process of casting of massive of rolls is accompanied by formation of non-metallic inclusions. They reduce quality of rolling tool and metal product. It has been received that such particles will able insert by starting materials or form as a result physical and chemical processes of melting and crystallization of rolls. On the base of study of process of such particles' formation methods on refining of melts are developed. Centrifugal method of casting contributes to reduction of working layers metals pollution by non-metallic inclusions.

It has been showed that massive rolls with working layer of high alloyed alloys are casted on centrifugal machines with vertical axle of rotation. The process of non-metallic inclusions' motion in rotating flux of liquid metal has been studied. It has been established that relative trajectory of particles' rising from working layers metal will curve.

The researches of centrifugal forces' influence on compound alloyed melts refining from non-metallic inclusions were showed reduction of pollution of pollution of such rolls along the entire depth of working layer. Particles in samples of centrifugal casted rolls are characterized by lesser size in comparison with stationary casted ones.

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ОЧИЩЕНИЕ ВАЛКОВОГО МЕТАЛЛА ОТ НЕМЕТАЛЛИЧЕСКИХ ВКЛЮЧЕНИЙ ПРИ ЦЕНТРОБЕЖНОМ ЛИТЬЕ

Наталья Жижкина, Николай Будагьянц, Юрий Гутько

Резюме. Статья посвящена рабочим валкам для горячей прокатки. Изучен процесс движения неметаллических включений в расплаве при центробежном литье массивных отливок. Показано, что такой метод способствует снижению загрязненности по всей глубине рабочего слоя валков. Установлено, что в центробежнолитых изделиях частицы характеризуются меньшим размером.

Ключевые слова: валок, загрязненность, неметаллические включения, очищение, рабочий слой, центробежное литье.

ANALOGUE COMPLEXING ALGORITHM'S USAGE
IN DATA MINING

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Summary. This paper presents the basic analogue complexing inductive method fundamentals which are not well documented in literature. Classical analogue complexing GMDH algorithm is illustrated on the basis of Fibonacci numbers, geometric series and short-range meteorological prognosis.

Key words: analogue complexing, GMDH, prognosis, Fibonacci numbers, geometric series, meteorology.

INTRODUCTION

Presently, the conception of analogue application is one of the most effective approaches in sophisticated task solutions with the general data' absence, fuzzy and incompleteness of information about the subject of inquiry [1-15]. Such tasks are in marketing [2], hydro- and agrometeorology [3-6] for example. Now the wide range of data mining' methods are applied, e.g.: maximum likelyhood, multivariate brownian bridge, linear interpolation, etc. Every approach has its advantages and disadvantages, isn't dominated in other words. Hence, extensification of the data mining' methods set is a topical scientific task. The main goal of this investigation is formulation and approbation of analogue conception for the missing data' repairing.

GENERAL INTRODUCTION TO ANALOGUE USAGE
IN TASK SOLUTIONS

Task solution' entity with analogue usage consists of application of decision S_1 of problem R_1 to the problem R_2 which has affinity relation with R_1.

Let denote the affinity relation as φ. Then analogue principle can be shown as follows. Let:

$$\beta_1, \beta_2, ..., \beta_n \models \alpha \text{ in } S_1, \tag{1}$$

$$\beta_1 \varphi \beta'_1, \beta_2 \varphi \beta'_2, ..., \beta_n \varphi \beta'_n,$$

where: $\beta_1, \beta_2, ..., \beta_n, \beta'_1, \beta'_2, ..., \beta'_n, \alpha$ are some facts and $\vdash$ is a sign of implication.

From these expressions we are obtaining: $\beta'_1, \beta'_2, ..., \beta'_n \vdash \alpha'$ в S'_1.

Fact α' was obtained according to the analogue principle, it can't be developed directly in S'_1.

For subsequent text we will introduce some definitions.

The term without variables we will define as atom. Minimal model S_i is set of atoms M_i. M_i is developed from S_i through logical rules:

$$M_i = \{ \alpha \mid S_i \vdash \alpha \}. \tag{2}$$

Affinity relation between S_1 and S_2 is defined as Cartesian product:

$$\varphi \subseteq M_1 \mathrm{x} M_2. \tag{3}$$

For S_1 and S_2 partial equivalence the axioms must be developed:

$$X_1 \varphi Y_1, ..., X_n \varphi Y_n \rightarrow f(X_1,...,X_n) \leftrightarrow f(Y_1,...,Y_n);$$

$$X \varphi Z, Z \varphi Y \rightarrow Y \varphi X \text{ (in } S_1); \tag{4}$$

$$Z \varphi X, Y \varphi X \rightarrow Y \varphi Z \text{ (in } S_2).$$

This axiom' set has difficulties in realisation through several affinity relations between S_1 and S_2.

φ and φ' are incompatible if they determine non-existent analogues.

ANALOGUE COMPLEXING GMDH ALGORITHM

The analogue complexing GMDH algorithm description is based on paper [2].
The main conditions are:
1. Investigated object can be described by multidimensional process.
2. Multidimensional process is sufficiently representative.
3. Part of previous behaviour of system in past can be repeated in future.

In multidimensional space each object has own coordinate – point A_0. The point A_1 nearest to each given output point A_0 is called as its first analog. The next after distance point A_2 is called second analog, etc. The point, which follows the first analog in time, A_{1F} is called as first analogs forecast. The point, which follows the second analog in time A_{2F}, is called the second analogs forecast, etc. Points A_{iF} which are located after analogues A_i in time are called as their predictions. Forecast is calculated by complexing of optimal number of analogs forecasts.

Distance between points in Euclidean space we will define as:

$$L_i = \sum_{k=1}^{P} \sqrt{\sum_{j=1}^{M} \left(x_{ijk} - x_{ajk} \right)^2}, \tag{5}$$

where: x_{ijk} – value of variable j in analyzed point i of observation k,

$j = \overline{1, M}, i = \overline{1, N}, k = \overline{1, P}$; x_{ajk} – value of variable j in analogue in analyzed point a of observation k; P – number of observations; M – number of investigated variables; N – number of analogues.

As closest analogue is used point i with minimal value L_i.

Let descript analogue complexing GMDH algorithm on the prediction task example. During rigid complexing of F predictions by analogues, the prediction A_{0F} is defined using weights λ_i of analogues complexing:

$$A_{oF} = \beta \sum_{i=1}^{N} \frac{1}{\lambda_i} A_{iF} \; ; \tag{6}$$

$$\lambda_i = \frac{L_i}{\sum_{k=1}^{N} L_k}, i = \overline{1, N}; \sum_{i=1}^{N} \lambda_i = 1, \tag{7}$$

where: F – number of predictions; β – multiplier for output variable scale accounting (in GMDH case of weights λ_i calculation the multiplier β usually equals 1); L_i – Euclidean distance between A_{0F} and A_{iF}.

During soft complexing of predictions by analogues the weights coefficients λ_i are defined by described rigid formulae (7) and then are adopted by sorting of their discrete values by inductive algorithm.

The long-term forecasting general problem of the parameters inductive algorithm optimization can be solved in two one-dimensional (on set of input variables X and coefficients λ_i) and one two-dimensional sorting (on number of predictions F and number of observations P).

The GMDH procedure for investigated variables can be following. If define as M number of investigated variables, then at first sorting is done with M samples. Then (M-1) sets of all variables pairs with variable selected at the previous step are used for analogues search. Then tested (M-2) sets which include best variables from previous layers, etc.

Analogue complexing algorithm with distance calculation in Euclidean space includes two main steps:

1. Euclidean distance L_i calculation.

2. Multiplier β calculation.

Computer code was realized in C++Builder 6 (form includes one Memo and one Button objects).

As we can see the computer code uses external data file 'data.txt' (example is shown on figure 1). This external file is located in a folder with executed file. Let consider three examples – calculation of Fibonacci numbers, geometric series and short-term forecasting (for meteorology). These three cases represent additive, multiplicative and additive-multiplicative disturbances accordingly. For Fibonacci numbers simple task the data have following view (table 1; P=8, M=2, N=4).
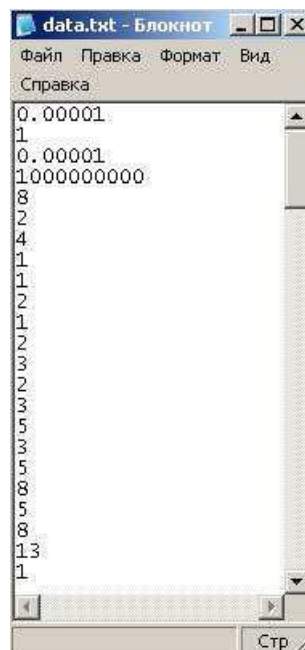
Fig. 1. Fragment of file 'data.txt' for Fibonacci numbers example

Software' screenshot for Fibonacci numbers example is shown on figure 2. As we can see the decision variable (55.0079751092222) nearly equals to exact value 55. The same results we are obtaining at other P values.
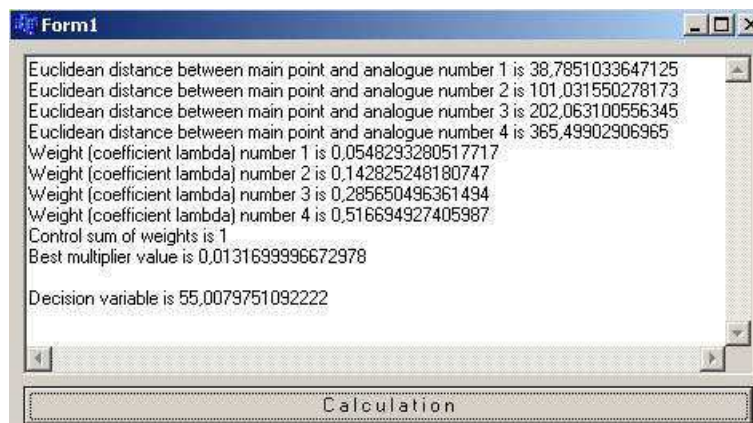
Fig. 2. Software' screenshot for Fibonacci numbers example

Table 1. **Data for Fibonacci numbers simple task**

Example	Variables and outputs	Target object	Analogue 1	Analogue 2	Analogue 3	Analogue 4
1	Variable 1	1	1	2	3	5
	Variable 2	1	2	3	5	18
	Output	2	3	5	8	13
2	Variable 1	1	2	3	5	8
	Variable 2	2	3	5	18	13
	Output	3	5	8	13	21
3	Variable 1	2	3	5	8	13
	Variable 2	3	5	18	13	21
	Output	5	8	13	21	34
4	Variable 1	3	5	8	13	21
	Variable 2	5	18	13	21	34
	Output	8	13	21	34	55
5	Variable 1	5	8	13	21	34
	Variable 2	18	13	21	34	55
	Output	13	21	34	55	89
6	Variable 1	8	13	21	34	55
	Variable 2	13	21	34	55	89
	Output	21	34	55	89	144
7	Variable 1	13	21	34	55	89
	Variable 2	21	34	55	89	144
	Output	34	55	89	144	233
8	Variable 1	21	34	55	89	144
	Variable 2	34	55	89	144	233
	Output	Unknown element	89	144	233	377

Software' screenshot for geometric series example is shown on figure 3 (P=5, M=2, N=3). As we can see the decision variable (110.150817217356) equals to exact value 120. Significant error in geometric series example is explained by intricate multiplicative arguments.
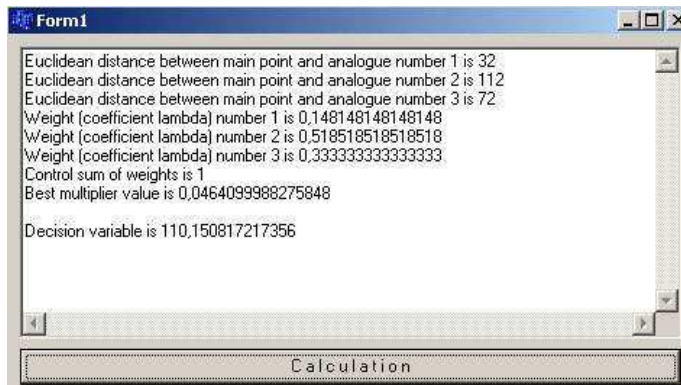
Fig. 3. Software' screenshot for geometric series example

As we can see from geometric series example the analogue complexing method can be used in forecasting process. Let consider the meteorological forecasting example (data represented in a table 2; *P*=6, *M*=4, *N*=4; variable 4 – discrete time; variables 1, 2, 3 and output present average air temperature at indicated date, ^{0}C).

Table 2. **Data for meteorological forecasting example**

Example	Variables and outputs	Target object (city Vinnitsa, Ukraine)	Analogue 1 (city Kiev, Ukraine)	Analogue 2 (city Lugansk, Ukraine)	Analogue 3 (city Kherson, Ukraine)	Analogue 4 (city Chernigov, Ukraine)
1	Variable 1 (December 1, 2008)	6.0	4.2	1.8	7.5	3.5
	Variable 2 (December 2, 2008)	7.0	7.2	4.3	8.9	6.5
	Variable 3 (December 3, 2008)	5.5	7	5.5	9.3	6.3
	Variable 4	1	1	1	1	1
	Output (December 4, 2008)	9.4	10	6.1	9.1	9.2
2	Variable 1 (December 2, 2008)	7.0	7.2	4.3	8.9	6.5
	Variable 2 (December 3, 2008)	5.5	7	5.5	9.3	6.3
	Variable 3 (December 4, 2008)	9.4	10	6.1	9.1	9.2
	Variable 4	2	2	2	2	2
	Output (December 5, 2008)	10.3	9.7	5.7	11.7	9.4
3	Variable 1 (December 3, 2008)	5.5	7	5.5	9.3	6.3
	Variable 2 (December 4, 2008)	9.4	10	6.1	9.1	9.2
	Variable 3 (December 5, 2008)	10.3	9.7	5.7	11.7	9.4
	Variable 4	3	3	3	3	3
	Output (December 6, 2008)	6.9	7.1	8.5	11.0	5.6
4	Variable 1 (December 4, 2008)	9.4	10	6.1	9.1	9.2
	Variable 2 (December 5, 2008)	10.3	9.7	5.7	11.7	9.4
	Variable 3 (December 6, 2008)	6.9	7.1	8.5	11.0	5.6
	Variable 4	4	4	4	4	4
	Output (December 7, 2008)	4.3	5.7	7.4	10.5	5.7
5	Variable 1 (December 5, 2008)	10.3	9.7	5.7	11.7	9.4

	Variable 2 (December 6, 2008)	6.9	7.1	8.5	11.0	5.6
	Variable 3 (December 7, 2008)	4.3	5.7	7.4	10.5	5.7
	Variable 4	5	5	5	5	5
	Output (December 8, 2008)	1.2	1.1	7.4	6.7	1.2
6	Variable 1 (December 6, 2008)	6.9	7.1	8.5	11.0	5.6
	Variable 2 (December 7, 2008)	4.3	5.7	7.4	10.5	5.7
	Variable 3 (December 8, 2008)	1.2	1.1	7.4	6.7	1.2
	Variable 4	6	6	6	6	6
	Output (December 9, 2008)	Unknown element	-1.6	4	1.2	-2.2

Software' screenshot for meteorological forecasting example is shown on fig. 4. As we can see the decision (forecasting) variable (-0.775333501597657) nearly equals to exact value -0.7.

The forecasting question is complicated generally. Practice decision is based on step-by-step approach frequently. For above meteorological example we can accept forecasting value (-0.775333501597657) at December 9, 2008 in Vinnitsa city as real value and then predict new forecasting value (table 3). For this prolongation $P=7$, $M=4$, $N=4$. Software' screenshot for meteorological forecasting example prolongation is shown on figure 5. As we can see the decision (forecasting) variable (-0.384966634188361) nearly equals to exact value 1.0 (according to Ukraine hydro meteorological centre estimation rules we obtained 100 % quality of forecasting in these two last examples).
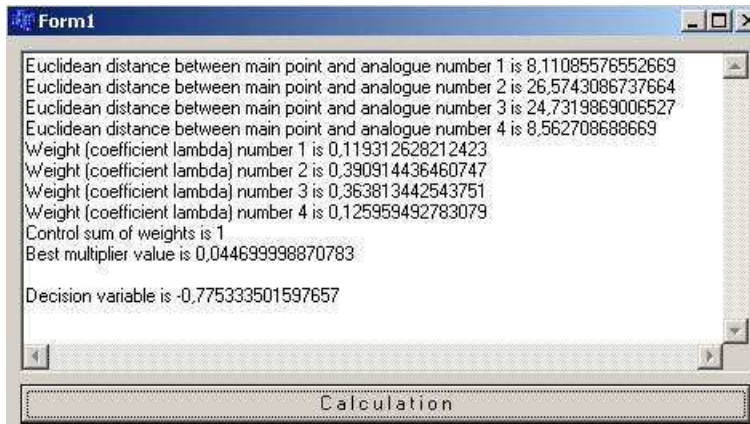
Fig. 4. Software' screenshot for meteorological forecasting example

Table 3. **Prolongation of meteorological forecasting example**

| Example	Variables and outputs	Target object (city Vinnitsa, Ukraine)	Analogue 1 (city Kiev, Ukraine)	Analogue 2 (city Lugansk, Ukraine)	Analogue 3 (city Kherson, Ukraine)	Analogue 4 (city Chernigov, Ukraine)
6	Variable 1 (December 6, 2008)	6.9	7.1	8.5	11.0	5.6
	Variable 2 (December 7, 2008)	4.3	5.7	7.4	10.5	5.7
	Variable 3 (December 8, 2008)	1.2	1.1	7.4	6.7	1.2
	Variable 4	6	6	6	6	6
	Output (December 9, 2008)	-0.775333501597657	-1.6	4	1.2	-2.2
7	Variable 1 (December 7, 2008)	4.3	5.7	7.4	10.5	5.7
	Variable 2 (December 8, 2008)	1.2	1.1	7.4	6.7	1.2
	Variable 3 (December 9, 2008)	-0.775333501597657	-1.6	4	1.2	-2.2
	Variable 4	7	7	7	7	7
	Output (December 10, 2008)	Unknown element	0.1	1.1	2.5	-2.3
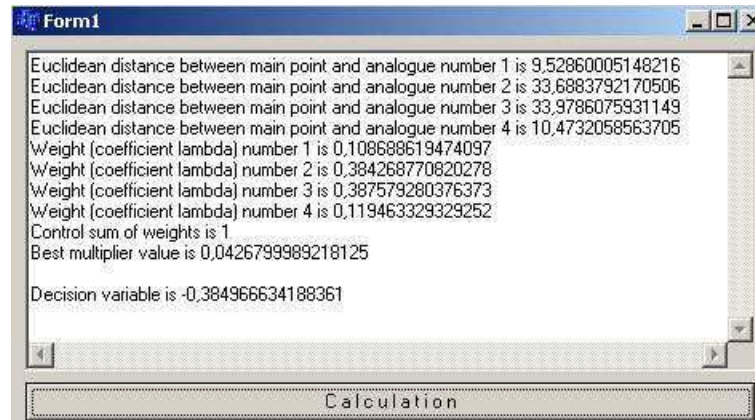
Fig. 5. Software' screenshot for meteorological forecasting example prolongation

The (5)-(7) analogues complexing algorithm we can meet on practice frequently – for example increasing/decreasing time series forecasting.

CONCLUSIONS

This paper presents the basic analogue complexing inductive method fundamentals which are not well documented in literature. Classical analogue complexing GMDH algorithm is illustrated on the basis of Fibonacci numbers, geometric series and short-range meteorological prognosis.

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ИСПОЛЬЗОВАНИЕ АЛГОРИТМА КОМПЛЕКСИРОВАНИЯ АНАЛОГОВ В DATA MINING

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Аннотация. Рассмотрен вопрос использования метода комплексирования аналогов в Data Mining, который в настоящее время недостаточно полно освещен в отечественной и зарубежной литературе. Приведены примеры вычисления неизвестных значений чисел Фибоначчи, геометрической прогрессии и краткосрочного прогноза температуры воздуха, которые соответственно отражают аддитивное, мультипликативное и аддитивно-мультипликативное взаимодействие аргументов. Анализ полученных результатов показывает достаточную адекватность вычисленных и фактических значений.

Ключевые слова: комплексирование аналогов, МГУА, прогноз, числа Фибоначчи, геометрическая прогрессия, метеорология.

MODELING OF PENSION SYSTEMS EVOLUTION

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Summary. The model of the stages of the pension evolution is based on the historical economical analysis of the evolution of the national pension systems of the developed countries. The realization of the model for the description of the pension systems evolution in Ukraine is presented here. The model of the pension reforms in the three-dimensional coordinate system is developed: degree of allocating funds, degree of government participation and degree of actuarial fairness. The vectors of reforms in the countries with the transitional economics are determined.

Key words: pension system, evolution, model, reform.

INTRODUCTION

According to the internal market and taxation commissar of the European Union Frits Bolkestein, present-day Europe deals with "the delayed action pension bomb" [Thatcher 2003]. The mass demonstrations against the pension reforms in France and Greece in 2010 became the confirmation of these words. In Ukraine the pension reforms are declared, though they are still restrained at the government level, as a politically non-popular measure. Nevertheless, the pension crisis caused by both the phenomenon of "population aging" and "institutional aging" of the national distributional pension systems forces to take some urgent measures. At that, it seems there are no painless ways out of the pension deadlock. This requires the knowledge of common laws and the stages of the pension systems evolution as well as the general ways of their development. The understanding which stage the pension system is on will allow to take timely strategical decisions in the sphere of pension reforming. The problems of the pension systems development are considered in [Banks and Emmerson 2000, Barnes and oth. 2008, Chawla and oth. 2007, Disney and Whitehouse 1999, Gaidar 2003, Holzmann and Hinz 2005, Mayhew 2001, OECD 2009, Piggott 2007, Roik 2008, Whitehouse 2007]. But the formal, model side of the evolution, and it is only it that can serve the basis for forecasting and selecting the best variants of the development, are avoided by the researchers.

RESEARCH OBJECT

The aim of the given paper is to build up the model of the stages of the pension systems evolution as well as the model of pension reforms based on the historical economical analysis of the national pension systems of the High-income OECD Countries and the countries with the transitional economics.

RESULTS OF RESEARCH

The socio-economical nature of pension has a dual character: on the one hand, it is the indemnity for the lost earnings, on the other hand, - it is the assistance to those who are in need. This is presented by two basic models of pension provision: continental (German) model (model of Bismarck), Anglo-Saxon model (model of Beveridge).

Historically, the first government pension system for all working population was created by the German chancellor Otto von Bismarck in 1889. Bismarck created the system of the obligatory pension provision for all working population as a redistributive system which was called Pay as YOU Go – PAYG. It means that pensions for current pensioners are financed by current workers by means of the insurance payments and their redistribution while the government guarantees financing pensions for future pensioners at the expense of future workers. In this way the principle of generation solidarity or the social contract of generations is realized.

The pension systems of the Anglo-Saxon model (now called "model of Beveridge" after the English economist William Henry Beveridge who developed the doctrine of social insurance in 1942) were created in Denmark in 1891 and in New Zealand in 1898. The Anglo-Saxon model is based on the principle that any person, irrespective of his economical activity, has the right for the minimum provision in his old age, and is based on the law of poor people: pensions are paid from the mutual tax income for people in need only.

So for the moment of the pension systems introduction, the right to obtain pension was given to: first, to persons of not younger than 70 years old who paid pension contributions, second, to persons not younger than 70 years old who went through the poverty control.

In the following years, model of Bismarck was introduced in the continental law system countries (except Netherlands) and in Finland, while model of Beveridge – in the countries of the Anglo-Saxon law system, Scandinavian countries (except Finland) and Netherlands. The further evolution of the pension provision, however, is characterized by gradual convergence of these models. Some guarantees of the minimum pension not dependent on the previous contributions are introduced into Bismarck pension insurance models. The neediness control is abolished in the Anglo-Saxon models of government guarantees and in addition to equal minimum pensions the system of obligatory social insurance is introduced.

Economical-historical analysis of the pension systems evolution in the industrially developed countries in the 21st century showed [Yakimova 2009]: the

national pension systems have undergone three waves of pension reforms which have led to the basic models convergence.

The first wave of reforms refers to 50s - 60s of the 20th century and is caused by the rapid economical growth the post-war economies and the favorable demographical structure with small number of elderly people. So the reforms of the first wave may be characterized by the increase of rights for pension provision as well as the pension models convergence. For example, in Germany the assistance to those in need was introduced, in Great Britain lord Beveridge introduced a three-level type of pension system: the government secures the living minimum for the whole population, the employer – professional earnings of the workers, i.e. compensation of the lost earnings, while the worker himself provides the supplementary pension on a voluntary basis [Mayhew 2001].

The second wave of reforms (early 1970s – late 1980s). Weakened by the energy crisis the economies don't withstand the load of the generous pension systems. Thus, first, the conditions of getting pensions (the increase of pension age, length of service, payments) became more rigid, second, the governments tried to transfer some part if their responsibility for pension provision on the shoulders of the citizens themselves – private accumulating pension schemes.

The third wave of reforms (the end of the 20th and the beginning of the 21st centuries) is caused by the demographical crisis – the number of elderly people increased dramatically. The distributive pension systems which presented themselves in a good light in the young society failed in the elderly one. The further stimulation of private accumulating pension provision, the increase of pension age and insurance length of payments are observed.

But no measures taken by the governments in the period of the third wave of reforms solve the problem. The demographical structure of the post-industrial society is irreversibly changing – the load of the pension system on the economics is growing. The problem is aggravated by the economic crisis of 2008. So the reforms directed to the reduction of the government pension expenditures take new turns, and it obviously becomes possible to speak about the beginning of the fourth wave of reforms.

Thus, as a result of the evolution of the basic pension models, the national pension systems are transformed, as a rule, into three-pillar: I pillar – mandatory redistributive, II – mandatory funded, III – voluntary funded. The structure of the pension systems, however, the level of government expenditures on pension provision, pension behavior of people – all depend on the basic pension model. In the countries which chose model of Bismarck, the load of pension provision mainly lies on the government. The introduction of private accumulating programs, even stimulated by the government, are coming into practice with much difficulty. For example, Rister-reform in Germany [Guardiancich 2010] (the government stimulates by cash bonuses the voluntary payments in the pension funds of 1-4% annual gross income) does not actually find support among the public oriented towards the government paternalism. As for the government expenditures on pension provision, one can observe the rapid growth in these countries (fig.1), because just solid systems are extremely sensible to demographical risks.
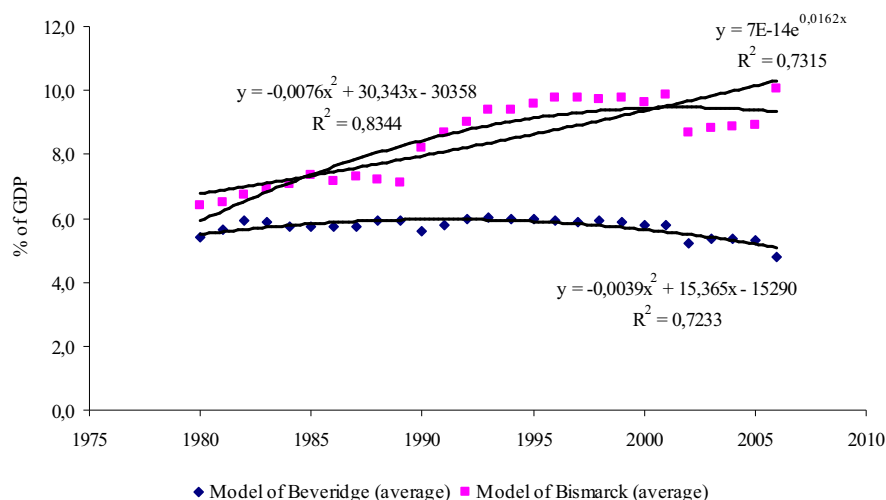
Fig. 1. Public expenditure on pensions*
*Constructed by the author according to [OECD 2009].

So, forecasting the future dynamics of pension systems development, it is reasonable to state that the failure of the idea of the solidarity distributive principle of pension provision in the conditions of decreasing birth-rate, growing length of life and individualization of the post-industrial society is inevitable. The future is with the system where the responsibility for pension provision is diversified between social partners: citizens, employers, government. At this, the government only provides social assistance to those who are in need. The able-bodied people provide their old years through corporative and individual accumulative programs themselves.

Thus, the carried out research makes it possible to determine the evolution of pension systems as the process of its parametric and structural reorganization in time, resulting in the form and structure which are qualitatively different from the previous one. The change of the parameters and structure of the national pension systems is caused by the change of the pension system load on the country's economics, crisis situations (economical, demographical, political), which can have both positive (rise) and negative (recession) sign, being the push towards revolutionary changes. So, it is possible to present the evolution of pension systems as several successive stages of stability and crises between them, i.e. to describe it by the model of the type of evolution stage models [Greiner 1998].

The indicator of a pension system development is not the length of existence, but the burden of the pension system on the national economy. Crisis is the direct predecessor of pension reforms. The evolution stage model, which is the example of the German pension system, is given in fig.2.
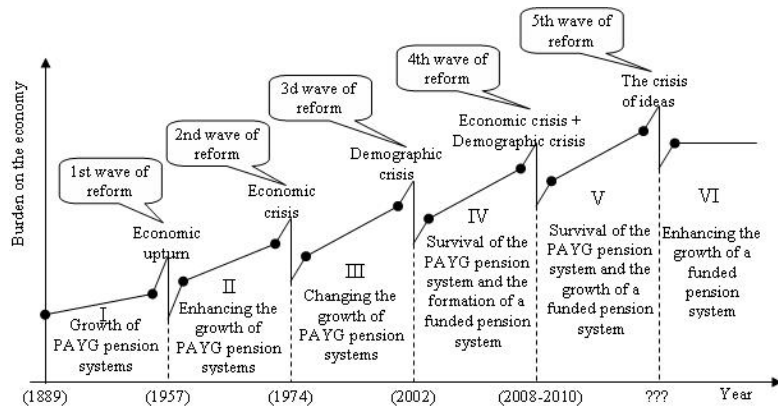
Fig. 2. Evolutionary model of the stages of pension systems (for example Germany)

It should be noted that, unlike the models of life cycle, in the stage models the system doesn't always go through all the stages and different successions of passing through the stages are possible. This thesis may be confirmed by the evolution of the pension systems of the former socialist countries – countries with the transitional economics. For example, the pension system of Ukraine evolved from the government official one at the beginning of the 18th century to the multi-level system with the non-government distributive level for the whole population at the beginning of the 21st century returning to the centralized distributive type in the period of socialism [Yakimova 2010]. The basic pension model in Ukraine, as well as in other countries with transitional economics, is model of Bismarck. The evolution stages of the pension system of Ukraine are given in fig.3.
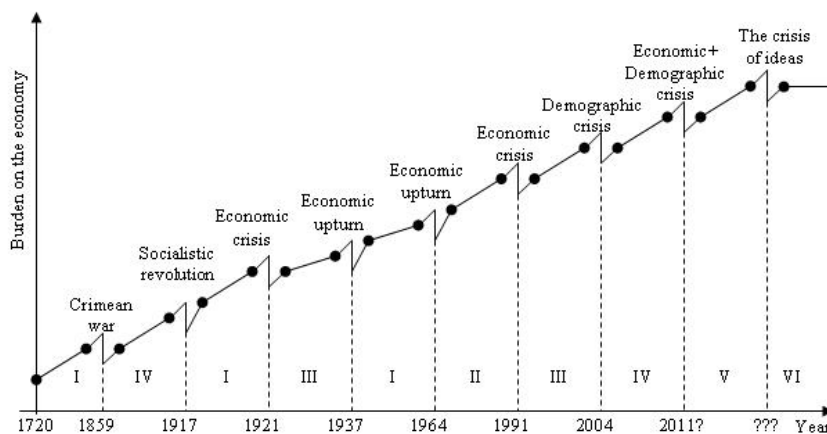
Fig. 3. The evolution stages of the pension system of Ukraine

Thus, pension reforms are the legal mechanism of the evolutionary transition. The analysis of the reforms of the national pension systems [Holzmann and Hinz 2005] allowed: first, to point out two types of pension reforms: parametric and structural (system); second, to point out four types, which can be performed in three possible directions, among the structural reforms: change of the mode of allocating funds, the degree of the government participation and actual fairness (table 1).

Table 1. **Classification of pension reforms**

| Parametrical reforms	Structural(system) reforms
a) reforms aiming at changing the parameters of the system (pension age, length of service, method of indexation, etc) but which stay unchanged structure of payment, government control of pension system and its non-allocating (distributive) character.	b) the reform referring to the transition to the conventionally accumulating or point system (actuarially fair) with defined contribution (DC) resulting in the change of pension structure while the government control of the pension system and its non-allocating character stay unchanged.
	c) the market conception of the reform foreseeing totally accumulating system with defined benefit (DB) controlled by the private sector.
	d) the reform foreseeing accumulating government financing of the models DC and DB within the government control.
	e) the multicomponent reform, foreseeing diversification of pension structure, pension system control and the order of accumulation.

Hence, to formalize the process of pension reforms and to define the place of the national pension system in this process, the area of pension reforms in a three-dimensional system of the corresponding system of coordinates is built up (fig.4). The given model makes it possible to present structural changes of the national pension systems. The example is the evolution of the German pension system (fig.5): 1889 – the creation of the government distributive system, the system is in point B. Till the end of 1950s the pension system remains in point B, since only some parametric reforms are performed in that period. 1957 – plan of Wilfrid Shreiber – the pensions are calculated individually with the account of the insurance length, payments, wages; the actuary fairness of the system is growing and it passes to point B_1. 1974 – the_voluntary professional pension programs are introduced, that is the level of the government participation goes down and the level of the accumulating component in the pension structure increases. The system passes to point B_2. 2002 – reform of Reister – stimulation of private accumulating pension accounts, the further decrease of government participation and the growth of the accumulating component. The system goes to point B_3. 2010 - 2030 – reforms of the fourth wave, the hypothetical transition of the system to point B_4 with the minimum level of the government interfering in the pension provision and the maximum level of allocating funds.
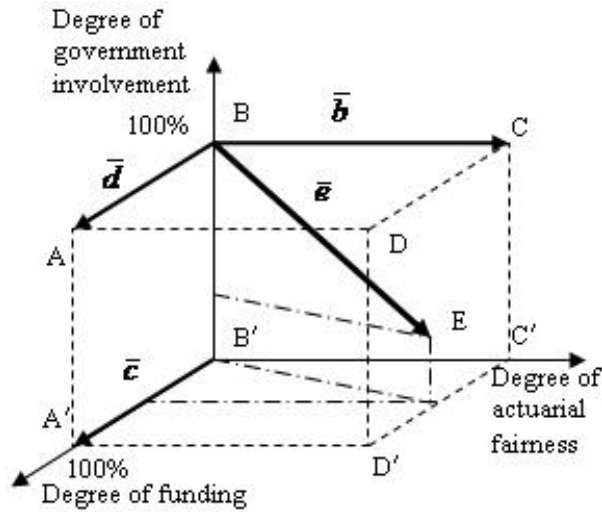
Fig. 4. Space of pension reforms
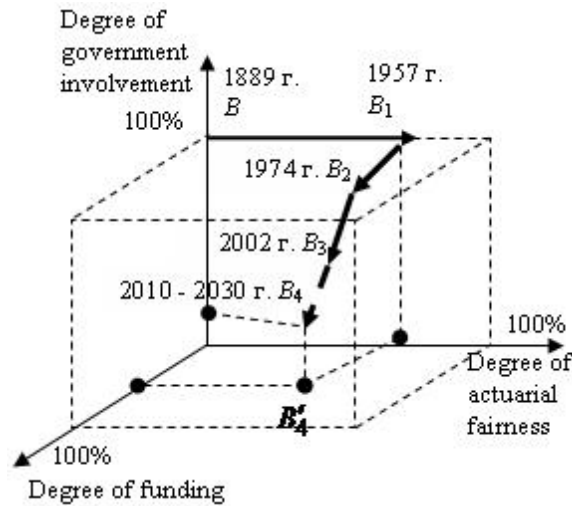
Fig. 5. The evolution of the pension system of Germany

Pension reforms of the countries with the transition economics comprising, according to the World Bank classification [Chawla 2007], 30 countries of Eastern Europe and Central Asia (post socialist countries and Turkey) present particular interest. At the beginning of 1990s all the pension systems were totally government distributive, i.e. they were located in point B. Further reorganizations [Snelbecker 2005, World Bank 2009, Lindeman 2000] turn the pension systems in the direction of certain vectors or, if

they are only parametric reforms, they stay in point B. For 2010 the sphere of reforms for the group of the countries with transition economics looks like that presented in fig.6.
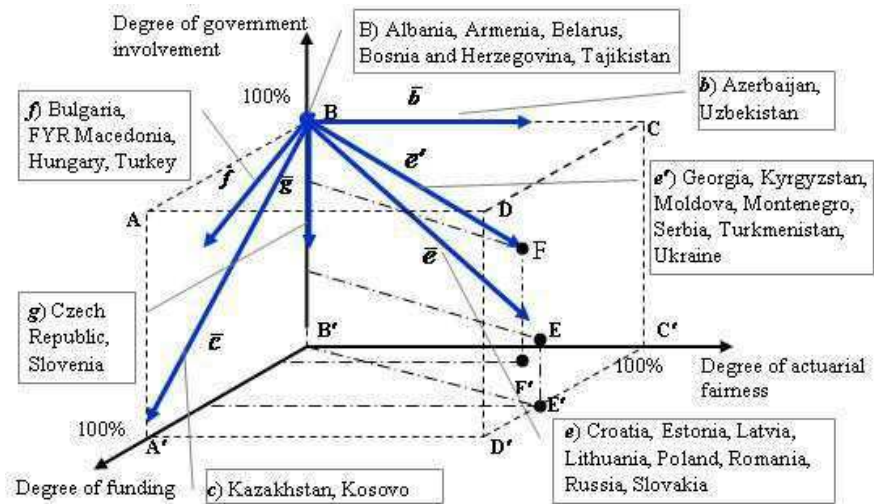
Fig. 6. Vectors of reforms in transition economies

The optimum (according to Pareto) is apparently the transition to some point E of plane CC′D′D – mixed multi-pillar pension system which rationally combines the reorganized government actuarially fair component (I pillar), obligatory government or private ones (II pillar) and voluntary private ones (III pillar) of the accumulation scheme. It also foresees the availability of "zero" pillar which provides the social pension to everyone who needs it. The World Bank recommends its member-countries just this kind of pension system [Holzmann and Hinz 2005].

CONCLUSIONS

Thus, the Ukrainian actuaries are challenged by the following tasks: 1) to find the coordinates of point E, i.e. the parameters of Pareto-optimum national pension system which would be most financionally stable and would satisfy all the categories of population to the most; 2) to determine the optimum trajectories and models of transition from point F to point E, i.e. the parameters of Pareto-improving reforms accounting the experience of the countries which completed the reforms in the direction of vector $\bar{e}$; 3) to simulate the processes of distribution of funded pillars of the pension system based on models of avalanche-like socioeconomic processes proposed in the article [Danich 2010].

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МОДЕЛИРОВАНИЕ ЭВОЛЮЦИИ ПЕНСИОННЫХ СИСТЕМ

Виталий Данич, Лариса Якимова

Аннотация. На основе историко-экономического анализа эволюции национальных пенсионных систем индустриально развитых стран построена модель стадий эволюции пенсионных систем. Рассмотрена реализация модели для описания эволюции пенсионной системы Украины. Построена модель пенсионных реформ в виде пространства реформ в трехмерной системе координат: степень фондирования, степень участия государства и степень актуарной справедливости. Определены векторы реформ стран с переходной экономикой.

Ключевые слова: пенсионная система, эволюция, модель, реформа.

THE PROBLEMS OF ADMINISTRATION
FOR INDUSTRIAL ENTERPRISES

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Summary. The principal approaches to organizing of the administration of industrial enterprises were comsidered; industrial enterprises defined features that affect the administration, offered the basic definition of administrative.

Key words: enterprise, administration, object and subject of administration, administrative influence.

INTRODUCTION

Overall performance of the enterprise often depends not so much on the level of management strategies, the ability to develop competent business plans, how much of the executive discipline and clarity of the implementation of these plans. This determines are important for responsibility centers, which are responsible for the plans, programs and decisions. The content and nature of such centers are the responsibility of the elements of the system of administrative management in the enterprise. It should be noticed that in the practice of Ukrainian enterprises and scientific research conducted, there is not enough attention for theoretical and methodological position, which provide a high level of administrative control. Basically, the system of administrative management in enterprises forms on the basis of empirical evidence of experience of managers and do not always use all available opportunities and potential administration. That's what the relevance of the problem determined in the article.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

The problem that is associated with the organization of administrative control are considered mainly in the context of public administration. In most cases the issues of administrative controls on industrial plants are presented as a helper in the manual on the organization of management companies. There is not enough to have the individual papers devoted to problems of organization of the administration and they are mainly

represented by articles in scientific and journalistic compilations. Among the most significant works where the organization of administrative management in the enterprise is considered, we should mention the work O.V.Raichenko [5], I. Adizes, B.Z. Milner [4], G.V. Latfulina [3].

In general, the issues, which are associated with the account of the features of industrial enterprises in organizing the administration of them haven't been adequately studied and require detailed consideration.

AIM AND RISING OF RESEARCHES TASK

Aim and rising of researches task is to study the guidelines and campaigns, determine the requirements and nature of administrative control in the industry.

BASIC DIVISION WITH RESULTS AND THEIR ANALYSIS

As a rule, industrial enterprises are the key elements for the construction of regional socio-economic systems and solutions to common macroeconomic problems in the state. Except the economic value of their performance it determines high socio-political significance. The performance of large enterprises is the result of many factors, both external internal environment.

Environmental factors are the sphere of public administration in order to create favorable conditions for enterprises of this class based on their socio-political significance. The factors of internal environment are more dependent on the actions and decisions that are adopted and implemented the management of these enterprises [13].

There are the traditions and stereotypes, that the basic conditions necessary to ensure effectiveness and efficiency of the enterprise are the solution in the field of investment, innovation policy development and implementation of marketing strategies. In this case, there are the contradictions between the efforts of the concentration of the intellectual and the material resources for solving problems of this kind of results that actually reach many businesses [11].

For large Ukrainian enterprises the weak link always was the implementation of taken decisions, bring them to completion. This problem existed in the era of administrative economy. This problem exists today.

Analysis of the causes and determinants, determining the lack of effectiveness, in general, correct and informed decisions shows that basically it is due to an insufficient level of organization processes to implement these decisions. Major problems arise in meeting deadlines separate stages of work, strict compliance with the requirements for content and quality of these works, coordination of performers. This situation often arises from the fact that this set of questions has no clearly defined center management, and distributed among multiple decision makers who decide them together with other functional tasks. In this case, the problems of organized activities are not allocated as a priority [7-12; 18-20].

In cases where the enterprises forms a strict system of accountability and the distribution of authority to manage the processes of implementing the taken decisions,

the administrators of these processes highlights, and the results achieved significantly higher and at lower cost.

Many of the problems in the functioning of enterprises are defined so that sufficient account of administrative tasks process of implementing decisions. Issues of administrative controls are relatively new in the construction of control systems and determining the functional content of the work performed. This is due to the fact that quite often the actions of administrator identified with activities mainly in the regulatory regime for emerging failures and problems [1].

Role, value and functions of the administrator in large enterprises are not considered, practically not been studied. This is evidenced by the analysis of enterprise standards, regulations on structural subdivisions, duties and responsibilities of managers and other internal organizational and legal documents. In the scientific sphere, this situation is reflected in the absence of regular publications, it is big enough, both at the level of articles and on the level monographs. Overseas experience suggests just the opposite. For most businesses, especially large ones, a key figure in the control system is an administrator. This is reflected both in staffing patterns, and in the preparation of administrative business processes [2]. Fairly well-known system of MVA, which is aimed at training highly qualified administrators for leadership in business as a whole and individual functional target areas related to management of large objects – administrators in the field of marketing, operations, personnel management, logistics activities, the administration of objects certain types and characteristics. This approach determines the high stability of production and management processes, and their high level of organization.

Implementing a similar approach for major Ukrainian industrial enterprises requires not only changes in attitudes towards the role and significance of the administrator at the level of mentality, but also build a special administrative management system as a subsystem of enterprise management in general [9].

Content of the work and actions of administrator defines the essence of administration, the correct understanding of its facilities and the nature of administrative actions. In the literature there is no consensus regarding these definitions. The semantic and morphological analysis allows offering as an interpretation of these terms, the following provisions.

Administration management, in our opinion, it is set of processes and actions associated with the organization, control and regulation of the conduct of a particular object to its compliance with established regulations, goals and objectives.

Under the subject of the administration is understood the control center, whose functions are executed by individual authorized persons engaged in the administration process as a part of the overall activity, and as a separate activity with respect to a predetermined object or process [8].

Under the object of the administration we should understand the position, management or manufacturing structural unit, a separate business process that have certain properties and characteristics. The task of the administrator is to use fuller the features and the properties of an object that administered by taking into account existing limitations in the current period.

Under the administrative action is understood a set of actions undertaken by the administrator to ensure strict compliance with established regulations and the course of the processes realized in the enterprise [3].

The system of administration now implies the formation of the centers of the administrative responsibility for implementing plans and guidance, and decision in general in all subdivisions and on all types of works and processes being implemented. The system should include centers along with the hierarchy of administrators providing in terms of the information management, the regulatory support, the resource provision.

Another problem is the development of issues related specifically to the informational and regulatory support of administrator's actions. This will determine the characteristics and content of the work and activities that administrator performs at any level. This specificity is following [14-16].

At first, the administrator responds on arising deviations in the implementation of any process or work, so the informational support should go in such mode, that administrator has time to recognize an emerging issue, to prepare and to implement the necessary actions to its removal till the moment of the crisis situation.

If the mode of operational management reacts to emerging crises, in the mode of administration there is necessary to control signals on the brewing crisis situation. This places special demands on the organization of the informational security, the building of communicational network within the administration. These requirements include the following:

systematization of the microscopic processes and actions of the perpetrators, who are the micro objects of the administration;

identification and systematization of the work and the administrator's actions with respect to each of the micro objects ;

definition of the requirements for quality and quantity of the information on each type of works and actions of the administrator;

formation of the necessary informational base in accordance with the requirements of the administrator.

The implementation of this algorithm of action requires special studies, a clear structuring of administrator's actions and behavior of the objects of administration.

This is certainly a very laborious kind of preparatory work, but the results of these studies can be used for enough long period of the time and allows avoiding the excessive information and costs associated with its acquisition, to provide conditions for the most effective actions of the administrator and thus put into practice proactive anti-crisis management. Prevention of the possible losses makes it economically feasible and necessary to conduct this kind of preparatory work only on the prevention of crises [4-5].

The second set of tasks associated with building of the system of administrative management in the enterprise is the task of forming the legal framework of administrator's action. This legal and regulatory framework should be based on delegated of the sufficient authority of administrator in using and maneuvering of all kinds of the resources: labor, material, information, production. The administrator should have the authority to intervene in the content and nature of the actions of the performers and to change them if necessary.

Only with the help of this approach may provide administration in real time. Otherwise, if the administrator has to spend time matching his actions with the leaders of the objects and managers of various works, there is a high probability when administrative actions can be late. In this case, the administrator will have to deal with the prevention of crises, and with their removal, due to large losses for the company as a whole.

This is especially actual and important for large industrial enterprises. The role of Administrator in such enterprises allocates in a separate post. The system of administration is multilevel. In large enterprises, there are usually complex linear functional relationships, which complicate the interaction between managers and performers. Therefore, administrators must have clear plenary powers and abilities to implement its actions.

In small and medium-sized enterprises, this problem is not so acute in connection with the fact that one person combines the functions of a manager, an administrator and a functional specialist. As the scale of these functions are separate and require appropriate regulatory and legal support [11].

Forming the legal framework it is necessary to consider a relatively short life of the cycle of legal documents drawn up, since they are mainly oriented to the current situation in the enterprise. The change of the situation due to the action of any factors internal or external environment determines the appearance of discrepancies in existing legal instruments for the administration and the requirements for the administrator. The greater the change in the situation, the higher the aging of the documents and the urgent need of modernization or replacement. This determines the feasibility of continuous monitoring of the conformity of the rights and powers of the administrator of certain documents in force and changes in requirements due to his dynamic changes occurring in the enterprise.

Thus, the construction of a system of administrative management in industrial plants requires the solution of the complex work associated with both the definition of objects and subjects of administration, the formation of subsystems for the activity of administrators, as well as internal mechanisms for monitoring and adjusting the system of administrative management to the enterprise environment, which vary. Organization of the administration of industrial enterprises should be based not on someone else's experience or stereotypes, but on the basis of real features on the main key areas of their activities. This necessitates the development of special methods and techniques of constructing a system of administrative management, more research on this issue.

CONCLUSIONS

The role and the importance of industrial enterprises for the economic and socio-political situation, both in the regions and in the country as a whole, determines the need for detailed study and development of the whole complex of issues that connected with the administration of their activities.

Building of a balanced workable system of administration, particularly the processes occurring in the large industrial enterprises, taking into account, is one of the key conditions for the stability of their position and success in competition.

Constructing the system of administration must consider not only the basic direction of its activities, but also the status of all internal processes to create the conditions for the success of managers at all levels, the ensuring of coherence and coordination of their actions. It allows with a minimum to improve the performance of enterprises and their characteristics both current and investment expenditures significantly.

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ПРОБЛЕМЫ АДМИНИСТРАТИВНОГО УПРАВЛЕНИЯ НА ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЯХ

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Аннотация. Рассмотрены принципиальные подходы к организации административного управления на промышленных предприятиях, определены особенности промышленных предприятий, которые влияют на администрирование, предложены основные дефиниции административного управления

Ключевые слова: промышленное предприятие, административное управление, объект и субъект администрирования, административное влияние.

WAYS OF PROFESSION-ORIENTED DISTANCE EDUCATION EFFECTIVENESS INCREASING

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Summary. There have been analyzed five general domains of "best practice" in distance education programs application. With the consideration of distance education specifics in Eastern Europe there have been worked out the nine basic domains applicable regardless of the home institution. The advantages/disadvantages of these domains are observed.

Key words: distance education, electronically-mediated education, distributed education.

INTRODUCTION

Distance education programs abound in higher education, particularly in degree programs in undergraduate education, and in certificate and graduate programs in education and business. Currently, about 56% of all regionally-accredited colleges and universities offer courses or degree/certificate programs through distance education and learning models.

Three terms are relevant to work of the Task Force: *distance education, electronically-mediated education, and distributed education*. They are defined as follows:

- *Distance education* is defined as a formal educational process in which the majority of the instruction occurs when student and instructor are not in the same place. Instruction may be synchronous or asynchronous [9]. Distance education may employ correspondence study, or audio, video, or computer technologies.

- *Electronically-mediated education* covers a wide set of electronic applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, and CD-ROM [22].

- *Distributed education* is the application of electronically-mediated instruction to students in traditional residential programs and programs or courses of

instruction in which students and instructors are separated by time and/or distance.

RESEARCH OBJECT

Presently, there is a paucity of literature on distance education models and little more on the use of electronically-mediated education. In fact, professional education is at the early stages of engaging in either distance education or electronically-mediated education as defined above. From this perspective, further advancement in each of these areas of pedagogy will enable the profession to meet several challenges.

1. It would increase access to professional education and training among those for whom this is not currently available, *e.g.*, to "place-committed" individuals located in isolated rural, frontier, and off-shore locations, as well as those who simply prefer this option.

2. It would allow electronically-mediated education to be used as a resource to upgrade the quality of traditional residential programs. For example, instruction in didactic courses might be improved by using an on-line platform to post lecture notes which have hyperlinks to full-text journal articles. Another example: using chat rooms and electronic bulletin boards to help integrate the diverse training experiences of advanced students on their internships. This challenge would come under the heading of "distributed education," as defined above, and in its most ambitious form would involve pedagogical efforts to match the goals of specific parts of the curriculum to the available and emerging technology.

These essentials are as follows:

1. *That education is best experienced within a community of learning where competent professionals are actively and cooperatively involved with creating, providing, and improving the instructional program.*
2. *That learning is dynamic and interactive, regardless of the setting in which it occurs.*
3. *That instructional programs leading to degrees having integrity are organized around substantive and coherent curricula which define expected learning outcomes.*
4. *That institutions accept the obligation to address student needs related to, and to provide the resources necessary for their academic success.*
5. *That institutions are responsible for the education provided in their name.*
6. *That institutions undertake the assessment and improvement of their quality, giving particular emphasis to student learning.*
7. *That institutions voluntarily subject themselves to peer review.*

RESULTS OF EXPERIMENTAL RESEARCH

Distance education can be employed across the spectrum of learning communities to provide training to place committed individuals and to enhance traditional educational programs. There already exist five general domains of "best

practice" in reviewing distance education programs and institutions. These domains were initially developed by the Western Cooperative for Educational Telecommunications (in 2000). A review of the literature suggests further delineation of relevant categories may be useful. What follows is a distillation of the extant information related to distance education, organized into nine domains:

(1) Access; (2) Learning Community; (3) Faculty Support; (4) Student Support; (5) Curriculum and Instruction; (6) Evaluation and Assessment; (7) Institutional Context and Commitment; (8) Facilities and Finance; and (9) Library and Learning Resources.

Domain 1: Access

- *Programs implementing technology-supported, distanced delivery provide evidence of careful attention to the issue of accessibility.*

Access issues include barriers that may be physical, cultural, linguistic, temporal, geographic, sociopolitical, sociocultural, socioeconomic. The use of technology is often seen as expanding access to education or services [12, 20]. In fact, this is seen as a primary benefit of distance education [17, 18]. The range of delivery systems, training models and learning activities has dramatically increased with the introduction of various forms of technology, particularly those that facilitate interactivity [13, 14]. Changes in the quality and availability of technology, such as reduced cost of hardware and software and increased availability of Internet and variability of bandwidths, continues to make internet-based delivery more accessible to a wider population [8, 13].

Technology offers the possibility of overcoming some of the limitations of the traditional classroom environment [5, 12]. In many cases, technology can increase access for rural and other traditionally underserved populations (e.g., those facing barriers of time, distance, physical disability) [14]. However, limits to accessibility that arise from the use of particular technological platforms may also be a useful consideration. Finally, technology may increase access for non-traditional groups such as Army University Access Online (AUAO), which provides access to education for enlisted soldiers across the globe.

The matches between the nature of the student population, student demographics and the technological platforms selected are important. General factors to be considered include age, cultural and socioeconomic background, experience and learning. The demand for training comes increasingly from non-traditional students, who may be working or balancing family and other demands with education. Therefore the importance of the program components, and the technologies employed, gains importance. For example, rural populations are limited by access to telecommunications services. Some ethnic minority populations have lower rates of access to computers and internet services. Persons with disabilities face additional barriers to the use of certain technologies.

Domain 2: Learning Community

- ***Facilitation of interactions in the learning community relies on the delivery method and technologies employed.***

The challenge is to ensure that the "interactive experience that are the hallmark of [graduate] education are integrated in the delivery"[12]. The relationships between instructor and learning and levels of interaction can, in fact, be enhanced by technologically mediated distance delivery. Faculty hold a more positive view of

distance courses and give those courses higher ratings when the degree of student interaction is higher. "The importance of appropriate interaction (synchronous or asynchronous) between instructor and students and among students is reflected in the design of the program and its courses, and in the technical facilities and services provided" [7, p.7].

Domain 3: Faculty Technical Support

- *Reasonable efforts are made to ensure the competency level of faculty and instructors to offer quality services through the methods of delivery and technological platforms selected.*

Many authors feel that faculty must be provided with an orientation to distance learning, technology training, and on-going technical support [7, 12, 23]. Currently, no standard of competency exists for distance education faculty, but specific faculty skills in program design and delivery, technology application, evaluation, etc. are presupposed to be obligatory. In any case, the academic institution shares in the responsibility for provision of continuing faculty education and training to build proficiencies related to the model of distance education in which faculty will be involved and the technologies they will be using.

- *Financial, human, and systems resources influence the choice of delivery models and technological platforms.*

Additional funding may be needed to support the technological infrastructure and increased demands of advanced learning technologies. These pressures may occur at the faculty, departmental and institutional level. The costs of incorporating distance education may vary; significant up-front, capital investment may be required. Sustainability rests on cost-effectiveness and other economic implications. The equipment and technical resources to support distance education create a complex system. Some system elements include: (a) transmission (phone/cable, rate, compression standards, radio frequency, carrier); (b) network support (hardware, software); (c) data storage; (d) specialty equipment [22]; (e) server capacity; (f) scalability; (g) down time; (h) system robustness; and, (i) maintenance, monitoring and repair.

Technical support staff and web-based development are needed to support distance delivery of online curriculum and programming. Colleges and universities currently have fewer IT support staff than is necessary to cope with all the volume of information. Faculty support services facilitate the application of technologies and distance learning processes [2, 3, 8]. Support for faculty include technical, design, and production functions such as web designers, database managers, graphic designers, instructional designers.

- *Attention is given to the changing roles of faculty in distance delivery, the demands that technology places on faculty time and resources, and to appropriate faculty compensation.*

While many thought that distance delivery would increase the reach and capacity of faculty for teaching, it was quickly noted that the degree of interaction between faculty and students is typically greater for distance-delivered than for traditional courses [12]. Moreover, in many settings, and particularly for those managing transfers of teaching technology from traditional means to distance delivery, faculty roles are expanded to include being content experts, curriculum design, project managers, etc.

The demands on faculty time are therefore increased and it is appropriate to compensate for faculty effort in some way (course release, etc.). Usually, one of the primary concerns for faculty is that they will do more work without appropriate compensation [17]. Workload, class size, compensation, intellectual property, merit and promotion review issues continue to be unclear and ought to be addressed.

Domain 4: Student Technical Support

- *Technical requirements are made clear to students before they enroll; and support services are provided to students in their use of distance education technology.*

Many authors feel that there ought to be a specified set of minimum hardware, software, and operating system requirements for technology-based distance programs [7, 12, 23], although it is likely that individual programs or organizations will have differing minimum requirements. There are no strong movements at this point suggesting that national standards be implemented. For example, specific technical requirements will depend on the nature of the learning technologies employed. While the requirements may vary from program to program, it is appropriate for students to have full informed consent regarding the technical aspects of programs in which they enroll and be made fully aware of the implications of technological systems failures to their course/program success.

- *Reasonable efforts are made to ensure competency among students with respect to the methods of delivery and technological platforms selected.*

Many authors have called for technology-based distance programs to have standards for computer literacy for students [7, 12, 23]. Client proficiency with technology is critical to effective service as computer-mediated learning requires special skills of students and more sophisticated technical support if students are to interact fully.

- *Reasonable technological support services provided to students in the program/courses to ensure continued ease of access to curricular materials and instructional/learning processes.*

To succeed in their studies, students should be provided with up-front training or practice sessions (prior to starting the course), as well as continued tech support [17]. In addition, it is useful to provide student support to facilitate comfort with the technological platform and provide direction for trouble shooting technological problems that arise. Appropriate student support might have a variety of characteristics including information that address each educational technology hardware, software, and delivery system required. Additionally, it is important for all students to have "equal access" to required technologies - including 24 hour support. Help desk services are viewed as important, with attention paid to evening and weekend access and various time zones to accommodate non-traditional students. Many questions could be answered through a FAQ (frequently asked questions) document or service as it related to distance access. In fact, providing adequate user support is one of the top challenging facing colleges and universities in distance education. Finally, student support for distance education requires unique considerations. Appropriate services must be available for students of electronically offered programs, using the working assumption that these students will not be physically present on campus (e.g. services related to registration, testing, financial aid, academic advising, access to grievance procedures, labs, library etc.).

Domain 5: Curriculum and Instruction

- *Programs implementing technology-supported distanced delivery describe the links between choice of technological platform and the learning objectives of the program.*

It is important to have evidence that the type of instructional or learning activities envisioned can be reliably and effectively delivered through the platforms selected [7]. This is especially important in the context of higher education's increasing emphasis on student learning outcomes as the basis for program evaluation. For example, courses and programs are to be judged on "their learning outcomes, and the resources brought to bear for their achievement, not on method of delivery" [7, p. 3]. The learning goals and desired outcomes guide the selection of technological platforms and other instructional strategies not the other way around. Different forms of technology offer different advantages and disadvantages and effective matching depends on learning goals, instructional purpose and learner needs. Unless careful attention is paid to the selection of appropriate models for delivery and technological platforms, there is a risk that the technology itself becomes the driving force in change.

When planning programs, the questions arise around the best mode of delivery for the various elements of a given educational program. Rather than a single one, "best" mode of delivery, there often will mean incorporating a mix of technological media to support the various curricular or student development goals. There does not seem to be a single clear answer to date about which technologies are most suited for the delivery of which services [21].

Delivery model viability needs to be assessed by qualified professionals with appropriate expertise and with attention paid to student learning outcomes. Instructors have the additional burden of understanding the legal and regulatory requirements of the jurisdictions in which they operate; e.g., requirements for service to those with disabilities, copyright law, state and national requirements for institutions offering educational programs, international restrictions such as export of sensitive information or technologies, etc. Mechanisms for ongoing evaluation of the suitability of any program applied are important, and can include the human, as well as the technological aspects of use. Evaluations can benefit from including qualitative and quantitative information, as well as outside reporting mechanism. Effectiveness studies demonstrate the application to a local, or service, area enhance the applicability of programs and evaluations. Additionally, ongoing quality assurance and quality improvement protocols with appropriate local control and ongoing mid-course evaluations resulting in appropriate mid-course adjustments can be helpful.

Domain 6: Evaluation and Assessment

- *Regardless of delivery method, programs are dedicated to identifiable standards that guide assessment of student learning and any impact on program structure and pedagogy that arise from technological innovation.*

As noted above, there has been a shift in accreditation emphasis from resources and process of education to outcomes of student learning as the basis for program and institution evaluation [10]. This represents a substantial challenge to the process of setting and applying quality standards. They need at once be clear enough to guide evaluation, yet broad enough to accommodate a variety of models and innovative approaches to training. Regardless of how standards are set, ideally, they allow for

desired outcomes to be achieved while encouraging innovation in instructional approaches, methods of reaching students, and training goals and objectives. Moreover, a good assessment represents a comprehensive evaluation of the learner, requires standardization of content, process, faculty competence, and careful documentation throughout the learners' tenure.

The issues of quality assessment in distance education are best addressed within the broader context of technology advances that can potentially enhance and change professional education regardless of context. Many of the same validity and reliability issues that arise in psychological testing also arise in assessment of learners.   Several issues bear particular attention. First, there is the issue of plagiarism. Plagiarism is not new, and in fact, is a venerable partner for most faculty and supervisors. However, the advent of technology has made plagiarism easier to accomplish, particularly the combination of computer generated "cut and paste" with the access to information that exists on the World Wide Web. While there are no foolproof methods to prevent plagiarism, vigilance its enhanced potential is worth noting. Furthermore, technical measures can assist in ensuring copyright infringement does not take place for materials placed on the web [13].

A second issue that bears addressing is also a perennial issue in teaching and training situations; authentication of the learner. This issue is fundamentally no different in an electronic environment than it is face-to-face. It is important to verify that the person who claims to be engaged in an activity is the person who is actually completing the activity. There are multiple methods for accomplishing this, with a growing number of options which requires authentication of people viewing confidential records. Many use proctored tests such as used in testing centers.

Finally, there is a great concern about data security. Data security, which is closely linked to authentication, is important both in health care and in training settings. Neither patient nor learner wants to worry about the privacy of their information. Measures to identify system users and control levels of access are very popular.

Domain 7: Institutional Context and Commitment

- *The institution's administrative structure, policies and procedures, and interdepartmental communications provide a supportive system for distance delivery of online curriculum and programming.*

A "sufficiently robust systems" [12, p. 24] and support collaboration between administrators, faculty, technical experts, departments, etc. enhance the potential for developing programs provides a list of some of the potential roles of university internal organizational structures listing the technological systems that may need to be developed / supported. Appropriate policies and procedures help ensure that the technical infrastructure remains up-to-date.

Domain 8: Facilities and Finances

- *The delivery model and supportive technologies employed benefit from remaining as consistent as possible, with care taken to minimize the impact of change on students and faculty.*

There are benefits from platforms remaining as consistent as possible across courses or programs [7]. Where change in courseware and other technological platforms is required, having a processes in place to familiarize students and faculty with the new technologies reduce the negative aspects of the transitions. In addition, faculty

education on new or upgraded technologies, prior to its introduction to students, has benefits.

- *Confidentiality and integrity of student records and other program and course materials is ensured. Electronic security measures are in place to address issues of reliability, privacy protection, safety, and security.*

Security and confidentiality issues raised by Reed, McLaughlin, and Milholland [19] apply also to the confidentiality of student records and other electronic security issues. There is a need for documented technology plan that includes electronic security measures to ensure both quality standards and the integrity and validity of information. The importance of secure, private, and confidential transmission of data is of vital importance. Additionally, it is important to assure the reliability of the technology and adequacy of back-up systems in the case of some level of systems failure.

Up-to-date aspects are the issues of client and practitioner safety, which may be particularly important in cases where teaching involves working with clients or patients. As with other areas, it is important for students to have full informed consent and be provided information about the implications of technological systems failures to their course/program success.

Domain 9: Library and Learning Resources

- *Programs have appropriate and comparable access to instructional/learning support services including library facilities, research resources, bookstore services, registry services, counseling / advising, and other resources is key to successful student activities.*

To date, however, there is no specific definition of "appropriate and comparable access" as compared to traditional libraries, but it would not be uncommon for resources to include a "virtual library" [17]. On the other hand, traditional libraries increasingly expand their holdings through access to electronic media including databases, electronic books and documents, as well as Internet tools. In some cases, such as searchable databases, the electronic versions of the information is superior to the traditional print versions. One important caveat is assuring that staff are trained in distance library techniques. As with most electronic resources, it is important that resources be "scalable and [there is a] viable strategy for making information resources available" to distance learners [18].

CONCLUSIONS

The institution assures adequacy of technical and physical plant facilities, including appropriate staffing and technical assistance, to support its electronically offered programs.

The internal organizational structure that enables the development, coordination, support, and oversight of electronically offered programs will vary from institution to institution, but ordinarily will include the capability to:

- facilitate the associated instructional and technical support relationships
- provide the required informational technologies and related support service
- develop and implement a marketing plan appropriate for target student population

- provide training and support to participating instructors and students
- assure compliance with copyright law
- contract for products and out-source services
- assess and assign priorities to potential future projects
- assure that programs and courses meet institution-wide standards
- maintain appropriate academic oversight
- maintain consistency with the institution's academic planning and oversight functions
- assure the integrity of student work and faculty instruction.

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ПУТИ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННОГО ДИСТАНЦИОННОГО ОБРАЗОВАНИЯ

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Аннотация. Проанализированы пять основных принципов «наилучшей практики» в применении программ дистанционного образования. С учётом специфики дистанционного образования в Восточной Европе разработаны девять основных принципов, которые следует применять вне зависимости от того, какой вуз предлагает данную программу. Рассмотрены преимущества/недостатки этих принципов.

Ключевые слова: дистанционное образование, электронно-опосредованное образование, распределённое образование.

USERS AUTHENTICATION MEANS ANALYSIS IN DISTANCE LEARNING SYSTEMS

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Summary. The main ways of personality authentication by means of voice biometrics as the method of the learner recognition in distance learning systems are considered. The advantages and disadvantages of such authentication means are pointed out. Their comparative analysis with other biometrical systems is provided.

Key words: distance learning, learner, information system, authentication, identification, biometrical systems, voice biometrics.

INTRODUCTION

Distance learning is a new specific form of education that differs a little from regular full-time and correspondence courses. It provides other means, methods, organizational forms of education, some other forms of teacher-student interaction. Nevertheless, like any other form of education it has the same composition [4-7].

RESEARCH OBJECT

The advantages of distributed distance learning are determined by its new functions, increasing the possibilities and quality of providing educational services to students, distributing it within different market sectors and territories, as well as using the system of flexible continuous education, flexible diagrams, conducting classes in synchronous and anisochronous regimes [10-11]. The main peculiarity of flexible regimes is that they do not have strict time and space limits of conducting classes and teacher-student communication. It allows both teachers and students to plan the most appropriate time of studies and educational process. Especially important it is for correspondence course students and those students studying in universities affiliates in other cities [17-18].

But apart the abovementioned advantages there appears a range of additional problems [14]. One of the most important of them is students' authentication [1]. The most reliable method of students' personality authentication is using biometrical systems [2-3]. Voice is such an integral part of a person as his/her face or fingerprints. Voice recognition of users is very comfortable and demands minimal efforts from them.

RESULTS OF EXPERIMENTAL RESEARCH

Voice recognition is the technology that allows using voice as authentication device.

For a long time the application of voice recognition technology presupposed pronouncing each word separately. It allowed computer to identify the endings and beginnings of words. Such application of voice recognition technology can still be used to manage computer systems [8].

Voice identification is based on the analysis of speech unique characteristics resulting from anatomic peculiarities (size and shape of throat and mouth, vocal cords structure) and acquired habits (loudness, speech manner and speed) [12-13].

Voice identification is conducted according to the following scheme: the system compares voice sample given in digital form with the so-called 'voice-print' kept in the data base. 'Voice print' is digital representation of unique voice characteristics. The process of putting the data into the data base takes several minutes. System offers some questions for answering. The answers are identification phrases that are later used for personality identification. For each question the user should pronounce the answers for four times. The answer should consist of three syllables minimum and last more than one second to create 'voice print'. The written answers are laid on each other and all extra noises are taken away. System compares the got phrases with earlier saved 'voice print'.

The user pronounces two or three identification phrases. If two of the pronounced phrases pass biometrical test the personality is identified. If one of these phrases is not accepted the system turns to the third pronounced phrase and in case it is accepted by the system the user's personality is identified. If the system is not sure in the user's identification correctness it denies the user's access and sends him to the operator or the connection is just aborted [15].

TYPES OF VOICE BIOMETRICS

There are two types of voice biometrics systems:
- Text-dependent
- Text-independent

Text-dependent ones are used in access control systems: for verification one should pronounce password phrase that is compared with pronunciation standard kept in the system for every registered user. The disadvantage of these systems is that it is difficult to keep password phrase in secret. Modern devices of acoustic listening

(different eavesdropping devices) allow making unapproved copying of the password phrase. This drawback is absent in text-independent systems.

Text-independent systems are used as a rule when solving some policemen tasks: hidden identification, criminalistic identification, transcription registration. For verification and identification in such systems there can be used any fragment of free speech sound of enough length. The drawback is that in such systems there are reduced reliability and speed of recognition [16].

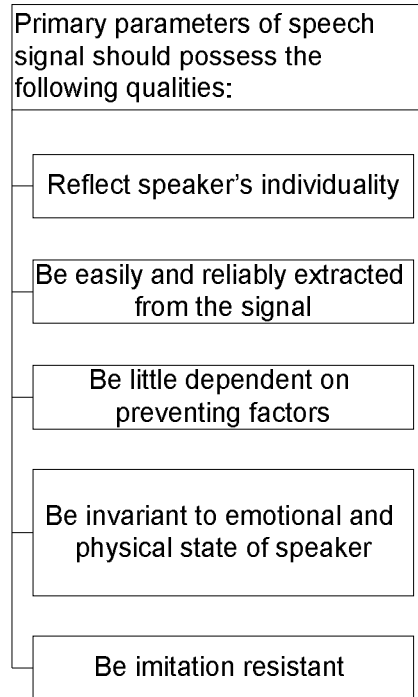Primary parameters of speech signal should possess the following qualities (fig. 1)

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┌──────────────────────────────┐
│ Primary parameters of speech │
│ signal should possess the    │
│ following qualities:         │
└──────────────────────────────┘
        │
        │   ┌──────────────────────────────┐
        ├───│ Reflect speaker's individuality │
        │   └──────────────────────────────┘
        │
        │   ┌──────────────────────────────┐
        ├───│ Be easily and reliably extracted │
        │   │        from the signal        │
        │   └──────────────────────────────┘
        │
        │   ┌──────────────────────────────┐
        ├───│ Be little dependent on        │
        │   │    preventing factors         │
        │   └──────────────────────────────┘
        │
        │   ┌──────────────────────────────┐
        ├───│ Be invariant to emotional and │
        │   │  physical state of speaker    │
        │   └──────────────────────────────┘
        │
        │   ┌──────────────────────────────┐
        └───│    Be imitation resistant     │
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Fig. 1 Primary parameters of speech signal

BIOMETRICAL SYSTEMS COMPARATIVE ANALYSIS

In comparison with other biometrical systems the voice one has advantage in its price and high level of reliability (Table 1). It is important to mention that only 2% of persons could not register in the system of voice verification while the percentage of denials in 'fingerprint registration' equals 4% and in iris it equals 7%.

The main problems on the way of speech recognition systems development are:
1. Huge volumes of dictionaries
2. Continuous speech patterns
3. Different accents and pronunciations

Table 1. **Biometrical Systems Comparative Characteristics**

Biometrical System / Parameters	Fingerprint	Voice	Iris	Face
Registration error	4%	2%	7%	~0%
Nominal meaning of 'stranger access' probability	2.5%	0.75%	6%	4%
Nominal meaning of 'familiar person denial' probability	0.1%	0.75%	0.001%	10%
System price	High	Low	Very high	High

Dictionaries volumes estimate complexity level, demands to processing power and voice recognition systems reliability. The system can adjust to continuous talkspurt but there are strict semantic rules that are to be followed so that the system could understand the semantics of word combinations in sentences. It is necessary to conduct fundamental research as it will allow to 'cope' with such speech characteristics as morphology, accents, tone pitch, speed, loudness, merging words, context, articulation, linguistic information, synonyms, etc. It is expected that the main development direction will be languages modeling for using them in voice recognition systems.

Besides, there exists the problem of separating speech signal from background noise. Voice signal should be recorded in conditions of minimal background noise.

The drawbacks of personality voice recognition technologies are:

1. Voice unlike papillary pattern of fingers and palms changes with age. Thus, the clients have to renew from time to time the speech standard kept in the system.
2. Physical and emotional state influence voice during speech act. Thus, for example, the system may not recognize the voice if the person is drunk, chewing a bubble gum or short of breath after hard physical work.

The reliability of system work depends much on the quality of speech signal transition channel to the identification system, particularly, such its characteristics as frequency range, nonlinear distortion level, ratio signal/noise, frequency characteristics irregularity. The highest reliability of work is provided when the client's voice standard and his request are sent through one and the same channel, for example, phone channel.

CONCLUSIONS

Presently, there have been received definite results on voice identification systems synthesis showing quite precise identification and verification of speakers. But the question on creating precise (extremely precise) voice identification systems still remains. That is why there appear a set of tasks such as investigation preciseness, steadiness and resolving capacity of primary parameters, enlarging characteristics field and automatic linguistic speech analysis.

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АНАЛИЗ СРЕДСТВ АУТЕНТИФИКАЦИИ ПОЛЬЗОВАТЕЛЕЙ В СИСТЕМАХ ДИСТАНЦИОННОГО ОБУЧЕНИЯ

Валерий Дядичев, Андрей Колесников

Аннотация. Рассмотрены основные способы идентификации личности методами голосовой биометрии, как средство распознавания обучаемого в системах дистанционного обучения. Выделены преимущества и недостатки таких средств аутентификации. Приведена сравнительная характеристика с другими биометрическими системами.

Ключевые слова: дистанционное обучение, обучаемый, информационная система, аутентификация, идентификация, биометрические системы, голосовая биометрия.

INFORMATION MODEL OF THE COMPETITIVENESS OF ENTERPRISE CONTROLLING

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Annotation. In this article had been created an information model of the competitiveness of enterprise controlling which is taking into the account tactical and strategic levels of planning. It is considered that there are two cycles in a model of controlling the competitiveness.

Key words: competitiveness, management, estimation, analysis, information model.

INTRODUCTION

The task of controlling the competitiveness of enterprise is one of the most essential tasks, standing before the director of any enterprise in the epoch of instability and economic changes. Success and competitiveness of enterprise at the market of commodities or services depends on activeness and timeliness of introduction of new competitive advantages and also on support of necessary existing ones, both in a short-term period and in a long-term prospect. Frequently, the leaders of the enterprises (especially we speak here about small and middle business) do not give this task needed substantial value, which results in the loss of positions of the enterprise at the market, and sometimes even can turn to result in a bankruptcy for an enterprise. Controlling the competitiveness must have system and permanent character, taking into the account the influence of external uncontrolled factors and modern conditions of market work [3, 9, 11].

THE OBJECTS OF RESEARCH

Problems of controlling the competitiveness of the enterprises had been researched by such foreign and domestic scientists of economic as: M. Porter, I. Ansoff, A. Dajan, P. Druker, B. Karloff, F. Kotler, M. Meskon, F. Rodgers, R. Yoterman, A. Hoskina, I. Shympeter, V. S. Andrianov, G. A. Azoev, E. A. Gorbashko, M. I. Gelvanovski, A. P. Gradov, M. G. Dolinskij, V. Zykovski, U. Kormnov,

I. V. Lipsich, A. Seleznev, R. A. Fathytdinov, A. U. Udanov, N. S. Yashin, U. B. Ivanov, N. A. Kisim, A. N. Tishenko, A. E. Voronkova, T. S. Maksimova and others. Nevertheless, nowadays there is not only single approach to the system of controlling the competitiveness of the enterprise, but also a single definition of the essence of competitiveness of enterprise and competition, as a motive force of social and economic development for society [1, 2]. Having analyzed the works of leading economists in this field, it is possible to make a conclusion that each of them is doing an accent on one or another constituent of competitive activity in a greater or less measure, and some of them are defending   the systematic approach in controlling the competitiveness, taking into the account all factors [5, 10]. But still their arguments are based on practical application of concrete model or method, which more frequent depend on the sphere of management of enterprise which these recommendations are developed for. Thus, depending on the subject of research and its aims, the structure of competitiveness of enterprise, method of its estimation, analysis and management, can substantially change [4, 14].

The purpose of this research is the development of informational model of controlling the competitiveness of enterprise with the use of the modified polygon of competitiveness.

THE RESULTS AND THEIR ANALYSIS

For development of informational model of controlling the competitiveness of enterprise the methodology of description of business processes IDEF0 had been used. This methodology allows to present basic business processes in a simple and comfortable way, to track basic streams and connections between separate actions [18].

On the basis of the conducted analysis of existent models of estimation and controlling the competitiveness of enterprise, an author has develop an informational model which allowed to accumulate the best works of other scientists in this sphere, and also to add author models and methods. At first level of diagram of IDEF0 an informational model is presented by five basic blocks:

1. Determination of aims, the market study.
2. Market monitoring.
3. Estimation of competitiveness based on factors.
4. Determination of integral index of competitiveness.
5. Management competitiveness.

Evidently this model is presented on the fig. 1. The process of controlling the competitiveness of enterprise must begin with the setting of purpose of this controlling, and also subsequent dividing purpose into some tasks. The named purpose greatly predetermines the scales of estimation and controlling the competitiveness. Result of work of this model block is a list of indexes and factors which in future will be researched and analyzed. Second block «Market monitoring» is responsible for collection of all necessary information and consists of 4 blocks of more low level: collection of information on an own enterprise, collection of information on

competitors, determination of all basic parameters of the market and market design. The correct collection and using the necessary information influence the whole work result and controlling the competitiveness, because inaccurate or distorted information on this stage can lead to absolutely unforeseeable results on the subsequent stages. This work is conducted by the marketing department of enterprise under the leadership of expert-analyst, engaged in the process of increasing of competitiveness.

On the entrance of this block we see incoming information about the current level of competitiveness of enterprise, which simultaneously plays role of feed-back for all system of estimation and controlling (management). On the way out of this block we get the massif of information necessary for further actions.

In the third block an expert-analyst conducts setting of norms of all information and adduction them to the single scale for comfort of subsequent calculations, determines standard values on each of factors and produces the calculation of private indexes of competitiveness on each of factors depending on the sphere of activity of enterprise.
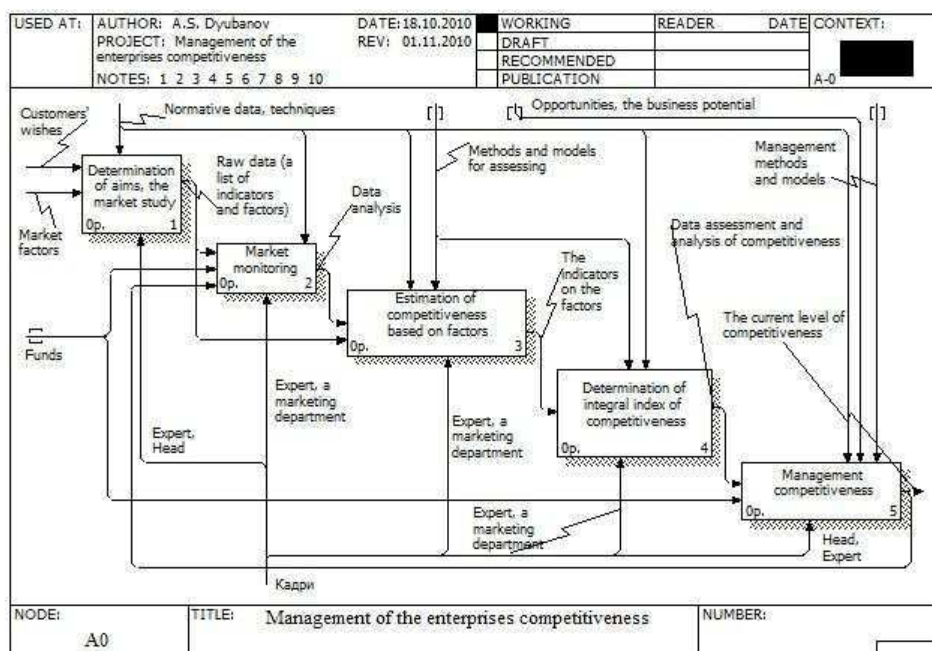

Fig. 1. General view of informational model of estimation and controlling
the competitiveness of enterprise

The received results are making the basis of the fourth block, which is devoted to the construction of the modified polygons of competitiveness, offered by an author earlier [8,12]. An expert-analyst builds such polygons for an own enterprise and for named before enterprises-competitors. After this, the areas of these polygons are being calculated like integral indexes of competitiveness, and their further econometric

analysis is being conducted (the phases of growth and slump are being determined on every factor and competitiveness on the whole, the rates of growth and rates of increases are being calculated, et cetera). All these data allow doing more grounded and argued conclusions and estimations for a subsequent competent management. For determination of positions of own enterprise in relation to competitors all enterprises are ranged on the expected indexes. All above-mentioned four blocks had been directed on the objective and exact estimation of current level of competitiveness. Estimation occupies greater part of all algorithm because making a right decision on the last (fifth) stage which is directed on the management (increase or support) of competitiveness of enterprise depends on its correct and exact calculating. Let's take a closer look on the fifth block «Management competitiveness» (fig. 2). The first stage of this block is composing the list of competitive advantages (both new, planned to introduction for the increase of level of competitiveness, and already existing on an enterprise, which is necessary to support and develop). This task is executed by an expert-analyst in area of controlling (management) the competitiveness of enterprises. The created detailed list of competitive advantages is ranged on the row of indexes, such as time, necessary for introduction of this advantage, required money and received effect as a result of introduction.
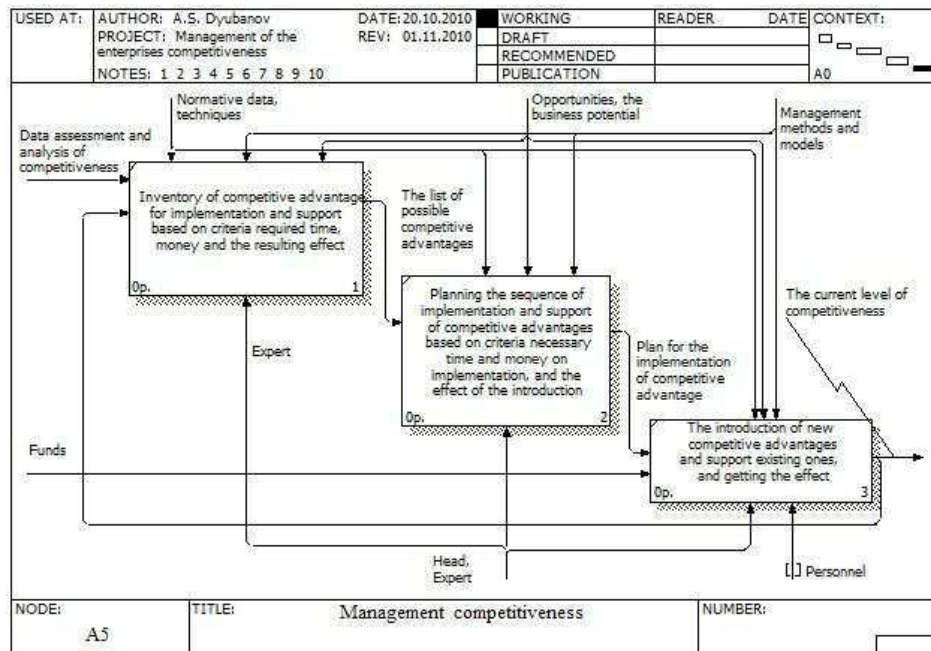

Fig. 2. Block «Management competitiveness»

Further this list is used during planning the realization of competitive advantages. Using above-mentioned criterions, an expert-analyst determines out of existent competitive advantages which of them require different level of support and

development, and what new competitive advantages must be established on the enterprise in order to constantly increase the level of competitiveness. All tasks related to application and support of competitive advantages, responsible person, terms and necessary resources should be in detail mentioned in a plan. The third block of this large stage is directly about the making out of composed plan and getting result.

As we can see from the picture #2, in this block there is a second reverse connection that is taking into the account the current level of competitiveness of enterprise within the framework of this stage of controlling the competitiveness.

Thus, in all scheme of controlling the competitiveness we have two cycles (two opposite connections) – a large one (including 2-5 blocks and taking into account the collecting of information and estimation of current level of competitiveness) and small one (directed on introduction and support of competitive advantages within the framework of one research).

The presence of two cycles is explained by the followings reasons:

1. Collection of all necessary information is a process, requiring big working, financial and temporal expenditures; therefore there is no need to conduct him one more time after introduction of every concrete competitive advantage or support of existing [19]. It is simpler to make and realize the tactical plan of controlling the competitiveness. It determines the small cycle of informational model (tactical), which does the process of controlling the competitiveness more operative.

2.   In some time collected and analyzed information becomes irrelevant, and it can not be used for controlling the competitiveness of enterprise. In such cases it is necessary to conduct new marketing researches, study the market and competitors. It characterizes a large cycle in an informational model and represents the strategic level of controlling the competitiveness of enterprise.

Naturally, in some time, there can also be a necessity of revision of purposes and tasks of controlling the competitiveness. As a rule, such situations appears at some substantial changes in rules of market functioning, at the sharp changing of macroeconomic position in a country, during the changing of leadership of a company and realization of the new vision of firm future, and also during placing a company to the new markets of activity et cetera [13, 15].

In such cases it is necessary to begin the process of controlling the competitiveness of enterprise with the first block of informational model [16, 17]. In other most cases the process of controlling the competitiveness of enterprise has continuous, dynamic, and successive character, characterized both by large or small cycle of the offered model.

Thus, the developed informational model, comparing with the earlier offered models [6, 7], differs by the presence of two opposite (reverse) connections that are allowing to optimize temporal, labor and financial expenses on controlling the competitiveness of enterprise. In the most analyzed present models there is an only one reverse connection - «way out-entrance».

CONCLUSIONS

Offered informational model of controlling the competitiveness of the enterprise which takes into account all key moments of this difficult process, strategic and tactical levels of planning, and also allows making complex and system analysis and controlling the level of competitiveness. The modified polygon of competitiveness used in the model allows passing from high-quality estimations to quantitative one, which promotes exactness of analysis of competitiveness and allows accepting more high-quality management (administrative) decisions.

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ИНФОРМАЦИОННАЯ МОДЕЛЬ УПРАВЛЕНИЯ КОНКУРЕНТОСПОСОБНОСТЬЮ ПРЕДПРИЯТИЯ

Алексей Дюбанов

Аннотация. Разработана информационная модель управления конкурентоспособностью предприятия, учитывающая тактический и стратегический уровни планирования. Обосновано наличие двух циклов в модели управления конкурентоспособностью.

Ключевые слова: конкурентоспособность, управление, оценка, анализ, информационная модель.

MINIMIZATION OF TERRORIST ACTION CONSEQUENCES IN THE TRAINS OF RAILWAY TRANSPORT

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Summary. There offered the system of the train automatic control of rolling stock under the conditions of terrorist action and there given the analysis of physical and technological preconditions for its creation. Main components of the system are the explosion identification sensors in the vans and the sensors indicating the running off the rails. The structure and algorythm of the system functioning are given.

Key words: railway transport, system of the train automatic control of rolling stock, terrorist action, explosion identification sensor, sensors indicating the running off the rails.

INTRODUCTION

Modern railroad trains are unprotected before terrorism threat. It is not of great difficulty to bring an explosion device into the van and bring it into operation. To a great pity there were such events at the railroad transport [Riley 2004].

Nowadays there are no hardware components which would ensure train control under the conditions of terrorist action [Lysyuk 1997; Anderson Robert 2004; The 9/11 Commission Report 2004]. Successful solution of this problem depends on the skill and experience of the engine driver.

However, not in all the cases the skill and experience of the engine driver can be the guarantee of the taking correct decisions under the conditions of extreme situations. In many cases there is even no time to analyze the situation and to perform any actions for train control. Under such conditions the train control is advisable only in the automatic operation.

RESEARCH OBJECT

In this connection, the purpose of this paper is the analysis of physical and chemical preconditions necessary for the device creation which could identify the explosion in the van and realize the train control in the automatic operation.

STATEMENT AND PROBLEM SOLVING

The analysis of the situation connected with application of the explosion device in the vans showed that there is the necessity to have two information signals for train control [Weinstock H., 1984]. One of them identifies the explosion and the second one detects the running off the rails [Malakhov 2010]. On dependence of the variation of these signals there formed the algorythm of automatic train control under the conditions of terrorist action which supposes either an immediate train stop or the train stop, taking into consideration the relief and peculiarities of the surroundings.

Let us consider physical and technical preconditions of the sensors creation which would ensure the realization of above mentioned functions.

It is known that the important components of the explosion are (fig. 1) a high level of noise radiation, local temperature increase, shock air wave, air smoke.

Fig. 1 gives the possibility to come to the conclusion that you can identify the explosion using one of the properties connected with the changes of:

- temperature;
- air smoke concentration;
- noise radiation;
- atmospheric pressure.

The analysis showed that the first two properties have already found the application in antifire systems of railroad transport [Peter Whoriskey 2004; United States General Accounting Office (GAO) 2009; Wilson 2007]. But their application with the purpose of the explosion identification is of low perspective due to a lot of time of operation which takes several tens of a second.
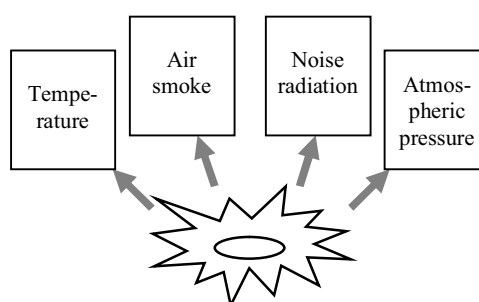

Fig. 1. Factors depending on explosion

The use of noise radiation is rather problematic as a criteria of explosion identification. It is explained by the complication of acoustics equipment and the possibility of false sensor operation while train passing along the neighboring track or reactions on other powerful sound sources.

The increase of atmospheric pressure is the most perspective for explosion identification in the van. In this case it is possible to ensure the time of explosion identification of several fractions of a second.

The oscillograph [Liin 1980] shown in the fig. 2 demonstrates the mechanism of pressure change in the closed space because of the explosion. The oscillograph shows that there is the phase of surplus pressure after a short phase of air discharge. It may be used as a control pulse for the work of the corresponding sensor.
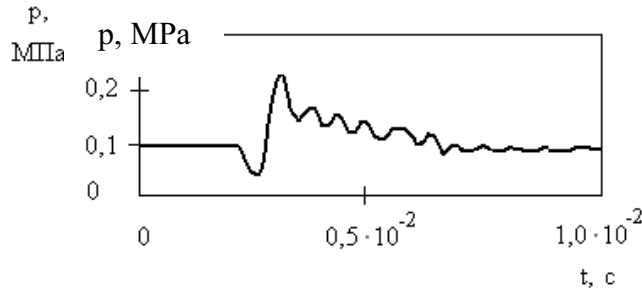

Fig. 2. Oscillograph of pressure in the van

The value of surplus pressure can be taken as the threshold of sensor operation. This value results in a weak failure inside the van.

In accordance with the paper [Kopitov 1982] in dependence on the surplus pressure Δp there are several zones of failure:

- full failure ($\Delta p > 50$ кPa);

- strong failure ($30 < \Delta p < 50$ кPa)

- mean failure ($20 < \Delta p < 30$ кPa);

- weak failure ($10 < \Delta p < 20$ кPa).

The level of failure is determined in dependence on the kind of explosive, its effective mass, nature of underlying surface and the distance to the centre of the explosion. The radius of the explosion zone is determined from the formula [Liin 1980]:

$$R = r\left(2\eta \cdot Q \cdot k\right)^{-\frac{1}{3}},$$

where: r - the distance to the centre of the explosion;
η – coefficient which takes into account the nature of underlying surface (for metal it is equal to 1);
Q – mass of the explosive;
k – reduction coefficient of the explosive to trinitrotoluene (table 1) [Liin 1980].

Table 1. **Values of reduction coefficient for explosive**

Type of substance	Trinitrotoluene	Tritonol	KDX	Ammonal	Powder
k	1	1,53	1,3	0,99	0,66

In dependence on the value of the radius, surplus pressure is characterized by the dependence:

$$\Delta p = \begin{cases} \dfrac{700}{3\cdot\left(\sqrt{1+R^{-3}}-1\right)}, & R \le 6{,}2m \\[4mm] \dfrac{70}{R\cdot\left(\sqrt{\lg R}-0{,}332\right)}, & R > 6{,}2m \end{cases}$$

Evaluation of surplus pressure is realized according to the graph constructed by means of the use of above mentioned formula (fig. 3) [Kopitov 1982]. The analysis showed that weak failure would be watched when the explosion of trinitrotoluene with mass of 1 kg at the distance $r = 10$ m and surplus pressure $\Delta p = 15$ kPa (fig. 3).
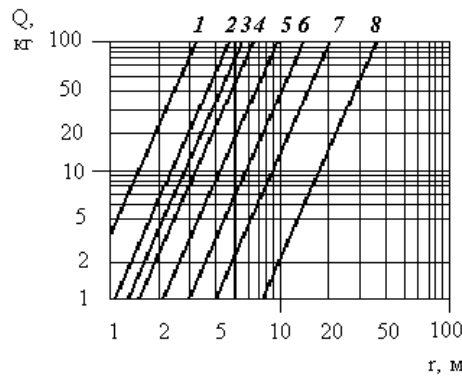

Fig. 3. Surplus pressure during the explosion in dependence on the explosive mass and the distance to the centre of the explosion:
1 – 1,7 MPa; 2 – 0,49 MPa; 3 – 0,29 MPa; 4 – 0,2 MPa;
5 – 98 кPa; 6 – 49 кPa; 7 – 29 кPa; 8 – 15 кPa

Surplus pressure $\Delta p = 15$ kPa is sufficient for sensor operation threshold and this ensures the explosion indication at the distance of 10 m. Taking all this into consideration it is possible to come to the conclusion that for effective explosion indication in a train van the installation of at least one sensor is necessary in the central part of the van and two more sensors are to be installed in the vestibule of the van.

The general structure of the system means the availability of the sensors which can indicate the very moment of running off the rails. Such sensors are nowadays used at the special railroad transport intended for transportation of very dangerous cargo. The principle of their operation is based on the property, namely – indication of critical accelerations occurred while running off the rails.

Such a sensor is rather effective but it has a complicated structure and a high cost. In connection with this its wide application at the rolling stock is of low perspective. Taking it into consideration it is offered to use a new sensor design which

enables to indicate the running off the rails [Osenin 2007]. The main criteria of the sensor development are the simplicity of its design, reliability and minimum cost.

The operation principle of the sensor is based on the failure of its elements which takes place in the process of striking of a sensor and a rail and other obstacles while running the rails [Osenin 2007].

The sensor of the explosion identification in the train van and the sensor indicating the running off the rails are the main elements of the equipment for automatic train control under the conditions of terrorist action, block-diagram of which is given in fig. 4.
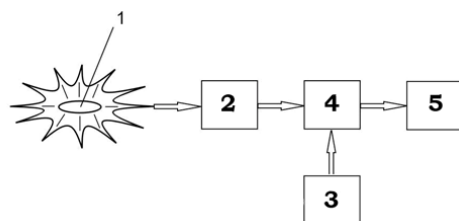

Fig. 4. Block-diagram of the equipment
1 – source of the explosion; 2 – the sensor of explosion identification in the van;
3 – sensors for registration of running off the rails; 4 – block of brake system control;
5 – brake system

In dependence on the information which comes from the sensors 2 and 3 two algorythms are possible for train control. The first algorythm of train control is realized under the conditions where there was explosion in the van and the wheels ran off the rails (the signal to the block 4 comes simultaneously from the sensors 2 and 3). In this case train brake takes place immediately.

The second algorythm is more complicated and realized under the conditions when the explosion took place inside the van but the wheels did not run off the rails (the signal to the block 4 comes only from the sensor 2). In this case brake and train stop is carried out with the account of the relief and peculiarities of the surroundings. This is stipulated by the fact that the place of the train stop is of great importance for realization of evacuation measures and rescue work. For example, the train stop in the tunnel or on the part of the track situated on the height (hill) becomes complicated for carrying out evacuation and rescue measures and even redouble consequences.

The information about unfavorable places of emergency shut-down is put into the central train computer beforehand. Later on the information is used (*in the automatic operation*) for place finding of train emergency shut-down.

There can happen such a situation when because of the explosion the electrical communications which connect the sensors 2 and 3 (fig. 4) with actuating mechanismus are damaged. Therefore the device cannot fulfill the functions placed on it. To prevent from this situation it is necessary to design the electrical circuits in such a way that in case when they are damaged the actuators should put the train brake system into operation.

The device offered can have more broadened functions. For instance, the device can perform functions of train control under the conditions of application toxic agents in

the van. For this purpose it is sufficient to set gas analyzers and adapt them to the work of the device.

CONCLUSIONS

1. At present there exists the probability to perform terrorist action in the passenger trains of the railway transport.

2. Modern passenger trains are not equipped with the systems enabling train control automatically under the conditions of terrorist action in the vans *(putting into action of the explosion device or application of toxic agents)*.

3. There offered the device for automatic train control under the conditions of terrorist action. The main components of the device are the sensors of the explosion identification and the sensors of registration running off the rails.

4. Train brake control system under the conditions of terrorist action is carried out by means of two algorithms which are used in dependence on initial information of the explosion identification sensor in the van and the sensor indicating running off the rails.

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МИНИМИЗАЦИЯ ПОСЛЕДСТВИЙ ТЕРРОРИСТИЧЕСКОГО АКТА В ПОЕЗДАХ ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА

Александр Голубенко, Юрий Ю. Осенин

Аннотация. В статье предложена система автоматизированного управления тормозами поезда железнодорожного транспорта в условиях совершения террористического акта и выполнен анализ физико-технических предпосылок ее создания. Основными компонентами системы являются датчики идентификации взрыва в вагонах и датчики, фиксирующие сход колес с рельсов. Приведены структура и алгоритм функционирования системы.

Ключевые слова: железнодорожный транспорт, система автоматизированного управления тормозами, террористический акт, датчик идентификации взрыва, датчик регистрации схода колес с рельсов.

IDENTIFICATION OF SIGNIFICANT FACTORS
THAT CHARACTERIZE THE ECONOMIC EFFICIENCY
OF INDUSTRIAL ENTERPRISES OF RAILWAY TRANSPORT

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Summary. According to developed economic situations and operating standard documents significant factors which characterise economic efficiency of work of the enterprises of an industrial railway transportation are defined.

Key words: management of industrial transportation company, hauling calculations, the cost of the transportation process.

INTRODUCTION

Efficient management of industrial transport company at the present stage under condition of change of various factors assumes a variation of approaches to methodology of maintenance of transportation process [15,17,18]. It in certain degree speaks that work of an industrial railway transportation is regulated by enough considerable quantity of acts and the standard documents [11,14,16], one of which, as a rule, economic character, costs of fuel, the rate of exchange, etc. factors change regularly in view of market condition, level of wages of the personnel. On the other hand, the methodology of maintenance of traction and transportation work as the railway transportation [1-3,13], developed in 70-80 of the XX-th century of remained without change.

The methodology of manufacture of traction calculations is based on the maximization of productivity of the locomotive [2] defined as:

$$w = \frac{\sum QL}{M},$$ (1)

where: Q - weight of cars of trains gross, t; L - distance of run of trains, km;
M - maintained park of locomotives, pcs.

Having passed to consideration of a separate train with locomotive draught at the established movement on various sites of a way of a stage, a tangent force of draught of

locomotive F_k and, accordingly, force of resistance F_c will be equal to movement of train [1]:

$$F_k = F_c = (Q + P)(w_0 + i)g, [H] \qquad (2)$$

where: P - weight of the locomotive, t; w_0 - average basic specific resistance to movement of cars and the locomotive as a part of a train, kgs/t; i - a bias of a site of a way, $^0/_{00}$.

Allocating from (2) weight of structure of cars it is had:

$$Q = \frac{F_k}{(w_0 + i)g} - P. \qquad (3)$$

Having increased the left and right part of expression (3) for speed of movement V и considering, that $V = L/t$, we will receive:

$$QV = \frac{F_k V}{(w_0 + i)g} - PV,$$

Or passing to specific productivity of the locomotive:

$$\frac{w}{t} = \frac{N}{3,6(w_0 + i)g} - PV, \qquad (4)$$

where: N - capacity of the locomotive, W.

The analysis (4) allows to draw following conclusions:

- for increase of productivity of locomotives it is necessary to raise weight of a train for the account of corresponding decrease in speed, rather the reverse;

- the maximum productivity of the set locomotive on the accepted profile of a way can be received at use of the greatest possible (settlement) force of draught of the locomotive which provides also the greatest weight of a train.

Such methodological approach is everywhere realized for the main and industrial railway transportation [9,10]. Use in traction calculations of economic components that is presented in [4-6], consist in definition power and (or) economically optimum trajectories of movement of a train only on a site of a stage and does not call into question dependence (4).

According to developed economic situations and operating standard documents definition of significant factors which characterize economic efficiency of work of the enterprises of an industrial railway transportation is necessary.

OBJECTS AND PROBLEMS

However work of industrial transport has the features. Along with expenses for cost of transportation of tonno-km of cargo and locomotive-hour works that is characteristic for the main transport, cost of payment of wagon-hour for use by cars of Ukrainian railway is imposed. Proceeding from it, it is necessary to consider as optimizing parameter cost of transportation of cargo.

Minimisation of cost of transportation of cargo is connected with necessity of reduction of time of transport service and, accordingly, increase in speed of movement of trains. However it is necessary to notice, that the increase in speed of movement of a

train is connected with reduction of weight of structure and, hence, increase in frequency of movement of the locomotive a reserve.

For the purpose of objective representation of formation of cost of transportation process it is necessary to consider making costs. According to data of GP «Antrazhitpogruztrans» for 2008 elementwise distribution of expenses at settlement cost of 1 kilometre-ton and 1 lokomotivo-hour is presented to tab. 1 and 2. Proceeding from the presented data, factors with the greatest weight factors which form cost of 1 kilometre-ton and 1 lokomotivo-hour at work of the enterprise of an industrial railway transportation it is necessary to consider wages (with charges), diesel fuel, materials and spare parts. Considering that fact, that now practically everywhere at the enterprises of industrial transport the personnel wages are charged according to size of the salary and, accordingly, do not depend on volume of transportation work of the enterprise the most significant factors are:
  - diesel fuel;
  - materials and spare parts.

Table 1. **Distribution of elements of expenses (in percentage) at calculation of cost of 1 kilometre-ton of transportation of cargo**

№	Cost elements	Value, %
1.	Materials and parts	20,58
2.	Fuel	20,63
3.	Electric power	1,05
4.	Production costs	7,99
5.	Wages (with charges)	37,85
6.	Amortization	6,74
7.	Other costs	5,16

Table 2. **Distribution of elements of expenses (in percentage) at calculation of cost of 1 lokomotivo-hour for diesel locomotive TAM2M**

№	Cost elements	Value, %
1.	Wages (with charges)	34,09
2.	Diesel fuel	35,25
3.	Diesel oil	0,67
4.	Other costs	29,97

On the basis of [7] since 2008 on present time the rate of payment for using freight cars of Ukrainian railway is essentially nonlinear (fig. 1), that stimulates consignors, consignees and transport agencies to minimize time of using cars. For comparison on fig. 1 graphic dependence of the rate of payment according to [8] operating during the period since 1999 on 2008 which essentially is 'softer' for clients in comparison with the existing is presented.

If to carry out the analysis of cost of diesel fuel (fig. 2) and rates of payment for using freight cars of Ukrainian railway (fig. 1) during the period from 1999 to 2008, it is possible to notice, that at change of a wholesale price of fuel in 12,5 times, the rate of payment for using cars has on the average changed in 2,5 times.

Thus, depending on the developed prices for combustive-lubricating materials and cost of use of cars, and also volume of a goods traffic, distance between industrial station and adjunction station updating of technological process of the enterprise is necessary.
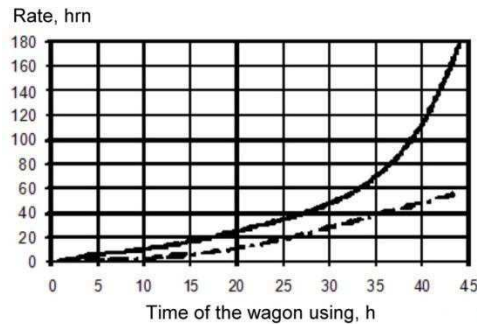

Fig. 1. Rates of payment for using freight cars of Ukrainian railway (1999 and 2008)
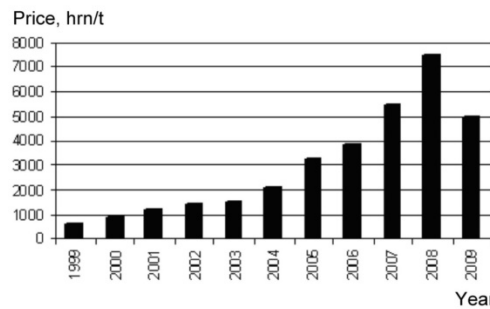

Fig.2. Dynamics of change of wholesale prices for diesel fuel

CONCLUSIONS

The operational administration of the enterprise of industrial transport without fail should assume regular recalculation of current cost of transportation process depending on the developed economic situation and, accordingly, to correct technological process taking into account possible change of weight of trains and time of transport service.

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ОПРЕДЕЛЕНИЕ ЗНАЧИМЫХ ФАКТОРОВ, ХАРАКТЕРИЗУЮЩИХ ЭКОНОМИЧЕСКУЮ ЭФФЕКТИВНОСТЬ РАБОТЫ ПРЕДПРИЯТИЙ ПРОМЫШЛЕННОГО ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА

Татьяна Гуцол

Аннотация. В соответствии со сложившейся экономической ситуаций и действующими нормативными документами определены значимые факторы, которые характеризуют экономическую эффективность работы предприятий промышленного железнодорожного транспорта.

Ключевые слова: управление промышленным транспортным предприятием, тяговые расчеты, стоимость перевозочного процесса.

THE ANALYSIS OF EXISTING CRITERIA
OF THE COMFORTABLE CONDITION OF THE PERSON
AT INFRA-RED HEATING

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Summary. It is shown, that thermal sensations of the person depend not only on thermal balance of its body, but also from the scheme of transfer of heat to the environment, and also from a parity of temperature of the air and temperature of the protecting constructions in a premise, around of the person.

Key words: thermal balance, comfortable conditions, radiant or convective heating, infra-red radiation, air or premise temperature.

INTRODUCTION

Earlier it was considered, that thermal sensations of the person depend only upon thermal balance of its body, that is upon the quantity of heat, that human body gives to the environment. Thus it was not taken into a consideration how this heat is given out and what is the parity of temperature of the air and temperature of the protecting constructions or subjects directly surrounding the person.

In researches on definition of comfortable conditions for the person [1] it was specified, that a person experienced those conditions at a certain interval of temperatures of air, for example, at performance of physical work this interval of temperatures of air considers to be - 18…22°. At decrease or increase of considered temperature limits the person experiences unpleasant thermal sensations. According to that norms of optimal temperature of air in the inhabited and public premises have been established [2].

With application of radiant heating in industrial premises there were many difficulties in maintenance of comfortable conditions for people. Cases when, under apparently identical conditions of heating of premises by radiant heating some people complained on cold, others - on heat were observed [3]. Researches [4, 5] have shown, that the person is not indifferent to the way now the heat is transferred to him or her or taken away. So, for example, it has appeared, that at radiant heating the general heat

loss of the person decreases a little bit in comparison with a heat loss at a convective heating.

By researches [6,7] it has been established, that for the achievement of comfort at radiant or convective heating it is necessary to provide a certain parity of temperatures of internal air and protecting constructions of a premise. Drawing 1 shows, that at radiant heating the admissible difference between temperature of internal air and protecting constructions can be much higher, than at convective heating. It means, that with the first was of heating comfortable conditions could be provided at lower temperatures of internal air, than with the second one, while the temperatures of protecting construction are the same.
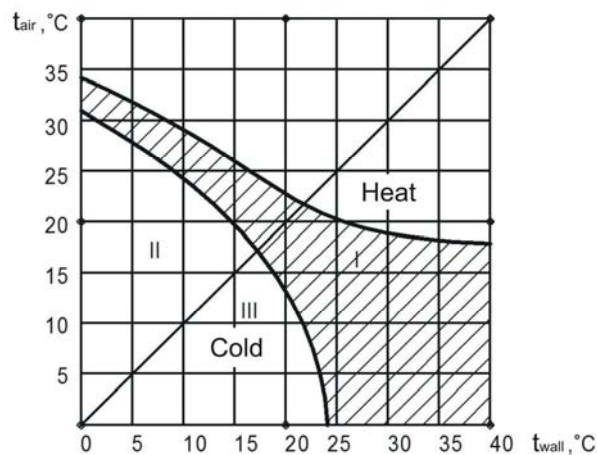

Fug. 1. Borders of a zone of a comfortable condition (I) of a person at
use of systems of convective (II) and radiant (III) heating

Researches [4,5,8] show, that working abilities of a person is considerably higher at inhalation of the air with considerable low temperature at identical thermal sensations. Results of researches have shown, that at heating of premises by torches of infra-red radiation the best state of health of people is observed at air temperature of 13…13,5 °C, that is below the established standard of 18…19°C. The level of physical activity is a very essential factor of person's heat sensing. With the increase of physical activity thermal emission can raise from 100 to 450 kcals/hours and more. These surpluses of thermal emissions should be extinguished by the transfer of them to the environment by convection to the surrounding air and by emission on protecting constructions or surrounding subjects.

At radiant heating the share of heat loss by convection increases, both due to the rise of skin temperature, and at the expense of increase in speed of air movement around the person. Thus, the results of the above-stated researches allow to assert, that adaptivity with radiant heating demands less efforts from the thermoregulating organs of the person.

RESEARCH OBJECT

The brief analysis of a condition state of the problem specifies that there are different approaches to the estimation of comfortable conditions at heating of industrial premises by means of infra-red heating. These approaches can't give a correct answer to the question why under identical conditions of heating of premises by radiant heating different people have different thermal sensations. Presented article is a search for the answer to this question.

RESULTS OF EXPERIMENTAL RESEARCH

Researches [9] show, that normal sensation of heat of a person is defined by two key parametres – the temperature of air and mid-radiation temperature, and their uniting parametre is the temperature of a premise [10] which is defined under the formula:

$$t_{prem} = r\,t_{air} + (1-r)t_{mrt}\,, \qquad (1)$$

where: t – premise temperature;
r – degree of influence of temperature of air (in different sources it is from 0,333 to 0,557) [6,10,11];
t_{air}– air temperature indoors;
t_{mrt} – mid-radiation temperature indoors.

According to [1] the resultant temperature is defined under the formula:

$$t_{res} = t_{air} - 0,83q\,, \qquad (2)$$

where: q – value of a thermal irradiation of the person, W/m^2.

And taking into account the mobility of air v can the temperature be found from

$$t = 0,55t_{mrt} + 0,32t_{air} + 0,46v^{0,5}t_{air} + 13,35v^{0,5} + 5\,. \qquad (3)$$

In [6,11] this parameter is named "the modified equivalent temperature" and can be calculated from the dependence:

$$t = 0,522\,t_{air} + 0,478\,t_{mrt} - 0,01474\,v^{0,5}\,(100 - t_{air})\,. \qquad (4)$$

In [1] the indicator of a thermal sensation of a person is offered. This indicator includes the temperature of a premise taking into account humidity and mobility of the air.

$$t = 0,431t_{air} + 0,408t_{mrt} + 0,132p_{ws} - 0,328 - 0,141v^{0,5}\,(37,8 - t_{air})\,, \qquad (5)$$

where: p_{ws} – partial pressure of water steam in air, mm Hg.

The resulted dependences are semiempirical and represent the attempts of researchers to express a comfortable condition of the person by means of one indicator - «premise temperature». However it is necessary to notice, that their reliability corresponds only to that range of internal conditions in which experiment has been put.
In [6] empirical dependences for the definition of temperature of radiant heating device according to its placement are presented. Krenko's method is used for panel-radiant heating with ceiling heating. Machkashy's method is used for radiant mid-temperature heating. Carrying out the experiments in a premise, the whole surface of a ceiling or its part was heated to such temperature at which the minimum quantity of complaints from the group of people was observed. Results were represented in the form of diagrammes

where: the optimum temperature of a heater was specified. The range of temperatures, for Krenko's diagramme reaches 60°C, for Machkashy diagramme - up to 290°C.

There is also a method when climatic parametres are shown in the form of the subjective characteristic called an indicator of thermal sensation S which is, according to the researches of Van Zuylen [1], can be calculated by means of the equation:

$$S = 7,83 - 0,1\,t_{air} - 0,0968\,t_{mrt} - 0,0372\,p_{ws} + 0,037\,v^{0,5}\left(37,8 - t_{air}\right). \qquad (6)$$

The same indicator according to Winslow and Gedge [12] is equal to

$$S = 11,16 - 0,0556\,t_{air} - 0,0538\,t_{mrt} - 0,0372\,p_{ws} + 0,014\,v^{0,5}\left(100 - t_{air}\right). \qquad (7)$$

The thermal balance of the person in the basis of the researches on working out of the criterions of comfortable condition, made by Funger [7]:

$$H - Q_{hd} - Q_{ob} - Q_{d} - Q_{dph} = \frac{t_m - t_{cl}}{0,153 \cdot R_{cl}} = Q_{rm} + Q_{cm}, \qquad (8)$$

where: H – full heat rejection of the person, W/m^2;
Q_{hd}, Q_{ob} – hidden and obvious breath heat loss;
Q_d – heat loss diffusion of water steam through a dry skin;
Q_{dph} – heat loss diaphoresis;
Q_{rm}, Q_{cm} – obvious losses of heat according to radiations and by convection from the person into the environment;
t_m – temperature of skin of a person;
R_{cl} – thermal resistance of clothes;
t_{cl} – temperature on clothes surface.

According to Fanger at comfortable state of health of the person the temperature of person's skin should be equal to:

$$t_m = 35,7 - 0,032 \cdot H, \qquad (9)$$

and diaphoresis heat loss:

$$Q_{dph} = 0,49\left(H - 50\right). \qquad (10)$$

With the deviation of these parameters from the optimum ones, the tension of thermoregulating organs is observed. Other components of thermal balance are calculated as follows. The total amimount of warmth which should be lost, is defined from the expression:

$$H = M\left(1 - \eta\right), \text{ W/m}^2, \qquad (11)$$

where: M – heat production of a person.

To find M of a kind of physical activity it is possible to take advantage of data [13]. Heat loss diffusion through dry skin could be find out from the formula:

$$Q_d = 0,41\left(1,92\,t_m - 25,3 - p_{ws}\right), \text{ W/m}^2. \qquad (12)$$

Hidden and obvious heat loss by breath are defined from:

$$Q_{hd} = 0,0027\,M\left(44 - p_{ws}\right), \text{ W/m}^2, \qquad (13)$$

$$Q_{ob} = 0,0014\,M\left(34 - t_{air}\right), \text{ W/m}^2, \qquad (14)$$

and heat loss radiation – from:

$$Q_{hlr} = \sum \varepsilon_{ral}\,\varphi_{mi}\,C_0\,f_{ef}\,f_{cl}\left[\left(T_{cl}/100\right)^4 - \left(T_i/100\right)^4\right], \text{ W/m}^2, \qquad (15)$$

where: ε_{rsl} – the resulted degree of blackness;

φ_{mi} – coefficient of irradiance of the person from definite surfaces with temperature t_i;

f_{ef} – coefficient of the effectiveness which considers self-shading of the person (f_{ef} for the sitting person is equal 0,696, for the standing – 0,725);

f_{cl} – factor which considers increase of the area of heat exchange of the dressed person in comparison with the undressed one.

The coefficient of the radiation of a person from an elementary platform d is equal:

$$\varphi_{m-dF} = f_p \frac{\cos\beta_n}{\pi R^2} dF , \tag{16}$$

where: β_n – is a tangle between a normal of an elementary platform and segment R;

R – distance from the centre of a person to the centre of an elementary platform;

f_p – projective factor of the person, that is the relation of a projection of a surface of a body of the person on a plane perpendicular to R, to the real area of person's surface.

In [7,12] diagrammes for calculation f_p of standing or sitting person depending on an angle of lifting of elementary platform P and angle of reference of this platform α are presented. For definition φ_{m-dF} surface it is necessary to integrate the equation (16) on this surface:

$$\varphi_{m-dF} = \int_F f_p \frac{\cos\beta_n}{\pi R^2} dF . \tag{17}$$

Heat loss by convection make:

$$Q_{cm} = \alpha_{cht} k \left(t_{cl} - t_{air} \right), \tag{18}$$

where: k – coefficient of influence of clothes on convectional heat transfer;

α_{cht} – coefficient of convectional heat transfer of a person, W/m²·°C, which at mobility of air to 0,1 km/s can be found from the dependence:

$$\alpha_{cht} = 2,4 \left(t_{cl} - t_{air} \right)^{0,25} , \tag{19}$$

At mobility of air $v = 0,1…2,6$ m/s α_{cht}, on [12] it is equal $\alpha_{cht} = 12 v^{0,5}$, W/m²·°C.

The coefficient considering reduction of heat transfer due to the influence of clothes is equaled [1]:

$$k = \frac{1}{1 + 0,155 \cdot \alpha_{cht} R_{cl}} . \tag{20}$$

The quantity of warmth, arriving from the person, is:

$$Q = Q_x \cdot F_m , \tag{21}$$

where: Q_x – intensity of heat transfer, calculated under the resulted formulas (12-17, 19);

F_m – the area of a surface of a person:

$$\sum_{i=1}^{n-1} Q_{1-i} + Q_{1-in} + Q_{1-out} = Q_{rad-1} + Q_{in.rad.-1} , \text{ m}^2. \tag{22}$$

In [14] and other sources results of researches of definition of an admissible difference of temperature of air at floor and head level are present. It is underlined, that for creation of conditions of comfort this difference should be not more than 2…3°C.
If radiators are settled down asymmetrically to a person, then the left side of the body receives other quantity of warmth, than the right side. The quantity indicator of degree of asymmetric heat supply is a vector's temperature (McIntyre's concept) [15]. It is defined from the difference of temperatures on both sides of a plate. To each side of the plate the thermal stream from that part of a hemisphere to which it is turned arrives. 20°C is the admissible value of vector's temperature for the premises with the lowered requirements of comfort, with average requirements - 10°C.

CONCLUSIONS

The executed researches show, that, first, radiant heating demands from the thermoregulating organs of a person smaller efforts for adaptivity, and second, that the majority of researchers were engaged in studying of working conditions at infra-red heating only from the point of view of thermal comfort of a person. Existing recommendations on calculation and application of systems of infra-red heating are reduced to the definition of thermal capacity of the devices and do not consider the influence of the infra-red radiation on a psychophysiological condition of a person.

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АНАЛИЗ СУЩЕСТВУЮЩИХ КРИТЕРИЕВ КОМФОРТНОГО СОСТОЯНИЯ ЧЕЛОВЕКА ПРИ ИНФРАКРАСНОМ ОТОПЛЕНИИ

Николай Касьянов, Виктор Рябичев, Иван Савченко

Аннотация. Показано, что тепловые ощущения человека зависят не только от теплового баланса его тела, но и от схемы передачи тепла в окружающую среду, а также от соотношения температуры воздуха и ограждающих конструкций в помещении, окружающих человека.

Ключевые слова: тепловой баланс, комфортные условия, лучистое или конвективное отопление, инфракрасное излучение, температура воздуха или помещения.

INFORMATION MAINTENANCE FORMALIZATION OF MATERIAL FLOWS IN LOGISTIC SYSTEMS

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Summary. In this article considered the problem of information maintenance formalization of material flow in logistic systems based on relational algebra, which will allow to draw up a single approach to information systems in logistics.

Key words: Logistics, material flow, dataware, relational algebra, formalization.

INTRODUCTION

Investigation of factors affecting the efficiency of logistics showed that the first two places by the importance occupy computer support and informational support of material flows [Levicov G.A. 2003]. However, as practice shows, along with the existing automated bundled software, serving single subsystems of logistics systems, there is no single approach to the information maintenance formalization of the material flow in logistic systems. The development of such a formalization would standardize the processing of information flows in accordance with the supply chain and will enable the processing and information maintenance of material flows on-line.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

In most logistics studies the formalization is based on the manufacturing process, which is correct in itself, but in turn it depends on the completeness of the process and on the place of the process in logistics chain, and thus is formally incomplete.

The performed analysis of the existing standards of comprehensive automation of logistics systems at all levels (MRP, MRPII, ERP, CSRP, SCM, SCEM) showed that all of them have complete description of properties and requirements for dataware of logistics subsystems. However, there is a need to detail the existing standards on the one hand, and to unite them with another, for the purpose of the universal representation of the information unit of material flow. The foundation for this task are current technologies of identification (bar code and RFID).

PURPOSE AND PROBLEM STATEMENT OF RESEARCH

The purpose is to develop a universal representation of the information unit of material flow. For this purpose we solve the problem of mathematical formalization of informational support of material flows in logistics systems based on constructive mathematical logic [P.S.Novikov 1977]. The foundation of this topology formalization (in terms of mathematics), should include consistent, comprehensive, complete (with the possibility of further development) system (algebra) of statements.

MAIN SECTION WITH THE RESULTS AND THEIR ANALYSIS

Information logistics is the constantly and continuously process in the existing logistic chain, which accompanies the material flow. Besides that, all components of the logistics process have both quantitative and qualitative characteristics, it means that information objects definitely correspond to them.

An important role in the logistics formalization plays many years' experience of semantic formalization of logistics processes in the economy. Sufficiently competent and complete semantic formalization of logistic chains allows us to make a mathematical formalization in our work. In the meantime, the purpose of such formalization would be very specific problem that arises before the developers of logistics information systems - the problem of designing a unified database of logistics system. It is quite obvious is the use of relational algebra in the formalization of information objects.

The main idea of relational algebra is as the relations (as the basic concepts of relational algebra) are sets, then the means to manipulate the relations may be based on the traditional set-theoretic operations, supplemented by some special operations, specific for databases. There are many approaches to the definition of relational algebra, which differ in a set of operations and ways of their interpreting, but in principle, more or less equivalent. We used the initial advanced version of algebra, which was proposed by Codd. In this version, a set of basic algebraic operations consists of eight operations, which are divided into two classes - the set-theoretic operations and the special relational operations.

On this, basic set of axioms that defines the specific use of relational algebra can be supplemented with axiomatic schemes, describing logistic chains of different functional types, corresponding to international automating standards in logistics, in the process of information maintenance formalization of logistic material flows.

The complete set of mathematical relations λi, which are used to represent the logistics system, generates a set consisting of 2h simplicial complexes (simplex), two for each λi. This set S is usually called a static background of the concerned logistics system. The dynamics of the logistics system must operate exactly on this ground. This dynamic will be described by changes in models (mathematical functions) defined on the simplexes of set S.

The proposed solution is based on the need of an adequate mathematical formalization of those problems, which arise in a particular part of the material flow of logistics system. The importance of this formalization is based on the fact that it offers each of us a ready set of the initial elements for a model constructing, but does not offer

a specific model. In this sense it is an illustration of the "metamodel". Consequently, it can not be "wrong" at the model level, but can only be poorly used. [J. Andrews, R. Makloun 1979].

Let's consider the proposed by the author [Malikov, O.B. 2003] schemes of logistics chains, putting them in line axioms founded in our formalization. As a component of our logistic chains are accepted:

• Companies - Manufacturers (ratio A)
• Companies - Consumers (ratio B)
• Terminal warehouses in multimodal transportation systems (ratio C)
• Resellers (ratio D)
•Transport companies of different types of transport (ratio E1, E2, E3).

There are seven types of logistic chains in the adopted formalization in the form of axiomatic expressions:

$$\lim(A) \cap \text{pro}(E1) \cap \lim(B)$$ – axiom for the chain of type 1

$$\lim(A) \cap \text{pro}(E1) \cap \text{pro}(C) \cap \text{pro}(E2) \cap \lim(B)$$ - axiom for the chain of type 2

$$\lim(A) \cap \text{pro}(E1) \cap \text{pro}(D) \cap \text{pro}(E2) \cap \lim(B)$$ - axiom for the chain of type 3

$$\lim(A) \cap \text{pro}(E2) \cap \text{pro}(D) \cap \text{pro}(E3) \cap \lim(B)$$ - axiom for the chain of type 4

$$\lim(A) \cap \text{pro}(E1) \cap \text{pro}(C) \cap \text{pro}(E2) \cap \text{pro}(D) \cap \text{pro}(E3) \cap \lim(B)$$ –
axiom for the chain of type 5

$$\lim(A) \cap \text{pro}(E3) \cap \text{pro}(C) \cap \text{pro}(E2) \cap \text{pro}(D) \cap \text{pro}(E1) \cap \lim(B)$$ –
axiom for the chain of type 6

$$\lim(A) \cap \text{pro}(E1) \cap \text{pro}(D) \cap \text{pro}(E2) \cap \text{pro}(C) \cap \text{pro}(E3) \cap \lim(B)$$ –
axiom for the chain of type 7

The number of such axioms is determined only by the capacities of applied problems of logistics, which give rise to them in the set - and this is the principle of the proposed formalization development, formulated at the beginning of the work.

At the application technology level the implementation of the assigned task is possible with MICROSOFT SQL SERVER software with built-in relational data manipulation language Transact-SQL (T-SQL).

In addition, each of the above logistic chains in formalized form can be interpreted using T-SQL language in the form of information request on the current state of logistic chain:

```
select * from A where lim(A)
union select pro(E1) from E1
union select * from B where lim(B) – for axiom 1
select * from A where lim(A)
union select pro(E1) from E1
union select pro(C) from C
union select pro(E2) from E2
union select * from B where lim(B) – for axiom2
select * from A where lim(A)
union select pro(E1) from E1
union select pro(D) from D
union select pro(E2) from E2
union select * from B where lim(B) – for axiom 3
select * from A where lim(A)
```

union select pro(E2) from E2
union select pro(D) from D
union select pro(E3) from E3
union select * from B where lim(B) – for axiom 4
select * from A where lim(A)
union select pro(E1) from E1
union select (C) from C
union select pro(E2) from E2
union select pro(D) from D
union select pro(E3) from E3
union select * from B where lim(B) – for axiom 5
select * from A where lim(A)
union select pro(E3) from E3
union select pro(C) from C
union select pro(E2) from E2
union select pro(D) from D
union select pro(E1) from E1
union select * from B where lim(B) – for axiom 6
select * from A where lim(A)
union select pro(E2) from E2
union select pro(D) from D
union select pro(E2) from E2
union select pro(C) from C
union select pro(E3) from E3
union select * from B where lim(B) – for axiom 7

We can add to the above formulated:

– query syntax can be modified by the construction INNER JOIN language T-SQL, which is especially efficient in the replication technologies of complex distributed data structures;

– flowsheet based on the made formalization is applicable in ONLINE, or OFFLINE access.

The main conclusion is that the adopted system of mathematical formalization of the information maintenance of material flows of logistics systems has topological (basic) character with respect to all other methods of formalization.

The proposed formalization principle of the information maintenance of material flows of logistics systems as the basis of any logistics chain formalization was implemented with the creation of a distributed database of information logistics system chain of a small wholesale by a company-manufacturer with information identification of an article.

CONCLUSIONS

Using the proposed formalization gives developers the opportunity of creation not only centralized, but distributed up to each product unit of the database of this system for the purpose of its further use (database) in forecast and analytical problems primarily used as a tool computer simulation.

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ФОРМАЛИЗАЦИЯ ИНФОРМАЦИОННОГО СОПРОВОЖДЕНИЯ МАТЕРИАЛЬНЫХ ПОТОКОВ В ЛОГИСТИЧЕСКИХ СИСТЕМАХ

Алексей Кичкин, Елена Кичкина, Максим Слободянюк

Аннотация. В статье рассмотрена задача формализации информационного сопровождения материальных потоков в логистических системах на базе реляционной алгебры, которая позволит выработать единый подход к созданию информационных систем в логистике.

Ключевые слова. Логистика, материальный поток, информационное обеспечение, реляционная алгебра, формализация.

METHOLOGY OF EXPERT WORK FOR INSURANCE OF ACCIDENT AT PRODUCTION

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Summary: The methology for improving the work of the expert in insurance of accident at production.

Key words: insurance experts, methodology of analysis of expert-insurance, accident at work, tariff policy.

INTRODUCTION

Insurance against accidents at work has the features for both commercial insurance companies and for social insurance against industrial accidents.

The specifics of this type of insurance leads to diverse analysis of the insurance companies and state enterprises insured. In order to improve and enhance the performance of insurance experts and insurance companies was established methodology. It is based on components that are the basis of the insurance against accidents at work, safety assured, tariff policy and prevention.

OBJECTS AND PROBLEMS

The analysis of publications shows that currently no single methodology that helps improve the operation of an insurance expert and fully consider the dynamics of the insurance against accidents at work.

Methodology significantly reduces the time a decision on the risk that arose or may occur in weather helps make payments in future years, to adjust the rates under the relevant risk-insured companies.

To improve the work of insurance companies was established methodology of expert analysis of insurance that allows you to analyze the activities of insurance companies for insurance against accidents.

The specifics of the insurance business determines the main directions of insurance companies.

The methodology allows to consider the work of insurance companies on all aspects of insurance against accidents at work both in the form of commercial and social insurance. Thus the efficient working of insurance experts determines the quality of insurance companies.

Methodology consists of three components:

▪ Model Fuzzy mathematical logic expert insurance work, realized on the basis of the analytical unit information system Accident.

▪ Agent simulation model prediction of the accident the employee-insured and insured enterprises.

▪ Simulation model of dynamic financial analysis of the rates for insurance and accident reserves to pay in the "Bonus Malus".

These three elements are the work methods and insurance experts and improving the state of the insured.

Detailed look at each point methodology.

Specificity of insurance related to problem solving that for modern insurance company is impossible without the use of information technology. Therefore an information system Accident, takes into account all peculiarities of accident insurance that provides insurance cases to analyze and make decisions to experts, based on information received from the system.

The first point is responsible for making decisions in an accident on the base unit of analytical information system Accidant .With fuzzy model is build reports in the system, and further expert decision.

According to the report, concludes about the danger of an accident on a particular business area. Evidence of this is another indicator of a report - rank. Where it is greatest when the most dangerous enterprise. Important when there is a recognition or non-accident insurance in the state social insurance. This unrecognized insurance cases shall be subject to commercial insurance against accidents at production.

Thus, the decision-making based on the analytical unit of Accident allows experts to identify the business in the region is the most dangerous for workers, which factors most affect the process of improving safety. Further to a flexible insurance, preventive and tariff policy.

The second point of methodology to make predictions about the accident risk for each company and the insured. Connect agent simulation model to the database information system enables Accident make forecasts for future years for individual businesses and city employees insured on it.

Thus, agent based simulation model allows to make educated decisions in which state insurance will be insured and the enterprise of insurance against accidents at production. Allows you to discover the most dangerous enterprise for working life, where we should hold prevention policy, which is most likely an accident, identify future payments by companies based on their status in previous years.

For verification of insurance rates under the actual conditions and the state labor safety, industrial injuries and occupational diseases corresponding system-dynamics model-third point methodology[Karpov Yu, 2006].

That model is created in the formation of insurance rates and reservation system using "Bonus-Malus" which is a financial base of insurance against accidents at production.

That tariffs are subject to business results for the previous calendar period.

The law on social insurance accident insurance rate depends on the occupational risk industries, into which the company up to him (for the low level of injury,

occupational diseases and proper state of health) or premium (for high levels of injury, occupational diseases and inadequate state of health) that actually corresponds to the use of "Bonus Malus" [Law of Ukraine,1999]. Imitating a system dynamics model uses dynamic modeling financial condition of the insurer in the "Bonus Malus".

Developed system-dynamic model allows:
▪ analyze dynamic performance of the commercial insurance companies and social insurance against accidents;
▪ dynamically analyze the activities of commercial insurance companies and social insurance against accidents in the "Bonus-Malus, separate changing values and norms Bonus-Malus-standards, having first opportunity to assess the impact of these regulations on the performance of the insurance company or from the Social Insurance Fund accidents;
▪ possibility of change in tariff model insurance loss and norms, creating a flexible tool to use models in different insurance organizations;

Thus, system dynamics model can be applied tariffs accident insurance for each of the client system authorized by law "Bonus-Malus. It is important to forecast the financial condition of the insurer.

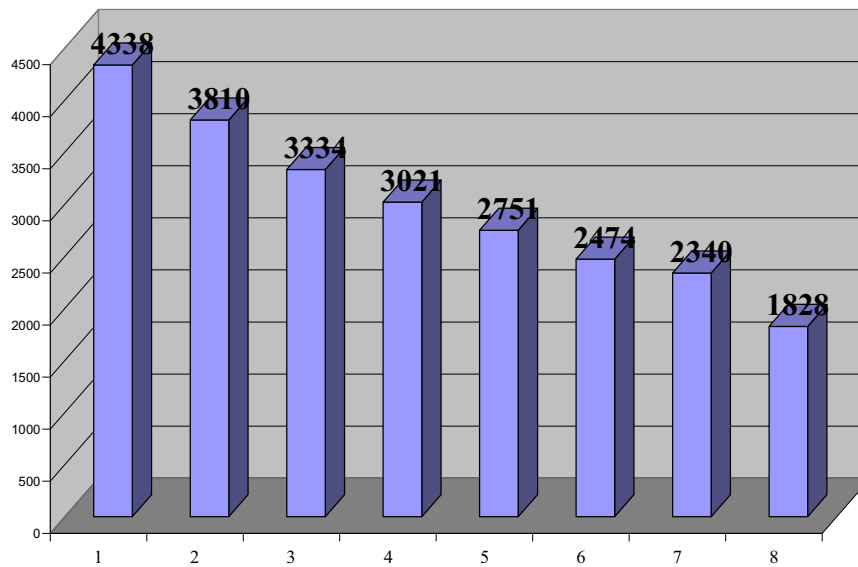Fig.1. The dynamics of occupational injuries in 2002 - 2009 years in Ukraine

Methodology insurance expert analysis creates the conditions of the insurance expert who:
▪ allows to quickly and objectively assess the risk-based insurance object promptly accumulated,
▪ improve the efficiency of decision-making expert,
▪ consider the numerical evaluation of qualitative factors that influence the occurrence of accidents at production,

▪   provide conditions for effective implementation of tariff policy with the insured for insurance against accidents in production,
▪   permit decisions based on the prediction of the insurer and the insured.
The effectiveness of the methodology and efficient operation of insurance experts suggest the data to reduce occupational injuries [electronic resource, 2010]:
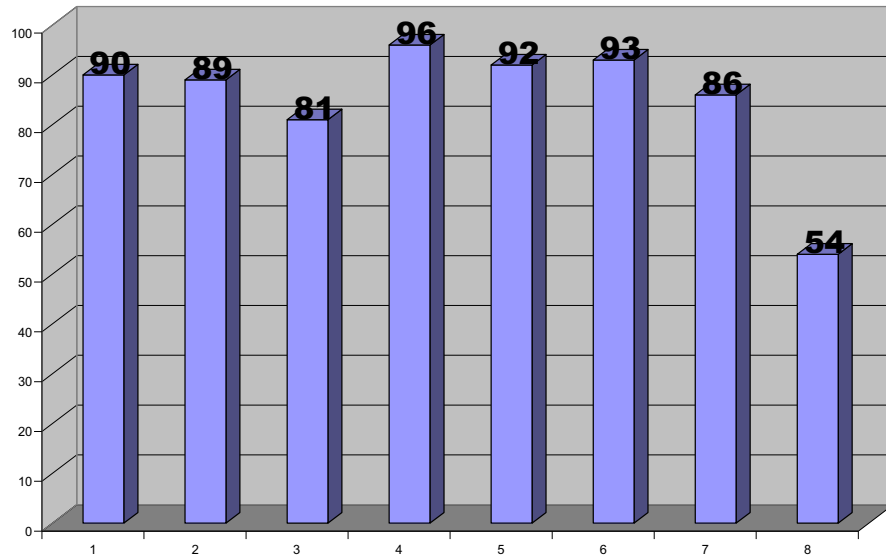

Fig.2. Dynamics of fatal occupational injuries in 2002 - 2009 years in Ukraine

By graphs we see that due to the efficient operation of insurance experts and a quality of preventive and tariff policies have seen the significant reduction of occupational injuries every year in Ukraine. Industrial injuries declined in 2009 compared with 2008 by 22%. And the most important and positive is the reduction of fatal occupational injuries especially in recent years. This is evidenced by effective work, both from the insurance companies involved in insurance against accidents at work, and from companies of insurers, who are their clients.

CONCLUSIONS

The methodology allowed:
▪   significantly reduce the decision-making through expert analytical unit information system Accident;
▪   allowed insurance experts have an idea of the state enterprises and the insured to pay the insured for the future based on that of the state enterprises are now;
▪   predicts that tariffs for insurance from accidents at work on the use of "Bonus-Malus.

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МЕТОДИКА ЕКСПЕРТНО-СТРАХОВОЙ РАБОТЫ ПРИ СТРАХОВАНИИ НЕСЧАСТНОГО СЛУЧАЯ НА ПРОИЗВОДСТВЕ

Татьяна Кичкина

Аннотация: Рассматривается методика усовершенствования работы страхового эксперта при страховании несчастного случая на производстве.

Ключевые слова: страховой эксперт, методика экспертно-страхового анализа, несчастный случай на производстве, тарифная политика.

FORMATION OF THE INFORMATION MODEL
OF SYNTHESIS SYSTEMS

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Summary. The uniform scheme of analysis stages and synthesis of difficult objects is offered. Possibilities of application of the structurally-logic scheme are shown at synthesis of difficult objects.

Key words: information model, synthesis systems, structurally-logic scheme.

INTRODUCTION

From positions of technology of working out of new systems it is possible to note analogy in approaches to the decision of problems between stages: system synthesis, system designing, system manufacturing, operation of system [1].

At each stage following steps can be realized [11]:

1. The analysis of existing physical systems or their prototypes.

2. Working out of information models of separate aspects of activity of physical systems.

3. System synthesis.

4. Working out of information systems (as independent objects).

5. Working out of information models of the software products realizing activity of physical or information systems.

6. Working out of software products on the basis of information models.

Working out of information models of various aspects of activity of physical system according to an object in view, and also corresponding software products allow to make more exact analysis and to predict the basic indicators of functioning of system [5,8,9]. It is natural, that working out of physical system, information models of different level and corresponding software products cannot be carried out is isolated, independently from each other. The problem is in working out of uniform methodology of creation of system at different stages, formation of the modeling, design and program documentation on uniform principles and approaches so that to minimize time and financial expenses at possible changes in the project, adjustments, etc [6].

In the given chain: physical system - information models - software products - it is necessary to establish requirements which would provide the uniform methodological approach to the analysis and synthesis of the listed objects [4,7,10]. Such communication is expedient for carrying out from positions of the system approach.

In work the uniform scheme of the analysis and synthesis of difficult objects which allows consistently is offered, with high degree of formalization of processes of working out of projects to raise accuracy of the decision of problems, reducing expenses for their realization.

OBJECTS AND PROBLEMS

The sequence of analysis stages and synthesis of systems should consider, first of all, interlevel character. For each level it is necessary to define: the analysis purpose, with allocation of object of the analysis and a subject domain, the functional-structural level on which it is necessary to allocate the functions defining achievement of the purpose, and also concrete ways and the implementers of functions accepted in physical system. On fig. 1. the scheme of sequence of performance of stages is presented at the analysis and synthesis of difficult objects.
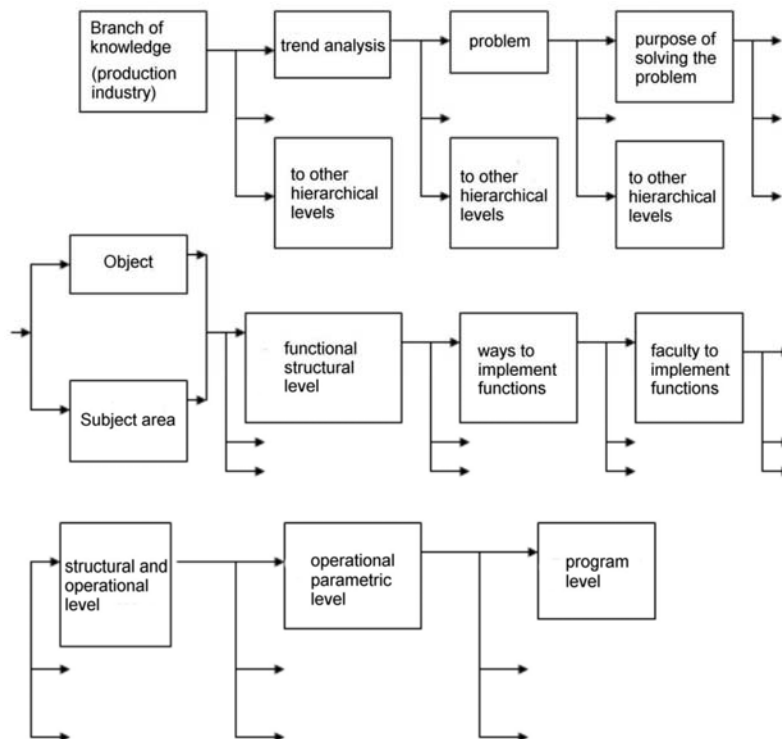
Fig. 1. Sequence of stages at formation of systems

It is necessary to notice, that at the analysis of system the primary goal is performance of rational decomposition of system, definition of rational quantity of steps of hierarchy and their interrelations, at system synthesis it is necessary to form variants of decisions, considering prominent features of each new variant on functional-structural and structurally-operational features and to make the decision according to the chosen criteria of an estimation [3].

At structurally-operational level possibilities of realization of the operations, expected events in system structure are considered set of operations according to structure of object, interrelation between functional-structural and structurally-operational levels. As a mathematical apparatus here are used at the bottom levels of Petri`s network and their expansions, rotational networks, etc., and the unified language of modeling UML [12-16] can be applied to the description of communications [2], for example.
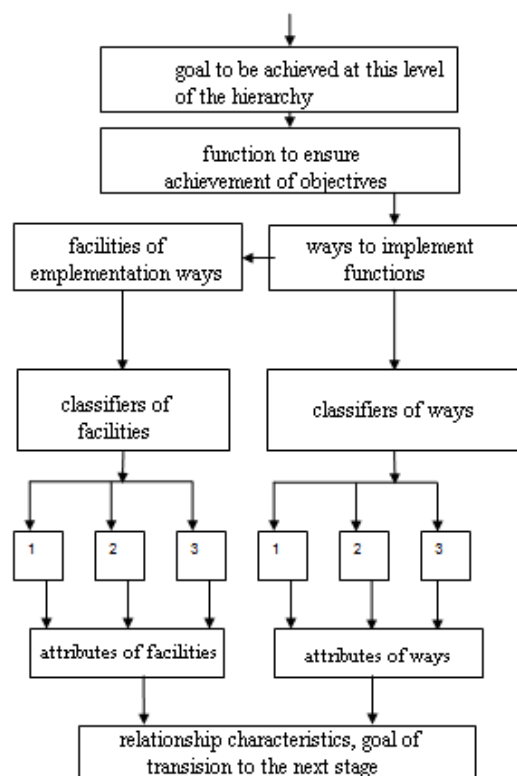
Fig. 2. A fragment of the structurally-logic scheme

At functional-structural level such functions which provide performance of set of the operations allocated at structurally-operational level should be considered, first of all. Hence, structurally-operational level makes demands to functional-structural on the

co-ordinated interaction though they are considered at different stages. In one cases it is possible to aspire to their unequivocal conformity, in others - at functional-structural level there is a realization possibility considerably more sets of operations, than it is required for concrete conditions of production.

Such situation allows to maneuver the nomenclature of produced products, the system possesses high degree of flexibility. The more possibilities for realization of different sets of operations, the above degree of flexibility of system.

At a choice of rational variants of difficult objects it is recommended to apply the structurally-logic scheme of synthesis of these objects. It allows to receive set of variants of functional-structural decisions of system with enough high degree of formalization and to choose from them the best.

The structurally-logic scheme can be presented as hierarchical structure with communications between elements in each hierarchical step and between steps. Each step can be considered as mutually connected sets of qualifiers of means and ways of their interaction which correspond to initial data and signs of other elements of the system having communications with elements of the given step.

The structurally-logic scheme is constructed on the basis of the system approach where following steps of transition are reflected: goal $\rightarrow$ function $\rightarrow$ ways and implementers of functions $\rightarrow$ parameters and communications. Each purpose is reached by means of various number of functions, and each function - by use of set of ways and facilities.

As there is a possibility of reception of a considerable quantity of variants of facilities, and is possible also ways with which help some function can be carried out, construction of qualifiers of ways and facilities is necessary. Classification is a construction of the description of classes and rules of their formation from objects, and the qualifier is an identifier of distribution of objects on in advance certain classes. Working out of qualifiers - a stage of creative work of the designer and the technologist. The problem consists in a substantiation of a minimum quantity of characteristics, parameters of elements of object, sufficient for the decision of a problem with demanded accuracy. The quantity of characteristics of elements in many respects defines further dimension of a problem.

The successful decision of problems with application of the structurally-logic scheme to a great extent depends on the maintenance of qualifiers.

Systemic of the approach by scheme working out allows to consider the most important communications between elements. These conditions give the chance to limit considerable number of possible variants of the decision. The definitive variant is checked by criteria of an optimality (economic, technical and economic, etc.) and then specified.

CONCLUSIONS

Thus, in work the scheme of sequence of performance of stages is offered at the analysis and synthesis of difficult objects which allows consistently, with high degree of formalization of processes of working out of projects to raise accuracy of the decision of problems, reducing expenses for their realization. Possibilities of application of the structurally-logic scheme are shown at synthesis of the difficult objects, allowing to receive and choose best of set of variants of functional-structural decisions of system.

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ФОРМИРОВАНИЕ ИНФОРМАЦИОННОЙ МОДЕЛИ СИНТЕЗА СИСТЕМ

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Аннотация. Предложена единая схема этапов анализа и синтеза сложных объектов. Показаны возможности применения структурно-логической схемы при синтезе сложных объектов.

Ключевые слова: информационная модель, синтез систем, структурно-логическая схема.

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THE PROGNOSIS OF THE DEMAND OF SPECIALISTS
ON THE REGIONAL MARKET OF LABOUR

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Summary. The article considers the generalization of the prognosis's model "Caterpillar" for the case of sentinel row which is set by fuzzy numbers and the modification of stochastic algorithm of the function construction of element's belonging to the sentinel row. The model is applied for the prognosis of demand of specialists on the regional market of labour and it is tested on the real data of Main administration of statistics in the Luhansk region.

Keywords: socio-economic development; regional labour market; fuzzy "Caterpillar"; prognostication of the demand on specialists.

INTRODUCTION

The important pre-condition of the adjusting of economy is the development of prognoses. In the conditions of passing to the market relations of prognostication becomes the initial stage, the basis of all system of management. It is related to the change of development's trajectories in the conditions of market, the increase of choice's variants, the development of the system of alternative prognoses.

The most difficult economic mechanism of concordance of interests of the hired workers and employers is a regional labour market [Zabelina 2002, Kashepov 2008, Baranik 2007]. Demand and supply are differentiated on it, and it is very not much irreproachable. The tool is limited enough with the help of which it is possible to carry out adjusting of the regional labour market, and the Luhansk region is not an exception here.

The exact and reliable prognosis of the condition of labour market becomes the most important instrument in this case [Conception 2004]. The value of prognosis means that it allows to estimate the development of the situation in the future [Yankovska 2005, Yashenko 2006].

ANALYSIS OF PUBLICATION

The basis of the prognoses of socio-economic development is created by the system of demographic, social, scientifically-technological and other prognoses of some spheres of economy. The experience of prognoses development of the requirement in labour force both abroad and in our country allows to formulate the list of common requirements: they must become an organic part of macroeconomic prognostication of the industries development and enclose a 5-10-year period; for the increase of the degree of prognoses authenticity of the common and additional requirement in labour force it is necessary to improve substantially the quality of the informatively-statistical materials, to perfect the methodology of calculations in order to connect the variable macroeconomic indexes with the dynamics of demand on the labour force [Klyachko 2006, Zabelina 2002, Moiseenko 2001, Chizhova 1998, Chizhova 2004, Krupskij 2004].

During the prognostication it is assumed that the value of prognosis depends on any factors or signs [Turunceva 2007, Pavlov 2004, Pavlov 2007, Krupskij 2003]. One of the approches near the problem of the prognostication is based on the assumption of the dependence of prognosis quantity from the previous values of the sentinel row. The theoretical ground of such approach is a theorem of Takens [Krisilov 2003]. If a sentinel row is generated by the dynamic system, it means that $\{f(t)\}$ is an arbitrary function of the state of such system, there is such a number d (which equals approximately to the effective number of the degrees of freedom of this dynamic system), that d of the previous values of the sentinel row determines definitely a next value.

RESEARCH OBJECT

The research purpose is model development for the prognosis of demand of specialists on the regional market of labour and it is tested on the real data of Main administration of statistics in the Luhansk region about demand on the specialists of different specialities. For achievement of this purpose the followings tasks are put and decided: the prognosis model of demand of specialists is developed on the basis of model "Caterpillar" with the use of fuzzy logic and modification of stochastic algorithm of construction of function of belonging of element of sentinel row for which it is necessary to execute the prognosis; the model of prognosis is tested within the framework of the decision support system of co-operation of the regional system of education and labour market.

RESULT OF RESEARCH

The prognostication with the use of models of the sentinel rows is one of the most widespread methods of prognostication of the indexes [Turunceva 2007]. During the prognostication of the sentinel row its future values or descriptions can be calculated on the basis of analysis of its known previous values.

Let's consider the generalization of the model "Caterpillar" with the use of the theory of the fuzzy sets. The dynamics of the sentinel rows is usually described by the numerical row of index values in the given moments of time:

$$f_i = f(t_i), i = \overline{1 \ldots N} \ , \tag{1}$$

where: t_i connected by the correlations $t_{i+1} = t_i + \Delta t$. It is foreseen that an uncertainty which is contained in every element of the initial sentinel row $f(t)$ is described in the form of the fuzzy set.

The procedures of the method "Fuzzy caterpillar".

Step 1. The unrolling of the unidimensional row to the multidimensional one (a construction of matrix F according to the initial sentinel row). You should choose some number $1 < \phi < N$, the length of the caterpillar, and with the help of the one-parametric function of shift an unidimensional row $f(t)$ grows into the multidimensional, which means the sequence of the vector-columns $\overline{F^1 \ldots F^k} \in \Omega^\phi$, where there is $k = N - \phi + 1$, in the following way:

$$F = \left(F^1 \ldots F^k \right) = \left((F_1)^{\mathrm{T}} \ldots (F_\phi)^{\mathrm{T}} \right)^{\mathrm{T}} = \begin{pmatrix} f_1 & f_2 & \ldots & f_k \\ f_2 & f_3 & \ldots & f_{k+1} \\ \ldots & \ldots & \ldots \\ f_\varphi & f_{\varphi+1} & \ldots & f_N \end{pmatrix}. \tag{2}$$

Since an initial row $f_i, i = \overline{1 \ldots N}$ consists of fuzzy numbers, so the elements of matrix F will be fuzzy too.

Step 2. The analysis of main multipliers: the singular expansion of the selective covariation matrix:

$$V_F = \frac{1}{k} F F^T . \tag{3}$$

Considering that the elements of the matrix F are fuzzy, as it was shown higher, the elements v_{ij} of matrix V_F, which are calculated by the formula, will be fuzzy numbers:

$$v_{ij} = \sum_{a=1}^{k} f_{a+i-1} * f_{a+j-1} . \tag{4}$$

Step 3. The calculation for the matrix V_F of own numbers $\lambda_1, \lambda_2 \ldots \lambda_\phi$ and eigen vectors which consist of fuzzy numbers:

$$W_F = \left(w^1 \ldots w^\phi \right) = \begin{pmatrix} w_1^1 & w_1^2 & \ldots & w_1^\phi \\ w_2^1 & w_2^2 & \ldots & w_2^\phi \\ \ldots & \ldots & \ldots \\ w_\phi^1 & w_\phi^2 & \ldots & w_\phi^\phi \end{pmatrix} \tag{5}$$

Let's mark through G_F the Jordanov's form of the matrix. Since the matrix W_F according to its construction is symmetric and positively certain, so all its eigen numbers are positive, and Jordanov's cells are simple. It follows from it that the matrix G_F is diagonal.

From the linear algebra it goes out the following:

$$G_F = (W_F)^T V_F W_F .\qquad\qquad(6)$$

Step 4. The calculation of the main multipliers of the matrix F according to the formula:

$$M_F = W_F^T F = \begin{pmatrix} M_1 \\ M_2 \\ ... \\ M_\phi \end{pmatrix} = \begin{pmatrix} m_1^1 & m_1^2 & ... & m_1^\phi \\ m_2^1 & m_2^2 & ... & m_2^\phi \\ ... & ... & ... \\ m_\phi^1 & m_\phi^2 & ... & m_\phi^\phi \end{pmatrix}\qquad(7)$$

Thus, the procedure "Caterpillar" generates the set of linear filters which are adjusted on the constituents of initial process. And at the same time the eigen vectors of the matrix W play the role of the transitional functions of the appropriate filters.

Step 5. The partial renewal of the initial row following the $s < \phi - 1$ first multipliers:

$$P = (p_{ij}) = (w^{j_1}, w^{j_2} \dots w^{j_s}) \begin{pmatrix} M_{j_1} \\ M_{j_2} \\ ... \\ M_{j_s} \end{pmatrix} = \sum_{i=1}^{s} w^{j_i} M_i = \sum_{i=1}^{s} F_i .\qquad(8)$$

$$i = \overline{1 \dots \phi}; \; j = \overline{1 \dots k}$$

Step 6. The prognostication of the element f_{N+1}.

Since the elements of the matrix W_F, the eigen numbers $\lambda_1, \lambda_2 \dots \lambda_\phi$, the elements of the filter $w \left(\bar{W}^T \bar{W} \right)^{-1} \bar{W}^T$ are fuzzy numbers, so the calculated element f_{N+1} is also a fuzzy number.

$$f_{N+1} = w \left(\bar{W}^T \bar{W} \right)^{-1} \bar{W}^T X .\qquad\qquad(9)$$

Here: $X = \begin{pmatrix} f_{N-\phi+2} \\ ... \\ f_N \end{pmatrix}$ $w = \left(w_\phi^{i_1}, w_\phi^{i_2} \dots w_\phi^{i_s} \right)_-$,

$$s < \phi - 1, 0 < i_1 < i_2 < \ldots < i_s < \phi , \quad \bar{W} = \begin{pmatrix} w_1^{i_1} & w_1^{i_2} & \ldots & w_1^{i_s} \\ w_2^{i_1} & w_2^{i_2} & \ldots & w_2^{i_s} \\ \ldots & & \ldots & \ldots \\ w_{\phi-1}^{i_1} & w_{\phi-1}^{i_2} & \ldots & w_{\phi-1}^{i_s} \end{pmatrix}.$$

In these conditions the task of continuation of the row $f_i, i = \overline{1 \ldots N}$, and thus the prognostication of the demand on the regional market of labour, consists in the calculation of the function of the belonging of the fuzzy number f_{N+1}.

Step 7. The close construction of the function of the belonging of the element f_{N+1}.

The close construction of the function of the belonging of the element f_{N+1} is based on the following transformations: the converting of the fuzzy number into a casual size and the interval converting of a casual size into a fuzzy set. On the basis of these transformations we modify the stochastic algorithm of close construction of the function of the belonging of the fuzzy indexes by the following way.

We take the row of the selective matrices:

$$\Phi_o = \left(\xi_{ij} \right), i = \overline{1 \ldots \phi}, j = \overline{1 \ldots k}, o = \overline{1 \ldots S} \tag{10}$$

which are generated during the implementation the conditions $\xi_{i-1, j+1} = \xi_{ij}$.

An ordinary "Caterpillar" prognosis $f_{N+1}{}^O$ is executed for each of them, and then the approximate interval transformation of the derived selection $f_{N+1}{}^O$ is executed with the use of the empiric function of distribution $\Phi_S(\chi)$, which is built according to this selection. The approximate construction of the function of the belonging of the element f_{N+1} is completed by this transformation according to the modified stochastic algorithm.

Step 8. The most probable prognosis $f_{N+1}{}^*$ of the element f_{N+1} is founded through the solution of the next optimization task:

$$f_{N+1}{}^* = Arg \max_{x \in R} \chi_{f_{N+1}}(x) . \tag{11}$$

The developed model of the prognosis of the demand of specialists on the regional market of labour unlike the statistical methods allows to execute a prognosis even with the presence of rather little amount of information.

For verification of the prognosis model on the basis of modified "Caterpillar" we used the data of the Main administration of statistics in the Luhansk region as for demand on the specialists of different specialities, particularly the specialities on the direction "Computer sciences".

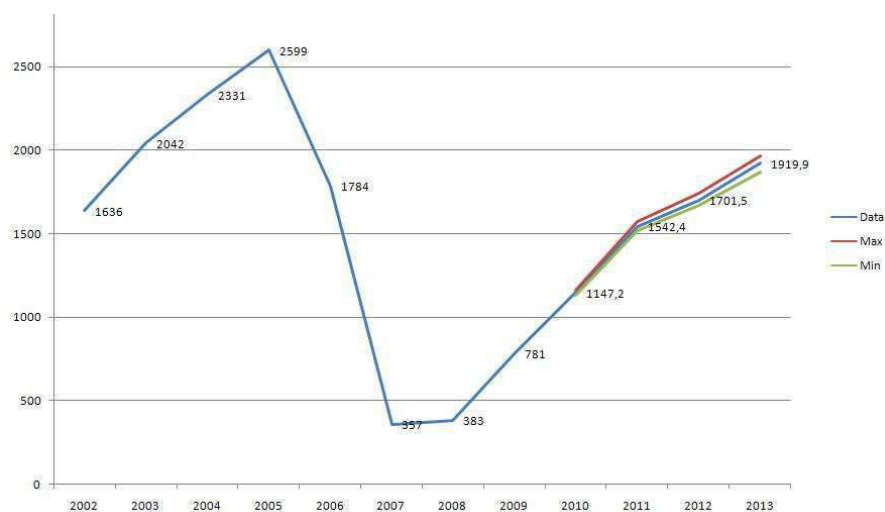The results of the prognosis are shown on the figure 1.

Fig.1. The prognosis of the demand on the regional market of labour for direction
"Computer sciences"

The most probable prognosis on the basis of the developed model according to the direction "Computer sciences" is shown in the table 1.

Table 1. **The prognosis on the direction "Computer sciences"**

Year	2010	2011	2012	2013
Prognosis	1147,2	1542,4	1701,5	1919,9
Max	1160,5	1571,2	1743,8	1967,3
Min	1131,1	1519,0	1671,1	1870,6
Reliability	94,46%	84,14%	67,49%	58,00%

CONCLUSIONS

The developed model allows to carry out the perfection of the regional system of education due to the prognostication of demand of specialists on the regional market of labour, from one side, and from the other one is the perfection of the labour market by the preparation and retraining of specialists. The model is used as an element of the decision support system of the co-operation of the regional system of education and labour market [Krupskij 2008].

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ПРОГНОЗ СПРОСА СПЕЦИАЛИСТОВ НА РЕГИОНАЛЬНОМ РЫНКЕ ТРУДА

Константин Крупский, Султан Рамазанов

Аннотция. В статье рассмотрено обобщение модели прогноза «Гусеница» для случая временного ряда, который задан нечеткими числами и предложено модификацию стохастического алгоритма построения функции принадлежности элемента временного ряда. Модель использована для прогноза спроса специалистов на региональном рынке труда и проверена на реальных данных Главного управления статистики в Луганской области.

Ключевые слова: социально-экономическое развитие, региональный рынок труда, нечеткая «Гусеница»; прогнозирование спроса на специалистов..

SOCIAL ENTERPRISE: EXPERIENCE
OF LEGAL REGULATION IN POLAND

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Summary. The comparative-legal analysis of organizational-legal aspects of social enterprise has been conducted in Poland and in other developed countries. Suggestions on the usage of foreign experience in the native legislation while reforming the system of social protection are grounded.

Key words: social securities, social enterprise, investing, socially unprotected groups of population, socio-secured legislation.

INTRODUCTION

Lately in Ukraine there is an active transformation of socio-secured legislation, directed at the increasing of social activity of separate individuals and their associations in the social problems solution. In the conditions of ineffective social security from the side of the state, which generates recipients' passivity of social securities and the growth of parasitic moods and also organizational-legal unattractiveness of social investments for businessmen of course, the institute of social enterprise, which is widely spread in the developed countries and which supposes to stimulate the social activity of the whole population both recipients of social securities and their investors is of great interest

The problems of the legal definition of social enterprise phenomenon are considered to some extent in the works of such researchers as R. Chavez, E. Lukashov, M.Eihner, N. Bolotin, L. Taradin, E. Frenkel and others [1, 174], [2, 213].

However, the idea of social enterprise formulated by a modern western theory as a public innovation, the phenomenon of a post-industrial society, supposing self-organization and the activity of people, being in a difficult vital situation considered by a society hasn't been stated in the native legislation. In this connection the experience of legal regulation of social enterprise in the developed countries, especially in such countries as Poland, which we are linked with not only by the communist past but also, we hope for European future has both theoretical and practical interest.

The aim of this paper is the development of suggestions on the improvement of native social security in the aspect of the development of social enterprise on the basis of analysis both legal and lawful experience in Poland.

THE SUBJECT RESEARCH

The subject research is meaning-category instrument and normative-legal base of social enterprise regulation in Poland.

Actual theoretical and practical aspects of legal meaning of social enterprise in Ukraine must be considered.

THE RESULTS OF THEORETICAL-LEGAL RESEARCH

In the nineteenth century a wide development of socialist ideas and projects has begun, then the term «public economy» (social economy) has appeared in everyday life. One of the first works in which this term has been used, was the work of the French economist Sharl Dunoie which was named Tretise on social economy [3]. During the theoretical comprehension of public economy, and also due to the lack of existing state systems of social security at the end of the 20th century the ideas of the extended involving self- organizing institutes of a civil society, uniting both the state and businessmen, and private organizations appeared in the social sphere, Thus, in particular, there was the idea of social enterprise, which had been examined by the researchers as a part of a wider context of publicly useful activity - «public economy».

So, in some European countries government activity on distribution and stimulation the growth of «public economy» is a duty of certain public positions and commissions. For example, in France there is the Minister of young people, sports and associations and also inter-ministerial Delegation on social innovations and «public economy» [4, 174]. In Belgium, the post of Minister on steady development and «public economy» recently has been re-named and became the post of Minister of «mixed economy». In Spain inter-ministerial National Institute of the Development of «public economy began to operate in the middle of 1990s» [5].

On the whole, it may be stated that in modern Europe clear conceptually-theoretical approaches have been formed to the phenomenon of social enterprise, which have the proper institutional and organizational-lawful status.

At present, the social enterprise mainly, is understood as a legal activity which is directed at the production of goods and/or services, the purpose of which is the social problem solution. Usually, the social enterprise has two aspects: the first one is sociality of the produced services or commodities, which are necessary for a certain social group; and which are distributed not at market prices and etc The second aspect of social enterprise is when the representatives of socially-non-protected groups such as invalids, non-wealthy families, unemployed people, people without a certain place of living or who have difficulties with the employment participate in the production.

Thus, the social enterprise is that instrument which on the one hand, can provide the solution of social tasks, and on the other hand it can involve this market mechanism into a social sphere. For enterprises and business people who are often the investors of the social programs, the technology of social enterprise appeared not only because they are ethically correct, but also because they are economically beneficial, it is more clearly for an ordinary businessman: «the money invested in charity using the of

principles of venture philanthropy and social enterprise bring more results, than money invested in vain as it was in old times» [6].

The social enterprise can belong both to the private sector, as business variety and to the «third sector», as a variety of non-commercial organizations. Now we can see what international practice testifies: the first variant is more usual in the USA, and the second variant is more usual in the European countries due to their traditions, when the social enterprise is referred to the «third» or non-commercial sector [7, 287]. . Italy where in 1991 the Law «On social cooperatives» was accepted became the earliest explorer of the legislation having the similar kind of legal forms; stormy growth of such enterprises began everywhere [8, 573]. In 1996 the European network of researchers studying the phenomenon of social enterprise was formed in Belgium, under the name of EMES European Research Network (European network of researchers of social enterprise), which included institutes, the study centers of social enterprise, and also individual researchers [9].

At present Ukraine has already separate normative-legal positions of civil law and right for the social security, which now it has already a legal basis for setting up and developing the social enterprise. So, the relations which are arisen due to the provision of services on a commercial basis are regulated by the Civil code of Ukraine [10], Law of Ukraine «On social service» [11] and they give the possibility to provide required paid services by lawyers who do not have a goal to get a profit setting the principle to combine paid and free of charge social service, etc. However, the existing normative-legal regulation is not adapted to the social enterprise and has fragmentary, and sometimes contradictory character. For example, if we use such a legal instrument as a cooperative of the social enterprise which today is set up by the new Civil code of Ukraine (paragraph 2) [10], and normative-legal acts of the USSR, which according to the Decision of the Supreme Soviet of Ukraine of September 12. 1991 «About the order of temporary action of some legislative acts of the USSR» [12] doesn't contradict the new legislation continue operating on the territory of Ukraine.

Creating the common normative decision for the social enterprise, EMES selected five criteria determining their main features.

1. Obvious aim o*directed at helping the native local society. The w*ork of organization is directed at maintenance local society or a certain group of people. The desire to spread the idea of social responsibility at a local level is the task of a social enterprise.

2. Initiative realized by the group of citizens. The social enterprise is the result of group dynamics of the involved people of the association or that special purpose group which activity will be realized at. Thus the leadership of a person or a group as organizers is not abolished.

*3. Decision-making power is not based on the possession of the   capital. The p*rinciple «one man is one voice» is used on the contrary to the system, in which a number of voices while making a decision depends on a quantity of the person's shares who is a member of the Board.

4. «The principal of parties' involvement», involving different groups dealing with this activity. Involving users or customers of social enterprise' services in the decision-making process, which is able to develop democratic principles at a local level and help to promote these principle better.

5. The limitation of profit distribution. The social enterprise includes not only the organizations, forbidding the profit distribution between participants but also the organizations which are allowed to do it within the limits. Thus, actually, the main aim is to solve the public problem [9].

The experience of legal regulation of the social enterprise in Poland where great changes in the development of the social enterprise have been made recently is very interesting for the research.

In 2004 Poland entered the European Union and became a participant of a great number of the European social programs [13, 87]. By the moment of Poland entrance in EC, the indexes of employment were the worst ones in comparison with other European states [14]. An unemployment rate was 20%, mainly due to free labour citizens migration in Europe, by 2007 it was 11, 7 already %. Nevertheless, the problems in the field of employment are still great: high structural unemployment, predominating unemployed people of low qualification, non-mobile and non-enterprising; high share of unemployed people for whom the unemployment means the risk of social isolation (firstly, we must mention invalids, they are 14,3% of all population in Poland, and 80% of them are unemployed people, it is also the highest percent in EC); other groups are people without a certain place of living, people from prisons and etc Another group is young people aged till 24 years old (who are not studying, they are unemployed. It is 41%) [15].

Approximately since 2004 the process of development and distribution of social enterprise has gone in Poland very actively, it was a new direction in a social policy, making the users of services be active, responsible, independent managers of their lives. This simple conception seeming elementary and natural has passed a difficult way of changes of public consciousness, institutional and legal norms, recognition at all levels.

The legal base of social enterprise in Poland is made of the following normative-legal acts: Law «On publicly useful activity and volunteers» (of April 24, 2003); the Law «On social employment» (of June 13, 2003); the Law «On the development of employment and structures of labour market» (of April 20, 2004); the Law «On social cooperatives» (of July 6, 2006) [16, 294]. Especially it is necessary to note the complex orientation of legal influence of these laws. As the Polish experts note y, the «public economy» is the complex of organizations (social enterprises) operating in private, public and non-commercial (NGO) sectors, combining properties of these sectors [17].

Thus, by the law «About social cooperatives» the following groups of population such as homeless people getting on dependence on alcohol and drugs, mentally sick people, unemployed people for a long period of time, people from prisons, refuges and invalids can create social cooperatives.

There are also legislative norms and limitations for social cooperatives. Not less than 5 people and not more than 50 ones can be founders. Those social cooperatives in which the number of members exceeds 15 people do not choose the Supervisory council, and their tasks are executed by General meeting. Thus every member of the cooperative has the right for the cooperative activity control. It is necessary to observe the principle of parity: 50% by 50% (the number of members of cooperatives, being professionals, can not be more than 50% of all members of cooperatives). The failure to observe above mentioned rules is a reason to liquidate the social cooperative.

The current Polish legislation states the following principles of social cooperative activity: voluntary and unlimited membership, democratic control from the side of members, economic activity of members, autonomy and independence, teaching, increasing of knowledge level, information exchange cooperation between cooperatives.

At present there are three methods of social cooperative establishment. An individual method supposes the possibility of cooperative establishment by people responding to the law (unemployed people, invalids and others). An institution method supposes the social cooperative establishment by means of and with the help of the Center of public integration, and also by means of invalids or blind people cooperative transformation. The social cooperative can establish public non-commercial organization (NGO) or the body of local self-government.

Particularly, it is necessary to note that the Polish legislation foresees the certain financial help for activity of social cooperatives. So, the unemployed person can receive help to establish a social cooperative in the size of to 300% this is a middle paid salary. The legal people, who use the income for the development of social cooperative activity, don't pay taxes. They have a possibility to receive a state order, to participate in the opened competition of suggestions to fulfill the tasks for state administration and local government. A social cooperative can also receive the help in the size of to 300 thousand EUR during three years. [17].

Legislative registration and support of social enterprise is very important for the possible growth and the development of social enterprises. Moreover, in 2004 the Polish government started the experimental project, aimed at providing the training services, organization- financial support for the creation of social cooperatives. As a result nowadays there are ten Centers which support social cooperatives in Poland. Each cooperative can get a subsidiary in the size of 3500 euro to set up a social firm and/or to get small investments (to purchase the equipment, instruments and etc) [16].

In 2007 the Fund of social and economic initiatives together with the Ministry of labour organized national teaching program of «public economy» for all public job centers. At the beginning of 2007 there were 106 social cooperatives in Poland, where 500 people worked [16].

Summarizing above mentioned, it is possible to come to the conclusion, that for all developed countries, despite the model of social policy, including Poland, there is a growth of social service users . Therefore as for the state it must become from the «state of universal thriving» to a «society of welfare», it means privatization of responsibility of the whole society and of every person in the field of social security. One of main directions of such transition in modern conditions, as experience of the developed countries shows, is the social enterprise.

CONCLUSIONS

On the basis of the conducted analysis it is possible to come to the conclusion that the normative-legal registration of social enterprise in the special legislation of Ukraine is quite necessary.

It is necessary to adopt the act on the social enterprise in which the concept and normative-legal forms of social enterprise must be determined. It is necessary to design

the specific features of social enterprises for commercial and non-commercial organizations. It is important to define the priority directions of publicly useful activity for the social enterprise and to set up the special mode of taxation for organizations which carry out these important types of activity. Besides it is necessary to design clearly the legal limits of state interaction   with the receivers of social services and investors in the field of social enterprise.

It is also important to state stimulating and supporting instruments for the development of a social enterprise. For example, to set up the institute of socially important non-commercial associations, which will get comprehensive support from the state, to create forms and organization-legal mechanisms of such support (including the form of privileges to pay taxes and collections, in the form of placing state orders , in the form of usage their activity, etc.). To correct the informative policy of local government bodies and self-government, obliging them to carry out monitoring of potential spheres for the development of social enterprise, to adopt the programs of socio-economic development taking into account this monitoring, to advise and teach the social enterprise.

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СОЦИАЛЬНОЕ ПРЕДПРИНИМАТЕЛЬСТВО:
ОПЫТ ПРАВОВОГО РЕГУЛИРОВАНИЯ В ПОЛЬШЕ

Лидия Лазор, Ольга Чутчева

Аннотация. Проведен сравнительно-правовой анализ организационно-правовых аспектов социального предпринимательства в развитых странах. Обоснованы предложения по использованию зарубежного опыта в отечественном законодательстве при реформировании системы социальной защиты.

Ключевые слова: социальное обеспечение, социальное предпринимательство, инвестирование, социально незащищенные группы населения, социально-обеспечительное законодательство.

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SOCIAL AND PSYCHOLOGICAL FEATURES OF INFLUENCE OF NETWORK COMMUNICATION ON ECONOMIC WELL-BEING OF INDIVIDUAL

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Summary. We consider the typology of subjective economic well-being (SEW), taking into account the impact of network communication (electronic business) on cognitive and affective sphere of personality. Revealed the effects of cognitive and affective components of the level of SEW. The analysis of interrelation SEW and modern directions in a cyberspace is carried out. The hypothesis about the leading part of socially-psychological features which participate in formation of subjective economic well-being of the person is confirmed.

Key words: subjective economic well-being, cyberspace, electronic business, cognitive and affective sphere information visualization, economical consciousness, electronic commerce.

FORMULATION OF THE PROBLEM

Social and economic transformation of the Ukrainian society has caused changes in system of values and life priorities on individual, group and societal levels. Researchers notice that the condition of mass consciousness is characterized by essential variability in judgment of various social groups of the population of occurring economic changes, internal discrepancy and affective " loading" of their estimations, against essential diffusion of moral principles, and sometimes signs diversification systems of values, losses by a society of cultural wealth, increases of a role of material interests and benefits, and also wrecks of former ideals of social justice [7]. As shown by our and foreign researchers phenomena of subjective quality of life and economic well-being aren't connected by unequivocally neither with living conditions of its carriers, nor with level of their incomes. Economic well-being isn't predetermined by the economic reasons as those, and it was mediated by difficult psychosocial mechanisms which result of mutual determination of external (social and economic) and internal (psychological) conditions (factors) of ability to live of the person is.

ANALYSIS OF RESEARCH AND PUBLICATIONS

This issue has been reviewed and developed by our authors investigated: the influence of emotional states in general life satisfaction F. Andrews, J. Robinson, A. McKenley; motivation of Internet users: O.Arestova, L.Babanin, A. Voiskunsky, O.Smyslova; measure of emotional intensity of interpersonal contact network: E. Belinskaya, A. Zhychkina, V. Nesterov, E. Nesterova. Internet - addiction as a phenomenon is studied in the works of foreign psychologists: K.Young, I. Goldberg, the impact of virtual environment on personality: J Suler, research of identity of users of computer networks and processes self-presentation in web (J.Donath, J. Beniger).

Object of research: determination of socially-psychological features of influence of network communications on subjective economic well-being of the person.

Research problems are:

1. Detection of the maintenance and features of subjective economic well-being of the person in a context of economic culture

2. Defining of leading social and psychological features of influence of network communications on subjective economic well-being of the person.

3. Allocation of effects of influence cognitive and affective components called by communications in a cyberspace on level of SEW.

BASIC MATERIALS RESEARCH, STUDY OF SCIENTIFIC RESULTS

Subjective economic well-being (SEW) is the important psychosocial characteristic of the person as subject of the economic activity connected with regulation activity on material maintenance of life. Reflecting the relation of the person to own financial position, SEW acts wasps-new of formation of identity of the person, an essential regulator of its daily social behavior, causes its economic self-determination and economic culture. The subjective feeling of a material prosperity promotes formation of the specific self-concept of the person (perception of, the social status, etc.), special social expectations and attitudes of people. Economic well-being or trouble of the person in many respects defines an orientation of outlook of the person.

Long time subjective well-being was considered by the majority of researchers as a condition of unequivocal conformity cognitive components: estimations the individual of satisfaction life as a whole or its specific aspects, on the one hand, and affective components - balance of positive and negative emotional experiences, with another. So, level of subjective well-being qualify as high when the person is satisfied by life and at it positive emotions - happiness, pleasure dominate, and also low frequency of displays of negative emotional conditions - alarms, hunger, fear is observed, etc. And, on the contrary, low level of subjective well-being define when the individual dissatisfied of life, extremely seldom tests a happiness condition, feeling of pleasure and constantly feels alarm and fear [5].

The type of subjective economic well-being acts as the important economic-psychological characteristic of the person as subject of ability to live. The offered typology leans against structural-level concept SEW. As the typology basis the combination and level of its expressiveness integrated cognitive and affective

components - a subjective standard of living and economic frustration persons have acted. The typology includes following types: the provided not content, needing not content, needing content, provided content.

Table 1. **Distribution of respondents by type of combination of components integrally**

Type	Combination and level of expressiveness of components		Percent of respondents
	Subjective standard of life	Economic frustration	
A provided not content	high	high	15,2
B needing not content	low	high	32,8
C needing content	low	low	11,6
D provided content	high	low	40,4

The effect of more essential contribution of positive emotions in the general, in comparison with negative, is fixed only under condition of increase of contradictions between cognitive and affective components SEW. In the absence of a divergence between them their contribution to its level is approximately identical that leads to mutual strengthening of their positive or negative influence.

Interrelation of SEW and satisfactions of life has the mutual, direct and mediated character. The financial position estimation raises the general satisfaction of life only when its material level is perceived as favorable for the individual, that is above, than at the majority of people surrounding it. As a whole influence of the general satisfaction by life on subjective economic well-being of the person more essentially, than return influence.

Influences of economic consciousness of the person on formation of types SEW carries difficult and, as a rule, nonlinear character, ie renders both positive, and negative influence on level of its economic well-being. Types of SEW differ features of consciousness of its carrier: a self-appraisal of potential of self-efficiency and subjective probability of business success, ability to achievements in economic sphere and competitiveness, the self-relation to as to the subject of business activity, orientation to materialism, and also preferred strategy of life-support.

According to our and foreign scientists, such as V.Moskalenko, C.Harkavenko, L.Moroz, J.Evans, B.Berman, F.Kotler, J.Zhandezon, A.Lansester there are few major factors influencing on formation of economic consciousness, such as:

1 Factors of cultural level: connected with influence on behavior of buyers on their culture and subculture;

2. Factors of social level: it is the influence of the status, a fashion, role positions in various reference groups of the person;

3. Factors of a psychological order: it is age, a stage of life cycle of a family, a trade and an educational level, an occupation, an economic situation, type of the person, and representation of the person about itself.

By means of development of information technology and the general complication of system of communications, we have influence of a cyberspace on cultural, social, psychological making persons.

The cyberspace - is a "virtual" space which is perceived by the user of the computer and which is in memory of the computer and has a graphic representation [10].

The term "a cyberspace" is used for the description of the artificial reality created by computers and Internet thanks to which there was possible a beam coupling in shape electronic business which changes consciousness of the person and forms economic behavior in the course of decision-making. Today many goods are bought and sale with application of means of a beam coupling. Irrespective of, whether we deal with purchase of books, clothes, consultation in financial sphere or services at the rate of the sums of taxes, the cyberspace unites the seller and the buyer means which very much differs from what is applied in traditional retail trade. Besides, thanks to a cyberspace the enterprises had a possibility to use the information on the activity and the goods. Arrangements of the enterprises, presence of the goods, an operating time, the prices, to the instruction on installation and other information is given to users of a cyberspace almost immediately. As a matter of fact, the cyberspace opens boundless possibilities in service sphere (both in retail trade, and in information representation).

The purpose of electronic business is use of advantages of a cyberspace (convenience, reliability, a global environment) both for expansion of possibilities of traditional business, and for creation of new virtual kinds of business.

As it is known, in any business strategy of its development and economic risks are a main point facing a management. However the Internet already has had time to create today so much new forms and the schemes which do not have analogs in traditional business that at times throws into confusion business - analysts, heads of the companies and the experts in marketing who have been grown up on traditional methodology of business. Now very many companies try to be engaged the Internet - in business, to introduce at themselves methods of electronic commerce or electronic business dealing. Every minute the large quantity of users to which manages to find the adherents is involved in virtual communications, whatever exotic, and even deviant their interests were strange, and to create on the basis of it the groups which do not have analogs in real life. Economic communications are considerably designated on individual and social life of the person, drawing thereby to itself attention of researchers by working out of a problem of subjective economic well-being.

Leading kind of perception of the information at work with computer means of dialogue is visual. The analysis of features of the visual information is carried out on the basis of dialectic unity of actually visual perception and thinking in general. Really, «the perception without thinking would be useless, without perception it is nothing thinking would be to reflect» [2]. Thus, «if the perception is included into thinking from this it follows that it is necessary to develop and improve evidently of perceptual base of thinking. But in the same way perfection of perceptual skills should develop powers of thinking, against which these skills lean and is serve» [3].

During goods presentation on distance value of a phenomenon of visual thinking increases. «Our ability to use certain forms as symbols which help a brainwork is remarkable and operate in a role of means of dialogue with other people separated from us by space and time» [7]. As the visual thinking is reason activity thanks to which there is a judgment of communications between studied objects [4] the cyberspace considers following factors of influence on consciousness of the person: laconic of representation

of the information; accuracy of reproduction of its structure and elements; accent on the main, essential details of images; use of three languages of representation of the information; the account of possibilities of the recipient in perception of the visual information; conditions of positive perception of information objects and communications between them. [8].

Online-communication possess a known phenomenon which describes a role of the person which it carries out under the pressure of a society. It gives the chance to be present at dialogue of others, without interfering with it and remaining not noticed, leaving intervention possibility to user. Communication in a mode of real time give the chance to an individual to change roles, entering into audience under different names and creating various virtual images that allows to fulfill communication skills and communication strategy. An underside of this process is the factor of the public person, is more true - substitutions own autoidentification than factors designed virtual.

According to a company field of activity it is possible to define some parts of electronic business which are connected with the Internet: business on the Internet (the Internet - providing, service - providing, contain - providing); business round the Internet (delivery of technique and software, Web - design, programming and accompanying services); business on the Internet (the Internet - advertising, the Internet - marketing, electronic auction, electronic shop etc.).

Thus, electronic business includes various kinds of activity, and has wide enough concepts.

Electronic commerce is a widespread kind of electronic business. The main functions of electronic commerce are: information service of the buyer; processing of orders, carrying out of payments, granting of data on passage of the order and goods delivery, creation of system of discounts (on seasons, types of people volume of the ordered goods etc.); conducting a consumer basket; support of electronic payment of the goods; accounting conducting (including calculation of taxes and delivery optimization), creation of statistical reports (for example, about attendance of several pages of knot of electronic commerce) [14].

Now the buyer shouldn't bury in a heap of catalogs, directories and advertisements. It is enough to have the personal computer with access in Internet and the Web-browser. The potential buyer sits down in a cozy armchair and, "looking through" pages of electronic shops, plunges into world WWW. Modern means of electronic supermarkets and the work program in Internet not only provide to the client contextual search of the necessary goods, but also represent a product in all foreshortenings, accompanying display of pictures by the description of advantages.

Through the Internet the buyer with help of the browser comes on Web - the server the Internet - the shop, containing an electronic show-window [19]. The basis of a show-window of electronic shop - the catalog of the goods with instructions of the prices which can be structured in the various ways (on categories of the goods, on manufacturers), and also can contain the full positive information on characteristics of each goods, its image.

The important requirement to shop is speed and efficiency of processes of information search (being guided by catalog structure, or using search system), a choice and the order of the goods, intuitively clear interface. Placing of sections with purchase rules in shop and the help will be correct step. The client should have possibility at any

time to receive answers on accompanying purchase. It concerns conditions of after-sale service, consultation on features of schemes of payment, etc.

Having chosen the pleasant goods, the user places it in "basket". "Basket" is some approach to a basket in a real supermarket, that is the list of products which are paid and delivered together, one package (it allows to lower expenses for delivery). At any moment before definitive registration of the order the buyer can edit contents of a basket and quantity of the goods of each kind, thus automatically to be made recalculation of a total cost of purchase, and also delivery cost pays off [18].

To or after a choice of the goods from the buyer it is required to fill the form in which it is underlined how payment and delivery, the address, etc. Upon termination of order and registration formation the collected information on the buyer will be made arrives from an electronic show-window in trading system (if it is connected) to the Internet - shop. In trading system goods stock-taking in a warehouse is carried out, the inquiry to payment system is initiated.

From the point of view of functionality electronic commerce makes the new technology of business dealing bringing new economic advantages, and also positively influences on SEW [13]. Electronic commerce is favorable both to suppliers, and clients. Both parties here win in the same categories, only differently formulating it. For example, the world distribution conducts the Internet to expansion of a commodity market of suppliers and a choice at buyers. The simultaneous prize of the supplier and the client does electronic business so attractive that forces the companies to reconstruct the activity for participation in it.

CONCLUSIONS

This trend in network communications influences ability to live of the person, development of its behavior, also changes in representation of the subject about the economic well-being. In quality cognitive components of SEW the subjective standard of living acts, and the affective component is economic frustration of the persons. The first defines: economic optimism - pessimism, a subjective standard of well-being, adequacy of the income to requirements of the person; the second: need degree in money, economic alarm.

The high positive subjective importance and at suppliers is meant: a global commodity market, high competitiveness, possibility of individual work, reduction or elimination of a chain of deliveries, reduction of the expenses, new possibilities of business. Also a positive component on cognitive and affective spheres of the person of the consumer: a huge choice, high quality of service, individual selection of the goods and services, the fast response, reduction of prices, the information on the new goods and services [Gregory, 1972].

Thus thanks to electronic commerce decreases economic frustration of persons, these are positive changes in work affective components which acts as a base basis in formation of economic culture of the person.

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СОЦИАЛЬНО-ПСИХОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ВЛИЯНИЯ СЕТЕВЫХ КОММУНИКАЦИЙ НА СУБЪЕКТИВНОЕ ЭКОНОМИЧЕСКОЕ БЛАГОПОЛУЧИЕ ЛИЧНОСТИ

Ольга Лосиевская, Людмила Андрианова, Вадим Лосиевский

Аннотация. Рассматриваются типологии субъективного экономического благополучия (СЭБ), с учетом воздействия сетевой коммуникации (электронного бизнеса) на когнитиво - аффективную сферу личности. Выявлены эффекты влияния когнитивного и аффективного компонентов на уровень СЭБ. Проведен анализ взаимосвязи СЭБ и современных направлений в киберпространстве. Подтверждена гипотеза о ведущей роли социально-психологических особенностей, которые участвуют в формировании субъективного экономического благополучия личности.

Ключевые слова: субъективное экономическое благополучие, киберпространство, электронный бизнес, когнитивно-аффективна сфера, визуальная информация, экономическое самосознание, электронная коммерция.

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INFORMATION AND ORGANIZATIONAL-ECONOMIC ASPECTS OF INNOVATIVE DEVELOPMENT MANAGEMENT OF REGIONAL ENTERPRISES

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Summary. The information and organizational-economic aspects of innovative development management of regional enterprises have been considered, the necessity of forming of theoretical propositions about information-analytical regoinalistics has been substantiated, and the directions of information-analytical support of regional systems innovative development have been defined.

Key words: development, enterprise, innovative development, management, region.

INTRODUCTION

Nowadays an innovative activity is the main condition to find the way out of the crisis for enterprises, firms, regions and the whole country. If you appeal to the world management theory and practice, you can note that principles of determinism and optimization of enterprise activity lost its actuality under conditions of dynamic external environment. In Ukraine these processes were accompanied by the process of primary accumulation of capital and the subsequent division of spheres of influence in different industries between the major owners of capitals. For the corporate structure of economy (based on interests of separate groups of control), existing today in Ukraine, most directions of scientific researches need correction against the institutes of ownership, management and control. The strategic constituent of cooperation of these institutes, which reveals in the processes of organizational changes and enterprises development, assumes the greatest importance under such conditions.

OBJECTS AND PROBLEMS

The effective management of regional innovative development demand the elaboration of the adequate instruments of its information support. The main shortcoming of the innovative policy carried out on microlevel is its primary orientation

on the management of the physical constituents of innovative process, instead of orientation on the eventual result of innovative changes. The orientation of production development on creation and wide application of brand-new complex technological systems is the purpose of such policy. However, the modern management of innovative process must be directed on creation of terms for the mass search of effective ways of technological changes and prompt support of positive results, and not on selective stimulation of the chosen themes of researches or workings. Only in such case Ukraine will become able to use the available scientific and analytical potential for development of the own economic system and achievement of stable rates of the economy growing. Only strategic ideology will be able to make enterprise innovative activity the main factor of economic development.

ANALYSIS OF PUBLICATIONS IN RELATION
TO RESEARCH OBJECT

A lot of different questions about creating of marketing [Maksimova, Shapran 2010., Zhdanova 2010], crisis management [Nadyon, Dyachenko 2010, Ramazanov 2010], national [Tretyak, Kurilov 2010, Voronkova 2010], dynamic [Voronkov 2010], intellectual [Voronkova 2010] and financial [Zhytnyy 2010] conditions for enterprises functioning and development have been considered lately in scientific publications. The research of development problems of microeconomics and regional production systems on the basis of the innovative determinants activization found its reflection in the works of many Ukrainian scientists [O.I. Amosh, V.P. Babych, V.M. Geets, S.M. Illyashenko, L.I. Fedulov, O.V. Knyaz]. But the information and organizational-economic aspects of innovative development support problem have been left unsolved. The development management must be aimed on the dynamic aggregate of interdependent administrative processes directed above all things at the search of the internal and external reserves of economical growing and development. As known from the classics of the economic cycle theories, one of the basic principles that provides microsystem development, is providing of possibility of transition from the stage of higher level of development within the framework of one period of cycle (maturity phase) to the phase of establishment with high-quality new parameters of the next level, passing the phase of recession and crisis. Providing of effective management of enterprise development must be accompanied by the permanent strategic diagnostics of activity that allows us to define possibilities of enterprise in external surroundings. Exactly on the basis of strategic diagnostics an enterprise can elaborate or correct the external activity strategy that will determine its development. For enterprise development it is necessary to create terms for adoption of innovative, organizational, economic measures that allow us to pass the phase of the next level becoming.

The information and organizational-economic aspects of innovative development management of regional enterprises have been defined in the article.

RESULTS OF RESEARCH

The functioning and development of enterprises of a regional system have been proceeded in the tight interconnection and interaction with external environment. An external environment is the uncontrollable factor therefore the question is about the possible scenarios of its development. For all this, an external environment represents today for enterprises in most cases uncontrollable and difficultly forecasting factor. Representation of external environment can not be limited to some one parameter therefore the vector of the state of external environment takes place. Components of the vector determine the possible scenarios of external environment development: pessimistic scenario of development; neutral scenario of development; optimistic scenario of development.

Enterprise innovative development is based on the set of interconnected elements, which facilitate the generation of new knowledge, manage their streams, distribute them. The efficiency of enterprise innovative activity is determined by co-operation of basic acting persons of innovative process as element of the collective system of knowledge creation and use. The substantiation of direction of enterprise innovative development consists in elaboration and use of optimum economic criteria and choosing on their basis from the great number of alternative decisions. In that time, enterprise innovative development is the organizational, administrative and strategic question not only economic. As the factors of innovations management have a different nature (social, economic, technical, organizational, strategic), it is necessary to define the proper mechanisms of innovative development that is the forming basis of the complex mechanism of innovative development management. The specialized action mechanisms on the concrete constituents of productive forces and production relations must be a part of the complex mechanism of enterprise innovative development management.

The economic mechanism of innovative development includes the following elements: preparation and substantiation of plans of assortment and volume of output taking into account the existing limitations on material, financial, labour resources, sales volume, location of enterprise capacities, that provide production development; elaboration of enterprise development plans and substantiation of economic efficiency of innovative and investment projects of enterprise reconstruction, equipment modernizations and products renewal, distribution of profit to the funds of accumulation and consumption; choosing the most advantageous level of specialization and co-operation; systematic economic analysis of enterprise, forming of indices, that characterize enterprise activity, and determination of their quantitative size. The economic mechanism of enterprise operates under market influence at the expense of the competitive forming of price and demand for products of enterprise. Duration of productive forces reproductive cycle depends on speed of innovations distribution, also determined competition and situation at the markets of financial resources.

According to the aims and tasks of information-analytical support of the innovative development of regional systems we elaborate the information-analytical system. Let's characterize the information-analytical support of innovative development of regional systems according to the following scheme: the imposition of conceptual

hierarchical model in a computer - the creation of informational model as a result of forming of the conceptual model – preservation of results – analysis of results.

1. Conceptual hierarchical model. The hierarchy elements of components and factors of innovative development estimation in a region are organized in the structure: the first level is the level of innovative development in a region; the second level is the components of situation; the third level is the alternative estimations of innovative development components in a region: „favourable", „unfavourable", „critical".

2. Creation of information model. The result of the expert work is the estimation of the innovative development in a region.

3. Preservation of results. The experts database is created that the basis of the information model.

4. Analysis of results. There are three possible estimation results, i.e. „favourable", „unfavourable", „critical". The summarized integrated estimation of the innovative development in a region is calculated as an average of each of the factors..

The strategic mechanism of innovative development is a set of ways, methods and modes of development of strategic guideline directives which regulate the conduct of subjects of administrative activity under different conditions of development of strategic situations and direct the dynamics of management objects at the achievement of the strategic goals of innovative development. A strategic situation is the existing state of object of innovative development and concrete terms of external environment that stipulate possibilities of realization of enterprise innovative potential. The process of analysis of strategic situation includes the following elements: determination of enterprise primary objective, determination of the system of descriptions and possible states according to the different scenarios of external environment development, analysis of the goals system, analysis of the system of enterprise innovative possibilities, determination of strategies of goals achievement in concordance with the different strategic situations, system of estimation indices of different variants of development of management objects and environment.

The first element is the primary objective of enterprise that is vector-function of enterprise innovative development. For conception of strategic conduct under the hard competition environment the primary objective consists in victory which in the field of economics means achieving the best results in the process of resources use. Receiving the best results today is possible only on the basis of introduction of the newest achievements in the field of production, i.e. on the basis of providing of enterprise innovative development. Representation of external environment can not be limited to some one parameter therefore the vector of the state of external environment takes place. Components of the vector determine the possible scenarios of external environment development: pessimistic scenario of development; neutral scenario of development; optimistic scenario of development. Similar judgements take place in relation to other factors which will influence on achievement of enterprise primary objective. But, these factors materially will be guided. The vector of the state of management objects characterizes the state, dynamics and efficiency of the use of enterprise production potential, which by-turn can become worse, remain without changes, or become better.

The system of innovative alternatives is the set of alternative innovative projects which an enterprise can use for providing of development. The possible three

correlations between enterprise innovative potential and innovative possibilities are: the insufficient innovative potential, i.e. enterprise production possibilities do not allow to innovative projects to realization; the sufficient innovative potential, i.e. enterprise production possibilities allow to implement innovations on an enterprise; the excessive innovative potential, i.e. enterprise production possibilities allow to implement innovative projects to realization in a greater volume than the offered innovative projects.

CONCLUSIONS

The information and organizational-economic aspects of innovative development management of regional enterprises have been considered in the article. The conducted analysis allowed us to define the basic mechanisms of enterprise innovative development, the features of the strategic mechanism of innovative development. Strategies of goals achievement according to different strategic situations (vector of strategic alternatives) in our case consist of the relevant strategies for achieving the primary objective of enterprise: increase of innovative potential or search of satisfactory innovative alternatives; support of innovative potential and its effective use; search of innovative alternatives which would allow to realize as much as possible enterprise innovative potential. The achievement of the defined strategies is possible only under condition of the proper regulation and correction of conducts of the separate subdivisions leaders and the separate executives. Providing of the selected strategies realization is achieved in the operative activity of executives and their behavior must be the function of the selected strategy.

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ИНФОРМАЦИОННЫЕ И ОРГАНИЗАЦИОННО-ЭКОНОМИЧЕСКИЕ АСПЕКТЫ УПРАВЛЕНИЯ ИННОВАЦИОННЫМ РАЗВИТИЕМ ПРЕДПРИЯТИЙ РЕГИОНА

Виталий Максимов, Руслан Галгаш, Лидия Синица

Аннотация. В статье определены информационные и организационно-экономические аспекты управления инновационным развитием предприятий региона, обоснована необходимость формирования теоретических положений информационно-аналитической регионалистики, определены направления информационно-аналитической поддержки инновационного развития региональных систем.

Ключевые слова: развитие, предприятие, инновационное развитие, менеджмент, регион..

INNOVATIVE APPROACHES IN RELATION
TO THE BALANCED STRUCTURE OF ENTERPRISE
COMMODITY ASSORTMENT FORMATION

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Summary. The features of structure management of assortment portfolio are expounded. Approaches in relation to providing of balanced assortment portfolio of enterprise are considered. The sequence of action in relation to realization of final choice of the balanced structure of assortment portfolio is presented.

Key words: assortment, portfolio, enterprise, commodity goods.

INTRODUCTION

Economic development of domestic enterprises has to provide active introduction of innovations. The commodity innovative politics of enterprise must promote formation of optimum structure of enterprise assortment portfolio that is why efficiency of its realization depends on its theoretical ground, methodical providing of realization mechanism, and correction depending on the actual state of marketing environment. Actuality of solution of these questions stipulated the purpose of research, the results of which are expounded in this article.

PUBLICATIONS ANALYSIS

Undoubtedly, in present time, exactly innovations which are realized through one of constituents of economic politics of enterprises - innovative policy - are big motive force of enterprises development [Goncharov 1998].

With the help of innovative theories scientists explain business cycles of development. Innovative theories which were grounded by Shumpeter and Khansen bind business cycle with the row of openings and inventions [Bragin 2000]. P. Samuel'son, in accordance with investment-innovative theory, where as a basis there is a model of multiplier-accelerator, it considers that external factors influence through a multiplier or accelerator and internal forces generate, thus, regular cyclic vibrations in production volumes and renewed commodities [Pavlenko 2000].

In opinion of Ukrainian scientists I. Lukinov, O. Gal'chinskiy, V. Geets, V. Dorofienko, M. Chumachenko plenty of domestic enterprises do not discover activity in innovative activity which slows down the processes of their dynamic development.

Without regard to considerable influence of scientists into formation of theoretical and methodological base of innovative activity, in the stated above researches there were not found questions, related to the specificity of enterprise management commodity innovative activity and systematization of executions sequence in relation to forming of structure assortment portfolio of enterprises on the basis of commodity innovations. Actuality and importance of these questions for providing of high rates development of domestic enterprises stipulated the choice of research theme.

OBJECTS AND PROBLEMS

The purpose of the research consists in popularization of innovative approaches to forming of enterprise commodity portfolio on the basis of structure optimization of produced products assortment.

RESULTS OF RESEARCH

Any enterprise which produces commodities or gives services has the nomenclature of products and assortment [Yezhova 2001]. An assortment is an aggregate of products varieties by brands, names, sizes, types, sorts which differ by proper technical-economic indexes [Pokropivnyi 1995].

An assortment politics is the system of measures, on determination of commodity groups list, which have most advantage for successful activity at the market, and which provide economic efficiency of enterprise activity on the market [Mozgovoi 1999].

The basic tasks of assortment politics are:
1. Satisfaction of consumer necessities;
2. Conquest of new buyers;
3. Optimization of enterprise financial results.

In practice of enterprise activity an assortment portfolio is the aggregate of commodities, which have a different level of profitability, are on the different stages of life cycle of commodity (LCC), and, as a result, have different prospects at the market [Anisimov 1990].

Thus composition and structure of assortment portfolio must correlate with the aggregate of aims of different level planning which are put in front of an enterprise [Khrutsky 1991].

In order that an enterprise could effectively function on the market, it is necessary to do the following:
- research of competitive edge terms;
- research of market potentials of commodities and services, that answer mission of an enterprise, and to the choice of such strategic areas of management, which are able in the protracted prospect to provide external flexibility of enterprise, meaning a possibility of orientation change of enterprise on functioning in the most favorable from the economic, political, legal, social-cultural, scientific and technical and ecological areas[Kardash 2002];

- forming of perspective commodity assortment of enterprise, that in a most degree will satisfy the actual individual and production necessities of potential buyers inside the country and abroad, and that provides on this basis a systematic income, meaning an income which will allow to realize the programs of the extended recreation;

- allocation of present additional resources of enterprise, which co-operate between various directions of activity which provides the burst performance (profitability) of these resources usage [Doyle 2001];

- forming of effective price politics, which provides in a long-time prospect the protracted position of enterprise on the traditional and new segments of market;

- early exposure of crisis tendencies both within the framework of national economy and its industries and inside the enterprise, and warning of enterprise bankruptcy [Martynenko 1995].

Thus, management of assortment portfolio structure is a difficult process and consists in the choice of optimum decision taking into account all of possible criteria of optimization and limitations which take place in existent and possible terms during realization of different alternatives of development [Kunts 1991]. However, somewhat wider the search of the best descriptions of assortment portfolio is not named as optimization, but search of the balanced structure.

A process of the enterprise's balanced structure of the assortment portfolio search is complex [Alekseeva 1990].

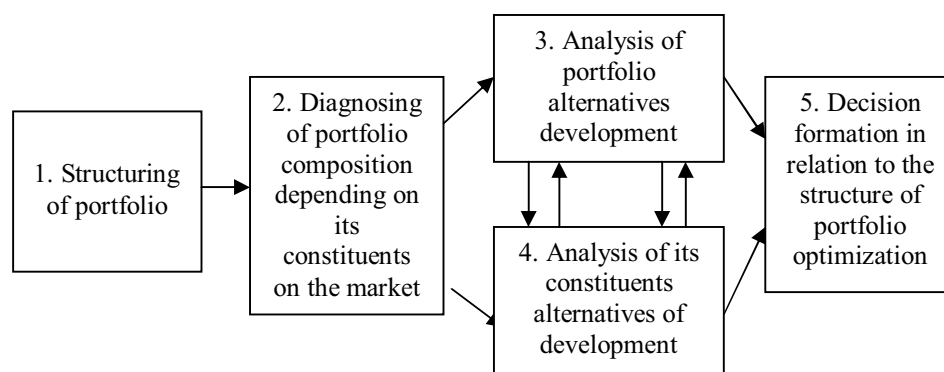The chart of its realization is resulted on fig.1.

Fig. 1 The chart of balanced assortment portfolio construction process

The table of contents of balanced assortment portfolio can be exposed with the use of the following approaches:

1. Coming from aims and tasks of enterprise.

Balanced assortment portfolio is such its state at which provided an achievement of all or most major aims of enterprise, both in short-term and in long-term horizons of planning [Mazaraki 1999].

Primary purposes in the management of assortment portfolio structure are:

- providing of maximal work-load of production capacities;
- achievement of maximal or minimum necessary profitability;
- providing of maximal market growth and volumes of sales share;
- decline of risk during the formation of assortment portfolio.

2. Coming from composition and structure of assortment brief-case [Kholodnyi 2006].

This determination is related to conception of LCC (lifecycle of commodity), in accordance with which the life cycle of commodity is counted on a certain term and update of commodity assortment is unavoidable and necessary [Afanasiev 1995]. Thus different commodities are on the different stages of LCC, have different prospects and, accordingly, their being in a commodity assortment is needed for aims achievement of different temporal horizons.

Thus, balanced assortment portfolio – is a provision of such composition and structures of assortment portfolio, when it contains elements with such total set of properties which answer the structure of the set aims, together with this, the proportions of elements must provide the necessary dynamics of their achievement [Landina 1994]. Under elements here it follows to understand the set of commodities types which form composition of portfolio, under the proportions of elements we should understand production of different commodities and their correlation volumes, and under properties of elements - a set of such indexes of every commodity, as a prognosis of volumes dynamics of sales, calculation of norm of income sizes and profitability, prognosis of duration of LCC.

3. Coming from the analysis of dynamics of indexes [Illyashenko 2004].

In this case balanced assortment portfolio - is such state of assortment portfolio, curtained by its structure, which provides the proof of commercial activity dynamics according to the aims of enterprise, which are attributed to the different periods of planning. Thus the row of dynamics must contain the properties of stability. Under stability we understand absence of strong overfalls in the temporal rows of such indexes, as a production and sales volume, work-load of production capacities, profit margin, market share, and in temporal rows - rates of their growth.

4.Coming from market demand and suggestion (from the side of external in relation to organization factors).

This is being reached by uniting initial determination of balanced assortment portfolio as in accordance to demand and supply of each other according to the modern conception of marketing [Belyavsky 1997]. In this case balanced assortment portfolio will be such structure of commodity portfolio, which will provide not only accordance of commodity suggestion of enterprise to the pattern of demand in a present tense but also pre-conditions of similar accordance in the future, and, moreover, one that actively will influence on structure formation of the future demand on behalf of enterprise.

Realization of final choice of the assortment portfolio balanced structure can be represented as the following sequence of actions:

1. Development of a few variants of composition portfolio formation (its update), together with this, from point of duration of the planned period one variants will anymore answer the growth of portfolio, other - to the current result of portfolio maximum; from point of aims of enterprises first - to the portfolio of profit, second - to the portfolio of maximum particles, third, - to the portfolio of a volume maximum, etc.

2. For every composition of portfolio it is suggested to develop a few alternative variants of structure optimization: by the variants of pattern of growth, model of profit, pattern of the balanced growth, and also choice of alternative development of constituents from point of risk minimization.

3. Every received result of portfolio is sent on high-quality estimation by a person who makes a decision, with the aim of the final choice of structure. The criterion of estimation will be in accordance to the dynamics of indexes, provided by this variant of structure, to the signs of balanced assortment portfolio (in accordance with determinations).

CONCLUSIONS

Optimization of assortment is a continuous process of commodity politics realization, and an assortment can't be optimized only once during all period of enterprise presence on the market. For every technological line there is a long-term plan of assortment update. Taking into account the rapid change of the market state of affairs, the new types of products, which can be asked by a market in the future, are constantly developed. Thus the special attention must be paid to monitoring of life cycle of products.

Different commodities have different duration of life cycle and it's every stage: from a few days to tens of years. Task of marketing specialist is to provide the rational lengthening of commodity life-span at the market, although the development of scientific and technical progress, opposite, results to the speed-up «senescence» of commodities and compression of life cycle.

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ИННОВАЦИОННЫЕ ПОДХОДЫ К ФОРМИРОВАНИЮ СБАЛАНСИРОВАННОЙ СТРУКТУРЫ ТОВАРНОГО АССОРТИМЕНТА ПРЕДПРИЯТИЙ

Татьяна Максимова, Ольга Жданова

Аннотация. В статье изложены особенности управления структурой ассортиментного портфеля. Рассмотрены подходы относительно обеспечения сбалансированности ассортиментного портфеля предприятия. Представлена последовательность действий относительно осуществления окончательного выбора сбалансированной структуры ассортиментного портфеля.

Ключевые слова: асортимент, портфель, предприятие, товар.

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RESEARCH OF EFFECT OF PHYSICAL FIELDS
ON ABILITY TO LIVE OF THE PERSON

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Summary. The problems of the investigation of the influence of physical fields on man's feelings with the purpose of protecting his health in the period of anticipating Sun's activity in the period of 2011 – 2015 years have been considered in this article.

Key words: ability to live of the person, physical fields, energy, energy potential.

INTRODUCTION

In the period of its development humanity repeatedly made attempts to establish close links between person's feelings and processes which take place in the surroundings. Heraclite, Hippocratus, Aristotel often refer to these factors in their woks.

The founder of heliobiology O.O. Chignevskiy determined and proved the existence of connection between the condition of man's health, world – wide historic events and cosmic vibrations. He considered that processes in Space were the consequences of Sun's activity. Physical characteristics of Sun, processes taking place in the period of its activity are the cause of enormous changes in the entire physical and organic world of our Planet, are also the direct cause of great magnetic storm and influence the state of practically healthy person [Zhelibo E.P., Zaveruha N.M., Zatsarnyj V.V. 2003, Dudnikova I.I. 2003, Pistun I.P., Berezovetskij A.P., Tubaltseva A.N. 2003]. The first reaction of a man on Sun's magnetic perturbations manifests itself just already in 8-10 minutes after the beginning of the storm. Every manifestation of Sun's activity becomes the cause of 1-2 thousand of deaths [Gordienko 2006].

The greatest negative influence of magnetic storms is observed on Earth's poles and in ecologically polluted zones.

Any influence of Space on the objects of living and inanimate nature is fulfilled by means of interaction with existing bodies and objects [U. S. Congress 1989, http://www.secondphysics.ru/node/ 2009, Akimov A.E. 2000]. In the course of the whole history of mankind many scientists believed that there existed the natural strength of life – prana in India, In-Yan in China, Illiaster in Europe, life energy in Greece [Gordienko 2006, Vladimirsky 2000] in modern world and, first of all, a man possessed it.

Under the influence of Space and natural force the changing of properties of surroundings appears and any material objects located inside this area react upon such changing.

The result of changing the properties of surroundings stipulated by the availability of the material object in it is called „a physical field". Each type of interaction existing in nature is in conformity with its own physical field [Gordienko 2006, Vladimirsky 2000].

Actually all vital processes in a person's organism on field level are duplicated owing to the generating physical fields and first of all due to the electromagnetic field which is characterized by its parameters- frequency, power, etc. [Semin J.A., Shvartsburg L.K., Dubovik B.V. 1995, Syromjatnikov J.P. 1995].

It is stated in modern physics that the diversity of interactions that biological organism have to deal with in the surroundings may be brought to 4 types – gravitational, electromagnetic, strong and weak [Grigoryev 1973, Kuznetsov 1994].

The correlations existing in the system „man – nature'' are indicative of the power nature of a man – the existing direct power exchange between a man and surroundings. There are different types of secondary physical fields among the mechanisms of coersion on biological objects.

They are the following: acoustic, electroacoustic, plasmatic, thermal. They are able of generating vibrations and feed the processes taking place in a man's organism.

RESEARCH OBJECT

Proceeding from the above-mentioned statements it is actual and necessary to investigate the influence of physical fields on man's state of health in order to preserve man's health especially in connection with the anticipating increase of Sun's activity in the period of 2011 – 2015 years.

RESULTS OF EXPERIMENTAL RESEARCH

The man's organism consists of water by 60 – 70%. It is known that water is a good conductor and any change of physical field will influence man's health. The influence of any physical field exerted on a man and surroundings is revealed directly in the period of its activity.

It is possible to detect the signs of fields influence only indirectly according to the residual reaction of living organisms after stopping fields' influence.

According to the character of the physical fields' influence, first of all, on a man and other biological objects it is necessary to distinguish the following types of influence:

- gravitational (influence of overloading and weightlessness);
- electromagnetic (veneering electric current in organism);
- electromagnetic ionizing (irradiation of a body or separate tissues);
- acoustic (sound effect);
- electroacoustic (veneering additional electric field);

    −   thermal (appearance of infrared radiation);
    −   biological (influence of the complex of fields engendered by the vital activity of each individual bioobject leading to appearance of man's hypnosis and other abilities).

The authors assert that all physical fields are potentially dangerous. Their influence on all bioobjects causes changes of parameters in the surroundings.

Many specialists estimate such influence and such changes as negative and consider that they are very harmful for man's health [Grigoryev 1973].

The character of the influence of any physical field on a man is determined by the type and total energy of the field itself and, to great extent, by power characteristics of its bearer.

The most dangerous physical fields are ionizing ones according to the character of their influence on bioobjects and availability of residual products of this influence.

Any change of the bioobject's condition takes place as the result of the interaction of its structures and elements. The main property of the living organism manifests itself in the presence of the potentials' difference on its membrane cells.

Any change of the potential of these cells results in physiological changes – such as nervous impulse and contraction of a muscular cell. Keeping up the potentials' difference of membrane cells is the base of all biological organisms including a man owing to the constant maintenance of regulating the structure of living matter. Upsetting such balance leads to the destruction of the living functions of a cell.

The power potentials of membrane cells play an important role in the activity of man's nervous cells-neurons [Gordienko 2006].

The connection between the main person's organs is carried out through the molecular signalling by means of electric impulse signals. Canals in the end-plates of nerve – muscular contacts are opened in response to a neuro – meditator – a chemical transmitter in a man's cortex [Gordienko 2006, Grigoryev 1973]. There appears an electric current with the magnitude approximately several amperes ($1pA=10^{-12}$ A).

For instance, the cells of the eye-retina (sticks and flasks) contain substances interacting with light – electromagnetic field. Isomerization of molecules and conformational change of albumen, i.e. Visual perception of surroundings by a man, takes place by means of transformation of light signal into molecular one - electrochemical signal under the influence of light. Blood supply of organism is not only a stream of liquid, but first of all, it is the motion of ions.

According to physical laws this process is considered to be no more than an electric current.

Sufficiently high temperature of a man's organism favors the formation of thermal field's energy around man's body.

Therefore, any living organism including a man, forms several fields around himself.

Man's electromagnetic field and its constant relative motion in the process of vital activity result in the emergence of acoustic and electroacoustic fields with their physical parameters – frequency, power and so on.

All these circumstances allow to state that a man is a generator of weak physical fields which actively accompany the processes occurring in his organism.

Power field of a man as the source of generation of different power influences into surroundings, bears detailed information about all processes in his organism and is called a biofield (bioplasma).

The so-called etheric man's body bearing information about all processes in his organism creates some power envelope around a man.

The greatest maximum power density of the etheric man's body – aura is observed around his head and can be perceived visually by a special category of people (bioenergetics, extrasenses) in the form of coloured range reflecting the inner man's world. The highest spiritual manifestations of a man are characterized by a blue component of the light's spectrum, the brutish ones – by the red colour shade of aura [Maletkin, Druz, Maletkina. 2010].

It is considered that the range of biopotentials of tissues in a man's organism may vary from 1 till 500 Hz [Tornuev 1980]. The total energy eradiated by a man is about 100 Wt, moreover, it absorbs about 75 Wt from surroundings.

Man's vital activity is accompanied by additional emission of electrostatic, acoustic, thermal and, to some extent, ionizing energy in the quantity of about 25-30 Wt into surroundings. The tensity of electrostatic field at the distance of 10 cm away from man's body may be from 1 to 100 W/m [Pavlenko A., Rusanov A., Kosov A. 2008, Heath C.W. 1996, Walleczek J. 1992, Rubtsova N.B. 1997, Gurvich E.B., Novohatskaja E.A., Rubtsova N.B. 1996].

CONCLUSIONS

1. Man's organism sensitive is to different physical fields existing in nature. He is a generator of weak fields himself, his vital activity is subordinated to physical laws of environment.

2. It's necessary to accept quantative physical characteristics of the examined fields as a lower verge of influence on a person at present period of time; they may be considered as restricted ones.

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ИССЛЕДОВАНИЕ ВЛИЯНИЯ ФИЗИЧЕСКИХ ПОЛЕЙ НА ЖИЗНЕДЕЯТЕЛЬНОСТЬ ЧЕЛОВЕКА

Валерий Малеткин, Олег Друзь, Людмила Малеткина

Аннотация. В данной статье рассмотрены вопросы исследования влияния физических полей на самочувствие человека с целью сохранения здоровья в период ожидаемого повышения активности Солнца в 2011 – 2015 гг.

Ключевые слова: жизнедеятельность человека, физические поля, энергия, энергетический потенциал..

RESEARCHING AND DETERMINATION OF APPROACHES AND ESTIMATED METHODS OF OPERATING MANAGEMENT OF ADMINISTRATIVE PRODUCT DEVELOPMENT PROCESS

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Summary. Existent methodologies of estimation operating management products are considered in the article, basic classification signs and offered approach are distinguished near grouping of instruments, which can be used for estimation method of operating management of administrative product development.

Key words: operating management, administrative product, principle of Paretto, three-level kernel, classification signs.

INTRODUCTION

Effectiveness and efficiency of enterprise's activity and his subdivisions are determined by the high-quality level of using administrative products. In this article administrative information, administrative decision and administrative results of activity are thought as basic administrative products. If there is a product, must be system which recreates it, processes and centers of responsibility. However obviously expressed such system is not on an enterprise, that's why to control these processes and consume high quality administrative products is impossible.

For increasing of administrative efficiency on an enterprise it follows to distinguish a separate subsystem which would perform the duty of administrative products making. If to conduct an analogy with material products making on an enterprise, which are made the system of operating management, it's possible to assert that the system of operating management of administrative product development process has a right on existence. This subsystem does not have clear broads, but answers to all system's signs as integrity, emergenty, functionality, synergy, subordinated, functionality and determination.

Forming and conditioning of the successful functioning of this subsystem requires realization of monitoring her activity, analysis her functions, intentions, if you need state of different component elements in her functioning process. For this purpose it is necessary to have a consequent instrument, methodology, which would in the

foreground mode execute intentions of operating management state, and also conduct the special researches for a deep analysis. Here actuality consists of problem of researching this subsystem estimation.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

Analyze of the special and educational literature, sanctified to the management and management enterprises is shown by the presence of great number of approaches and charts of estimation. As objects estimations are examined: whole system of management enterprise, functional and target subsystems, quality of realization of administrative results of activity, functioning of organizational mechanisms, state and level of good organization processes, using potential and possibilities of management subsystems, estimation of separate performers and groups of performers which execute separate administrative works or roles. Methodologies of such known authors as J. Fitzsimmons, Richard B. Chase, Nicholas J. Aquilano, Robert Jacobs, Larry Greiner and Richard Savich, David H. Meister, D. Upton and S. Macadam, etc. were investigated in the article [1, 3,7, 9,11,12,13,18-20].

It is possible to say on results research, that most worked out and investigated are questions of estimation management system, functional and target subsystems of enterprise, less investigated and require additional research - question of estimation separate administrative results of activity. More detailed the question of effectiveness and efficiency of activity of management subjects is considered in scientific literature, also much attention is spared to the estimation of logistic state, operating activity, sale etc. Some positions have universal character; however some administrative results of activity are specific enough and require adaptation to the existent estimation methods or even development of the special instrument.

Among administrative results of activity to the least studied it is possible to take results, which are dedicated to the internal processes which take place within the limits of management subsystems. The questions of estimation administrative results of activity which are related to development and using administrative products are considered episodically and through separate aspects. Integral and complex methodologies in the special literature are not observed, that's why it is necessary to work out new and adapt the existent instrument of estimation in relation to a specific and features of operating management of administrative product development process (after in text using short form - OM APDP).

AIM AND RISING OF RESEARCHES TASK

The aim of the article consists of systematization existent experience, separation those structural elements, units, which on the basis it is possible to get effective and capable-working methodology of estimation.

BASIC DIVISION WITH RESULTS AND THEIR ANALYSIS

Using administrative products is perceived by a management object, causes changes in his behavior or descriptions which allow arriving at the set aim.

Descriptions of administrative product are the consequence of operating his (administrative product) development process. In quality management subject we distinguish the internal subsystem of operating management, which provides development of administrative decisions produces administrative results of activity and uses administrative information [11].

Development new and adaptation of existent instrument of estimation in relation to a specific and features of OM APDP requires systematization of study existent experience, separation those structural elements, units, which on the basis it is possible to get effective and capable-working methodology of estimation.

For systematization experience and above-mentioned instrument of existent methodologies, it is necessary to analyze them from different positions. For this purpose we need to form the criteria of classification and define classification signs. In order to get the most objective results of determination main classification signs, the open questionnaire of respondents which work in scientific and productive spheres (representatives of theorists and practical management workers) was conducted [15]. To the classification signs which distinguished respondents, they take such: object of estimation, sign of using, type of methodology, origin of school, level of subjectivity, belonging to approach, methods of estimation parameters, level of dynamism, level of complexity. Farther to the respondents it was offered to range all signs by importance.

Thus, it is possible to assert that receipt information forms a three-level kernel (fig. 1) and, by principle of Paretto, it is considered the center of kernel complex represents all necessary properties and tendencies of all selection of signs and is most essential for future methodology of estimation of OM APDP.

Summarizing research results it is possible to do such conclusions, that the level of complexity, methods of estimation parameters and level of dynamism, behave to the most essential descriptions and classification signs of management subsystem. After getting results we propose to form classification of existent estimation methodologies of management subsystems, as it is shown on fig. 2.

OM APDP functions in two measuring – in time and space. All changes which acquire OM APDP are represented in the conditions of functions' realization process. Therefore OM APDP functions must be estimated both by concrete moments of time and by dynamics. The important index of any management subsystem is quality of its functions' realization, that's why is needed such estimation methodology of operative management of administrative product development process, which in the single indexes' system would enable to estimate component elements and functions high-quality and quantity.

Union methodology of estimation it's functioning will show by itself integrated methodology of different estimation methodologies of other management subsystems. For it in the article is needed to conduct the detailed research of existing on this time methodologies, instruments and approaches to estimation management subsystems 8, 9, 14, 17, 20].
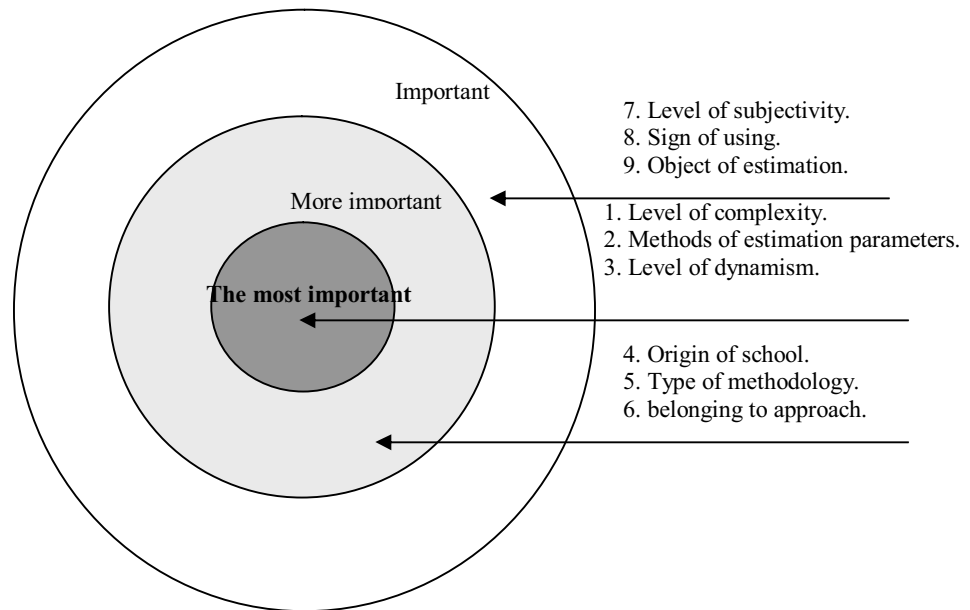
Important

7. Level of subjectivity.
8. Sign of using.
9. Object of estimation.

More important

1. Level of complexity.
2. Methods of estimation parameters.
3. Level of dynamism.

The most important

4. Origin of school.
5. Type of methodology.
6. belonging to approach.

Fig. 1. Three-level kernel of classification signs

Classification sings existent methodologies of estimation
management subjects

Level of complexity

Methods of estimation
parameters

Level of dynamism

complex

group

part

statistic

expert

analytic

graphic

dynamic

static

moment
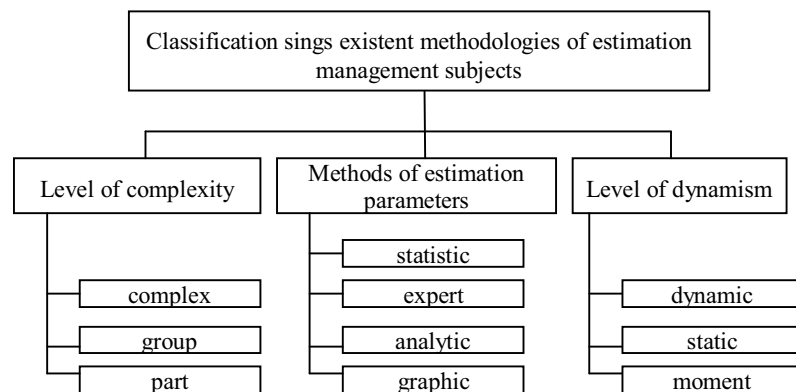
Fig. 2. Major classification signs of existent estimation
methodologies of management subjects

From management of OM APDP subsystem's functioning position it is necessary
to build methodology thus, to have the opportunity to watch work of separate elements
or separate operations. These requirements will be realized on the basis of using matrix
approach of estimation indexes, which is formed on the indexes system by possible

elements combinations which formed the subsystem of OM APDP, and types of operations, which them execute. Example of such matrix approach is made an in a table 1.

On the basis of this matrix the hypothetical objects amount of estimation is determined. In practice, according to the principle of Paretto, it is enough to consider 20% from the general objects amount, however for additional researches – just 20-30%. Due to it the work-intensiveness of estimations considerably goes down and the mechanism of implementation of estimation becomes comfortable in the real mode of time [16].

Table 1. **Determination of objects of estimation of subsystem of OM APDP**

Subsystem's elements (E_j)	Types of administrative results of activity (P_i)			
	P_1	P_2	…	P_n
E_1	P_1E_1	P_2E_1	…	P_nE_1
…	…	…	…	…
E_m	P_1E_m	P_2E_m	…	P_nE_m

A set of elements of administrative results of activity is typical, however takes into account a specific each of management subsystems of an enterprise which OM APDP is examined.

CONCLUSIONS

It is possible to draw conclusion by results of researching this approach allows enough flexibly to form the estimation instrument adequate to complication of the set tasks, to conduct an operative estimation and special researches. As indexes estimations can be used comparison indexes of normative value with actual (or standard value with actual). Using standard-normative indexes allows estimating the executive's level of administrative operations, elements' functioning quality and quantitative depths of rejections and also forming the program of actions on this basis. Offered approach to development gives an effective comfortable instrument for the estimation of the state of operating management administrative products development process subsystem.

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ИССЛЕДОВАНИЕ И ОПРЕДЕЛЕНИЕ ПОДХОДОВ И МЕТОДОВ ОЦЕНКИ ОПЕРАЦИОННОГО УПРАВЛЕНИЯ ПРОЦЕССОМ РАЗРАБОТКИ УПРАВЛЕНЧЕСКОГО ПРОДУКТА

Валерий Назаров, Елена Шарко

Аннотация. В статье рассмотрены существующие методики оценки продуктов операционного управления, выделены основные классификационные признаки и предложенный подход к группированию инструментов, который может использоваться для разработки методики оценки операционного управления процессом разработки управленческого продукта.

Ключевые слова: операционное управление, управленческий продукт, принцип Паретто, трехуровневое ядро, классификационные признаки.

TRANSIT POTENTIAL OF UKRAINE. POST-CRISIS STRATEGY

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Summary. The article provides a review of registers of convenience flags and the problems of the transport services, it presents research-to-practice recommendations on improvement of legislation in trade shipping, on development of the foreign trade of Ukraine, international transit and forwarding services. Some solutions to the problems of logistics, serving for the benefit of economy and international integration, are given.

Key words: cargo traffic, transit, second ship registry, multimodal transportation

INTRODUCTION

According to the leading world experts, Ukraine possesses Europe's biggest *transit rate* – index of 3.75 (compare to Poland's – 2.92). Domestic specialists – marine agents and forwarding agents – provide a wide range of services to carriers and cargo owners at the rate of 60% of export-import shipping operation and 75% of transit shipping operations [Burkinsky 2009, Slobodyanyuk 2010, Nechaev 2010].

However we do not use this huge advantage to the full. The transit ratio, which has recently constituted some 50% out of total volume of Ukraine's shipping operations, has reduced by half. In the situation of the systemic crisis the whole market of foreign cargo traffic, both transit and domestic, has declined, although at the lower rate than the rest of domestic economy. The main reason for it, according to our analysis, lies in purely Ukrainian problems: instable and inconsistent government, unbalanced domestic industrial production and consumption; the absence of a well-developed and resources-provided strategy of the state transport system; the neglected and underdeveloped foreign trade relations; the discouraging operation of border check points [Nechaev 2010].

ANALYSIS OF THE LATEST STUDIES AND PUBLISHED WORKS

The fulfillment of transit potential serves as a life-saving variant not only for the transport sector of economy [Nechaev 2008]. How, amid the global crisis, to use

Ukraine's unique geographic position for providing and serving trade relations between more prospering economies of our neighbours and their exporters-importers? Despite all problems sale-and-purchase contracts will be signed and the trade will grow.

Creating favourable and competitive conditions for export-import and transit cargo traffic is a key task of high priority. It requires improving the national transport system, its infrastructure, main roads and providing forwarding services [Nechaev 2010]. It is hundreds thousand of jobs. Nevertheless today all anticrisis measures mention not a word concerning transport; trade shipping and sea ports develop not with the help of legislative framework but despite it. After *Ukrzalyznytsya* (Ukrainian state rail carrier) lost its right to be customs carrier, it reduced its shipping operations of excisable goods by half. Today one letter or act of State Customs Service of Ukraine can cancel provisions of law. Complicated schemes of financial guarantees are introduced for particular bodies. Strict fiscal mode, lengthy customs clearance eliminate successful commerce operation of a fleet under the flag of Ukraine. There is a fleet which operates under foreign flags but it is under the control of Ukrainian businessmen. However they provide no revenue into Ukraine's budget.

Controlling bodies (veterinary, ecology, quarantine inspections) at border check points turned the border crossing into an unconquerable process. Here lies the reason for the unheard-of down time of transit containers in ports where various inspections introduce 30 control procedures, a dozen of signatures in order to obtain a permit for transshipping transit cargo from one shipping line into containers of another shipping line. It takes 2 weeks! – instead of simplified and rapid procedures of the programme, enacted by law, 'Ukraine – a transit State.' It is well-known to our partners and potential clients abroad.

RESULTS OF RESEARCH

The sector of dry-cargo vessels is the last where international freight market felt the global crisis influence: its collapse started in October 2008 as a result of the global recession in metal, chemical and coal industry. However the construction of new tonnage of more that 400 million tons was ordered in 2009-2010. It will lead to the doubling of the deadweight of the bulker and the world fleet [Burkinsky 2009]. Amid the development of merchant shipping Ukraine's participation in the world maritime trade is insignificant - less than 5 million tons of cargo, or 0.05% out of 7415.5 million of the world's maritime cargo turnover (according to UNCTAD, on January, 1, 2007).

At the same time the structure of shipping operations and goods turnover in Ukraine is not balanced: most of import comes in containers, most of export is carried by bulkers. The share of maritime transport in Ukraine's GDP is a bit more than 2% (with the potential of 15%). During the last 20 years the share of domestic carriers export-import cargo reduced by 10 times (from 75% to 7.5%). The rate of increasing import shipping operations and the reduction of export proves Ukraine's loss of fleet competitiveness at the world freight market.

The reduction of tonnage under Ukraine's State flag took place simultaneously with the significant increase of shipping companies. Thus today according to British Lloyd, 82 companies are registered in Ukraine which own vessels under State flag (of

which only 7 companies own fleets more than 5 units and 51 companies own 1 vessel each) and 110 companies own fleets also under the flags of other countries [Burkinsky 2009]. The fleet of Ukrainian companies under the flags of Open Registry countries increased from time to time according to the standpoint of our exporters (first of all metal products) at the world trade markets. Due to this fact Ukraine ranked 33 out of 35 world's maritime states. However with the weakening of the positions of metal exporters at the SE Asia markets Ukrainian ship-owners began to get rid of their tonnage. It turned out that they could not operate the fleet at the world freight market because of the absence of carrying trade institute and cutting down independent agency services, survey services and forwarding services. Shippers tend to create their own service companies and do not allow independent operators to shipping operations, although in the situation of the crisis it is unsettled domestic units that are closed first of all.

EU countries focus on shipping operations by environmentally-friendly modes of transport – by rail road and water. The Western Europe is about to prohibit long truck shipping operations [Nechaev 2008, 2009]. In Ukraine on the contrary logistics centres are built only for motor transport, far from water and railway main roads. It may cause serious problems in the future.

Several years ago with the growth of cargo traffic port development started to boom; the number of new investment projects on port development is increasing rapidly. Today rail road is not keeping up with this it: old mechanisms work worse and worse; old, outdated principles of sectoral management need reforming. The Bill concerning ports introduces a new definition: 'port' – not as a legal entity but 'transport complex' as an economic and geographic notion. Thus the noncompliance with Merchant Marine Code of Ukraine should be removed [Rabotnev 2010].

According to the Strategy of sea ports development until 2015, access channel, water area, mooring berths, hydraulic engineering structures, navigation equipment, communications, entrance routes are assigned to State port administration. Facilities connected with cargo transshipment (lifting gear, terminals, warehouses and territories) can be sold or rented out, leased or granted to concession to private entrepreneurs and companies [Slobodyanyuk 2009, Nechaev 2005]. No common-sense logic and consequently no logistics will tolerate irresponsible rent pressing of inspectors. Otherwise this alogical and mental phenomenon should be called as 'peculiarities of the national hunting' for everything that moves, including charter fleet and common carrier [Izotov 2010, Kaver 2008].

The reproduction of Ukraine's merchant fleet and the development of shipping are hampered by artificially created conditions when there is no demand for marine transport operations, when it is unprofitable for Ukrainian exporters to send cargo under CIF conditions (when they become charterers and commodity price increases significantly because of transportation and cargo insurance). As a result institutes of the freight affair do not develop, and the national shipowners loses its potention carrier-based cargo. Direct losses of Ukraine's economy because of this during the years of independence have amounted to more than a dozen of billions dollars [Nechaev 2010]. Taking into account the migration of skilled labour and the reduction of cargo traffic (with the fall of the transit index to 2.7), the total losses increase significantly.

In order to stimulate domestic demand for tonnage it is necessary to exclude freight payments out of double taxation, cancel VAT on the services of Ukrainian

freighters, to create conditions for 'part cargo' combined transportation and single contract carrier-forwarder under a joint bill of lading and unified tariff rate [Nechaev 2003, 2005]. Importers, exporters, motor railway and water carriers and dockers should more actively implement contract relations with domestic forwarders (FIATA members) on the base of INCOTERMS, carry on logistics according to multimodal scheme. Even simple measures like these will soon increase cargo-carrying basis of all modes of transport [Slobodyanyuk 2009]. Only due to the rising demand of cargo owners domestic forwarders will be able to grow into multimodal transportation operators and contract carriers.

Many countries of the world has successfully tested the mechanism of creating International Ship Registry (Second Ship Registry) which presupposes privileged and simplified tax system. For example, all taxes are replaced by a single reasonable one-time registration fee and fixed rates depending on the tonnage of a vessel which are paid once a year. World shipping taxation has its own peculiarities (fig. 1). The profit of vessels registered in the countries of open registry and offshore zones are subject to tax of about 2% and the profit of vessels of other international registry of about 7%. The profit tax of the vessels listed on the national registry is set from 5% (Greece) to 50% (Italy). It is the high tax that resulted in tonnage 'drain' towards 'convenient' or 'cheap' partners which presented huge economic benefits to ship owners.
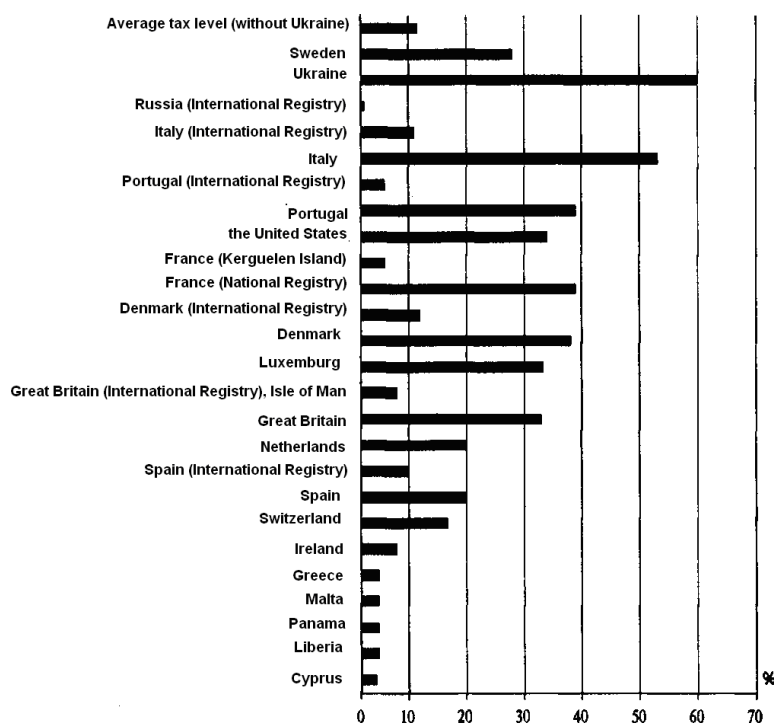
Fig. 1. Shipping tax level across the world

According to official figures, at the beginning of 2010 on State Registry there were 6846 vessels of integral gross tonnage of 2731 thousand register tons. After 1997 (since the implementation of the Registry) 1939 vessels of tonnage of 2031.7 thousand register tons. However a revision showed that the real number of vessels and the tonnage volume under Ukraine's flag is sort of a commercial secret.

It contradicts numerous official statements about the necessity of making Ukraine's flag attractive and the most convenient for ship owners. The procedure of registering a fleet is an integral part of this convenience. The EU purposeful policy in this direction stopped the fleet drain to the open registry countries and there is a tendency of returning its fleet under its nations' flags. Like all over the world the main purpose of creating the registry is not the profit from the registering of vessels but a multiplier effect for economy on the whole including the protection of foreign trade from acute fluctuations of freight market, maintenance of economic security of export-import operations, the revival of economic sectors connected with shipping (metallurgy, shipbuilding, instrument-making industry).

One of the conditions of the development of the markets of convenience flag registry is marine specialists. For the training of crew personnel and the staffing with the citizens of home country of vessels we need:
– specialized marine educational institution;
– sources of funding of personnel training;
– surplus of vessels of national and open registry flag.

At the same time national trade fleet should be fully manned under conditions of the reproduction of labour-power in the context of Ukraine. In the system of world labour market and man-power export, convenience flag vessels become a very important form of application of unclaimed marine professions for many Ukrainian and Russian seamens [Primatchev 2006].

A complex of new regulatory acts on merchant shipping is needed for the implementation and development of the Maritime Doctrine of Ukraine, and the main act is 'International Ship Registry Of Ukraine'. The means invested into shipping and other fields of maritime activities bring triple return as far as all branches of national economy are concerned. The multiplier effect which is expected from creating Second Registry will be perceived not only in merchant fleet but also by those who build and repair ships. It is there that appear new jobs, the biggest profit will be sent there (туда пойдут наибольшие прибыли), from there should come assignments to the budget. With active reinforcement of domestic fleet by new ships there will appear a real opportunity of resisting the pressure on our exporters to transport sold goods by importers themselves (*FOB*). Special procedures may encourage this which are provided for WTO members but we should be able to use them properly [Rabotnev 2010].

CONCLUSIONS

1) We value the capacity of logistics market today at 30 bln $. Bat logistics centres in Ukraine are created without taking into consideration world tendencies. Port customs infrastructure fails to clear cargo timely, which results in down time. The

development concept of logistics which is being worked out by Ministry of Transport and Communications foresees the transition of customs clearance into inland. It is at the crossing of main water and railway lines that logistics centre's should be built. Motor transport should be used only within 200 km to deliver cargo 'from a warehouse to the client's door'.

2) Nearly half of International registries relate to offshore. They are formed on island territories of states. For Ukraine for this purpose there is Sevastopol on the Crimean peninsula and of course Serpents' Island (*Ukrainian* – Zmiinyi Island).

3) In the situation of a more rapid crisis overcoming by world's export-oriented economies we should offer Ukraine's transit potential with competitive terms of transit, up-to-date standards of logistics and forwarding services, price rate. The government should remove the corporate barriers of controlling bodies on the way of transit cargo traffic. The government should give support to transportation industry, as provided for in the legislation. It is possible to fulfill before budget inflow and expenses on the building of roads, terminals, new vessels, locomotives, carriages – first of all by means of the revision of the legislative framework of international shipping operations. When the fleet under Ukraine's flag will transport not 5-8% of cargo as today but 30-40% then this country will again become a maritime power.

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ТРАНЗИТНЫЙ ПОТЕНЦИАЛ УКРАИНЫ. СТРАТЕГИЯ ПОСЛЕ КРИЗИСА

Григорий Нечаев, Сергей Изотов, Игорь Кавер

Аннотация. Приводится обзор проблем рынка транспортных услуг и реестров «удобных» флагов, даются научно-практические рекомендации по совершенствованию законодательства в торговом судоходстве, по развитию украинской внешней торговли, международного транзита и экспедирования. Раскрываются узловые точки логистики в интересах экономики страны и межгосударственной интеграции.

Ключевые слова: грузопотоки, транзит, второй реестр флота, мультимодальные перевозки.

PRE-CONDITIONS OF FORMING OF INFORMATION-INNOVATIVE DEVELOPMENT PARADIGM OF UKRAINIAN INDUSTRIAL ENTERPRISES

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Summary. The pre-conditions of information-innovative development paradigm of Ukrainian industrial enterprises under conditions of global economic system evolution have been considered in the article.

Key words: economic system, enterprise, information-innovative development, paradigm

INTRODUCTION

The present crisis in Ukrainian economy in the first place deals with the deceleration of the innovative processes in an industry. On the basis of analysis of pre-conditions of the industrial enterprises innovative development it was defined that one of the necessary components of enterprise development under modern conditions is the transformation that takes place in the information-innovative environment of an enterprise.

OBJECTS AND PROBLEMS

The theoretical researches of the problem of economic system innovative development were made by such famous scientists as I. Shumpeter, P. Druker, H. Beret, B. Tompson, B.Twist, B. Santo. The well-known works of Ukrainian scientists deal with the questions of enterprise innovative development management, i.e. V. Grynyova and O. Kozyreva, V. Ponomarenko, O. Trydid, M. Kyzym, S. Illyashenko. Analyzing the term "development" S.I. Ozhegov defines it as "a process of the naturally determined change, the transition from one condition to another more perfect condition, the transition from the old qualitative state to the new one, from simple to complex, from lower to higher" [Ozegov, Shvedova 1998]. E.M. Korotkov considers a development as "the set of changes that leads to the appearance of new quality and strengthening of system vitality, its capability to resist the destructive forces of the

external environment" [Korotkov 1997]. V.A. Zabrodsky and M.O. Kyzym think that "the development of economic-production systems is the process of transition an economic-production system into the new more qualitative state at the expense of piling up of quantitative potential, change and complication of structure and composition that consequently increase the ability to resist the destructive forces of the external environment" [Zabrodsky, Kyzym 2000]. S.M. Illyashenko [Illyashenko 2005] and P.P. Mykytuk [Mykytuk 2007] single out two types of market strategies of the economical agents functioning, i.e. stabilization (preservation of the achieved production level, market share etc.) and developmental (expansion of production, market share, profit increase etc).

The pre-conditions of the information-innovative development paradigm forming of the Ukrainian industrial enterprises under conditions of global economic system evolution have been substantiated.

RESULTS OF RESEARCH

Globalization processes add changes practically in all constituents of production system. A production in the process of economy functioning and development considers as a phase that fulfil oneself in the form of goods which are necessary for society existence and development. The traditional paradigm of reproduction and development is based on the interpretation of production as a main stage that includes directly material production and production infrastructure. The interpretation of reproduction and development that is used in the foreign economic theory was formed under the influence of postindustrial transformation processes and theories that widened the idea about production. It is called economical production which includes not only the material production but also the intangible production sphere. Such change comes of the identical definition of manufactured products and services as two types of use value that have utility property and from this point of view are comparable. The postindustrial transformation found expression in the change of production structure and correspondingly results structure of reproduction system functioning. Today in spite of the crises the rapid increase acceleration of these sectors of national economy that concern the information component of reproduction system that deals with development of information economy. The forming of the information-innovative development paradigm of Ukrainian industrial enterprises takes place in the modern conditions.

The development in the economy of "information" sector can not be identified only with the increase of services sphere role in the economy structure and permits the progressive increase in the leading productive industries that is one of the factors of process improvement. The informational support of development process leads to the transformation of the role of material and labour production factors that influence employment structure in the form of increase the part of employed people in the sphere of informational services and the transition to the qualitatively new factors of economical growth. Scientific and technical progress allows to grow the gross domestic product without consumption increase of the material factors of production and without involvement the extra labour forces. The basis of the intensive growth becomes "innovativeness" of reproduction process.

The adoption in the domestic industry activities and separate enterprises the concept of the stable innovative development makes conditional on the necessity for searching the new mechanisms which from one point of view would be the safe understandable instruments, and from another point of view would allow to identify the basic problems and would be favourable to the elaboration of the adequate and effective decisions according to the long-run aims of the stable innovative development. The world-known scientists experience of solving the problem of the balanced development indicate that such mechanisms are information support.

The complex system of information support of the enterprise stable innovative development must meet the following criteria, i.e. correspondence to the key aspects of the stable development; representativeness for the international economic business-society; simplicity; limitedness of indices quantity; possibility of the properties and dynamics quantitative determination; trustworthiness; accessibility and reilibility. The creation and implementation the information system in the sphere of enterprise innovative development must influence not only on the development of the statistical accountancy but also on the possibility of integration into the global world informational space.

The basis for the stable innovative enterprise development is the long-run economic programs that were made with an allowance for ecological and social consequences. The implementation of the stable innovative development, when elaborating the long-run economic enterprise strategy, take place in Ukraine against the background of strengthening of private capital role in using of the innovative development advantages during the transition to the informational phase of development. But according to the society development strategy the state also has to make more active its role, make it adequate to the modern crisis situation in economy.

The postulates and theoretical conclusion built on the industrial economy regularities already can not explain the set of crisis phenomena. Today the collective search of the new theoretical solving of the modern economic problems that can not be solved on the basis of today's theories. The Ukrainian economic science now has the unique possibility to concentrate its efforts on the research and the creative development of new economic concepts, namely on the concept of the stable development and innovative activity.

One of the main goals of the modern stage of the Ukrainian economy development is to reduce sharply the break in comparison with the world economic system that is based on the use of up-to-date technologies, human potential, capital consentration, innovative activities. The wide use of knowledge incarnated in the new technology becomes the most important factor of the developed economies competitiveness. The technological progress has changed the scale and the production structure of the industry-developed countries. The developed countries carry out the transition from the industrial stage of economy's development to postindustrial, i.e. informational stage. These processes are actively regulated and stimulated by the bodies of state power. Their role is not limited to the traditional frames of support of fundamental science and special-purpose researches, but also includes the measures for the purposeful development of the priority branches of industry.

The isolation of Ukraine from adoption of up-to-date technology unfortunately leads to global development disproportion, when other countries pull ahead at the

expense of new technology development. The phenomenon of "new economy" appears that deals from one point of view with wiping of boundaries for entering the engineering branch of industry and from another point of view with appearance of the big international monopolies. Under such conditions the question arises about informational technologies and market models. The question is competitive or monopoly tendencies are intensified and to what extend this intensification take place. The appearance of "new economy" submits many new questions to classic theory. Thereby the traditional economic theory comes out of operation of the law of decreasing marginal profitability of a variable production factor on the basis of which a lot of concepts and processes are researched in the economic science. But information products do not obey this law. Information as a product differs by the high fixed costs and low variable costs. Correspondingly the branches that are involved in information product production receive huge possibilities for economy of scale exploitation. The phenomenon of profitability that grows was analyzed by economists before in those branches of industry where the economy of scale effect appears, i.e. railway, gas industry, electricity. The peculiarities of information products lie in that fact that profitability grows more intensively. In Ukrainian economy spreading of informational products is not considerable. But the readiness at all levels is important to use effectively potential and advantages of "new economy" for the stable economy growth. One of such advantages and also the problem that is not researched well is the operation of intangible factors of economic development on dynamics and quality of reproduction process, economical and scientific and technical development. The most important of these factors is the human capital in the form of professional training level.

In developed countries more than a half of the gross domestic product increase is provided by innovations that is the result of human capital functioning. Such situation is the result of education functioning and development. The central significance under such conditions has the intensified investments in educational sphere, re-education, training in order to make personnel flexible and able to adapt.

During the imminent transformation of the Ukrainian economy along the innovation-informational direction, the domestic enterprises will demand effective managers, who are able to improve or at least to hold on (if it is sufficiently high) the quality of management. It is impossible without managers being proficient in innovation knowledge and key management instruments. First of all this regards planning and managing finances of innovation activity as a factor of effectiveness and labour productivity increase.

In spite of the wide range of researches regarding innovation development of domestic enterprises, one can note with regret that the practical results are insufficient. However the analysis of the unreasonable inconsequent acts and direct mistakes, which were made by the top managers of the whole governance of the economy sector, branch complexes, big companies, monetary and banking systems, indicates the high price of them for economy and population even without strict qualitative estimations and special indicators.

The competitiveness in new branches runs mainly not at the expense of reduced cost, but at the expense of production of the products which a competitor can not produce in principle (by quality, newness etc.). Today the most productive are those countries and companies, which achieve success in producing complex, science

intensive advanced technology products, which demand high knowledge. A company which produces a high-quality product with heavy expenses can be more competitive than a company which is not based on high technologies and qualified professionals by the main indicator "price/quality". The development of high technology industries requires the whole range of conditions among which is the high educational level of personnel along with scale financial expenses. This is especially important taking into account irreversibility of the globalization process, which raises standards to effective management. The last is impossible without using the accumulated in the world knowledge in professional work of managers (in the spheres of business, governance etc.), the use of which have proved already its effectiveness. At present there is only a narrow stratum of managers who are able to work in the global world and meet the world standards. Though human resource as knowledge resource is believed to be the only competitive resource, without its support and development it can become exhausted.

CONCLUSIONS

The modern economy depend more and more on the intangible information economy that has already penetrated in all basic branches of industry. The new economy leads to the necessity of reconsideration of the usual opinion about the measuring and estimation of education innovative potential. The point is that in spite of the high educational potential of the Ukrainian labour force according to the wold's standards it meets the requirements of the old industry employment structure of the industrial type. In comparison with the developed economy countries there is the high level of employed in industry and agriculture in Ukraine. The Ukrainian employment level corresponds to the level of the least developed agrarian and industrial countries of the European Union.

The rapid renovation of the highly technological industries and therefore the constantly growing requirements of innovations needs significant investments in scientific and research works, personnel training. The replacement of simple labour by intellectual labour as a result leads to reduction of total production cost level in the economy, to increase of labour productivity at the expense of the constant quality growth of labour potential that is necessary for the support of technologies aimed at innovations.

The problem of innovative development is worsened, if we consider that the meaningfulness of informational factors grows in the XXI century economy. The recognition of information as an important economic recourse and final product of an economy becomes the turning point in development of the innovative-information thinking.

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ПРЕДПОСЫЛКИ ФОРМИРОВАНИЯ
ИНФОРМАЦИОННО-ИННОВАЦИОННОЙ ПАРАДИГМЫ
РАЗВИТИЯ УКРАИНСКИХ ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЙ

Ирина Бузько, Александр Ефремов

Аннотация. В статье определены предпосылки формирования информационно-инновационной парадигмы развития отечественных промышленных предприятий в условиях эволюции глобальной экономической системы.

Ключевые слова: экономическая система, предприятие, информационно-инновационное развитие, парадигма.

INFORMATION SYSTEM OF SPATIAL CONTRAST SENSITIVITY DIAGNOSTICS IN OPHTHALMOLOGY

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Summary. The analysis of the existent information systems and methods of spatial contrast sensitivity diagnostics is carried out. New computer diagnostics on more exact method of man spatial sight estimation basis is offered.

Key words: information systems in ophthalmology, computer diagnostics, spatial contrast sensitivity.

INTRODUCTION

The end of the twentieth century was marked not only by fantastic scientific and technical achievements of humanity but also by very sad circumstances of worsening of health in general and sights in particular from them. As it is known, a man gets more than 95% of the information through sight. For the last 30 years ophthalmologists have marked the abrupt rising of eye diseases that are directly related to scientific and technical achievements. About 45 % of the population of industrially developed countries needs vision organ diseases treatment and optical correction. In this connection correct diagnostics and timely revealing of any departures in a state of man sight health are necessary [Shelepin U.E., 1987].

It is expedient to use high level of achievements in the sphere of the newest information technologies, the computer technique and hardware support also for diagnostics and visual analyzer diseases treatment quality improvement. The presented work is directed on information system of diagnostics in ophthalmology creation with the use of modern approaches and methods of man spatial sight estimation.

RESEARCH OBJECT

An object of research of this work is an analysis of existing medical information system and diagnostics systems in ophthalmology.

The subject of research is the information system of spatial contrast sensitivity diagnostics (SCS) with the use of computer technique.

A purpose of this work is in spatial sight diagnostics quality improvement on the basis of computer realization of reversing hexagonal method of spatial contrast sensitivity measuring which was offered by G.V. Panteleev the medicine doctor (Lugansk).

For realization of this purpose the followings actions were executed:

1) The medical information systems used in practice are researched.

2) Improvement directions of existent spatial contrast sensitivity measuring diagnostics are determined.

3) The diagnosing algorithm is developed and the followings parts are realized programmatically:

– a database of patients and measurements;
– graphic display of diagnostics results;
– computer module of reversing hexagonal method.

RESULTS OF RESEARCH

Spatial contrast sensitivity, as a man sight index, it is an ability to catch minimum differences in two nearby areas luminosity, and also to differentiate them on a brightness and color. As the visual analyzer receptor fields are similar to the local filters system of different spatial frequencies and orientation, multicontrast black-and-white or chromatic sinusoidal lattices of different directions and width with the dim contours are the best test stimulus for their excitation [Shamshinova A.M., 1996].

The essence of reversing method is in the following: as a physiological structure of man eye retina is hexagonal and reminds bee honeycombs on the structure, therefore at SCS measuring applying hexagonal grids (fig. 1, a), an eye expressly reacts on a change of the contrast and hexahedral pattern sizes (grids) that are presented to him. In case of a reversive grid presentation (fig. 1, b) other retina receptors activate and, as a consequence, brain sites which are responsible for volume perception activate too (a light part of lattices is subconsciously perceived as closer).
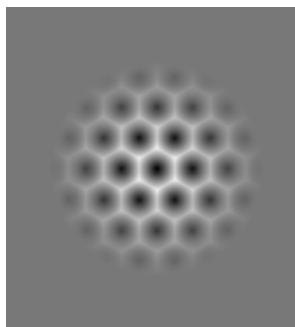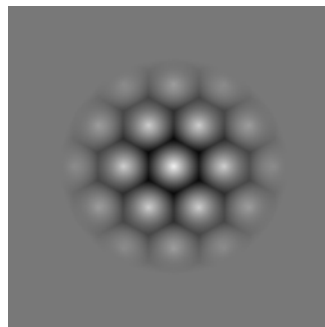
a – direct measuring   b – reverse measuring

Fig. 1. Hexagonal grids

This method allows to define frequency of discomfort feelings appearance for each patient individually (with certain colors combination, contrasts and grates sizes there can be dizzinesses, nausea and other).

As an eye perceives different colors variously, therefore patial contrast sensitivity will differ on a different background. For today investigations are carried in several colors: black-and-white, red, green and dark blue. In norm such variations SCS for different measurement colors (fig. 2) are observed [Belozerov A.E., 2009].
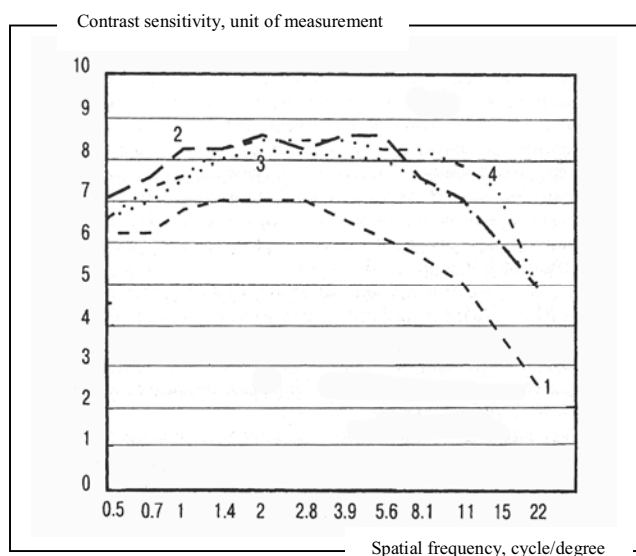
Fig. 2. Normative curves of contrast sensitivity on a black background:
1 – dark blue; 2 – green; 3 – red; 4 – white

For normative SCS value corridors determination age-related group gradation is introduced, there is a selection of SCS indexes of healthy patients of different age and unification of these indexes in a norm for the certain age-related group. It is considered to be healthy those patients at whom the standard indicators of sight (visual acuity, the field of vision, color perception, etc.) are equal or above norm. According to the carried clinical researches, proceeding from physiological eye features at different age, following age groups: to 20 years, from 20 to 40 years, more senior than 40 are distinguished [Belozerov A.E., 2000].

Computer realization of reversing hexagonal method of spatial contrast sensitivity measuring has been developed for inspection simplification and necessary information accumulation. Program which will realize the resulted method is called «SOTA».

The use of this program allows to get information about a color contrast sensitivity along with achromatic one, to reveal the shares of color photoreceptors

participation in SCS, and also to specify the SCS curves features for one or another pathological process localization.

On the result of research the chart of contrast sensitivity dependence, equal unit (maximum contrast), from spatial grates frequency, and also chart of its safety (in decibels), that shows, in how many times contrast sensitivity examinee on different frequencies differs from a standard, are built.

The diagnostic graphic module is an essential part of the program that was built on the base of the opened graphic library OpenGL, it is responsible for test stimulus display in the form of a hexahedral grid on the monitor screen. Cells diameter depends on a sinusoidal grid cycles number which is laid down in one circular degree. As a result of materials learning, concerning contrast sensitivity measurement, it has been decided to carry out measurement using grids frequency from 0,5 cycle/degree to 16 cycle/degree. It is caused by that eye refracting force influences on high spatial frequencies perception (8-22 cycle/degree) and doesn't almost influence on low spatial frequencies perception (0,5-1,5 cycle/degree) [Belozerov A.E.,1999], [Shamshinova A.M., 2004].

The use of this program due to an intuitional clear interface (Fig.3) [Materialy conferencii, 2010], [Herbert Shildt, 2004] gives possibility to carry out measuring to anyone, who has minimum computer using skills. The database presence decides the question of diseases statistics accumulation [Yakhontovaya V.H., 2004].
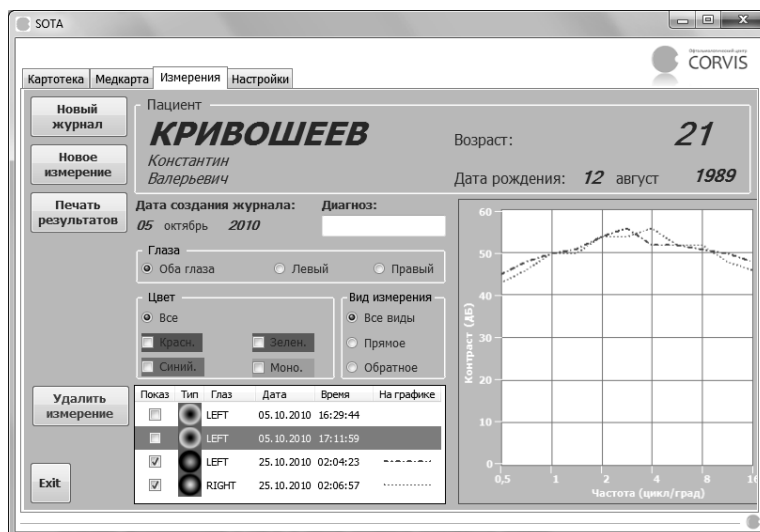
Fig. 3. Main window of the program «SOTA»

After SCS parameters determination it is planned to carry out sight correction on the received frequencies, that is an eye is obliged to learn to see the offered grate. With that purpose the special perforation glasses [Bessmelcev V.P., 1997] are developed and in future it is planned to introduce the module of co-operating with 3D glasses [Hill F.,

2002], [Richard S., 2006]. In due course primary on-line diagnostics creation on the basis of the program «SOTA» is also planned.

CONCLUSIONS

Developed computer diagnostic program of contrast sensitivity «SOTA» improves clinical inspections quality and diminishes the medical service cost. Also it allows to select the row of additional advantages, namely: allows to increase exactness, effectiveness and as a result number of man spatial sight parameters measuring; makes SCS research more accessible from the economic point of view; allows to accumulate diseases statistics; opens additional possibilities for new methods of correction and treatment of man sight creation.

Basic advantages of the modern technologies use are shown, as to the improvement of existing and creation of the newest medical systems of diseases diagnostics in ophthalmology. Now on the basis of the computer program «SOTA» development of mobile diagnostic cabinet is carried out in which it will be possible to make ten measuring simultaneously and also to make the primary diagnosis to each patient without participation of a doctor.

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ИНФОРМАЦИОННАЯ СИСТЕМА ДИАГНОСТИКИ ПРОСТРАНСТВЕННОЙ КОНТРАСТНОЙ ЧУВСТВИТЕЛЬНОСТИ В ОФТАЛЬМОЛОГИИ

Григорий Пантелеев, Султан Рамазанов, Константин Кривошеев

Аннотация. Проведен анализ существующих информационных систем и методов диагностики пространственной контрастной чувствительности. Предложена новая компьютерная диагностика на основе более точного метода оценки пространственного зрения человека.

Ключевые слова: информационные системы в офтальмологии, компьютерная диагностика, пространственная контрастная чувствительность.

FINANCIAL GLOBALISATION AND ITS POSITIVE AND NEGATIVE OUTCOMES FOR ECONOMY DEVELOPMENT OF THE COUNTRIES

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Summary. Positive and negative consequences of financial globalization of economy the various countries are considered. Ordering of possible results for world and national financial systems. Influence of globalization of movement of financial streams on economic development of the states. Display of process of movement of financial streams.

Key words: globalization, finance, market, countries, economy, government.

PROBLEM RELEVANCE

One of the principal issues in the conditions of gradual international integration is how to apply globalization advantages and avoid losses in case foreign competitors are entering the national market.

In recent years the problem of globalization has been widely covered in the works of Ukrainian and foreign scientists, such as T. Leavitt, A. Taylor, M. Obstfeld, G. Heskyuere, D. Lukyanenko V. Lukashevich, I. Homynych, A. Makushkin, A. Arkhipov, N. Stukalo and others.

The term "globalization" was put into scientific practice by T. Levites in 1983. He defined the "globalization" as a merging of markets of certain products produced by transnational company (TNC) [Makushina 2003].

Globalization reflects in strengthening the integration processes of national economies, growing of international cooperation, liberalization of commodity markets, services and capital. The distinctive features of globalization include the increased capital mobility on international scale, strengthening of international financial markets (currency, stock, credit ones), self-sufficient and independent value for international capital. Under such conditions financial globalization is acquiring one of the outstanding features in the process of globalization.

Constituent issues of financial globalization are global financial markets, its objects (transnational banks, central bank, TNC etc.), global financial instruments as the global production (money, investments, securities, loans and credits) as well as

technologies of financial globalization (global finance nets, finance innovations etc.) [Trofimova 2002].

Global financial markets are increasingly separated from the sphere of production and trade. As a result there is the growing number and volume of financial speculation, new market participants and new financial instruments, new opportunities of financial capital for self-expansion, ignoring the sphere of production. Therefore the big gap appears between the development of the financial system and real economy sector, i.e. hypertrophy of the financial sector.

Financial globalization reflects the process of the financial flows outside the national borders and covers the set of relations which is connected with the formation, accumulation and using of financial resources in the area where national frontiers are no obstacle. While the amount of transactions on the world currency market is substantially higher than indicators of world foreign trade. If the average daily turnover of the former was 1,88 trillion dollars in April 2004, the annual volume of the world export of goods and services in the same year was equal to 11,2 trillion dollars. At the same time the average annual growth rate of turnover of the world exchange market in 1989-2004 was 8%, while the world trade volume of goods and services at the same period in dollars increased by 6,4% per year. It follows that world foreign exchange market serves foreign trade operations fewer and agreements concerning the capital movements more.

The globalization of financial flows increases supply of capital. Thus much of the income is exported from Ukraine to be invested in offshore areas or in economically developed countries, countries where the capital is protected from the risks (according to IMF, not less than $ 1 billion is exported from Ukraine annually). As A. I. Sukhorukov and A. D. Ladyuk mention, the export of capital is an ordinary phenomenon on conditions of economic globalization, but most of this capital is exported in the form of illegal and that is a threat to economic security. This integration of financial flows will insure the integration of national economies of particular countries. Taking into consideration the heterogeneity of national economies development, including their financial systems, financial integration is an important part of increasing the maturity of particular countries national economies and it is the basis for their harmonization and unification.

Presently the world finance sector is developing the function of finance resource accumulation and sharing the capital among economy agents of the world on rivalry principal. The regulation of finance flow is of principle importance in view of general and financial globalization.

Generally the threats to economic security of Ukraine connected with financial globalization can be divided into two groups:

1) threats arising from uncontrolled processes of financial globalization;

2) threats arising from ineffective economic policies of national states [Stukalo 2005].

The globalization of financial flows affects the states` economies in different ways, the effect of such influence depends on the degree of economic development, its openness and government effectiveness. According to 2004 data, Ireland, Singapore and Switzerland have the highest rating of globalization. Ukraine takes the 43rd place and it is the latest among the countries of Central and Eastern Europe in this rating. First of all this is because of the slowdown of reforms in key sectors (such as telecommunications), political instability and corruption in the country. Among the other countries of our

region Slovenia should be mentioned, as it is among the top twenty the most globalized countries and takes the 19th place. The leader in Central and Eastern Europe is Czech Republic, it takes the 14th place in the world on an index of globalization.

CONCLUSIONS

Globalization of finance flows is very important in the processes of structural economy reconstruction because it influences the national economy development of the countries. At the same time the effect of this influence depends upon the level of the economy development, its openness and state management.

The negative effects of finance flow globalization may be observed in:

- unsafe global financial crisis,
- increase of debt bondage of some countries,
- disbalance between economy and finance development of a country
- the dependence of less developed counties on the developed ones,
- capital export out of dependent countries,
- brain drain from less developed countries.

Basic advantages include the development and creation of the new finance instruments, innovations, info technologies, accessibility to international resources etc.

Thus, it is necessary to analyze both positive and negative outcomes of globalization for the world finance system and for Ukraine in particular and develop the strategy of maximum application of finance globalization advantages.

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ФИНАНСОВАЯ ГЛОБАЛИЗАЦИЯ И ЕЕ ПОЛОЖИТЕЛЬНЫЕ И ОТРИЦАТЕЛЬНЫЕ РЕЗУЛЬТАТЫ ДЛЯ РАЗВИТИЯ ЭКОНОМИКИ СТРАН

Елена Решетняк, Инга Пастушкова, Елена Яцура

Аннотация. Рассмотрены положительные и отрицательные последствия финансовой глобализации в экономике различных стран. Система возможных результатов для мировых и национальных финансовых систем. Влияние глобализации движения финансовых потоков на экономическое развитие государств. Процесс движения финансовых потоков.

Ключевые слова: глобализация, финансы, рынок, страны, экономика, правительство.

EFFICIENCY OF DECISION MAKING
IN THE STATE INSTITUTIONS

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Summary. Investigation of methods for assessing managerial work and performance criteria and efficiency of management activity of local authorities in relation to control levels.

Key words: management labour, local government, performance criteria and efficiency, levels of government.

INTRODUCTION

Changes in political and economic life and the gradual transition of Ukraine's economy to the model of scientific, technological and innovation development have resulted in drastically increased the need for modern and qualified managers in government agencies. For the effective functioning of the entire state apparatus, it is necessary to ensure high productivity of managerial work, starting with local authorities [1,2].

OBJECTS AND PROBLEMS

Specificity of this area is the difficulty in assessing the results of managerial work and the difficulty of selecting criteria for effective functioning of government.[16] Daunting task is the definition of the measured effects of the authorities at the level of socio-economic condition of society.

In practice, to build a single unified model for calculating the efficiency or effectiveness of management is simply impossible. Have to differentiate between the criteria and methods for evaluating the effectiveness and efficiency of administrative work in relation to specific levels in the hierarchy of the organization.[14,15]

The article aim is to study methods to assess the management of labour and its criteria for effectiveness and efficiency in local government in relation to control levels.

BODY

In world practice, the number of indicators of efficiency and effectiveness of professional performance management personnel authorities has developed. These indicators are primarily divided into two major governing groups: qualitative and quantitative. Breadth of application for each group of indicators to assess the effectiveness and efficiency of civil servants in international practice [3,4,6,7,8] is shown in fig. 1.
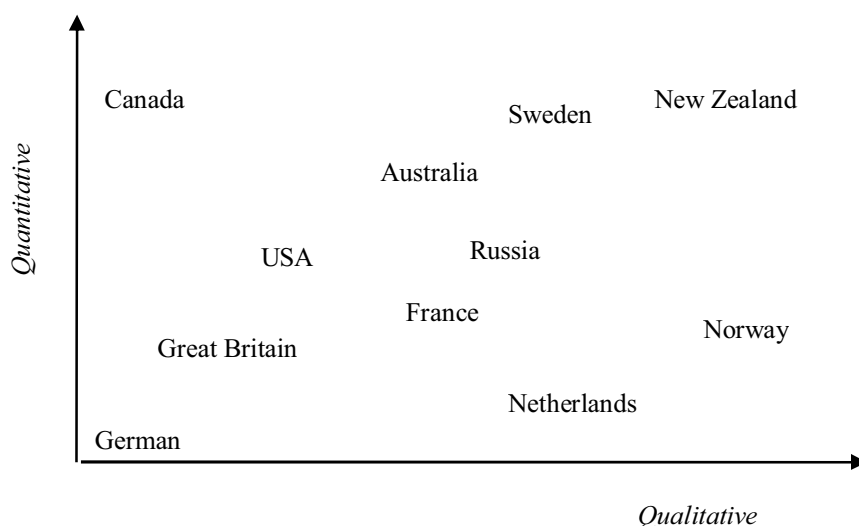

Fig. 1. The breadth of indicators to assess the effectiveness and efficiency of civil servants

The tendency to use such methods and criteria observes in the Ukrainian practice either. The Law of Ukraine "About Sovereign Service" [9] the problem is to assess the activities of authorities at all levels and, accordingly, officials on concrete results.

We select in the linear-functional structure of city the government control levels (fig. 2):

1. *Senior management.* Top managers are only a few people. Typical positions of senior managers in the administration are the Chief Magistrate and his first deputy. Senior executives responsible for making important strategic decisions for the organization, city and region [10,11].

2. *Middle management.* Coordinate and supervise the work of junior officers. A typical position of middle managers is the head of administration in a specific area (economic, social, education and science, Housing, Labour and Social Welfare). Middle managers are the buffer between the top and bottom sections. They are preparing information for the decisions made by senior management, and transfer it after the transformation into a usable form.

3. *Grassroots-level management.* Younger chiefs are also called the leaders of the first unit or operating managers. A typical job title at this level is the department head. The leaders of this level are often responsible for the direct execution of tasks and functions of the department [17].
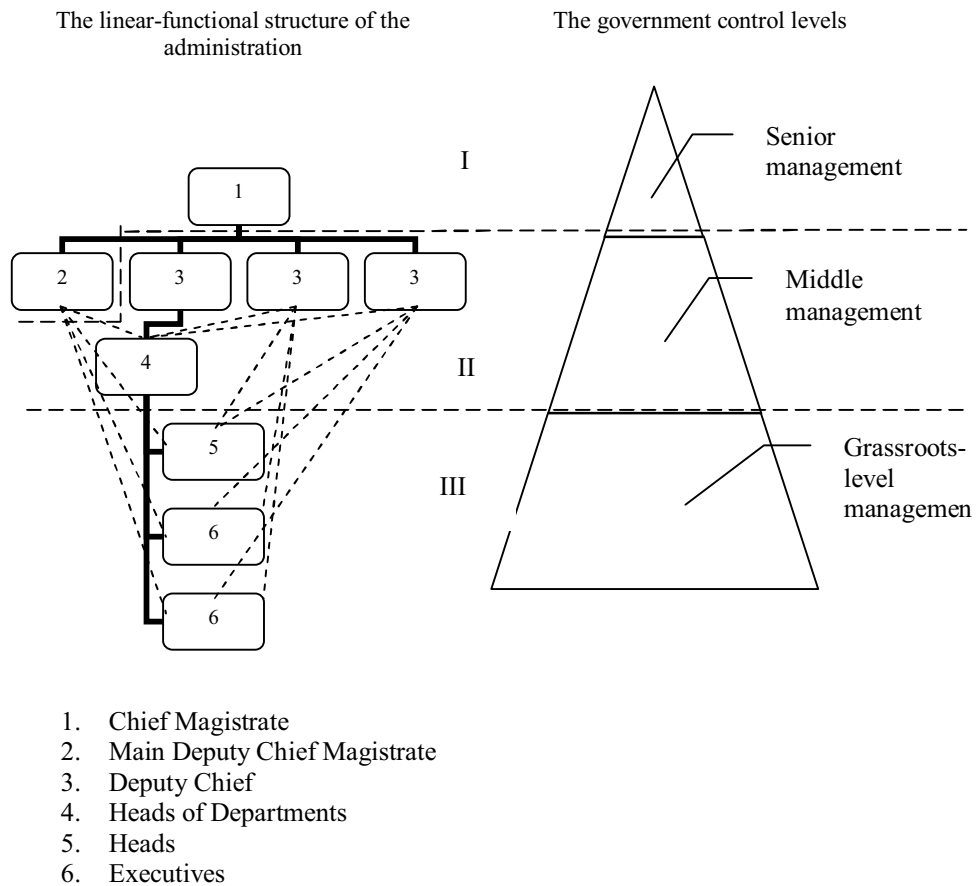
The linear-functional structure of the administration   The government control levels

1. Chief Magistrate
2. Main Deputy Chief Magistrate
3. Deputy Chief
4. Heads of Departments
5. Heads
6. Executives

Fig. 2. Allocation of management levels in linear-functional structure of the administration

For each of the three levels of government, define qualitative and quantitative evaluation methods and criteria of effectiveness and efficiency of administrative work. At level III deals with methods for assessment of management of specific low-level manager [12]. Level II involves the relationship between managerial work of middle managers and the functioning of the administration. Upper Level I estimates the adoption of strategic management decisions and their implications for the region development [13].

Classification methods and criteria for evaluating the effectiveness and efficiency of management, depending on the level of management is presented in Table 1.

Table 1. **Classification methods and criteria for evaluating the effectiveness and efficiency of management, depending on the level of management**

Evaluation methods	Evaluation criteria
I level	
Qualitative	
Method of "brainstorming"	– compliance with the functioning of the administration to the objective requirements of performance and the implementation of the strategy (elimination of disparities in the socio-economic development of the subordinate territories)
Method of "sceneries"	
Morphological methods	
	– balanced strategy areas (economic, social, political, environmental)
Quantitative	
Integral calculus	– development of industry
Theory of plays	– development of human resources
Simulation modeling	– creation of migration policy
Graph Theory	– development of interregional links
	– development of innovation producing
	– creation of industrial and agricultural clusters
	– strengthening the control of "noxious" industries
II level	
Qualitative	
Expert evaluation	– match results achieved set objectives of the organization (providing a self-sustaining development of the region)
Matrix form	
Method performance evaluation	
SWOT-analyze	– efficiency
The method of "objectives tree"	– economy
	– adaptivity
	– flexibility
	– operational efficiency
	– reliability
Quantitative	
Evaluation by gathered factors	– compliance with the socio-economic development planned ("fixed regional statistical offices - the main indicators of socio-economic development of cities and districts") [4]
The ranking method	

III level	
Qualitative	
Evaluation method of the activity results	– perform basic duties
The method of group discussion	– attitude to work
The method of "in-depth interview" (key informant interview)	– leadership qualities – communicational skills
Direct observation	– capability to education
Mini polls	– activity
Business game	– self – determination
Matric form	– perceptivity
Method of photography of working day	– initiative
The method of paired comparisons	– creativity – rational planning and allocation of working time
Quantitative	
The method of rank order	– identification of the level of professional knowledge and skills
The method of scaling ratings	
Method specified scoring	– level of business qualities
The method of free scoring	– correspondence of the results planned
System Imaging Profile	– effective use of time and resources spent on carrying out assigned tasks
The method of summed ratings	

Among the methodological problems of efficiency of work occupies an important place the issue on the very principle of its determination. The most reasonable view on the effectiveness of both the commensuration results of the personnel management, it is expressed in terms of useful technical, technological, organizational, social, economic and other effects [5].

The table shows that the content and nature of the labour leader depends on the level of the hierarchy to which his post. Senior management a substantial part of their time and effort is spent on development concepts, strategies and policies of the enterprise. The structure of mid-level management supervisor must be a harmonious combination of professional and socio-communicative, and the head of primary care must have a high level mainly prevailing knowledge and skills in their specialty.

CONCLUSIONS

Based on the criteria that must be evaluated at each level, apply special mathematical, analytical, statistical, and set-theoretic methods based on the identification and synthesis of the views of experienced experts.

The weakest link in assessing the effectiveness of staff management is the lack of development of methodology of quantitative measurement of costs and benefits of labour.

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ЭФФЕКТИВНОСТЬ ПРИНЯТИЯ РЕШЕНИЙ В ГОСУДАРСТВЕННЫХ УЧРЕЖДЕНИЯХ

Наталья Рязанцева, Геннадий Тюленев

Аннотация. Исследованы методы оценки управленческой работы и критерии эффективности управленческой деятельности местных органов власти в привязке к уровням управления.

Ключевые слова: управление труда, органы местного самоуправления, критерии эффективности, уровни управления.

ROLE AND IMPORTANCE OF MIKROPROCESSOR APPROACH IN MANAGEMENT OF ENTERPRISE

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Summary. The conceptual approach to the management of the microprocessor, the role, place and main tasks, provides basic definitions of management microprocessor.

Key words: process, microprocessor, process management, regular management, operations management, management of the microprocessor.

INTRODUCTION

Development Management at the Ukrainian enterprises has come to the stage when the surface of reserves management improvement is mainly found and already used. It has been proposed for the organization management. At the same time the level of management companies is much lower than European. Ukraine's WTO accession, the general processes of global economic competition determine the cause of Ukrainian companies with foreign firms, which have long traditions and high level management. In order to resolve existing problems in the organization of the Ukrainian company to move to a new level of management improvement. The new approach is that reserves increase the impact of management should be defined and used at a higher level, at the actions of individual agents or groups of performers. The problem is partly solved through the development and implementation of business processes in enterprise activity. However, business processes cover only separate the sphere of management and are based on the operational approach, which is close to the technological point of view on performance management activities. Technological approach requires the artist is no alternative option and behavior is due to this dramatically reduces the attractiveness of social work. Overcoming this contradiction perhaps based on the consideration of some closed microprocessor, which must implement performers or groups of artists, not changing the multi action and socio-psychological appeal of the work. By using management-level microprocessor reserves added as a separate individual and group behavior reserves to increase the effectiveness and management activity in general.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

Managing business processes as the scientific direction today is actively considered in the works of Ukrainian and foreign scientists [1,4,6]. Defined principles to the allocation of business processes, inputs and outputs, and resource support, information flows.

Some problems of work elements are represented in administrative and operational management [2, 3, 8, 11, 12]. The use of norms and standards of individual work items and work contributes to the desired effect in the administration, but does not provide detailed management microprocessor. The basis of the operational management of assigned real operating activities in the enterprise. The degree of detail of processes is quite high, but real time, which is not allowing operational management to pay attention to the microprocessor and the elements of individual works.

Thus it was established that significant developments concerning the management elements of the microprocessor works, whether the company exists. The purpose of this article is the role, place and task management microprocessor in enterprise management.

AIM AND RISING OF RESEARCHES TASK

Most of the process meets the requirements of modern management direction that is called regular management [5, 9]. The basic concept of regular management is careful regulation of overall processes and actions that relate to operational management.

BASIC DIVISION WITH RESULTS AND THEIR ANALYSIS

Operational control directly aimed at the use of productive capacity of the enterprise.

Therefore, this trend is primarily the most important in the management of the microprocessor. Suggest that regular management fully realizes the concept of management microprocessor could not quite accurate. But, in general techniques and regular management tools can be attributed to the concept. Regular management allows the first, substantially reduce the time spent by managers for operational management attention on solving strategic tasks, and secondly, increases the attractiveness of the company to foreign investors and the third gives the ability to sell their business, not just assets; Fourth, improve the manageability of new business units, and thus creates an opportunity replication business [3-7].

During the regular management processes are understood certain parts of the company. Due to the fact that the work is very complex, with its multiple levels of regulation highlighted processes. At the lower level processes of each individual employee can perform its functions, exercising a certain sequence, for example, draw up documents for shipment. In this case, regulation is required if the action difficult or require more accuracy. As regulatory documents commonly used technological

instructions or cards. Just this level of the processes is the main in the management microprocessor.

At the middle level is regulated by the interaction between officials (employees). In one process often combined average sequence of interactions that take place without branching. As regulatory documents used procedures or manufacturing instructions. At the top level describes the interaction between the processes and principles of work. This level of regulation is required when many processes required to track and connections between many procedures. As a regulatory document are used Regulations on the activities, or policy. In the next stages of development using all types of regulatory documents their coverage on objects close to 100%. In those scope of activities and situations where inappropriate use of institutional, regulatory or planning records used efficient [17-20].

Thus, management is a regular system of management, where each employee performs certain duties clearly. Detail of duties, regulation of individual actions, valuation of time, finances and other resources and the individual artist – the scope of scientific development management microprocessor.

Another direction which to some extent realizing a management microprocessor is a logistics management especially in the part of internal and warehouse logistics [7]. Logistic approach by definition involves the rationalization of certain operations that make the process of movement of resources. Therefore, development of logistics management is exactly the direction in detail and clarification of action at the level of individual operations associated with the movement of goods in a particular production system. However, the question of management tools and the microprocessor are under initial development. This is due primarily to the fact that many conceptual and methodological issues are not clearly defined and there is no understanding of their place in the overall management.

Problems associated with the microprocessor to a certain extent in the school investigated the process approach in the works of some authors [1, 4, 6]. Direct regulation of workers in separate processes and procedures carried out in real time, called the operational or process management. Differences between the concepts of operational and process management are almost absent. Process management deals with the regulation of activities throughout the chain of controlled operations to obtain the final result to a given time. In this sense, process management is synonymous with the phrase target oriented operational management.

Operational management — is a broader concept that includes process management as a special case. Operational control extends to individual actions and their results. Form of operative management called decentralization management if its subjects have different functional and administrative leaders. The effectiveness of simultaneous actions of multiple entities into separate parts of a single functional mechanism is small, because it is difficult to overcome differences in approach, competence, interests and most importantly, to coordinate activities for process pulses in time. The main task of managers with operational control is to regulate the ongoing activities of subordinate objects (business unit). Under the current activity understand solving problems in real time [14-15].

Unlike the administration, exercised through the hierarchical vertical speed, operational control subsystem regulates Transverse cross-functional processes for

monitoring their key metrics (volumes, time, status, etc.) at the junction of units or even jobs. In this case the process of functioning considered as the only horizontal flow of resources and works from enter to system to outside on parameters of result.

Regulated activities of operational control should not affect the functional authority of the employees who determine the technological and technical features of the works. That is the task of operational management is not the answer to the question of how to do it. And this is a task management microprocessor.

Summarizing the evident approaches to the point and content of the concept of the processes and the microprocessor, we can form the following complex terms and concepts of management microprocessor.

As for our opinion, to the microprocessor we can include some of the artists, aimed at obtaining an intermediate result for each phase of the received task. When a problem is can be understood as being done regularly performed in the framework of duties and individual assignments [20].

Place the microprocessor in the overall process is determined by technology and features action performed administrative work.

The subject of the microprocessor manages the process. Under the administrator of the process we understanding contact manager, who responsible for the result of business-process or realization specific administrative operations, missions. In some cases, a process that is administered, can act alone administrant of the self-management.

In the management instruments include microprocessor methods for monitoring and evaluation activities specific artist, the tools influence the action mode in on-line, methods based on detailed regulation of conduct performers technologies, evaluation of quantitative and qualitative parameters of the actions of performers and performance of micro operations, a set of methods and motivation stimulation of both individual and group performers.

To ensure management of the microprocessor includes a set of actions that create the conditions necessary for compliance with established regulations and quality of the received task performer. Primarily, it refers to information supply, organizing actions of performers, equipping his workplace at the technical level in accordance with the requirements of the microprocessor.

In causal analysis means identifying the factors and forces their action at the fuller use of the separate management structures or individual leaders. Typically, a measure of influence on the outcome of the microprocessor may be substantial, but it is quite noticeable. Therefore, the high intensity of production processes, a significant amount of resources used, even minor improvements in the effectiveness of actions and control centers, defining objects and processes within the enterprise provide significant performance, incomparable to the cost of refinement and use of the microprocessor.

Using microprocessor controlled instrument is the prevention of micro crisis in the implementation of operations management and performance management activities. Lack of controlled microprocessor determines the actions of micro crisis artists at certain circumstances begin to develop in a crisis more considerable level gradually unorganized as private (individual) business processes and introducing the disruption in the overall performance management system. Therefore, micro crisis are the initial causes and factors that determine the development crisis in the enterprise. Therefore, using microprocessor as a tool for prevention and suppression of origin and

development crisis is important and significant for the company and determines the direction of the management in general [17].

From the perspective of a systematic approach using controlled microprocessor is a full realization of the system requirements for monitoring and control. This requirement is that each element of the system and its interaction with other elements should be monitored and controlled. Otherwise, the behavior becomes chaotic elements and generates gradual destruction of the whole system. Sometimes this requirement is called the law of catastrophes (systems theory). Every disaster begins when lost control over any part of the system. Therefore, if sufficiently comprehensive and enjoyable management microprocessor, the same does not occur in conditions of unorganized facts in the control system as a whole.

Suggested approaches to understanding and nature and features of the microprocessor allows the systematic, comprehensive development in a particular company or organization programs related to management of the microprocessor and move to a new level of stability and efficiency of management in general.

CONCLUSIONS

The development of productive forces, an intensification of production and administrative processes, attraction of a critical mass of resources determines the economic feasibility of finding and using the deepest reserves of efficiency and stability of operation of enterprises and organizations. This determines the urgency and importance of management theory and methodology of the microprocessor. Management of the microprocessor, as the scientific direction requires a deeper and more accurate understanding of a number of categories and concepts. Necessity to specify the methodological tools of the microprocessor in the company.

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РОЛЬ И ЗНАЧЕНИЕ МИКРОПРОЦЕССНОГО ПОДХОДА В ОРГАНИЗАЦИИ УПРАВЛЕНИЯ ПРЕДПРИЯТИЕМ

Оксана Ромахова

Аннотация. Представлен концептуальный подход к менеджменту микропроцессов, определена роль, место и основные задания, приведены основные дефиниции менеджмента микропроцессов.

Ключевые слова: процесс, микропроцесс, процессное управление, регулярный менеджмент, операционный менеджмент, менеджмент микропроцессов.

ENTERPRISE AS A SUBJECT OF LABOUR LAW
IN UKRAINE AND POLAND

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Summary. The legal status of enterprise as a subject of labour law in Ukraine and Poland is analyzed, their powers are compared. The ways of legal status improving of the enterprise as a subject of labour law in the conditions of market economy are identified. The propositions for the using of legal experience of Poland in the sphere of labour law in the domestic labour law are formulated.

Key words: enterprise, subject of labour law, employer, social partnership and collective agreement relations, the local rulemaking.

INTRODUCTION

At present the enterprise is one of the major economic subject and at the same time, the object of the investment activity of the state and other persons. At the same time the enterprise actively uses the hired employees to achieve its economic goals. Therefore it is necessary to determine the place and the importance of the enterprise among the subjects of labour law to improve the legal regulation of labour in the conditions of the market economy.

Many scholars, such as L. Aleseenko, N.B. Bolotina, I.Y. Kiselev, L.I. Lazor, V.V. Lazor, S.P. Mavrin, V.I. Prokopenko, E.B. Frankel, G.I. Chanysheva and others paid great attention to the legal research of the role and the value of the enterprises in the regulation of public relations on the usage of hired employees. However, the place of the enterprise among the subjects of labour law and therange of its powers are not still clearly defined in the Ukrainian legislation.

Foreign legal experience of regulation on the use of hired labour may be very useful for domestic legislators at the stage of national labour laws. The experience reformation of our close neighbor, Poland, is particular interesting. Active development of labour laws in Poland during the 90s of the last century has allowed the country to create a quite progressive system of regulation relations on the usage of hired labour. Poland's new labour legislation has been worked out at the highest professional level. It

reflects the typical features and trends of the labour law development in post-socialist countries. Therefore, the research of the enterprise legal position as a subject of labour law is of great interest for thenative labour law science and legislative activity.

The aim of this paper is: to make a comparative analysis of the enterprise legal status as the subject of labour law according to the Ukrainian and Polish legislation and on this basis to formulate the propositions for improving labour legislation in Ukraine.

SUBJECT OF INVESTIGATION

The subject of the investigation is a normative- legal base for the regulation of the enterprise legal status of enterprises in the field of labour relations according to the legislation of Poland and Ukraine. At the same time the ways of improving the company legal regulation as the subject of labor law in Ukraine and the prospects of reflection of Poland legal experience have also to be considered.

THE RESULTS OF LEGAL-THEORETICAL INVESTIGATION

The characteristic features of continental European countries' labour law are given in up-to-date Polish labour law. The European model of labour law differs having efficient combination of labour law with a developed system of collective-contractual regulation at the national level and within the enterprises. For many years this model is justified itself both in Western European countries and in Poland. Therefore, this foreign experience should be taken into account the by a native legislator.

As a positive feature of the Polish labour law it should be noted that the parties are clearly defined there. These parties are employers and employees of the labour relationship. I.Y. Kiselyov pointed out that the entrepreneur is a businessman who invested money into the production and is a supreme supervisor and a manager [4, p.50]. As can be seen, the entrepreneur is the owner of the capital. Modern enterprise is an economic entity which has the property to do some kind of activity, so it is an invested subject.

Corporate entities and individuals, says I.Y. Kiselyov, are considered to be entrepreneurs. According to the corporate entity the ownership in many cases is separated from management, it seems that the manager is a subject of the labour relationship, although usually he is only a representative of the actual owner (that is the enterprise). The above-mentioned author points out: «Certain individuals or groups (trade partnerships, joint stock companies, industrial associations, and so forth) and also the state may play the role of business. So, the subjects of the labour contract may be employers, corporate entities and individuals." [4, p.51].

It can be concluded that the enterprise is an entrepreneur and acts, according the Polish law, as a subject of the labour relationship, i.e. an employer.

In Ukraine at present there is no so clearly determined enterprise's place among the subjects of labour law. In jurisprudence, there are different approaches to the question whether the owner (or his authorized body) is a subject of labour law; or the party of the labour contract is the enterprise, institution or organization.

B.S .Stychinsky, I.V. Zub, V.G. Rotan believe that the term "employer" unite two entities – the enterprise, the institution, the organization, and the owner (or his authorized body) [10, p.9]. From the point of view of these authors it is clear that they recognize the existence of employers' legal personality of the enterprise.

According to L. Alekseenko, the owner may be considered to be as an individual participate in the labour relations [1, p.50]. I'd like to note that the civil legislation of Ukraine, individuals and corporate entities can be subjects of ownership rights, at the same time the corporate entities are recognized as full subjects of civil-legal relations [3, art.325, art. 80]. It is known that corporate entities may exist in the form of the enterprise, institution or organization. According to the formal logic, we can conclude that the party of the labour contract is namely a corporate entity. Thus, the enterprise is the employer that is one of the main subjects of labour law.

However, L. Alekseenko concludes that the relationship between the owner and manager of the enterprise are governed by civil law and between managers and employees they are regulated by labour law [1, p.50]. According to this position, the enterprise is not an employer, but it is its manager. Professor V. Kravchuk supports this view and believes that among the founders of a corporate entity (enterprise) and the administration there are civil-legal relationship, and between administrative bodies and emploees – there are labour law relationship. [5, p.104].

Presented positions aren't convincing enough. At a present stage, most scholars are inclined to think that the enterprise should be recognized as a major economic entity as an employer in a modern labour law.

Thus, G.I. Chanysheva and N.B. Bolotina note that the legal position of leader of the enterprise is closely related to the legal status of the enterprise and recognize employers' legal personality right for the enterprise. [2, p.116].

The position of Professor S.P. Mavrin is noteworthy. This scientist clearly states: "The employee concludes a labour contract not with the authorized owner officer, but with the enterprise, institution, organization as a corporate entity, where he exercises his right to work. If we accept that a labour contract is signed with the director, so in the case if the enterprise owner breaks a labour contract with the employee who has been hired by this person it means that the labour contract is broken, it ceased to exist.At the same time, especially in public enterprises, there are often changes of the governing entity. But when such a replacement take place, workers continued to work on labour contracts because these contracts have been concluded with enterprises, institutions, organizations, and not with their officials, authorized to the governing [6, p.54].

Professor V.I. Prokopenko directly states that: "To achieve its mission the enterprise concludes the long-term labour relationship with employees, making the enterprise the subject of these relations, and,at the sametime the subject of labour law" [8, p.111]. L.V. Solovyova insists that the enterprise's authorities (sole or collegiate) will always act in legal relations not on the name of the founder (founders), but on the name of the corporate entity and can not be in power of employers' legal personality [9,p.79].

Thus, we can conclude that the recognition of the current Labour Code of Ukraine (further – the Labor Code) [11, art.21] of the body that is authorized by the owner to manage the enterprise as a party of the labour contract is unreasonable. This body is the subject of labour law, which implements the authority of the employer, in

relevant part. But this body is not directly the employer itself. The enterprise, i.e. corporate entity should be legally recognized as employer.

It is important to note that the person who is authorized to be an owner to manage the enterprise he himself is the subject of the labour relationship as an employee. The employee can not claim to the head of the enterprise for a material aspect (e.g., pay) or a claim for cancel of punishment, etc. Such claims are presented directly to the enterprise, institution, organization, i.e., to the corporate entity.

Thus, we can conclude that the employer is not the governing body of a corporate entity, but a corporate entity itself. Therefore, following the Polish example, employers' status of the enterprise has to receive legislative consolidation.

Positive feature of the national legislation is that the draft of the Labour Code stipulates that the employer is a corporate entity (enterprise, institution, organization) or an individual, who uses labour of other individuals within labour relations [12, art. 24]. It is important that the normative which provides for employers' legal personality of enterprise acquired legal force in Ukraine. This will make the clarity and certainty in the subject of legal relations on the usage of hired labour.

Legal comparison of the powers of the enterprise in Poland and Ukraine in the sphere of usage hired labour also lets us to justify the propositions of the reflection of the legal experience of Poland in the native legislation.

I.Y. Kiselyov notes that labour legislation of Poland possesses increased flexibility in the legal regulation of labour, which led, particulary, to a certain correction of the principle "in favorem". The principle "in favorem" means that the labour contracts can only improve, but not make worse the position of the employee in comparison with the current legislation. Now, it is allowed to include the normative in the collective agreement rules, which make employees' working conditions worse in comparison with the legislation if it is justified to prevent or limit the unemployment [4, p.211].

I think that in conditions of instability of the market economy, the existence of such a rule is justified. To prevention and control unemployment is an important task of a contemporary legal and social state. Therefore, the experience of the Polish legislator deserves attention.

In Poland, E.B. Frankel said, there is a system of collective and contractual regulation at the enterprise level, including issues of remuneration [7, p.17]. Many of the provisions of this system may be useful for Ukrainian legislators at the present stage.

Thus, according to the Polish legislation, the enterprise must provide the contractors on collective talks (i.e., workers) information about its financial position. At the request of any party an expert can be invited to assess the issues dealt with collective talks. The payment of inspection is done on the initiative party which invited the expert, if the parties of collective talks have not agreed with each other [4, p.228]. It is important to note that at the same time the representative of workers (trade union) must not give information concerning the financial condition of the employer and other information which is top secret [7, p.84]. All these standards ensure the effectiveness of collective contract as a normative-legal act and encourage parties to participate in the negotiation process.

The task of the enterprise in the conditions of market economy is a successful economic activity. According to Polish legislation the provisions for higher rates in

collective agreements can not be applied to the enterprise, for which the efforts for financial rehabilitation are being made, or while it is in the process of liquidation or bankruptcy announcement [7, p.33]. I believe that such a rule is particularly important at the present stage. Firstly, it is aimed at the protection of business interests of the enterprise and it contributes to its functioning. Secondly, this normative promotes the authority of the collective agreement as a normative legal act, because it has not declarative provisions which actually can not be fulfilled.

The positive feature of the Polish legislation is the fact that the parties of the collective agreement at the local level are uniquely and clearly defined. They are the enterprise (employer) and employees (working teams). An the same time, the law requires that appropriate statutory body (the director) acts from the side of the enterprise, and the trade- union acts from the side of employees [7, p.83, 22].

Clear legislative regulation of the representation from the side ofemployers and employees in collective contract relations at the local level provides a high level of these relations.

There is not such clearness in the Ukrainian labour legislation. Existing labour legislation of Ukraine is limited by the note that the party of the collective agreement at the enterprise is the owner or its authorized body. Draft of LC indicates that at theproduction level the party of the collective agreement is the employer [12, art.335]. In this case, the legal normative does not completely specify exactly who will act as the representative of the employer in collective contract relations.

I.Y. Kiselyov said: "As for the ideas of industrial democracy, employees, working teams participation in production management different approaches have appeared in various countries. In some countries this is done through the trade-unions and the usage of collective agreements (Anglo-Saxon model). While in Poland the rights of working teams,production councils at the enterprise are stated in the legislation (European model) [4, p.212].

At the same time in Poland trade unions play a significant role in the regulation of hired labor and, as it is noted, there is a developed system of collective contract relations. We can conclude that a comprehensive legislative regulation of the subject of the social-partner relations at the enterprise level provides a high level of enterprise activity as a subject of social partnership, the effectiveness of this partnership and social peace in society.

We note that the ensuring of enterprise social peace is considered in Poland as an independent task of labour law. It deserves the attention of the Ukrainian legislator. It also seems quite reasonable that nowadays in Ukraine a working group is not recognized as the subject of labour law. The current Labour Code and the draft of Labour Code aren't mentioned and they don'tany information abour teams workers' councils at the enterprise. We have such a situation because we understand the prominent role of them in Soviet labour law.

This approach is difficult to accept being justified. There is no doubt that the national labour law has to be reformed. Such a model of Ukrainian labour law has to be created, which will be adequate to market relations in a society. But at the same time there is no reason to reject positive past experience in the field of legal regulation of using of hired labor at the enterprise.

It can be proved by the positive experience of the enterprise operation as a subject of labour law in Poland over the past twenty years. In Poland, the basis of industrial democracy at the enterprise is stated in the legislation: the legal personality of the working team at the enterprise is recognized, the working team and productive council of the enterprise have specific rights, and a trade-union has a greater power. In accordance with the Labour Code of Poland the periodic public inspection of working conditions is conducted at the enterprises. Their goal is: to investigate the state of working conditions, to assess the implementation of the plan for improving working conditions and for the efficient expenditure of funds for these purposes, to provide suggestions for improving working conditions. The leaders of enterprises are obliged to provide conditions for the smooth inspection and the results of such inspection must be reported, the employees must know the measures to be taken [7, p.p.419, 420].

The above-mentioned legal framework ensures the effectiveness of collective contract relationships. The developed system of industrial democracy at the enterprise meets the interests of the enterprise itself, and its workers, this system promotes the growth of the economy.

The enterprises in Poland are entitled the rulemaking activity in the sphere of hired labour. I.Y. Kiselyov noted the greatest importance of enterprise local acts at the present stage, which in the Polish Labour Code are expressly declared as sources of labour law [4, p.211]. Existing labour legislation of Ukraine does not contain such a normative. At the same time, we should recognize that the most important legal expression of the economic employer's power is the rules of internal labour time-table. Therefore, in the Ukrainian labour legislation appropriate to provide the right of the employer-enterprise to establish internal working rules and to take other legal acts. This will give the employer the opportunity to take into account the specifics of production while employing hired labour at the enterprise and take rapid organizational and administrative decisions, adequate to market economy. We can state that the legal position of the enterprise as the subject of labour law in Poland and Ukraine does not have principal fundamental differences. However, this provision can not be called identical. The experience of reforming the Polish labour law and its functioning in the conditions of market economy should be taken into account while reforming the native labour legislation.

CONCLUSIONS

Under the conditions of market relations the meaning of enterprise as a subject of labour law is increasing. At the present stage the legal status of enterprises in the system of subjects in the Ukrainian labour law needs to be improved. To achieve this aim it would be useful to use of the positive experience of Poland concerning the legal regulation of the usage of hired labour at the enterprise more creatively. In particular, the new Labour Code of Ukraine must: a) recognize the enterprise as a subject of labour law and consolidate employers' legal personality of the enterprise, and b) receive the working team as the subject of labour law and as a party of collective contract relationships at a local level, c) establish that the subjects of social partnership relations at the local level are the enterprise and the working team, and also mention the parties'

representatives in the collective contract process, d) consolidate the duties of the parties collective contract relationships concerning the provision of information and non-disclosure of information about confidential one, e) provide a flexible approach to the formation of the content of the collective agreement, depending on the real economic condition of the enterprise, and d) give the enterprise the rule-making authority and state the normative acts of the company among other sources of modern labour law.

The improvement of the legal status of enterprises in the proposed directions will contribute to the successful reform of the national labour law in accordance with the realities of market economy.

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ПРЕДПРИЯТИЕ КАК СУБЪЕКТ ТРУДОВОГО ПРАВА В УКРАИНЕ И В ПОЛЬШЕ

Ирина Шамшина

Аннотация: Исследовано правовое положение предприятия как субъекта трудового права в Украине и Польше, сопоставлены их полномочия. Определены пути совершенствования правового положения предприятия как субъекта трудового права в условиях рыночной экономики. Обоснованы предложения по использованию правового опыта Польши в сфере трудового права в отечественном трудовом праве.

Ключевые слова: предприятие, субъект трудового права, работодатель, социальное партнерство, коллективно-договорные отношения, локальное нормотворчество.

MANAGEMENT OF ORGANIZATIONS: APPROACHES AND METHODS

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Summary. In the article the hierarchy of approaches and methods in the management of organization and, essence of business-process are considered, descriptions of methods of its improvement are brought. Arrangement and grouping of such methods is carried out.

Key words: method, approach, business-process, improvement, management.

INTRODUCTION

Strengthening of competition between organizations, and also the processes of globalization the world's economics cause growth of role of using of modern approaches and methods to management of organizations which will allow to strengthen competition positions of firms on internal and world markets. Consequently, establishment of essence, advantages and failings, acceptability of methods of improving of business-process of an enterprise and also their arrangement, within the limits of the set approaches.

ANALYSIS OF ANALOGICAL RESEARCHES

To the question of determination of essence of management as providing of functioning of organization and its methods the great number of scientific researches is devoted, including [Albastova, 1998, Anikin, 2006, Afanas'ev, 1986, Barinov, Dyakiv, 2002, Martynenko, 2003]. Thus each of these researches examines only part of questions with a sufficient depth. Regarding to complex approach concerning it, in scientific literature it is lighted up quietly not enough.

For the decision of this questions with application of complex approach it is necessary to consider etymology of the names of methods of improving of business-process, and also to go back to the awareness of management essence. Moreover, it should be finding out synthesized, in relations.

RESEARCH PURPOSE

Consequently the purpose of the article is research and description of methods of improving of business-process and explanation of their relation.

RESULTS OF RESEARCH

An economic encyclopedia interprets management essence as aggregate of principles, methods, means (ways), functions and forms of management of organizations, enterprises with the purpose of realization of strategic plans, achievement of efficiency of production and increase of income [Dyakiv, 2002]. It is indicated in scientific sources [Martynenko, 2003], that a management shows by itself the aggregate of types of administrative activity (not labour), directed on the effective use of resources, for achievement of certain general aims. Really, considering the variety of determinations of management the unity in approaching to its essence is obvious. Also the term «management» is used not only as a management of enterprise but also in the field of political and social relations, that is why it is inalienable part of any human activity which needs to be organized [Martynenko, 2003].

Organization is the object of management, essence of which is folded in co-ordination of actions of separate elements of the system with the purpose of achievement of mutual accordance of functioning of its parts [Dyakiv, 2002]. Obviously, that such interpretation of organization rather answers the concept of «organization activity». Thus, organization (as an enterprise) is the system which shows by itself the well-organized aggregate of the connected between itself elements, the social-economics system, which is consciously coordinated. Such perception of organization is related to determination of it as structural formation which represents some static state [Martynenko, 2003].

Concept «organization» quite often is associated with a concept «business» which is related to organization or organizational activity for the receipt of income.

Business-process is a major concept of management which represents the process of activity of organization. To the most often used elements at determination of concept «business-process» is applied: «sequence», «action», «aggregate», «activity», «input», «resource», «output (result)», «value» and «consumer». Using elements, logic and nature of process, «business-process» can be defined as a sequence of executions, which convert on a «input» to receive resources with the purpose of receipt of result which will have a value for an consumer. Such formulation can give general description of process of activity of organization as a business-systems which activity is directed on satisfaction a need of consumer.

Business-processes   in   organizations   are   heterogeneous.   In   essence, organizational activity is an aggregate of interdependent business-process which represent realization of separate functions of organization [Kozachenko, Lyashenko, Ladyko, 2006].

Today, for a pity, in scientific literature the clear differentiating of concepts absents approach and method of management organization [Albastova, 1998, Afanas'ev, 1986, Wikipediya, Khammer, Champi, 1997]. Moreover, the substitution of

these concepts is carried out. However from the point of view scientific methodology, which foresees the hierarchy of these concepts, equation of approach and method is not allowed (fig. 1).
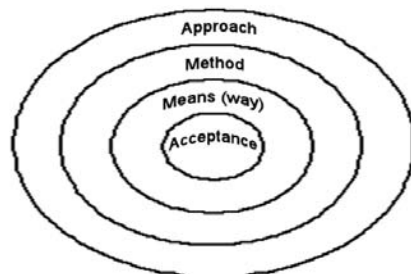

Fig. 1. A hierarchy of concepts «approach» and «method» at scientific methodology

Such methods of improvements of business-processes are known [Bulakhov, 2005, Kozachenko, Lyashenko, Ladyko, 2006, Lifeschool.ru] (fig. 2):
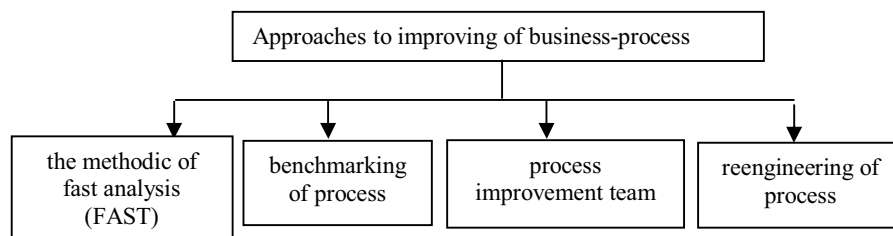

Fig. 2. Approaches to the improvement of business-processes of organization

Obviously, that not all from the resulted methods are actually can be called methods. In particular, method of fast analysis of decision (FAST), which is named a «breach» approach to an improvement of business-process [Baklajanova, Barinov] or "brainstorm" [Kozachenko, Lyashenko, Ladyko, 2006] and attracts attention of group on a certain process during one- of two-day conference for determination of methods which a group can improve this process during the followings 90 days. Before completion of conference guidance approves or casts aside the offered ideas, that is why a method is mentioned rather relates to the modelling of business-process.

Lately in scientific literature devoted to management and on the sites of the Internet [Albastova, 1998, Anikin, 2006, Afanas'ev, 1986, Barinov, Wikipedia, Dyakiv, 2002, Martynenko, 2003, Kozachenko, Lyashenko, Ladyko, 2006, Khammer, Champi, 1997, Lifeschool.ru] terms, which determine essence of methods which make maintenance of directions of improvement of business-process, appear all more frequent. Outsourcing, outtasking, insourcing, outstuffing, outplacement, coaching, crowdsourcing, teambuilding belong to them.

Benchmarking of process – there is an art of exposure of that other do better (study, improvement and application of standard methods of work), that puts the purpose on the basis of research reliably to set probability of success of enterprise. The analysis of maintenance of benchmarking shows in general, that he can be considered as direction of marketing's researches within the framework of competition analysis [Kozachenko, Lyashenko, Ladyko, 2006] which are not new and foresees research and introduction of the best methods and technologies of other enterprises or industries.

Process Improvement Team (PIT) concentrates effort on improving of existent process. PIT is usually used to those processes which are successfully enough carried out now. At PIT the simulation model of current status is built. After it facilities are used, that will rationalize him (removal of bureaucracy, analysis of the added value (costs), removal of duplication, simplification of methods, reduction of duration of cycle, defence, from errors (analysis of current problems), modernization of process (restructuring of organization), standardization, partner relationships with suppliers, automation, mechanization, application of information technologies) [Baklajanova].

Reengineering is fundamental recomprehension and radical reprojecting of business-processes for achievement of sharp, saltatory improvements of main modern performance of an enterprise indicators, such, as a cost, quality, service and rates (the term of «reengineering» entered Khammer M., Champi Jh.) [Khammer, Champi, 1997].

Reengineering of business-process of enterprises is used in the cases when it is necessary to take the substantiate decision about reorganization of activity: radical transformations, restructuring of business, replacement of operating structures of management. Consulting, which is based on past experience, judgements of specialists, prepared approved decisions, analogies, eureka estimations, comparison of ideas, is attracted for this purpose. But it is possible to use an alternative way, which engineering activity which guarantees the receipt of result on condition of observance of rules and methods of application of tools of reengineering with plenitude of implementation of the offered solutions and estimation of their quality is.

It is possible to select three types of organizations, for what reengineering necessary and expedient.

The first type is organizations, which are on the verge of collapse, that is why the prices on commodities notedly higher and (or) their quality (service) notedly below than competitor's. If these enterprises won't undertake something, they unavoidable will be bankrupt.

The second type is organizations which do not have complications, now, but foresee the origin of problems connected, for example, with appearance of new competitors, change of requirements of customers, change of economical surroundings, and other.

The third type is organizations which do not have problems now, not foresee them in future. There are organizations-leaders which pursue an aggressive marketing policy and not satisfied with good current status and desire with the help of reengineering to obtain the best. A tasks of reengineering are analogical to a task of innovations: mastering of innovations for providing of competitiveness of products and in a final – to welfare of enterprise [Barinov].

Obviously, that above-mentioned the variants of improvement of functioning of organization are possibly considered lacking amenities enough, and direction of

improvement of business-process remains unstated, that is why expediently to complement them and put in an order (fig. 3).
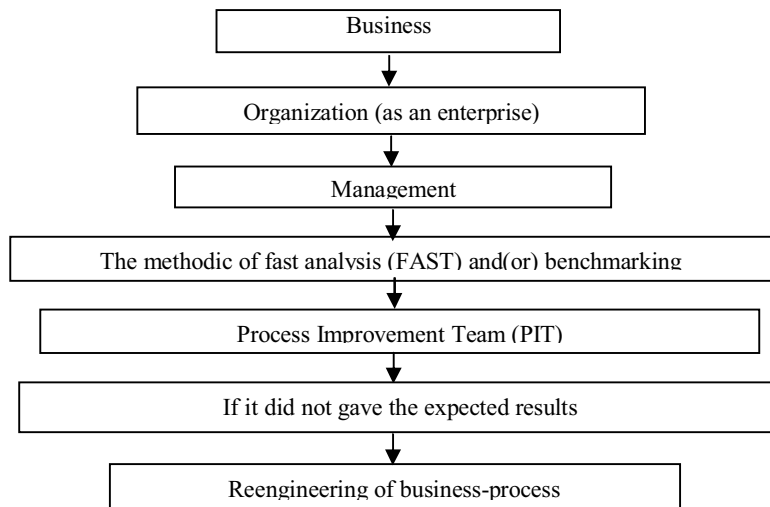
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                        ┌─────────────────────────────────┐
                        │            Business             │
                        └─────────────────────────────────┘
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                  │      Organization (as an enterprise)       │
                  └──────────────────────────────────────────┘
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                  ┌──────────────────────────────────────────┐
                  │                Management                  │
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              │ The methodic of fast analysis (FAST) and(or) benchmarking │
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              │        Process Improvement Team (PIT)            │
              └──────────────────────────────────────────────────┘
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              │      If it did not gave the expected results     │
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                                        │
                                        ▼
                ┌────────────────────────────────────────────┐
                │      Reengineering of business-process       │
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Fig. 3. A sequence and hierarchy of approaches to the improvement of business-process

Consequently, as evidently from the figure, reengineering is more radical direction of improvement of business-process than process improvement team, that is why it is expedient to consider them more in detail.

First of all it should be noted that the methods of improvement of business-process should be considered after different criteria. In this article each of them is considered after the depth of the carried out measures ("insignificant" (table 1) and "radical" (table 2)).

The considered higher sides of methods which allow to perfect business-processes of organizations not in every time it is possible to attribute to the discharge of the «newest». Probably it can be explained that the processes of globalization, combining a world concord and destroying linguistic barriers, transfer science on the unique languages. And possibly, the new stage of development of management (as sciences) will allow to combine effort entire countries in search of methods of improvement of business-process due to the use of the unique terminology, as it is accepted in mathematics, physics, chemistry.

CONCLUSIONS

The thus conducted researches allowed considering functioning of organization as aggregate of business-processes, and representing the methods of their improvement in intercommunication and hierarchy.

Table 1. **"Insignificant" methods of improvement of business-process (direction – PIT)**

Method	Essence	Acceptability	Advantages	Failings
Coaching	Strategy of permanent studies of personnel, special method of opening of potential of personality for maximization of the own productivity and efficiency. Coaching anymore helps personality to study, than teaches. Coaching on principle differs from instructing, tutorship, advising and psycho-analysis, as presents direct influence with the immediate increase of efficiency and receipt of result (always carried out in form advices and directives) [Wikipedia].	Acceptable to all, without an exception, organizations.	Allows in an unobtrusive form to support the professional level of personnel.	Does not suit for a personnel with nihilistic moods.
Crowdsourcing (crowd resource using)	Use of collective mind of thousands of people, their labour, including in commercial aims, with the purpose of bringing in of cheap labour force. For example, it is possible to declare a competition on speed of landing of tree, inviting two hundred participants and promising a winner a symbolic sport shirt (competition on the best logotype at an insignificant reward and others like that).	Acceptable only to very known (brand) or large organizations	All necessary work is done by the people-amateurs which will outlay the spare time on the decision of problems unpaid or little paid in general, or even on the lead through of researches and development [Wikipedia]	Results of crowdsour-sing can not arrange customers, work was done by non-specialists
Teambuilding	Forming and (or) making healthy of psychological climate of personnel which works on an enterprise. Teambuilding assumes collective departure on nature, lead through of competitions with the commands of competitors or partners, etc.	Acceptable to all of organizations.	Teambuilding increases the productivity and motivation of labour of personnel [Lifeschool.ru].	It can be annoying through the expense of spare time of personnel.

Table 2. **"Radical" methods of improvement of business-process (direction – reengineering)**

Method	Essence	Acceptability	Advantages	Failings
Outsourcing (outside resource using)	Sequence of organizational decisions essence of which is folded in a transmission some functions or types of activity from external organization for independent realising by enterprise. Relations within the limits of outsoursing link organization - producer of products or services which are a customer or client, and outsourser that organization-performer which disposes necessary resources.	Acceptable to such organizatio nal forms as association.	Bringing in of resources of outsourcer approaches organization to the most complete accordance the requirements of market. The best satisfaction of queries of user, that accordance of product or favour to the separate price, high-quality criteria or individual necessities [Anikin, 2006].	Not always allows to get the desired level of competiti-veness through the very rapid change of tastes of users, wrong choice of outsourcer-partner, unjustified outsourcing-project and others like that.
Outtasking (outside task using)	Passing to of small business-function to an extraneous organization (to the performer). Outtasking is the variety of outsoursing - partial transmission outside of separate tasks of organization (customer), when only a separate part of services (works), fixed before on the certain department of organization (customer) or on an employee, is passed [Anikin, 2006].	Acceptable to large and middle organizatio ns.	Bringing in of resources of outtasker approaches organization to the most complete accordance the requirements of market.	Requires hard control after realization of commission, which were given to external side.
Insourcing (inside resource using)	Additional use of internal resources of organization. For example, an enterprise which owns storage is acceptance on storage of commodities of extraneous organization on a period, when storage is not in use by the enterprise. Obviously, that insourcing is a process reverse outsourcing.[Anikin, 2006].	Acceptable to large organizatio ns which work to the capacity not.	Insourcing allows to reduce charges from retaining of not in-use power.	Not always justifies a hope from the renewed work of resources which were not involved in own business.
Outstaffing (outside stuff using)	Technology of loan labour or, leasing of personnel. A customer pays for the given personnel.	For organizatio ns, whose business has seasonal character.	Allows not to release the personnel "in vacation at an own expense".	Requires hard support from the side of labour legislation [Anikin, 2006].

| Outplacement (outside placement) | «Placing» or employment of employees in the cases of the mass freeing, and work with them, that foresees psychological support, help, in the search of new work. It is a favour, that, above all things, cares of authority of organization (customer) which carries out freeing. | Acceptable only to organizations with (more than 20 persons) plenty of personnel, when after large dismission it is important to save reputation of fair employer. | As a rule, more cheap to order outplacement, than allowed in court claims, inflicting the loss of business reputation. | Not always can satisfy the requirement of perturbative dismissed personnel. Needs some financial charges. |

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МЕНЕДЖМЕНТ ОРГАНИЗАЦИЙ: ПОДХОДЫ И МЕТОДЫ

Анна Шаповалова, Светлана Шаповалова

Аннотация: В статье рассмотрено иерархию подходов и методов в менеджменте организаций, сущность бизнес-процессов, приведена характеристика методов их совершенствования. Осуществлено упорядочивание и группировка таких методов.

Ключевые слова: метод, подход, бизнес-процесс, усовершенствование, менеджмент.

MANAGEMENT OF DIVERSIFIED ENTREPRENEURIAL STRUCTURES ACTIVITY HARMONIZATION

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Summary. Features and specifics of diversified entrepreneurial structures activity harmonization are considered. The range of tasks connected with harmonization of various divisions interaction, and also the purposes and goals of administrative management of work on functioning of diversified entrepreneurial structures are defined.

Key words: diversified entrepreneurial structures, harmonization, divisions interaction, administrative management, diversification processes.

INTRODUCTION

Modern trends in enterprise development are based on active use of diversification strategies with increase in enterprise stability and viability in view. Diversification of the enterprise activity is connected with essential complication of their internal industrial structure and coordination processes in interaction of enterprise divisions. It defines the problems connected with maintenance of sufficient organization level in the enterprise.

The general criterion and characteristics which reflects the state of an enterprise managerial activity and successfulness of coordination of its divisions interaction is harmonization. Harmonization as such based on empirical actions is practically unachievable. It is possible to ensure harmonization of the enterprise activity in the conditions of its difficult structure only on the basis of constant control and regulation of executors interaction at all levels according to the criterion of their activity consistency. It is the prerogative of administrative management and responsibility of the managers accountable for certain processes carried out inside the enterprise.

Work stability and sustainability at a diversified enterprise depends greatly on the level of administrative management. This determines the urgency and importance of the problem under consideration.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

The problem under consideration is being studied by various authors from the position of enterpreneurial structures diversification processes , their activity harmonization and the administrative management organization. Therefore it finds reflection in publications devoted to strategic management, organization of the enterprise functioning, as well as in publications dealing with problems of administrative management. And first of all it is necessary to point out the works by P.F.Drucker, M.E.Porter, A.A.Thompson., A.J. Strickland, O.S.Vihanskiy, A.I.Naumov, O.G.Turovets, B.Z.Milner, A.V.Kozachenko, G.I.Dibnis, A.V.Raychenko. But along with this, the issues of administrative management and, namely, activity harmonization of diversified entrepreneurial structures (DES) have been studied insufficiently and demand more detailed consideration.

AIM AND RISING OF RESEARCHES TASK

The objective of the article is systematization of diversification processes influence on harmony maintenance in functioning of diversified entrepreneurial structures. Achievement of the necessary harmonization level of their activity at the cost of administrative management improvement (enhancement).

BASIC DIVISION WITH RESULTS AND THEIR ANALYSIS

One of problems of the diversified entrepreneurial structures (DES) having various fields of activity and a great number of divisions, is ensuring their coordination and action coherence, harmonization of joint operation performance which would allow to use their possibilities as much effectively as possible without bringing in restrictions and disorganization to their activity, caused by contradictions in behavior of certain participants of the process [1, 4, 11].

Basically, it is all about the harmonization of the process of connected tasks performance, which should be lined up in a stream of events directed at achievement of the common purpose of the DES development . The ideal situation can be achieved if several conditions are observed:

full match of local purposes of each structural division with the general objective of the DES development;

equality or ratio of the production potential, collaborating divisions with the view of corporate problems solution;

use of the common methodical base and general principles of operational and commercial activity organization of cooperating DES divisions;

comparability or equality of qualifying characteristics of the personnel;

existence of sufficiently high development level of the administrative structures providing the DES divisions interaction in the process of corporate problems performance [2,3,7].

Harmonization of structural co-performance of DES divisions is understood as such organization of process when there are no losses or failures in performance of the process participants because of inconsistency in cooperating structures behavior.

Certain experience of harmonizing problem-solving has been accumulated in the operational management area. Operational management in its status is connected with obtaining of a certain finished product according to set techniques. At this the problems of direct interaction, both of separate workplaces and structural divisions are being solved. Harmonization of production process is achieved by means of one of the three following methods:

The first method – accumulation of the sufficient level of reserves, isolating the production process in cooperating divisions. As a rule, it is connected with creation of certain materials reserve, semi-finished products or time reserve introduction for necessary works performance. In this case, available reserves allow to harmonize production process on the basis of its planning and regulation, using the average level of both planned, and alignment-coordinating tasks [12].

The second method – careful supporting processes planning, allowing to organize their realization and supervise the course of processes, based on previously known time, volume and qualitative operation factors. In this case requirements for the performance planning level of teamwork increase sharply, but the requirements for alignment-coordinating work considerably decrease. This work block is focused on revealed deviations from the set work regulations.

The third method is based on operative response to the situations arising in the course of collaborative tasks realization by means of active handling of the reserves available. In this case the role of scheduled work is confined to the tasks and goals formulation, and the main efforts on collaborative work harmonization are shifted to alignment-coordinating sphere [5, 16, 20].

Each method has its advantages and disadvantages connected with resource – intensiveness, as well as with complexity of their use. Application of the harmonization method is defined by cooperation conditions and characteristics of the processes realized both by each division separately and all entrepreneurial structure as a whole.

The experience of production process harmonization can be adapted to problems and goals of organization of the integrated structures functioning on the basis of their activity diversification. Important factors determining harmonization objectives and tasks are principles and conditions of integration [17, 18].

Integration conditions depend on the chosen type of the entrepreneurial structures activity diversification. In this case we are interested in three types of diversification:

1. Vertical diversification, when interaction of structures is defined by technology of the final product receipt.

2. Horizontal-central diversification, when corporal technological base is used for realization of various products and the problem of limited resource distribution arises.

3. Conglomerate diversification, when cooperation of divisions involved in the integrated structure is interrelated not technologically, but due to the use of corporal infrastructure, administrative potential, organization financial resources, in other words indirect cooperation within one organization.

The first type of diversification demands approaches to joint work harmonization that are close to operational management, as each participant of the general process carries out a certain technological function, but differs from usual industrial divisions by

the freedom degree in decision-making, range of activity and territorial arrangement. Activity harmonization of such DES assumes not simply a proportion of production potentialities, but also thorough harmonization of logistic processes, financial streams, information streams, etc [8].

The second type of diversification demands to use special harmonization tools with action coordination methods, possibilities of operative resource handling, high intellectual and professional level of executors, realizing this coordination, as a basis. Internal logistic processes, distribution of resources, reserves handling and determining priority of work performance come within their incidence.

With the third type of diversification, activity harmonization is reached at the level of strategy development, organization of processes connected with realization of the released product, tactical and operative problem-solving in the sphere of financial maintenance, investment development.

It is necessary to point out that in foreign companies management the questions of activity harmonization are considered to be the key questions, which is demonstrated by active use of special applied programs packages of operational activity management, like MRP, timely, optimal technologies of management. All these software products are focused on harmonization of structural divisions activity within the limits of one enterprise. Thus, problems and issues of structural divisions interaction harmonization are topical and actively used in practicable enterprise activity.

DES creation raises the significance and timeliness level of these issues, because neither do groups of workplaces, nor structural divisions of the enterprises begin to cooperate, but large enough, independent divisions that use considerable resources in their activity. Therefore the error cost, disharmony in activity, become more significant and critical.

In such conditions one of the key problems that have to be solved by DES is management and control of the interaction harmony in the framework of realized tasks and processes. The sphere of responsibility for realization of tasks and processes is administrative management, that's why building of an adequate system of administrative management, forming mechanisms of administrative management through harmonization of the interaction DES divisions is timely and important [11].

In administrative management harmonization is considered not as an objective itself but as a characteristic of successfulness of realized processes and actions management. Relating to administrative management which is aimed at achievement of a certain intended result, harmonization can be considered as a characteristic on which functioning of the whole administrative system and correction of managerial actions are based. The notion of harmonization is a system characteristic and its usage in management of any object can be seen as demonstration of the given characteristic in relation to a specific object of processes and executors work management.

In the process of administrative management such parameters as harmony and processes harmonization as assessed. Harmony is understood as static characteristic of certain proportions achievement in the process under realization. Harmonization is seen as a dynamic characteristic, that is change of proportions in time for achievement of the necessary result. We consider the notion of "harmonization" as a characteristic which must be ensured as a result of the work of an administrative management system.

The main objective of administrative management on harmonization of DES activity can be regarded insurance of DES objects and divisions with minimal level of

contradictions and conflicts, which allows to realize the declared mission of the whole DES as well as objectives of each structural division [19].

Proceeding from the objective that has been formulated the key moment of DES functioning harmonization is minimization of losses caused by misbalance in the process of interrelated structures cooperation.

Imbalance minimization can be achieved at the cost of predicting counteraction to possible contradictions, which will allow not only to restrict the process in time but also to rationally use the whole complex of resources involved in DES functioning. In contribution to the general objective of DES divisions interaction harmonization the main tasks of these processes administrative management can be considered as follows:

1. Providing harmonic interaction in time of all divisions involved in realization of any process.

2. Providing rational use of general purpose resources for all interacting divisions.

3. Providing balance of volumetric characteristic of products received by every DES division and used for the released product receipt.

4. Providing balanced parameters of products and services delivered by DES divisions in the framework of the general process of the released product receipt.

5. Rational use of financial resources for the realized processes of the released product receipt funding.

6. Rational use of investment finance to safeguard balance development of DES divisions in accordance with the mission being realized and the tasks being solved.

7. Rational use of managerial and intellectual potential of all divisions forming DES.

8. Preventative measures and minimization of conflicts of interests in interaction of the general process participants.

Realization of the tasks specified in the process of administrative management is the basis for high level of harmonization achievement in the process of DES divisions activity and obtaining top financial and economic result.

CONCLUSIONS

Processes of entrepreneurial structures activity diversification are an objective tendency of their development for enhancement of stability of the enterprise work and its position at the market. Diversification process considerably complicates internal interactions and increases likelihood of rise of contradictions and conflicts between structural divisions as well as individual DES executors. This leads to disharmony in functioning of such entrepreneurial structures and lowering of general organization level of their activity. To prevent such situations harmonization must be seen as the most important characteristic of enterprise division functioning and one of the management objectives.

Harmonization asks for constant control and influence on the work done and business processes under realization in the framework of DES. This is the function and one of the main tasks of administrative management. To ensure the necessary level of DES functioning harmonization it is necessary to form administrative system as one of enterprise management subsystems and aim it at achievement of the necessary level of

harmonized executors interaction in co-realization of any kind of work. Organization of administrative management must be exercised on the basis of general principles and rules allowing for ensurance of the necessary level of quality and effectiveness of management.

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УПРАВЛЕНИЕ РАЗНООБРАЗНОЙ ПРЕДПРИНИМАТЕЛЬСКОЙ ГАРМОНИЗАЦИЕЙ ДЕЯТЕЛЬНОСТИ СТРУКТУР

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Аннотация. Рассматриваются особенности и специфические особенности разнообразной предпринимательской гармонизации деятельности структур. Диапазон задач соединился с гармонизацией различного взаимодействия разделений, а также определены цели административного управления работой в функционировании разнообразных предпринимательских структур.

Ключевые слова: разнообразные предпринимательские структуры, гармонизация, взаимодействие разделений, административное управление, процессы диверсификации.

USING OF ICT IN FOREIGN LANGUAGES TEACHING TO FUTURE IT-SPECIALISTS

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Summary. The article gives a general overview of the affordances and limitations of various technological resources currently used today in education. The advantages of multimedia learning environments and new attitudes and approaches to learning foreign languages in high school are described in the given article.

Key words: multimedia learning environments, the system of higher education, computers, information and communication technologies, foreign language learning, students.

INTRODUCTION

Computers and the Internet technology have a great impact upon the field in the system of the higher education. The importance of Internet technology in high schools and universities cannot be ignored. In fact, with the set of computers in the system of the higher education, it has become easier for the teachers to render knowledge and for the students to grasp it. Computer technology is used to add a fun-element to education. And it goes without saying that the Internet has improved the system of the higher education with interactivity.

The process of learning foreign languages in the classroom has significantly become richer as students have access to new and different types of information, can manipulate it on the computer through graphic displays. They can controll experiments in ways never before possible, and can communicate their results and conclusions in a variety of media to their teacher, students in the next classroom, or students around the world.

The success of the Internet technology in the classroom generate impressive results for students, including improved achievement; higher test scores; improved student attitude, enthusiasm, and engagement; richer classroom content; and improved student retention and job placement rates. This is brought by softwares that can be used to render information to the students in an interactive manner in the complex system of foreign languages learning in high schools and universities of Ukraine.

OBJECTS AND PROBLEMS

The problem of using computers to teach foreign languages to students in high schools is widely reviewed and presented in the scientific works of such prominent researches as Balbi, R. [1]; Bax, S., Chambers, A. [2]; Camilleri, A. [3]; Carlson, S., Gadio,C.T. [4]; Davies, G. [5, 6]; Fitzpatrick, A. [7, 8], Haddad, W.D., Draxler, A. [9]; Heyworth, F. [10]; Kenning, M. M., Kenning, M. J. [11]; Kirkman, G., Osorio, C., Sachs J. [12]; LeLoup, J., Ponterio, R. [13]; Marsh, D., Coyle, D., Marshland, B., Wolff, D [14]; Nunes, A., Cesar, A. A., Gaible, E. [15]; Pearson, S., Chambers, G., Hall, K. [16]; Reeves, T.C., Reeves, P.M. [17]; Underwood, J. [18]; Vogel, T. [19]; Warschauer, M. [20].

In the article we'd like to :

1.   to give a general overview of the affordances and limitations of various technological resources currently used today in education;

2.   to describe the advantages of multimedia learning environments and new attitudes and approaches to learning foreign languages through the new media;

3.   to emphasize on new and important teacher's roles in contexts of autonomous multimedia learning environments.

So, table 1 gives a general overview of the affordances and limitations of various technological resources widely used today in education [Fitzpatrick, A., 2004].

It is taken from Chapter 7 in W. D. Haddad & A. Draxler (2002) *Technologies for Education: Potential, Parameters and Prospects*, a report prepared for UNESCO and the Academy for Educational Development [Nunes, A., Cesar, A. A., Gaible, E., 2002]. The report is downloadable from the Academy for Educational Development web site: *http://www.aed.org/publications/ TechEdInfo.html.*

Table 1. **Affordances and limitations of modalities**

Mode	Instrument	Affordances	Limitations
Text	Books/ magazines	Portable Durable Can present complex information Sequential structure guides learner Little eyestrain Moderate cost of development	Difficult to modify (as in localization, up-dating) Requires literacy plus higher-order thinking skills Content is difficult to extract for use in other resources High per-unit cost of publication
	Web page	Dynamic and easy modified Hyperlinks enable nonsequential navigation Low cost of development and very low publishing costs Supports interactivity (e.g. navigation, user-entered information, etc.) Can support assessment	Nonsequential structure may obscure critical information or cause confusion Reading may cause fatigue Requires PC, electricity, connection Potential additional system requirements (e.g. Java, plugins)
Images	Printed photos, maps, and schematic drawing	Concrete, specific, detailed information Appropriate for learners with "visual intelligence" Engaging and motivating for many learners	Low information value relative to text Resistant to reuse by learners "Visual literacy" skills required for best use Highcost to reproduction

Table 1. **Affordances and limitations of modalities (continued)**

Mode	Instrument	Affordances	Limitations
		Affordances similar to printed photos Easily copied, chared, and used Low costs for reproduction and publishing Can be data-based or Web-served for delivery to handheld computers and other "anytime, anywhere" devices	Limitations similar to printed photos Require PC and electricity, possibly an Internet connection
Audio	Radio	Can present contemporary and topical information easily Highly accessible and potentially engaging format (no literacy skills required) Widespread adoption in developing countries Moderate production costs Highly scalable Low-cost hardware	Information is not durable; learners can't "review" a broadcast Poor presentation of complex concepts No visual component (e.g. schematics, maps, photos) Synchronous form requires system-wide coordination (announcements, class schedules etc.)
	Digital audio (Web-and CD-based)	Can present contemporary information easily (Web) Information is durable (it can be reviewed many times) Medium is durable Moderate production costs Low reproduction costs; easily scaled Can be indexed or catalogued to enable access	Requires robust PC and/or high-speed Internet connection High storage "overhead" (in terms of hard drive capacity) May not support presentation of complex concepts
Videoo	Analog	Highly accessible and potentially engaging format (no literacy skills required) Sequential structure guides learner Concrete, specific, detailed information Appropriate for learners with "visual intelligence" Engaging, motivating for learners	High production costs; moderate reproduction costs Complex information may be difficult to present effectively Information may prove difficult for some learners to analyze

Table 1. **Affordances and limitations of modalities (continued)**

Mode	Instrument	Affordances	Limitations
	Broadcast	Same as analog-video Can present contemporary or topical information easily Easily catalogued and reused (by developers and users) Can be indexed or catalogued to enable nonsequential access	Same as analog video; however, costs may be higher Requires robust PC and/or high-speed Internet connection High storage "overhead" (in terms of hard drive capacity)
Simul ations	Interactive (Web-and CD-based)	Active-learning characteristics engage learners via several parts to reinforce concepts Quantitative elements are supported Engaging and motivating for many learners Can support assessment	Requires robust PC and/or high-speed Internet connection Potential additional system requirements (e.g. Java, plug-ins)

Educationalists and researchers [Camilleri, A., 2000; Carlson, S., Gadio,C.T., 2002; Fitzpatrick, A., 2004; Heyworth, F., 2003 and etc.] have recognised that the introduction of the new media into educational processes of learning foreign languages in the system of professional education in Ukraine calls for a change in learning and teaching patterns.

They believe that the new media will lead also to a major change in the **culture of learning**. The reasons given for this supposition are the learning efforts and learning possibilities linked to the new media.

They believe that the new media:

• call for and facilitate more independence on the part of the learner, more self-directed activities and the organization of learning processes;

• encourage interactive work;

• facilitate direct feedback;

• call for a change in the role distribution of teacher/learner, where learners take on teaching functions;

• enable contents to be continually updated with minimum efforts;

• provide faster access to teaching materials;

• provide greater opportunities for individual forms of learning;

• but also demand more social learning in group and team work [Warschauer, M., 1996].

The new media provide new opportunities and challenges by:

• offering a wider range of teaching contents (especially teaching methods);

• enabling more self-directed learning, offering a range of choices,

individual learning pathways and freer forms of learning;

- offering teachers and learners the chance to plan and organise courses together (empowering learners to influence the choice of teaching contents);

- freeing learning and teaching from the limitations and constraints of the traditional classroom by opening up and using spaces outside the school/teaching institution;

- facilitating communication between learners and between learners and the teacher via the Internet [Reeves, T.C., Reeves, P.M., 1997].

As mentioned above, language teachers are now required to take on new roles and come to the classroom situation with appropriate attitudes and approaches. As in contexts of autonomous learning, the teacher is now increasingly having to function as facilitator and guide to the learners. Other new and important teacher roles are those of mediator, researcher, designer of complex learning scenarios, collaborator, and evaluator [Camilleri, A., 2000].

CONCLUSIONS

1. The media foreign language teachers will have to master a wide range of skills and competencies. Above all, foreign language teachers will need to focus on the design of situations, sequences, and activities conductive to learning foreign languages by encouraging future IT-specialists to participate in their collaborative efforts.

2. The management of learning scenarios where future IT-specialists and teachers complement one another's skills, expertise and knowledge in collaborative efforts must, we believe, form the basis of the system of foreign languages' learning of tomorrow.

3. At the same time, we think that the using of computers to teach foreign languages to future IT-specialists means that there is a unique opportunity to make future-oriented, technology-integrated, dynamic and authentic practices for the backbone of professional education.

4. We insist that the right support (e.g. institutional organization, educational policies), such teacher's expertise can be developed. Technologies influence upon foreign languages' productions, our use and understanding of foreign languages, and how we are socialized through taking part in communicative foreign language activities (for example, professional) . In short they transform important aspects of our social lives at all. This is the real and truly challenging perspective for foreign languages teachers.

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ИСПОЛЬЗОВАНИЕ ИКТ В ОБУЧЕНИИ ИНОСТРАННЫМ ЯЗЫКАМ БУДУЩИХ СПЕЦИАЛИСТОВ ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫХ ТЕХНОЛОГИЙ

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Аннотация. В статье дается краткий обзор возможностей технологических ресурсов, которые широко используются сегодня в системе образования. Описываются преимущества мультимедийной информационно-образовательной среды обучения и современные подходы к обучению иностранным языкам в высшей школе.

Ключевые слова: мультимедийная информационно-образовательная среда, система образования, компьютеры, информационно-коммуникационные технологии, обучение иностранным языкам, студенты.

PROBLEMS AND PERSPECTIVES OF DEVELOPMENT AND APPLICATION OF BINDING AGENTS BASED ON PRODUCTS OF VEGETABLE RAW MATERIALS PROSSESSING

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Summary. Under the circumstances of economic uncertainty it is reasonable to clearly understand possibilities of one or the other binding agents use to provide competitiveness of manufactured products. It is reasonable to use such kinds if binding agents and their combinations which providing necessary technical level of requirements possess not only and probably not to a certain extend relatively low cost, but would be ecologically clean materials, providing modes of complex resource-saving production processes.

Key words: vegetative raw materials, binder materials, technical lingosulphonats, binder ability.

ANALYSIS OF THE STATE OF PROBLEM

Binding agents are effective technological instrument they are widely used in different spheres of industry to solve of a number of tasks: to granulate and briquette different dry materials, in wood-particle board and fibro-board production, to produce different building articles, in composite materials production, in production of mould forms and rods in casts manufacturing, and many others. Actually, binding agents are variety of gum used for technical needs.

Presently, due to economic reasons, intensity of scientific works in Ukraine connected with this group of materials considerably decreased, though, the problem of highly effective binding agents development has become even more actual than before. First of all, it is caused by the influence of two factors:

- First, sharp increase of prices on binding agents based on oil and oil derivatives, resulted in economic unsuitability to use many traditionally used binding agents;

- Secondly, considerable toughening of ecological requirements to the production revealed principal impossibility to use many conventional materials due to their toxic nature or poisonous products generated when such materials are used. It is not a secret that in many cases binding agents themselves are the source of harmful

emission into environment because of their nature and, as a rule, these are the substances of the first and second grade of danger.

AIMS AND TASKS OF INVESTIGATION

The aim of the present investigation is in assessment of potential of vegetable raw materials processing for synthesis of principally new ecologically clean, technological and resource-saving binding agents on the example of technical lignosulphonate analyses.

MAIN PART: PROBLEMS AND PERSPECTIVES OF INVESTIGATION

It should be noted that ecological imperative, in the light of modern tendencies and production development, is gaining ever increasing importance. In this connection, binding agents based on products of vegetable raw materials processing are the most perspective.

To some extent, technical lignosulphonates (LST) may become such a potential for development of principally new binding agents.

Precondition may be the fact that LST are: one of the cheapest material [2]; not scare, because they are produced when processing vegetable raw materials large-capacity waste products (processing of sulphite alkaline solution in pulp and paper industry) [2,4]; ecologically safe for a man and environment, i.e., ecological by its genesis [3,4]; expansion of their use is an example of complex solution of the ecological problems, thus taking off the problem of nature pollution in pulp industry - in the place of their generation and in productions where they are used as binding agents at the account of exclusion of toxic substances contained in binding agents (formaldehydes, phenol, acroeline, petropyren).

All these explain their attractiveness when looking for alternative solutions of the production processes ecological problems.

The other positive LST ecological peculiarity is the fact that primary raw material for their production is timber, which unlike oil, is reproductive. At this, problems of sewage recycling is solved in complex because LST are the products of sulphite alkaline solution, sulphite pulp production large-capacity, liquid waste, processing.

The balance of LST advantages and disadvantages is presented in table 1.

Drawbacks presented in the table considerably narrow a sphere of this binding agent use, but a great number of positive characteristics predetermines the perspectives of LSTs as a substance which resources may be looked at as a n original raw material for development of new binding agents and composites.

Thorough investigations imply complex approach which is impossible:
- Without analysis of material physical nature;
- Without taking into consideration technical characteristics and experience of discussed material use;

Table 1. **Advantages and disadvantages of technical lignosulphonate as a binding agent**

No	Characteristic features
	LST advantages
1	Low cost, because the raw material for its production is a sulphite alkaline solution - large-capacity pulp and paper works waste
2	Not scarcity. The problem of sulphite alkaline solution recycling is very burning, because nowadays only 10% of general potential LST production is used.
3	Raw material resources renewability is stipulated by the possibility of wood, which is the original raw material for LST production, natural renewal.
4	Ecological cleanliness, which shows itself in high sanitary and hygienic conditions at the enterprises where LSTs are applied.
5	Long-term storage (according to TC not less than one year).
6	Manufacturability when producing casts and rods (high fluidity, plasticity, formability of mixtures with LSTs).
7	Simplified knock out of rod and casts made of mixtures containing LSTs
8	High regeneration of used rod mixture
9	Commercial use of lingo-containing materials (SSh, SDB, LKBZh, LST) in foundry production
LST disadvantages	
1	Instability of characteristics (considerable, up to 50%, fluctuation of characteristics If materials are taken from different lots)
2	Low biding ability (insufficient strength of cast rods and forms in the process of their use)
3	High viscosity at temperatures below zero
4	High hygroscopic, i.e., ability to become less strengthened in long-term storage due to increased environmental moisture absorption

- Without taking into consideration the perspectives and trends in development of production and the place of the problem;
- Without detailed ecological appreciation of material under investigation;
- Without analysis of trends and approaches taken to solution of the abovementioned drawbacks of the material and preposition of concrete technical solutions.

Lets discuss each stated aspect in more details in order to understand trends and perspectives of LSTs use.

Analyzing existing groundwork from the point of view of LSTs possible application as a nonconventional method to solve the problems connected with the use of binding agents, we may come to the following conclusions according to directions of investigation:

PHYSICAL NATURE OF LST

Chemical structure of the material under investigation depends on influence of many factors, primarily of technical nature, and on the degree of wood delignification in the process of pulp boiling in particular. Due to this, LST structure is not stable which allows to consider LST as a fractal object.

Taking into consideration multi-variant and malty-factor nature of wood delignification processes resulting in manufacturing LST as a by-product, the problem of LST univocal structure in general have principally no solution.

According to their consistence lingosulphonate is dark-brown viscous liquid which by its chemical characteristic presents a lingosulphonate acids water solution (up to 70%, but as a rule 48-51%) in form of oligo-measured poly-dispersed systems with a wide range of molecular mass (from 2000 to 1000 000 specific units), oligomolecular of which form irregular, tangled, branchy spirals.

Lignin in wood naturally plays a role of binding agent and all lingo-containing materials (SSh, SSB, SDB, LKBZh, LST) have binding abilities to a certain degree.

From the nature of material under investigation point of view, their molecular mass influences on the LST binding ability, at this, the greater their molecular mass is the greater strength characteristics of LST mixtures are.

LST PRODUCTION

LSTs are a product of multistage processing of large-tonnage waste - sulphite alkaline solution, formed in the technological process of wood processing to produce cellulose according to sulphite method on the cellulose works.

Sulphite alkaline solution being a large-tonnage waste, is a sound source of water pollution (Lake Baikal problems for one), and technical lingosulphionate production out of sulphite alkaline solution, is a way of its recycling, a way to its rational use. Taking into account the volumes of sulphite alkaline solution production (approximately three million tons a year) this predetermines potentially low cost and non-scarcity of lingo-containing materials now and in the near future. At present, about 10% of all potential of these materials is used as binding materials.

Table 2. **Indexes of the use of lingo-containing materials**

No	Indices	Characteristics
1	Quantity of raw material for LST production	3 million ton/year
2	Volume of LST used as a binding agents	~0,3 million ton/year
3	Raw material for LST production	sulphite alkaline solution

Wood is a source for LST production which is very important because wood is naturally renewable resource unlike oil which is presently used for production of the majority of binding agents (synthetic resins). This feature makes LST a perspective raw material for development of new binding agents.

Due to technological peculiarities (raw material, equipment, treatment specifics, etc.) characteristics of LST produced by different works (CDB) of CIS may fluctuate in a sufficiently wide range (for example, actual binding ability, defined by the samples breaking strength from 0.3 to 0.8 MPa). It leads to some unpredictability in display of LST features and may result in technical rejects.

As LST is not a basic product manufactured by CDB, the level of technical requirements and degree of attention to this material on the manufacturing- enterprises is insufficient which to some degree cause instability of LST characteristics.

THE LST USE AS BINDING MATERIAL IN FOUNDRY PRODUCTION

Ligno-containing materials, in one or another way, under this or that trade mark, have been traditionally used in foundry production as binding agents on enterprises of Ukraine and CIS since 20s of the last century, and this allows us to speak about availability of obtained experience in their study and use.

LST should not be definitely evaluated by their technological characteristics, because according to some indices (for example, fluidity, plasticity, formability, pliability, easier punching out) this material considerably surpasses analogue ones but according to other characteristics are in considerable disadvantage in relation to others (for example, binding ability, hygroscopicity, length of hardening), that is without any binding to any concrete technology it is impossible to judge about LSTs advantages and disadvantages.

In many cases the reasons limiting spheres of LSTs application are:
1) Low binding ability, which is expressed in insufficient strength of forms and rods, produced of mixes with this binding material;
2) Long hardening time which limits the LSTs use in technological processes of forms and rods manufacturing in heated tool sets;
3) Low heat-resistance, which narrows the sphere of LSTs application by cast-iron moulding;
4) High hygroscopicity of LST rods and forms make them unsuitable for long storage and limit possibility of LSTs dried rods use with foundry forms obtained by green sand casting.

The main reason restricting LST application is their low binding ability. LST considerably yields to other binding agents (for example, to synthetic ones approximately by a factor often) in this index.

As a rule, LSTs are used in combination with other binding agents. Usually they are oil binders of USK type, KO, SKT, and so on, or resins (or example carbamide-formaldehyde or phenol-formaldehyde ones). This allows to compensate LST insufficient binding ability with their good technological properties.

Having in mind the above mentioned, LSTs are invariably cheap and non-scare material. LST cost is significantly low than the cost of oil binders and much lower that the cost of synthetic resins. That is why foundry rods and forms produced on LST basis are much cheaper than forms and rods produced using mentioned binding agents.

LST ECOLOGICAL CHARACTERISTICS

According to data obtained by SHOT (city of Ekaterinburg) [3], LSTs have the best indices compared with other organic binding materials by ecological indices (see table 3). Having in mind implementation experience, the change of binders USK and KO types by LST results in considerable improvement of sanitary and technical and sanitary and hygienic working environment in enterprises (for example, introduction of KPI developments). These data are supported by the results of conducted experiments (see table 4).

Table 3. **Conditioned toxicity of organic binding materials [3]**

Type of binding materials	Binder brand	Conditioned toxicity per one per cent of binder at stages		
		Mixture preparation	Mixture hardening	Pouring and melting
Technical lingo-sulphonates	AtT=180°C	-	0.8	53.1
	AtT=240° C	-	8.5	-
Oil binders	KO	-	78.6	223.2
	USK	-	72.9	208.0
	SKT-11	-	18.5	102.7
Phenol-formaldehyde binders	SF-480	1.95	218.2	516.7
	Phenolo-alcohol	1.4	70.0	494.1
	SF-015	-	235.8	947.0
	SF-262	-	82.6	1404.0
Carbamide-formaldehyde binders	KF-MT	-	111.0	758.8
	KF-MT and 20% area and phenol-alcohol solution mixture	-	23.9	380.6
	KF-MT and phenol-alcohol mixture	-	118.4	354.3
Phenol-carbomide-formaldehyde binders	TOL	0.44	161.4	1457.4
	FML	0.45	146.7	1402.0
Carbomide-furan binders	KF-90	0.42	87.8	570.7
	Furitol-107	0.416	91.5	765.2

Table 4. **Results of mixtures gas- creation and toxicity investi Ration**

No	Indices name		Qualitative indices			
			1	2	3	4
1	Quarts sand 1K02B,%		100	100	100	100
2	LST, %		6		4.5	
3	LST-M,%			6		4.5
4	USK,%				3.5	0.8
5	Specific gas-creation	300°C	1.33	1.29	1.81	1.19
	KF-MT and 20% solution mixture	-	23.9	380.6		1.19
6	Break strength	Mpa	0.4	2.9	1.9	2.1
7	Harmful substances content (toxicity),% gr.					
8	Formaldehyde	300°C	0.090	0.093	0.419	0.109
		1000°C	-	-	-	-
9	Acrolein	300°C	0.004	0.006	0.049	0.014
		1000°C	-	-	-	-
10	Carbon Oxide	300°C	0.089	0.091	0.919	0.251
		iooo°c	0.008	0.014	0.989	0.283
11	Sulfureous alhydride	300°C	-	-	-	-
		1000°C	0.001	0.001	0.007	0.003

ANALYSIS OF LST PROPERTIES IMPROVEMENT TRENDS

Perspectives of LST use volume increase and spheres of their application in foundry and other productions are directly connected with the solution of t0068e LST binding ability improvement problem [5]. Nowadays there is a great actual material of experimental research somehow directed on the solution of the problem [6].

Developments analysis shows that the following directions may be considered as perspective ones:

1) LST modification;
2) Mixture composition optimization when combining LST with other binding agents;
3) Thermal or thermo-chemical activation.

The most fruitful and perspective trend is modification which is supported by the obtained results (see table 5). The use of modifiered LSTs allows to reduce the content of oil component KO, which is the main source of harmful emissions, in composition of rod mixture by 3.5-4.0 times.

Table 5. **Composition and properties of rod mixtures to be used**
in technology of heating radiators production

No	Components composition and mixture quality indices	Mixtures quantitative indices	
		Presently used	Proposed for use
1	Filler: quarts sand brand 1K02B,%	100	100
2	Binders: LST,%	4.0-4.5	4.0-4.5
	Modified LST,%	3.5-4.0	0.8-1.0
	KO(USK),%		
3	Technological additives:		
	Ammonium sulphate,%	0.19	
	Diesel engines fuel,%	0.5	0.5
4	Strength after drying in break test, MPa	1.8-2.5	1.8-2.5
5	Pressure strength in humid condition, kgc/cm	0.055-0.065	0.06-0.07
6	Humidity,%	3.3	2.7

MAIN CONCLUSIONS AND RESULTS OF INVESTIGATIONS:

Because of characteristics instability and low binding ability, LST as binding agents use only 10% of their potential and at these are:

1) Ecologically clean;
2) Potentially cheap and non-scare;
3) Manufacturable materials.

Using obtained experience of LST application as binding agent in foundryproduction and existing scientific potential, LST may be considered as a raw material for development new binding agents having stable and pre-set characteristics.

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ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ РАЗРАБОТКИ И ПРИМЕНЕНИЯ СВЯЗУЮЩИХ МАТЕРИАЛОВ НА ОСНОВЕ ПРОДУКТОВ ПЕРЕРАБОТКИ РАСТИТЕЛЬНОГО СЫРЬЯ

Юрий Свинороев, Владимир Коструб

Аннотация: В складывающихся условиях экономической неопределенности целесообразно четко и ясно представлять возможности использования тех или иных связующих материалов для обеспечения конкурентоспособности выпускаемой продукции. Рационально применять такие их виды и композиции, которые бы обеспечивая технически необходимый уровень требований, обладали не только, а может быть не столько, относительно низкой стоимостью, сколь являлись бы экологически чистыми материалами, обеспечивающими режимы комплексного ресурсосбережения производства.

Ключевые слова: растительное сырье, связующие материалы, технические лигносульфаты, связующая способность.

POTENTIAL OF UKRAINE PROCESSING INDUSTRY AGRICULTURAL SECTOR AND HIS APPRAISAL

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Summary. There is the considered state of processing industry of agricultural sector of Ukraine in the article. Potential of this sector of economy is appraised. Tab. 4. Fig. 8. Sour. 8.

Key words: processing industry, brewing and non-alcoholic beverages, salt making industry, agricultural sector, potential, appraisal.

INTRODUCTION

Agricultural food sectors of Ukraine ranks one of the leading places in the national economy. The market share of its contribution to GDP, formation of the state budget and export potential is expanding. The national processing industry is gradually becoming competitive in the agricultural markets; its share in global production volumes of strategic agrifood products is increasing. Consumption of basic foodstuffs by Ukrainian population is growing.

Proven records show that the GDP growth owing to the agrifood sector promotes to reduce poverty more efficiently if compared with the other industries; this being of utmost importance in the periods of recessionary economic phenomena. Therefore today Ukrainian a course for system-based agrarian reforms [1].

Technical and technological re-equipment geared to cost-effective use of resources, rational and efficient use of agricultural lands, development of organic farming, formation of a modern selection background, development of quality management systems and food safety are the main requirements to meet this goal.

The policy for system-based agrarian reforms includes such important components as creation of open and transparent market environment, formation of productive marketing infrastructure for agricultural market, optimization of sales channels, improvement of the instruments for agrifood sector state regulation focusing on ensuring of the country food security and increasing its presence in international agrarian markets.

RESEACH OBJECT

The Ukraine implements the commitments on the priority development of the national agrarian sector in compliance with the provisions of the Laws of Ukraine "On the Priority of Rural Social Development and Agribusiness in National Economy", "On State Support of Agriculture in Ukraine", "On Fundamental Principles of the State Agrarian Policy for the Period till 2015", the State Target Program of Ukrainian rural development for the period till 2015 [2].

Priority directions:
- improve efficiency of plant cultivation industry;
- develop highly efficient pig husbandry and diary cattle breeding industries;
- regulate land relations, improve land uses, create transparent agricultural land market;
- develop agrarian market infrastructure, form a network of wholesale markets and cooperative channels to sell agricultural products;
- reform agrarian education in line with the real needs of farming;
- rural area development;
- improve public administration system in agrarian sector.

Thanks to the taken actions volumes of loan attraction by agribusinesses have been increased 1.4 times against the last year respective period. In January-April 2010 agricultural total output produced by all categories of enterprises has increased by 4.9% against the same period the previous year, including by agricultural enterprises – by 12.1%. The volumes of livestock and poultry sales for slaughter have increased by 6.7%, egg production – by 4.3%. The number of pig population rose by 15%, sheep and goats – by 5.5%, poultry – by 5.9%. Productivity of livestock has grown.

The situation in manufacturing food, beverages and tobacco products has stabilized. Within January-April of the current year, the overall production has increased by 1.2%, against the respective level of the previous year, including food and beverages production – by 3.1% [3, 4].

Gain in production of oil, meat and meat products, confectionery, beverages and some other processing industry was achieved.

Rise in export of agrifood products was observed. They were exported for the amount of $2991 mln. USD within four months of 2010, this being by 6% higher if compared with the same period of 2009.

In particular, export volumes of meat and meat products increased 2.5 times, milk products – 1.7 times, oil – 1.4 times, tobacco and tobacco products – by 12%, sugar – by 9%, thus reflecting the growing competitiveness of a number of domestic goods in foreign markets.

Foreign trade balance is positive and constitutes $ 1075.2 mln. USD.

Due to the increased production and sales of agricultural food products, receipts of tax payments to Consolidated Budget grew by 53%, to Pension Fund – by 27%.

RESULTS OF EXPERIMENTAL RESEARCH

Ukraine processing industry comprises of flavoring, meat, milk and fish sectors. A separate group of industries includes flour and cereals and mixed feed industry.

Flavoring sector unites a group of specialized sub sectors to produce food from mostly vegetable raw materials. They are sugar, oil and fat, bakery, wine, distillation, alcoholic beverages, beer and non alcoholic beverages, confectionery, macaroni, horticultural, yeast, starch and molasses, salt, fragrance and cosmetics, tobacco, tea, food concentrate sub sectors and some others.

In 2009 food, beverages and tobacco products (in sales prices without VAT and excise tax) were sold to the amount of 124.8 billion UAH, representing 18.7 percent of the total volume of industrial products sold in Ukraine against 14.2 percent in 2008.
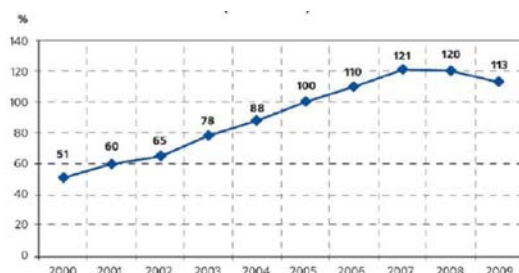
Fig. 1. Dynamics of production indices in processing industry (1990 = 100%)

The industry ranks one of the leading places among budget forming sources. In 2009, all level budgets received around 21.5 bln. UAH of taxes and compulsory payments from the national food enterprises, this being by 7.4 billion UAH (or by 52.5 percent) more if compared with 2008.

billion UAH
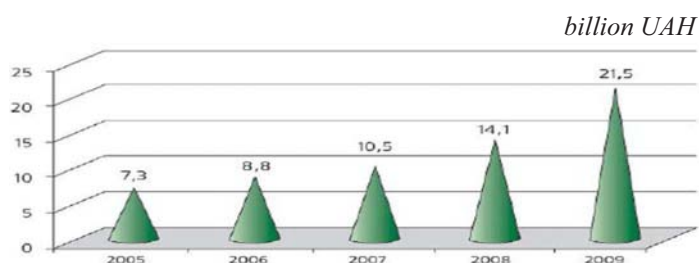
Fig 2. Revenues to all level budgets from processing industry enterprises in 2005-2009 [7]

Processing industry is engaged in creation and introduction of innovative power and resource saving technologies to produce, preserve and transport food products.

Dairy Industry. In 2009, manufacturing of dairy products decreased by 9.2 percent if compared with the last year respective period. In particular, production of butter has decreased by 12.1 percent, lactic and non-fermentable cheese – by 8.0

percent, processed liquid milk – by 4.3 percent and fat cheese – by 3.4 percent; while rennet cheese manufacturing has increased by 0.7 percent.

Table 1. **Production of major type milk products [5]**

mln. UAH

	January- December		Percentage of 2009 against 2008	
	2008	2009	increased, reduced (−)	%
Liquid processed milk	791,4	757,7	- 33,8	95,7
Sweet butter	83,9	73,7	- 10,2	87,9
Sweet butter and milk fats over 85% fat content	0,78	0,83	0,05	106,2
Spreads and fat mixes	80,9	72,7	- 8,2	89,9
Fresh non-fermented cheese and lactic cheese	92,1	84,7	- 7,4	92,0
Fat cheese	235,3	227,3	- 7,9	96,6
Rennet cheese	196,8	198,1	1,3	100,7
Fermented milk products	530,5	492,1	- 38,4	92,8

Great attention is paid to improving the efficiency of milk production through the development of dairy breeding herd and industrial production of ecologically clean milk. For example, "Ukrainian Dairy Company" Ltd. of Zhurivsky rayon Kyiv oblast is implementing such a project with in Kyiv, Chernihiv, Zhytomyr and Ternopil regions in the years 2009-2011. The scope of financing exceeds 1.1 billion UAH. The project objective is to ensure competitive production of quality dairy products through the establishment and operation of a powerful network of industrial type farms milk for 18 thousand heads. In 2009 production facilities for 4000 dairy cows have been already put into operation in Kyiv region.

Meat Processing Industry. In 2009, a 12.2% decrease in production of meat industry was observed if compared with the last year. However, production of poultry meat and by- products increased: fresh or chilled – by 14.0% and frozen – by 6.2%.

Table 2. **Production of meat and meat products in 2009**

mln. UAH

	January- December		2009 against 2008	
	2008	2009	increased, reduced (—)	%
Beef and veel, thous. t				
fresh (slaughter warm) or chilled	111,9	79,5	- 32,5	71,0
frozen	37,2	25,5	- 11,8	68,4
Pork, thous. t				
fresh (slaughter warm) or chilled	125,6	97,5	- 28,1	77,6
frozen	13,8	5,1	- 8,8	36,7
Meat and edible by-pass of poultry, thous. t				
fresh (slaughter warm) or chilled	555,2	633,2	78,0	114,0
frozen	75,2	79,8	4,7	106,2
Sausage products, thous. t	322,3	260,0	- 62,3	80,7
Meat convenience products (including from poultry), thous. t	90,3	64,0	- 26,2	70,9

On the contrary, production of the meat industry other products was less than in the same period of 2008. In particular, production of fresh and chilled beef has reduced by 29.0 percent, fresh and chilled pork – by 22.4 percent and sausages – by 19.3 percent.

Ukraine makes efforts to improve safety and quality of meat and dairy products. In particular, draft technical regulations on manufacturing requirements for milk and milk products, meat, meat products and meat-containing products, poultry and poultry products have been prepared and sent for approval to the concerned ministries and departments.

Minimal quality specifications for major products of animal origin have been approved. They establish minimal quality requirements to indices for major species/types and groups of products (meat, meat-containing, dairy, milk-containing, eggs and their products as well as products of animal origin for infant food) manufactured, imported and are in circulation in Ukraine. Business entities in the areas of production, processing, storage, transportation and sale of animal origin products must introduce the food into circulation only subject to their observing their requirements.

Table 3. **Vegetable oil production, (net of oil mills) [9]**

thousand tons

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total oil production	894,5	864,2	928,3	1279,3	1320,0	1350,6	2011,1	2167,6	1914,3	2763,1
Including Sunflower oil	880,3	834,0	903,9	1261,5	1288,9	1299,0	1976,7	2121,2	1813,0	2718,0
Margarine	161,6	198,3	201,2	254,0	277,6	297,6	300,1	295,7	315,4	350,3

Oil and Fat Industry. Oil and fat industry is one of the basic sectors of Ukraine processing industry. Its products meet the requirements in vegetable oil, margarine, cooking butter, mayonnaise, soap not only of consumer market but also of the other industries, such as bakery, confectionery, milk, fruit and vegetable, fish, chemical, pharmaceutical, fodder and catering. In 2009 specialized oil and fat enterprises of Ukraine (net of oil mills) processed estimated 6.6 mln. t of oil seeds.

As of January 01, 2010 productive capacity of oil extracting enterprises in Ukraine constitutes 8.7 million tons per year and have a tendency to further growing.

Vegetable oil production volumes completely meet the internal market requirements and enable products delivery to foreign markets. During 2009 2,333.8 thousand tons of sunflower oil was exported to 64 countries worldwide. Ukraine leads the world in sunflower oil sales at the world market.

Sugar Industry. Sugar industry is mainly oriented to meet the internal market demand. Per estimation of the Ministry of Economy of Ukraine, the demand of domestic sugar market for 2009/2010 marketing year constitutes 1,840 tons.

In 2009 the area of sugar beet harvesting amounted to 320 thousand hectares against 377 thousand hectares in 2008. 56 sugar-refineries accepted sugar beet and processed 9.21 million tons of sugar raw material.

Sugar output from the start of production in 2009 was 13.74 per cent against 12.84 per cent in 2008. In 2009 1,272 thousand tons of white crystal beet-root sugar was manufactured.

thousand tons
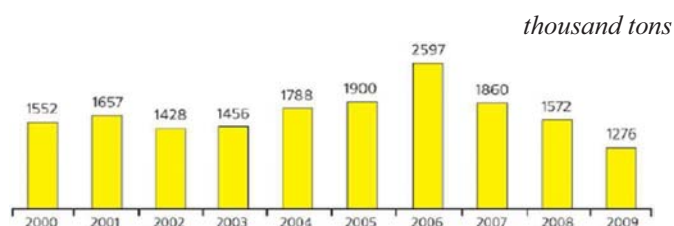
Fig 3. Dynamics of sugar gross output [10]

Distilling Industry. "Ukrspirt" group of companies comprises of 75 state distilling plants having capacity of 62.6 mln. deciliters of ethyl alcohol per year. In 2009 11 enterprises did not produce alcohol.

Within 2009 marketable output of the sector was 1.77 billion UAH, thus increasing by 1.7 per cent, if compared with 2008.

mln. UAH
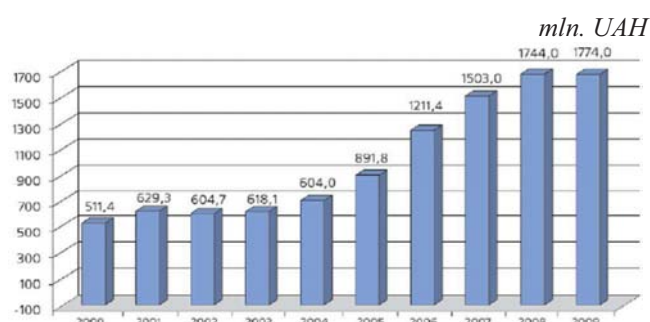
Fig 4. Marketable output at "Ukrspirt" group of companies (in effective prices) in 2000-2009 [12]

In 2009 27.5 million deciliters of ethyl alcohol was sold, including 22.6 million decilitres at the domestic market, this being a 5 percent increase against 2008.

In 2009 "Ukrspirt" enterprises exported 4.9 million decilitres of alcohol, this being by 8% less than in 2008. The largest importers of Ukrainian alcohol in 2009 were Poland, Turkmenistan, Azerbaijan, Hungary and Turkey.

Confectionery Industry. Confectionery industry in Ukraine is concentrated in 28 specialized enterprises, their production ratio being approximately 60 percent of the

total output, plus around 800 small and medium enterprises of the local processing industry.

Table 4. **Confectionery output in Ukraine [11]**

thousand tons

Years	2002	2003	2004	2005	2006	2007	2008	2009
Confectionery	756,5	843,6	939,8	998,7	1011,2	1084,4	1115,6	1068,3

Confectionery output in 2009 was 1.07 million tons, including 378.8 thousand tons for export (35.1 per cent). The output is exported to 48 countries and constitutes 378.8 thousand tons for the amount of 715.4 million USD in 2009. The greatest share of products is exported to Russian Federation & 146.1 thousand tons (38.6%) for the amount of 336.3 mln. USD (47.0%), and also to Kazakhstan (15.9%), Azerbaijan (7.7%), Kyrgyzstan (4.2%), Georgia (5.4%), Moldova (4.9%), Turkmenistan (4.3%), Mongolia (3.2%). Blistering production pace of confectionery is secured owing to plant renewal and substantial investment into enterprise development (over 200 mln. UAH annually). Among the regions of Ukraine the following are the leaders in confectionery production: Donetsk (19.6%), Kyiv and Kyiv oblast (10.8%), and the following regions: Poltava (9.9%), Vinnytsya (7.9%), Dnipropetrovsk (6.1%), Kharkiv (5.9%).

Brewing and Non-Alcoholic Beverages. Due to financial crisis, the industry suffered decline in production first within the last 10 years In 2009, beer production was 300.3 million decilitres and decreased by 6.2% against 2008.
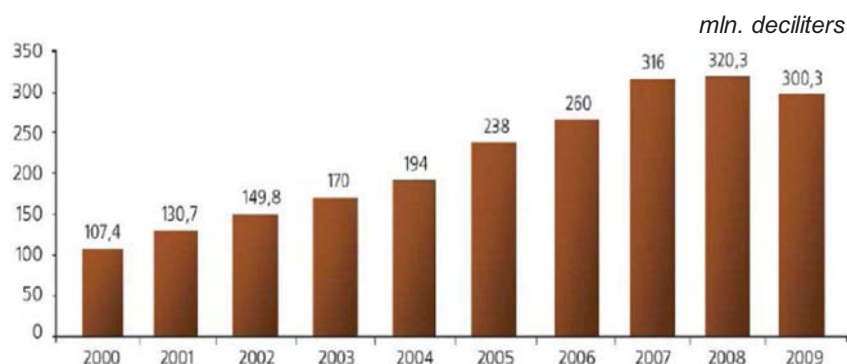
Fig. 5. Overall brewing in 2000-2009 [13, 14]

The number of countries - Ukrainian beer consumer has increased from 31 to 42, in 2009 34 million decilitres of beer was exported to these countries, which is a 3,2% decrease against 2008.

Brewing sector is completely supplied with the national malt.
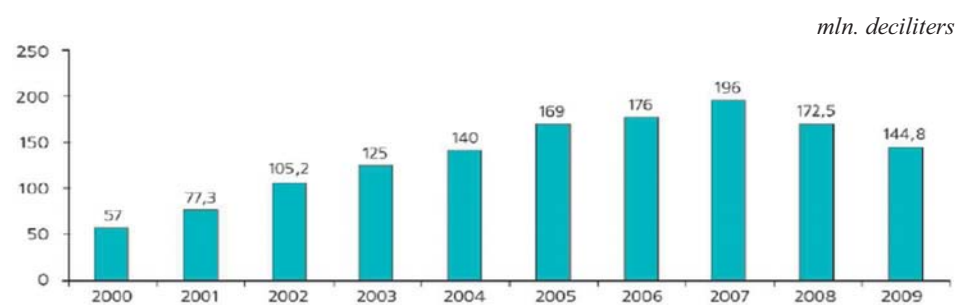
mln. deciliters

Fig. 6. Overall production of nonalcoholic drinks in 2000-2009 [15, 16]

Manufacture of soft drinks decreased by 16% and reached 144.8 million deciliters.
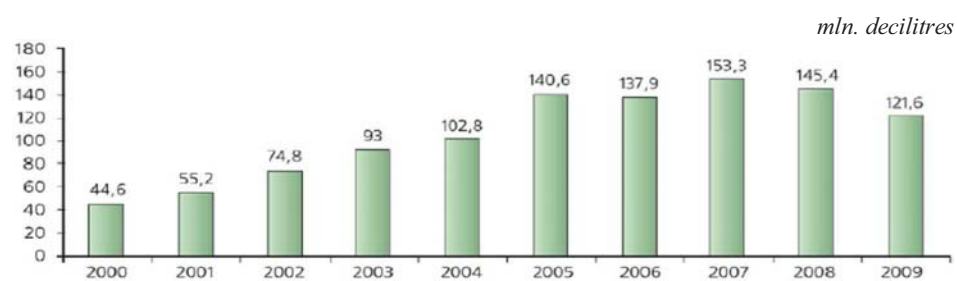
mln. decilitres

Fig. 7. Overall production of mineral water in 2000-2008 [17, 18]

121.6 million decilitres of mineral water was produced (a 16.4 per cent reduction).

Salt Making Industry. The basis for salt making industry is a state enterprise of "Artemsil" corporation (Donetsk region) that produces rock salt by deep mining.

mln. t
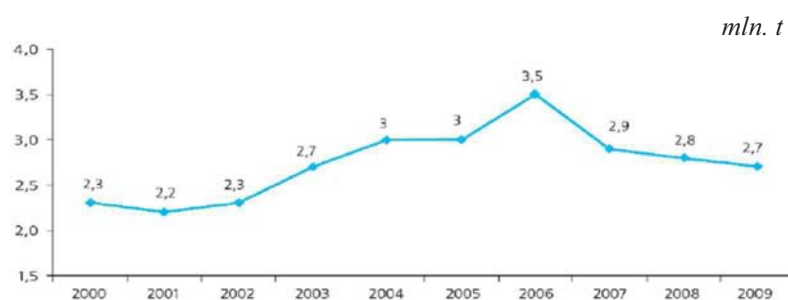
Fig. 8. Salt Mining in 2000-2009 [19, 20]

Cooking salt is used by citizens as essential product and also in technological processes of almost all industries - agrarian and food, mining and metallurgical, power and other critical areas.

Mine tunnels are used to locate underground allergic clinics to cure bronchial asthma patients.

Products of salt mining companies are known to numerous consumers at the international market and are exported to more than 20 countries worldwide.

CONCLUSIONS

WTO accession is of strategic importance to Ukraine due to further gradual integration into European and world processes and entities and systemic reformation of the national economy in line with liberalization principles and market openness. The above said, in its turn, makes actual a set of contemporary systemic problems, among which is the need in efficient restructuring of agribusiness, establishing productive mechanisms to protect the interests of domestic producers, increase quality standards of products. Having accede the WTO, Ukraine gained access to the world markets. However, to gain a foothold in foreign markets the efforts should be made to increase quality and safety of the nationally manufactured agricultural products.

Ukraine establishes active cooperation in agricultural area with the Central European Initiative, the Black Sea Economic Cooperation (BSEC) Organization, the International Epizootic Bureau, the International Plant Protection Convention and the others.

The FAO membership makes possible for Ukraine to get the FAO technical assistance; take part in the development of international standards and join the international quality and safety standards of agricultural and food products; accede the FAO informational network; together with FAO commence pre-investment study of the respective agri-industrial sectors; introduce monitoring systems; utilize FAO capacities to attract financing from the leading inter& national organizations to implement priority sectoral projects, etc.

During the last years Ukraine is steadily augmenting its export processing industry potential and expands its foreign market representation.

However, financial crisis made negative effect on international trade indices. Foreign trade turnover of agricultural products has reduced by 17,2 per cent in 2009 against 2008, export volumes – by 13.5 per cent, import – by 23.5 per cent. While the export share in the total volume of Ukraine foreign economic turnover has grown on the whole from 16 to 23.6 percent.

Grain and oil and fat products prevail in the export structure. Confectionery, beer and soft drink, distilled and salt production industries are competitive in the international market.

All of it proves that Ukraine is a powerful and strong agricultural state with great potential and opportunities for partnership and implementation of business ideas.

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ПОТЕНЦИАЛ ПЕРЕРАБАТЫВАЮЩЕЙ ПРОМЫШЛЕННОСТИ СЕЛЬСКОХОЗЯЙСТВЕННОГО СЕКТОРА УКРАИНЫ И ЕГО ОЦЕНКА

Владимир Тищенко

Аннотация. В статье рассмотрено состояние перерабатывающей промышленности сельскохозяйственного сектора Украины. Оценен потенциал этого сектора экономики.

Ключевые слова: перерабатывающая промышленность, пивобезалкогольная промышленность, соледобывающая промышленность, сельскохозяйственный сектор, потенциал, анализ.

ORGANIZATIONAL BASES OF FORMING
FOREIGN ECONOMIC RELATIONS OF A REGION

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Summary. The organizational aspects of forming regional foreign economic strategy have been described. The conceptual vehicle and methodological tools for forming foreign economic relations at the level of a region have been proposed.

Key words: foreign economic relations, region, strategy, potential, organizational bases.

INTRODUCTION

The employment of foreign economic factor is an effective tool for the realization of regional socio-economic interests, being in modern conditions one of major aims of regional economy functioning. The possible degree of region participation in the system of international division of labor represents the natural potential of growth.

ANALYSIS OF PUBLICATIONS

Different aspects of forming and developing foreign economic relations have been embodied in researches of such scholars as E.Avdokushin, I.Balabanov, A.Balabanov, S.Bludova, A.Bulatov, L.Vardomskiy, G.Vasilyev, O.Voronkova, A.Granberg, M.Dolishniy, V.Yevteev, L.Zhigalova, V.Gukov, B.Kliyanenko, E.Kochetov, N.Larionova, V.Lomakin, O.Lyaskovets, Y.Makogon, E.Prokushev, E.Puzakova, E.Rubinskaya, K.Semenov, I.Faminskiy, G.Shestopalov. However, at the regional level the process of forming foreign economic relations is not studied enough, with a number of actual questions left unsolved. One of basic problems is the theoretical-methodological aspect in the system of forming and developing foreign economic relations of Ukraine's regions. Thereupon, the main goal of this work is the development of theoretical, methodological and methodical statements, and also scientific and practical recommendations concerning the process of forming and developing foreign economic relations at the level of a region.

OBJECTS AND PROBLEMS

The importance of determining specificity and priorities in forming regional economy, based on comparative advantages of a certain region and its historical and cultural features, is caused by an objective necessity for a more complete realization of foreign economic relations regional advantages. Creating an effective structure of foreign economic relations can provide regional economic systems stabilization and also create bases for their further development [18]. The methodological vehicle of forming foreign economic relations at the level of a region is called to sanction creating favorable terms for their effective development. The foreign economic sphere of a region includes such categories as foreign economic complex, export potential, foreign economic conception, foreign economic strategy, mechanism of foreign economic relations.

The scheme of forming foreign economic relations of a region should include a number of certain blocks (fig. 1). The first block is represented by the modern paradigm of forming foreign economic relations of Ukraine taking into account the regional factor on the basis of features and specificity of regional reproduction and foreign economic complex and potential of region that are formed on its basis. The second block consists of regional foreign economic relations conception, called to determine structural principles of realizing foreign economic activity of different kinds and forms, to represent the sequence of solving the problem of including region in global economic relations, raising strategic aims and tasks of regional foreign economic relations development in a long-term prospect. The third block includes defining strategic directions of development of foreign economic relations of region. The realization of the given block can be regarded as a result of balance of interests in foreign economic sphere belonging to different subjects with placing priorities on the basis of estimation of meaningfulness, mutual support and competitiveness of the goals. The fourth block stipulates the design of Program for development of regional foreign economic activity with the selection of target guidelines that determine the tasks of providing optimum foreign economic relations of a region, priority industries of foreign economic activity development and ground the economic priorities. The program of foreign economic activity development is determined in time by both long-term and short-term, current periods including its implementation phases. The fifth block is related to implementation of transformational function - from conception of regional foreign economic relations to the sphere of practical actions, i.e. implementing the Program of regional foreign economic activity development.

The modern paradigm of foreign economic relations must be based on a new theoretical foundation. Foremost, the comprehension of basic concepts and categories of the new paradigm from positions of forming foreign economic activity at the regional level is required. The modern paradigm of forming foreign economic relations of a region must reflect a new conceptual vision of a country's foreign economic relations. Taking into account that in terms of location foreign economic complex of Ukraine is represented by practically all regions, the modern paradigm of forming foreign economic relations has to take into consideration the priorities of developing foreign economic complex of every specific region and solve the tasks aimed at the increase of its utilization efficiency. Thus, in spite of existence of regional distinctions in contents of foreign economic relations efficiency increase tasks, effective primary purposes from point of region's inclusion in globalization processes can be formulated as general ones.
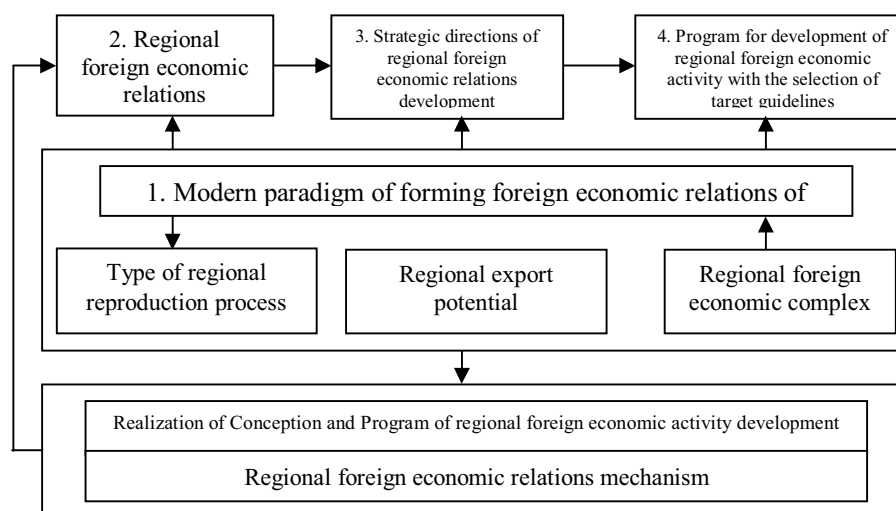
Fig. 1. Scheme of forming regional foreign economic relations methodology

The foreign economic complex of a region, being an organic part of regional economy, is the material basis for developing foreign economic relations. The regional foreign economic complex consists of enterprises of different industries and subindustries of regional economy that carry out foreign economic relations in different kinds and forms, state and regional authorities that co-ordinate and control the realization of foreign economic activity. The regional authorities working in the direct contact with enterprises that participate in foreign economic activity, with represented in the region administrative structures of all collateral subordination hieratic levels, with subdivisions of the infrastructural provision of regional foreign economic activity represent the central link in the regional foreign economic complex management [9]. The basis of foreign economic complex of region is composed by:

1. Firms, enterprises which activity is aimed at the production of export goods and services and ones that use imported goods;

2. Firms, enterprises that deliver commodities to foreign users and ones that receive commodities produced abroad.

The modern stage of regional foreign economic complex development consists in establishing direct, steady and long-term connection between manufacturing and foreign economic types of activity and transforming the complex in a dynamic and balanced manufacturing-commercial system. Commercialization of production is oriented at the intensification and activation of region's participation in global economic relations, at forming an open to the world economy type of regional economy. The results of manufacturing and commercial activity of regional enterprises are intended both for oversea markets and for domestic consumption. Thus, the formation of foreign economic complex is determined, on one side, by integrity of the regional economic system, and on the other – by the specificity of cooperation between the region and the world market.

The basic task of regional foreign economic complex functioning consists in defining the maximal realization of present foreign economic potential in behalf of own steady and balanced socio-economic development. By-turn, successful development of industries and subindustries included in the foreign economic complex of region renders influence on perfection the state economy on the whole [13, 17]. Thereupon, the foreign economic complex acts as the basis of stability, carrying the considerable social assignment and being a considerable part of social shock absorber in society [10].

In the existent theory and methodology of forming foreign economic relations, the major role must belong to the analysis of export potential, examined as an initial base for estimating possibilities of perspective regional foreign economic development [4, 7]. The questions of forming export potential of a region become one of the most actual directions of research of development of regional foreign economic relations in modern terms.

Export potential of a region includes the aggregate of reproduction factors able to provide the possibility for effective movement of region's enterprises to the oversea market: competitive products; modern highly technological equipment; highly skilled labor force and specialists in foreign economic activity; high level of raw material and stuff deliveries; advantageous location in respect to the efficiency of foreign economic relations development [6]. The reproduction factors mean the regional availability of necessary and sufficient resources (natural, labor, financial, technological, informative ones) able to take part in producing and reproducing of material goods and providing services at a certain level of developing the productive forces of the given territory and possessing interstate mobility.

Export potential of a region is determined by the share of competitive products in the pattern of regional economy production and also by the possibilities of different regional resources utilization in the structure of world cooperative relations. The given problem at the modern stage of development of Ukraine reflects not only the resource provision of national economy but also takes into account the capacity of the system for development on basis of present scientific, technical and technological potential. It improves the structure of foreign economic activity taking into account its priority kinds, industries of economy, possibility of competitive goods production [12]. Thus, export potential determines the possible degree of a region's participation in the system of international division of labor and is determined by possibilities of technological, labor, intellectual, natural and other regional resources utilization in the structure of world cooperative relations. For its effective realization the creation of optimum terms that implies creation of foreign economic relations infrastructure, favorable legal environment, guarantee against different risks, legal help to the managing subjects with the aim of price losses minimization and decline of possibilities for the defamation of partner relations is required. In this respect, the export potential is the basis of regional foreign economic complex functioning. It supposes region's ability to produce and export the necessary amount of competitive commodities for the oversea market.

Export potential of a region thus depends on its competitive advantages, capabilities to quickly adapt to foreign influences, situation changes on national and global markets. On the essence, as it applies to the foreign economic sphere, the adaptation means rational distribution of foreign economic activity in space. Regional development in a great deal is determined by the ability of regions to innovations and

production of specialization industries goods for sale on national and global markets. Inequality of regions becomes the problem of different dynamic competitiveness degrees that reflect different potential possibilities of regions to reform in accordance with new terms [1].

Strengthening and diversification of export potential are the preconditions of the effective use of region's present potencies in the foreign economic sphere [11, 20]. Developing export potential promotes creating long-term stimuli for modernization and increase of national economy competitiveness. In its turn, it requires mobilization of both own resources and use of foreign economic activity possibilities, especially attracting considerable foreign investments, modern technologies, creation of healthy market environment and necessary infrastructure. Thus, in the modern economic situation, saving and expanding the export complex of a region is regarded as a major strategic direction of regional industrial policy reformation.

Export activity of a region is directed at the simultaneous realization of several fundamental functions – functions of development (integrative function), function of stabilization of the regional economic system and function of economic efficiency, i.e. region receiving full income and in accordance with the specific tasks of regional economy development. Taking into account that functioning of socio-economic complex of most regions of Ukraine to a great extent is provided by export activity of the enterprises located in their borders, one of the major functions in forming regional export complex is the stabilization function. The importance of the given function is especially obvious in the period of crucial economic changes. The growth of macroeconomic efficiency of the export activity related to the increase of number of enterprises participating in the release of eventual export products is the condition of stabilization function activation of regional export complex. As well as any other economic activity, export activity must be economically effective. So the economic effect must be present both in the process of goods production and in the process of its realization at the foreign market.

As a result of regional export potential estimation and comparison with the situation on the global market on the account of its tendencies, the priority, most perspective directions of foreign economic activity development are determined. In the given context there emerges the necessity for development of regional mechanism of forming export potential of region promoting the competition positioning of region in the structure of global economic relations adequate to a new paradigm. The mechanism of forming export potential includes various constituents directing a region as a subject of competitive activity at actions on withholding of present market positions and gaining new ones. In the most general form the mechanism of forming regional export potential can be described as an aggregate of several basic elements that form the associate system in which they are closely intertwined and actively cooperate. The major ones are as follows:

- organizational forms of regional enterprises, allowing them to be actively integrated in the global economy;
- foreign economic relations of a region, their structure and principles of development;
- legal forms and methods of adjusting foreign economic activity of region; the mode of foreign investments;
- international marketing as an integrating function of management by exporting and joint enterprises;

- planning as an important link in the process of forming export potential: system of activity planning indexes and estimation of exporting and joint enterprises efficiency;
- financial-economic support of regional export;
- forms of participation of trade-unions in the operations management as the most bright display of democratic transformations in the region;
- forming a new style of consumers behavior;
- forming a positive image of region [16].

The development of any region of Ukraine can be represented as a process of complex multilevel organization change in time [5, 14, 15]. Therefore it is now impossible to imagine regional progressive development without an intelligent and adapted to the regional terms strategy. Effective realization of regional comparative advantages, its adaptation to the changing domestic and foreign conditions, formation of competition structures or new comparative advantages on their basis can be attained only by the correctly chosen foreign economic strategy of development, foreseeing the rational use of export potential and including the specific program for realization of the given strategy.

Forming foreign economic strategy must originate from the primary purposes marked by priorities for the foreign economic policy of Ukraine, namely:

- provision of balanced economy and domestic market equilibrium;
- stimulation of progressive structural economy changes, including foreign economic relations of the foreign economic subjects of Ukraine;
- creation of the most favorable terms for the inclusion of Ukraine's economy into the system of world division of labor and its approaching to the market structures of foreign countries;
- creation of the best terms of access to the world market for domestic commodities, services and labor force;
- protection of the domestic market of commodities, services and labor force;
- provision of access to the international resources that have strategic value for economic development - capitals and technologies, goods and services absent or limited in our country;
- increase of state support efficiency for export of products with the high added value.

Regional foreign economic strategy must correlate with state foreign economic strategy, i.e. provide combination of national, regional and corporate socio-economic interests that is called to promote the national economy growth [19, 2, 3]. Defining the assortment and volumes of specific commodity groups export and import must be taken into account, foremost, production importance, its significance from point of regional development, instead of long-term commercial benefit of specific exporter or importer. It is expedient to limit the import of commodities, necessity in which is fully satisfied with domestic producers. In addition, it is necessary to export those commodities which the domestic market is saturated with. It is necessary to get back to once existent mechanism of quality control of the imported commodities with the target of domestic market protection from harmful and ecologically dangerous goods.

Forming foreign economic strategy of a region takes place by adaptation and synchronization of domestic economic processes with a geoeconomic situation, by the tendencies of its development taking into account the current state of affairs, middle-term and long-term prospect. Foreign economic strategy of a region will be realized through the system of national economic and organizational-administrative attributes providing cooperation of economy with global economic sphere for the solution of national strategic tasks [8], i.e. through the model of foreign economic relations.

CONCLUSIONS

Realization of foreign economic strategy of a region provides for:

1. Development of the integral program of actions, able to tie up own and attracted from abroad resources in a single economic innovative mechanism.

2. Creation of the single system of government control and stimulation of domestic and foreign economic activity on the basis of integral infrastructure in a region.

3. System of priorities:
   a) for bringing in perspective experimental-design developments and starting production of domestic innovations;
   b) for stimulating export of perspective new products with the high degree of treatment to the world market;
   c) for stimulating foreign investments in mastering, producing inside the country and exporting new technics, technologies, commercialization of scientific know-hows;
   d) for stimulating enterprise capital export accompanying domestic know-hows;
   e) for stimulating the production of import-substituting goods.

4. Creation of legislative-legal base corresponding to special purpose options and world practice, tying it up with basic principles of foreign economic activity.

One of the main tasks of foreign economic relations strategy forming is made by the choice of optimum direction of regional foreign economic relations development, determined by necessary positions, laws and actions promoting to the goal achievement. Strategy must reflect long-term character and availability of legislative and executive power in the process of conception realization.

The specification of conceptual vehicle and development of methodological tool for forming foreign economic relations at the level of a region, definition of organizational bases for process of forming regional foreign economic relations compose the scientific novelty of the given work.

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ОРГАНИЗАЦИОННЫЕ ОСНОВЫ ФОРМИРОВАНИЯ ВНЕШНЕЭКОНОМИЧЕСКИХ СВЯЗЕЙ РЕГИОНА

Виктория Третьяк, Максим Курилов

Аннотация. Описаны организационные аспекты стратегии формирования внешнеэкономических связей региона. Предложены понятийный аппарат и методологические инструменты формирования внешнеэкономических связей на уровне региона.

Ключевые слова: внешнеэкономические связи, регион, стратегия, потенциал, организационные основы.

TO THE PROBLEM OF DYNAMIC FORECASTING OF CATASTROPHES IN "TIME-PLACE" COORDINATES

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Summary. The article suggested the use of stochastic dynamic regression models to predict the random processes in the coordinates of the "time-space." The description of the models on the numerical example shown their advantages over traditional methods of prediction of random processes.

Key words. Forecasting, stochastic processes, regression equation, lag, cross correlation function.

INTRODUCTION

Analysis of the catastrophic consequences of natural disasters in recent years suggests that at present there are no reliable methods of their forecasting.

ANALYSIS OF PUBLICATIONS, MATERIALS, METHODS

Decision referred to the problem taken towards the establishment of a broad coherent system of sensors and observatories with the relevant states of observers and analysts. There are many approaches to solving this problem [Werbos P., 1974], [Kolmogorov A.N., 1963], [Xueyan J., 1990], [Dillman R., 1983], [Keith E., 1984], [Kruleshov, 1986], [Kumpati, 1990], [Porter B., 1988], [Werbos, 1974], [Chen Y.L., Chin Y.H., 1990], [Chu Y.J., Liu T.H., 1995], [Booch G.: 1994], [Rumbaugh J., Jacobson I, Booch G.: 1991], [Selic B., Gullekson G., Ward P. T.: 1994] but most of them do not works in big and complex systems. In parallel, developing mathematical tools to analyze the data collected. Create a powerful unit, aimed at reducing damage in the event of disaster.

OBJECTS AND PROBLEM

In this paper, we propose to use stochastic dynamic regression models to forecast the catastrophes in the coordinates, time-of-place. "

STATEMENT OF BASIC MATERIAL

Let's consider the abstract region (fig. 1)
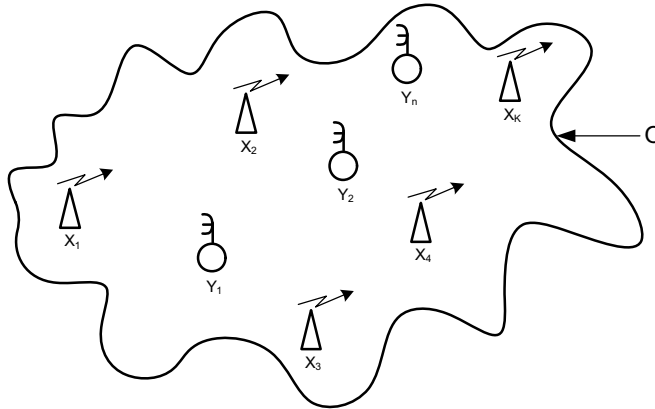
Fig. 1. Layout of observation stations

- station in a communication system; - observatory in the communication and

notification; - the observed region (object)

Observatories are located in major centers and stations cover the entire region. Formalized fig. 1 has the form (fig.2)
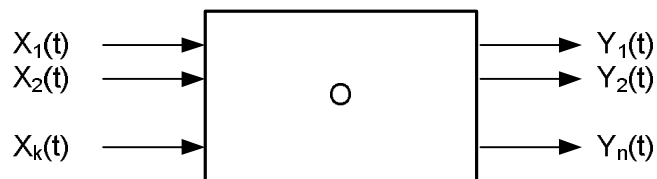
Fig. 2. The formalized representation of the monitoring system

Where $x_1(t), x_2(t), ..., x_k(t)$ - random processes of observation sensors (eg, seismogram);

$y_1(t), y_1(t),..., y_n(t)$ - packages of random processes of observation points in the observatory.

O – object of observation (eg, the Earth and its crust).

Continuous observation of random processes $x_1(t),...,x_k(t)$, represented in digital form (using Theorem Nyquist-Kotelnikov) below shall be interpreted as:

1) The flow of "wave packets", derived from the superposition of waves with continuously varying frequency;

2) "Wave packets" moving in the space of trajectories and velocities to be determined by the internal structure of a stationary object of observation.

Catastrophe, we assume a case where a combination of smooth small changes of input factors leads to a sharp significant changes in output parameters.

Considered below the model offers to abandon conventional attempts to simulate complex structures of the stationary object, defining the trajectory of waves and their speed and move to a model of object identification as a "black box" (fig. 3).
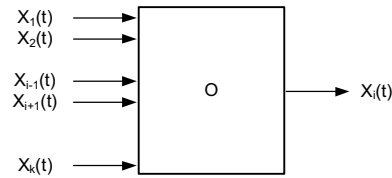
Fig. 3. Submission of the monitoring system as a "black box"

Here $x_1(t), x_2(t), ... x_{i-1}(t), x_{i+1}(t),..., x_k(t)$ - the random stationary flows of the existing network of observation stations, united by a common communication system.

$x_i(t)$ - - The chosen station i, for which an attempt of synthesis of "output" random observations of steady flow as a superposition of an ensemble of observations of "wave packets" at the entrance of the object O.

$$x_i(t) = H(t)\{x_1(t), x_2(t),...,x_{i-1}(t), x_{i+1}(t),...,x_k(t)\} \tag{1}$$

Here H (t) - a multi-dimensional linear operator

Trying to identify an object O (fFig. 3) based on the well-known multivariate regression model as a static (no inertia), the object led to the models, inadequate reality. These models were inadequate soundly rejected and research in this direction are collapsed [Pugachev 2002].

Below is a model that is based on the idea of a multidimensional dynamic regression model [Box, Jenkins, 1974], [Fredman M.L, Tarjan R.E., 1987], [Banks J., Carson J.S., Nelson B.L., 2001].

It incorporated the following assumptions:

1) object O (fig. 3) is inertial and stationary;

2) There are stationary causal relationship between flows of events $x_i(t)$ and $x_1(t)$; $x_i(t)$ and $x_2(t)$, ... $x_i(t)$ and $x_k(t)$;

3) consequence is always "late" to the cause, ie, there are always lags (delays) between $x_i(t)$ and $x_1(t)$; $x_i(t)$ and $x_2(t)$, ... $x_i(t)$ and $x_k(t)$;

4) lags are defined as the abscissas:

$$\tau_1, \arg : \sup \left| extr\, R_{x_i(t), x_1(t)}(\tau) \right|$$

$$\tau_2, \arg : \sup \left| extr\, R_{x_i(t), x_2(t)}(\tau) \right|$$

$$...$$

$$\tau_k, \arg : \sup \left| extr\, R_{x_i(t), x_k(t)}(\tau) \right|$$

(2)

Here: lags $\tau_1, \tau_2, ..., \tau_k$ are found in the delay area in the corresponding normalized cross-correlation functions $R_{x_i(t), x_1(t)}(\tau)$, $R_{x_i(t), x_2(t)}(\tau)$, ..., $R_{x_i(t), x_k(t)}(\tau)$ (fig. 4).
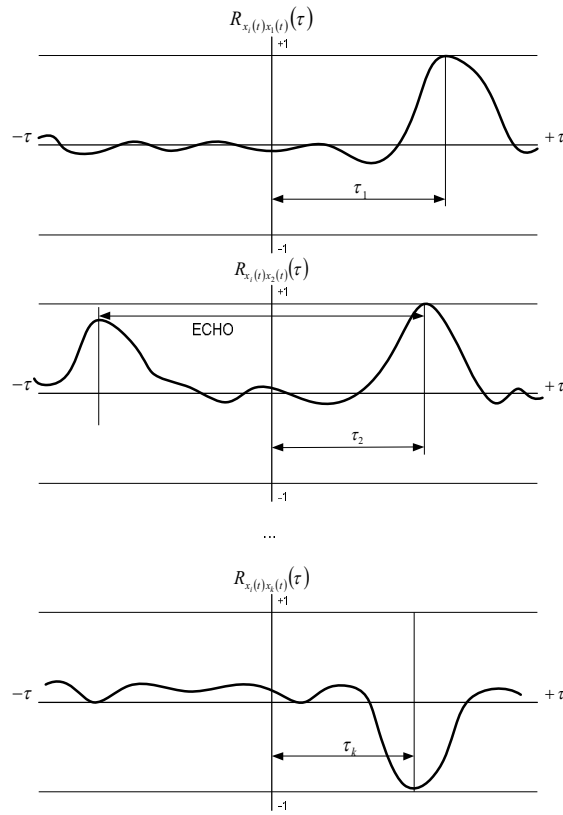
Fig. 4. Lags definition

Given the above considerations, the observed characteristics of the "wave packet" (eg, seismogram) in paragraph i of geodetic coordinates GPS, at the time of observation

t is equal to UT is most likely a superposition of the ensemble of characteristics of "wave packets" $x_1(t-\tau_1)$, $x_2(t-\tau_2)$, ..., $x_{i-1}(t-\tau_{i-1})$, $x_{i+1}(t-\tau_{i+1})$, ... $x_k(t-\tau_k)$ in corresponding points GPS 1, 2,..., i-1, i+1, ... k, in the time moments UT $t-\tau_1$, $t-\tau_2$, ..., $t-\tau_{i-1}$, $t-\tau_{i+1}$, ... $t-\tau_k$.

Exposing a set of regression analysis of archival data in the monitoring system over a sufficiently long period, we can obtain a dynamic multivariate model, having the form:

$$x_i(t) = a_0 + a_1 x_1(t-\tau_1) + a_2 x_2(t-\tau_2) + ... + a_{i-1} x_{i-1}(t-\tau_{i-1}) + ... + a_k x_k(t-\tau_k). \tag{3}$$

Where $a_0, a_1, a_2, ..., a_k$ - coefficients that determine the "weight" of the influence of the input ensemble packets on the output of a "wave packet" $x_i(t)$.

The coefficients of regression equation (3) are calculated by least squares, with the simplest (linear) case we solve the system of linear equations with k +1 unknowns.

Repeating the manipulations with respect to all points of observation in GPS with i = 1 to k, we obtain "individual" mathematical model of the type (3) for each observation point.

Speed of modern computers is sufficient to carry out such calculations. As a result of operational work can be predicted (within a lag of operational calculations) moments UT emergence of a "catastrophic ensembles" conventionally called us the "parade of planets". Thus, in our opinion, we are close to solving the problem of dynamic prediction of catastrophes in the coordinates of the "time-space."

The authors have developed software that implements the above considerations. The adequacy of the proposed approach was confirmed by calculations based on artificial samples.

For example, we have such files $Y(t)$, $X_1(t)$, $X_2(t)$, $X_3(t)$, ... (fig. 5).

The processing of these files by known methods [Pugachev, 2002], [Braek F. Haugen Th.: 1993], [Kleijnen J., Rubinstein R.Y.: 1996], [Krutchen P.: 1998], allows us to obtain a stochastic regression model (4).

$$Y_{модСТАТ} = 7{,}363953 + 0{,}118868 X_1 - 0{,}17245 X_2 + 0{,}062035 X_3, \tag{4}$$
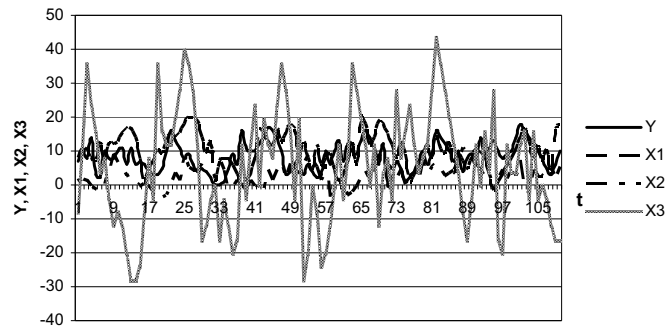
Fig. 5. Initial data

The processing of these files proposed in [Pugachev, 2002] method provides a stochastic dynamic model

$$Y_{модДИН}(t) = 9,315865 - 0,16409X_1(t - \tau_1) - 0,16668X_2(t - \tau_2) + 0,234108X_3(t - \tau_3), \quad (5)$$

where: $\tau_1 = 6$, $\tau_2 = 2$, $\tau_3 = 10$ are obtained as abscises $\sup|R_{YX_i}(\tau)|$ of the normalized correlation functions.

Te results of forecasting Y(t) obtained with (4) и (5) are shown at Fig. 8 a and b corresponding.

a   b
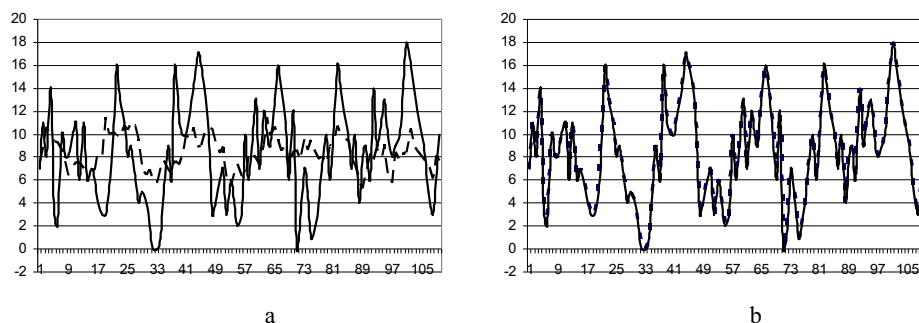
Fig. 6 The results of forecasting using a stochastic regression model (a)
and stochastic dynamic model (b)

Comparison of Y static model (4) and Y (t) the dynamic model (5), Y (t) the real evidence of greater adequacy of the model (4) in comparison with the model (5).

CONCLUSIONS

The paper proposes an approach to build forecasts of stochastic dynamical systems with delayed output relative to inputs. It should be noted that this method can be applied to the analysis of random processes observed not only physical but also economic, social and other systems.

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К ПРОБЛЕМЕ ДИНАМИЧЕСКОГО ПРОГНОЗИРОВАНИЯ КАТАСТРОФ В КООРДИНАТАХ «ВРЕМЯ-МЕСТО»

Антон Велигура, Людвиг Гуц, Татьяна Ляшенко

Аннотация. В работе предложено использование стохастических динамических регрессионных моделей для прогнозирования случайных процессов в координатах «время-место». Приводится описание моделей, на числовом примере показано их преимущество перед традиционными методами прогнозирования случайных процессов.

Ключевые слова: прогнозирование, случайные процессы, уравнение регрессии, лаг, взаимная корреляционная функция.

METHODOLOGY OF RESEARCH OF POTENTIAL CHANGES AT THE ENTERPRISE: THE TRANSFORMATION CONCEPT, EVALUATION AND SYNERGISM

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Summary. The necessity of complex research of changes' management at the enterprise in condition of innovative development is proved. The concept of potential of changes is introduced, the methodology of its research, within which the attention is focused on interpretation of concept of potential of changes, approaches to its evaluation and occurrence of synergic effect is offered.

Key words: management of changes, potential of changes, an indicative estimation, factors, a synergy.

INTRODUCTION

Successful realization of model of economy innovative development broadly depends on ability of the enterprises to initiate and promote the strategic changes focused on innovative development. The experience of the leading countries of the world demonstrates that the change management is one of the vital aspects of management both in general sense of systems' management and in applied sense of management of economy, business and organizations, as far as any system assumes performance and development and thus transformation [3,6,9,10]. . The process of change management is a continuous cycle of enterprise's development providing. Taking of managerial decisions concerning planning and realization of strategic changes is based on possibilities, enterprise resources, i.e. on potential of changes. However despite of many researches of enterprise potential problems, researches of change potential which are focused on innovative enterprise development require advanced elaboration.

The analysis of recent publications in the scientific literature [1,2,5,8,10,13,15,16] specifies the interest of scientists and experts to the newest approaches in change management sphere. However, the complex researches of change management in context of innovative development of the enterprise are still missing. Therefore the modern theory of change management should be entitled to updates on the basis of creation of concept of strategic change management in context of innovative

development. The development of methodology of change potential research should be the one of the fundamental elements of such concept.

OBJECTS AND PROBLEMS

The object of an article is the determination of basics of enterprise change potential research.

As researches conducted by the author shows [21,22,23], the enterprise development could be schematically displayed as a vector of changes $\overrightarrow{AB}$ which describes enterprise transition from a current condition A to the future (desirable) condition B, which is qualitatively upwards of previous. This facilitates occurrence of new possibilities at the enterprise. The steadiness of development and permanence of change are displayed in a direction to $\overrightarrow{AB}$ vector and its borders' absence: the position A of enterprise resulted from changes implemented in passing from the previous position, the position B is not final and provides the further changes along-track to the future more qualitative position and so on.

The choice of enterprise change vector is accompanied by the evaluation of difference between enterprise current condition and its new future condition that is a development implementation. This difference is aligned with essentially new concept of change management – **the potential of changes** which should be considered as a basis to realization of enterprise ability to development, as an embodiment of enterprise development in specific dimension. This gives grounds to investigate it as a key concept component of change management.

In general the concept "potential" is widely used in economy. In general scientific context it connects with ideas of "force" or "durability" more often and thus the term "potential" is traditionally applied to characteristic of means, resources, reserves, sources or possibilities which can be used to resolve certain problem or achieve definite goal of enterprise performance [2]. The enterprise potential in a general view is considered as a set of possibilities in any area pursuing goals, which implementation is provided by relevant resources of the enterprise. So, the enterprise potential, on the one hand, defines a set of resources, means, stores which can be utilized in enterprise economic activities, on the other hand – set of possibilities of its complete and efficient utilization which is defined not only by quality and quantity of enterprise resources but also qualification of its personnel, innovative, information and financial capacities. The enterprise potential is structured by its possibilities in spheres and also presents a complex of industrial-financial, intellectual and labor capabilities. The potential of economic growth and enterprise development are analyzed in paper [14], thus as objective criterion of enterprise development the qualitatively new level of potential and its compounds is considered as well as potential improvement, complication of communications and relations between them, expansion of range of real possibilities to further development. But the author doesn't refer this kind of potential to structural components of enterprise potential and defines it apart as kinetic potential.

Essentially the potential of changes concerning innovative development in a certain manner corresponds with enterprise potential totally, since characterizes possibilities toward change implementation in all fields of enterprise activity i.e. in its

subsystems. So, it can be also considered as stock, means, reserve, possibilities that make transition possible from the previous condition of the enterprise to its new condition through change implementation.

However, definition of changes potential has certain features essentially distinguishing it from other kinds of potential. Conducted research of approaches to enterprise potential evaluation in general and its structural components in particular has shown that under evaluation the enterprise capabilities are considered by researches mainly in static aspect (for potential evaluation specific indicators on certain period of time are used).

Change is the phenomenon which essentially characterizes certain dynamics, movement, development. According to the dynamic approach to a potential estimation, at the bottom of change potential's definition there must be no particular assessment of enterprise capabilities in certain period of time (present or future), but reserves for current condition improvement in the making. That gives grounds to offer following definition of concept of change potential: the potential of change is a set of possibilities required for transition from a current enterprise condition to a new condition in the future in the making, where this transition is assured with availability of enterprise resources utilized for change implementation: material, financial, innovative, information, human, organizational etc. The potential of change is defined as a gap between a current condition of the enterprise and its future desirable condition with the glance to resources available. Such understanding of potential in a context of changes management is crucially new.

Enterprise development, as well as any economic event, is a subject to specific valuation. Commonly growth is aligned with quantitative characteristics of enterprise (growth of sales volumes, productive capacity, market share etc.), and development allows to accumulate potential that support further growth of the company [19]. There are plenty of enterprise potential's quantitative measurement methods suggested in economic literature, among which are analytical, expert, points, rating benchmarks, economic and mathematical modeling, simulation technique, etc. [7]. Their common features lie in use of certain indicators system which structure depends on the goals of evaluation, methods and forms of evaluation, a kind of potential subjected to evaluation. To obtain the quantitative characteristic of changes potential, author has developed a system of indicators which, based on his definition, should characterize both actual and future condition of enterprise [22].

Successfully functioning, viable organization adapts to external environment requirements. Process of adaptation, as one of obligatory stages, includes diagnostics of external environment condition. But considering communications between external and internal environments, which is important in terms of situational approach, awareness of necessity to implement strategic changes and sense of enterprise activities' support in the balanced state equally depend on evaluation of both external environment and current condition of internal environment of enterprise, to which diagnostics is sub-stated.

Significance of diagnostics of enterprise current condition as initial stage of change manage process on one hand, and absence of methodological bases of diagnostics implementation in strategic change aspect in context of innovative development on the other hand, determine the actuality of its in-depth research in the

range of change management concept suggested. Diagnostics of current condition is offered to be implemented through the modes of consistency and logical basis in terms of indicative evaluation using economic indicators - indicators that in complex characterize enterprise economic activities. The indicative evaluation of enterprise current and future conditions underlies the change potential specification.

Constructing economic indicators system [4,12,17] focused on determining potential of strategic changes in terms of innovative development, it is necessary to consider following branch goals which define specifics of performance assessment of heavy-duty production enterprises: retargeting to manufacture of competitive goods for outer markets; assimilation of new progressive technologies; adaptation of information systems for managerial solutions acceptance; adaptation of economic methods of management in transition to market economy; adaptation of innovative samples of machine-building industry in terms of wastes minimization and possibility of its further use to turn out other goods; expansion of machine-building production's nomenclature by means of development and manufacture of all-in-one techniques, capable to compete with foreign analogs; increase in currency supply from machine-building production export by means of scientific and technical progress accomplishments.

Being based on the offered conceptual model of strategic changes character, structure of functional enterprise subsystems in context of strategic changes need, set indicators system, which comprehensively characterizes a current condition of the industrial institution, and principles of economic indicators systems integration for change potential's indicative evaluation, there were 86 indicators provided. The indicators system embraces all spheres of enterprise performance.

The potential of changes as a difference between expected possible and actual values of indicators is one of the factors which define nature of innovative changes at the enterprise [22]. Considering resources necessary for change implementation and scenario of enterprise innovative development, the depth, speed and scope of change is defined and the program of changes is formed. Graphic visualization of conceptual model for strategic changes character looks as follows (fig. 1).
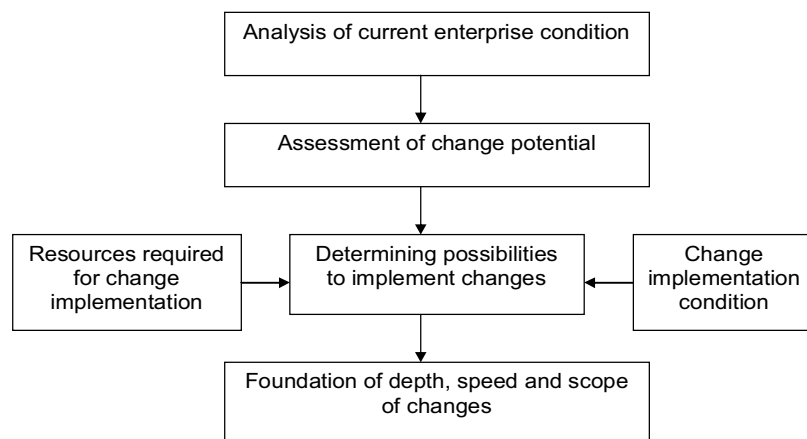
Fig. 1. Conceptual model of strategic changes character at the enterprise

The results of values calculation for separate economic indicators for 10 machine-building enterprises of Lugansk region testify that value of indicators for surveyed enterprises are on the same level. Based on economic indicators calculation, the rating of enterprises as for each indicator is developed. The rating of enterprises concerning each indicator is large enough. But indicators separately determined for every enterprise do not allow constructing the general rating of enterprises and accurately determine their competitive positions towards each other whereas the rating of enterprises each several indicators is considerably differs. Thus simple calculation of indicators and attempt, on its basis, to give a complex idea about enterprise condition, in comparison with competitors, are not correct. Therefore the indicative evaluation of both current enterprise condition and potential of changes, requires considering of indicators only collectively, taking into account connection between them.
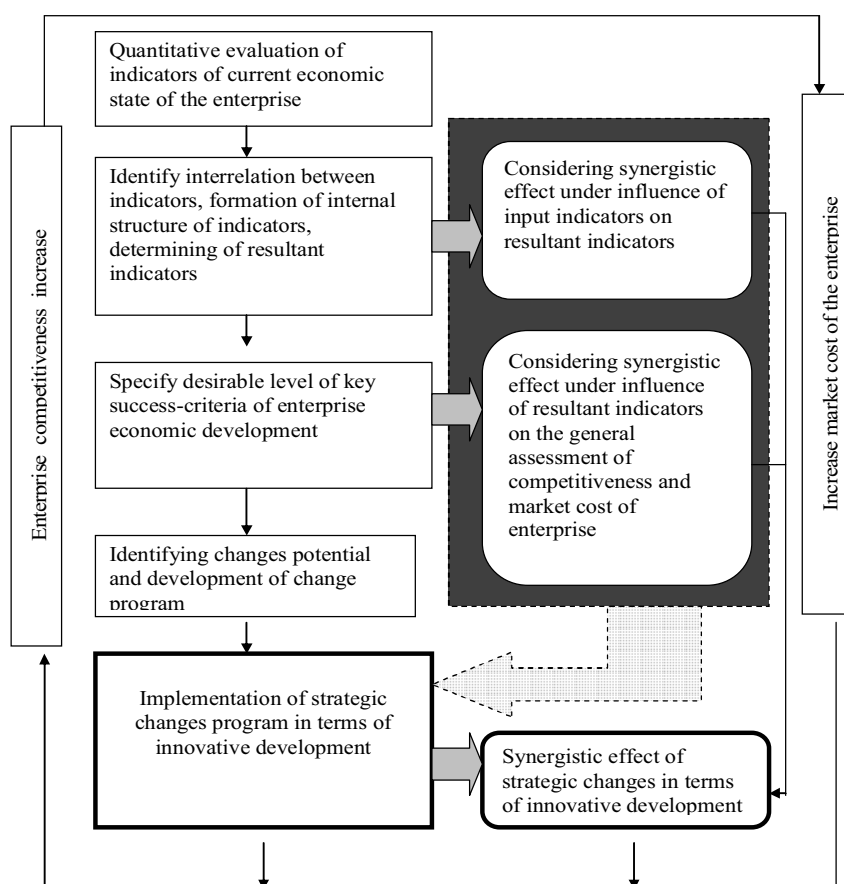
Fig. 2. Synergistic effect development when implementing strategic changes at the enterprise

According to principle of causal relationships between indicators which characterize enterprise as a system, strategic changes in context of innovative development should also have a system character, i.e. initiation of changes in one subsystem will inevitably lead to changes in other subsystems of the enterprise. In this connection it is advisably to assume that complex interaction of industrial enterprise's subsystems in transition will provide additional performance efficiency growth in comparison with common arithmetic sum of benefits from changes in separate subsystems, i.e. at initiation of strategic changes at the enterprise the synergistic effect arises.

In terms of change management synergistic effect appears in such a fact, that the complex of effective innovative changes in all enterprise's subsystems is able to provide improvement of its performance on long-term basis which consists in creation of additional competitive advantages and increasing of cost of the enterprise in relation to changes in separate subsystems. Occurrence of synergistic effect should be prescribed at different stages of changes' program organization; it appears in process of strategic changes implementation in terms of innovative development (fig. 2).

Considering synergistic effect when evaluating potential of changes will allow increasing quality and adequacy of change program development at the enterprise. In process of strategic changes program implementation, in terms of innovative development, synergistic effect will facilitate increasing success - criterion of enterprise development - competitiveness and market cost.

CONCLUSIONS

In area of strategic changes management there is important to engage new approaches which would provide possibility of economic processes' formalization connected with innovative changes implementation at enterprises. Adoption of an indicative evaluation of changes' potential will allow managers of the enterprises monitoring of a current enterprise condition, to define character of strategic changes using particular economic measurements, to generate the complex program of strategic changes with participation of all subsystems of the enterprise. The further researches are required in studying communications between input indicators, output indicators of changes' potential and success – criteria of innovative development using cognitive approach, expert and statistical methods.

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МЕТОДОЛОГИЯ ИССЛЕДОВАНИЯ ПОТЕНЦИАЛА ИЗМЕНЕНИЙ ПРЕДПРИЯТИЯ: ТРАНСФОРМАЦІЯ ПОНЯТИЯ, ОЦЕНКА, СИНЕРГИЗМ

Денис Воронков

Аннотация. Обоснована необходимость комплексного исследования управления изменениями на предприятии в условиях инновационного развития. Введено понятие потенциала изменений, предложена методология его исследования, в которой акцентировано внимание на толковании понятия потенциала изменений, подходов к его оценке и возникновению синергического эффекта.

Ключевые слова: управление изменениями, потенциал изменений, индикативная оценка, факторы, синергия.

INFORMATION TECHNOLOGIES IN PUBLIC ADMINISTRATION PRACTICE

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Summery. Municipal authorities' informatization processes are considered in the work. Analytical unit of information system is developed for the city administration. This unit is for providing information and analytical support to management of all levels in decisions-making processes.

Key words: information technologies, informatization processes, administration, public administration, decision-making process, information and analytical reporting.

INTRODUCTION

Innovative using of information technologies significantly changes the content of the various activities in organizations. Today, information technologies are viewed as a means to improve organizational performance and the most widely used in management activities. Application of information technologies in the practice of public administration promotes a comprehensive transformation of municipal governance organizational principles [Teresita Perez, Reece Rushing, 2007]. Creation of information technology infrastructure and adoption of several laws accelerate the processes of state institutions informatization. However, these processes are not extensively and face several difficulties.

According to the Division for Public Administration and Development Management of United Nations Department of Economic and Social Affairs state of public informatization of the country can be expressed through E-Goverment index whose value ranges from 0 to 1. Rating of some countries in years 2005, 2008 and 2010 are in table 1 [United Nations 2005], [United Nations 2008], [United Nations 2010].

There are numerous variants effective usage of information technologies in public administration according to experience of other countries. So, it is necessary to set clear development paths and strategies for implementing these technologies and systems.

Table 1. **E-Goverment index of countries**

Country	year 2005		year 2008		year 2010	
	position	index	position	index	position	index
United States	1	0,9062	4	0,8644	2	0,8510
United Kingdom	4	0,8777	10	0,7872	4	0,8147
Germany	11	0,8050	22	0,7136	15	0,7309
Poland	38	0,5872	33	0,6134	45	0,5582
Ukraine	48	0,5456	41	0,5728	54	0,5181
Russian Federation	50	0,5329	60	0,5120	59	0,5136

ANALYSIS OF PUBLICATIONS

World experience of using information technology in the practice of public administration headlined in the annual reports of United Nations Department of Economic and Social Affairs, Division for Public Administration and Development Management. It presents the statistics information in the public administration sector for more than 180 countries.

In the Russian practice, the use of information technologies in higher authorities and technical features of public authorities informatization reviewed in publications V. Buryakova, head of Corporate IT Solutions in CIS Department of Sun Microsystems, Inc. [Bouryakov V., 2008]. Computerization of municipal management was investigated by Gladkikh B., Kiriyenko V., Makarov A. [Gladkych B., Kiriyenko V., Makarov A., 2007]., [Gladkych B., Lyuhanov V., 1976].

In Ukraine, the use of e-commerce technology and information systems in public administration are considered in the works by Sendzyuk M., Brozhik L., Nizhnik N., Lelikov G., Gnattsov O., Piskorskay G., Mashkov O.

THE AIM OF RESEARCH

The aim is to develop and implement analytical unit to administration information system of Sverdlovsk city, in order to provide information and analytical support to management of all levels in municipal governance decision-making. Also local authorities informatization processes consider as a part of global concept for improving state management.

RESULTS OF EXPERIMENTAL RESEARCH

Processes of informatization in public bodies covered under the Law of Ukraine «The Concept of National Informatization Program» [Law of Ukraine, 1998] and in the context of the State Committee of Communications and Informatization of Ukraine order № 149 about "The procedure for providing information and other services using electronic information system" Electronic government "on 08/15/2003.

E-Government covers the following areas of information exchange: G2G, government to government, G2B, government to business, G2C, government to citizens.

Public bodies' informatization processes clearly traced in connection G2G which includes such application elements: transition government to paperless record keeping, establish for all public bodies performance indexes for the year and their regular monitoring through information technology [Lapinsky I. 2009].

For the electronic information exchange between departments and full documents work flow automation between government structures should be developed nationwide standards. In some countries, such standards exist, for example, in the UK it is a standard e-Gi (e-Government Interoperability Framework) [Kushchu I., Kuscu M., 2003], based on XML. Ukrainian experience is to try implementing local information systems at different administrative levels: municipal and regional administration.

Since 2009, in Sverdlovsk city executive committee is functioning, "Analysis and Information System office work and documents work flow" developed within the bounds of Department of Economic Cybernetics economic contract theme [Rjazantseva N., Voronova, A., 2009]. This system corresponds to the concept of administration transparency - oversees the executive discipline and the adoption of administration management decisions.

Support management decision-making in the software system is implemented through analysts unit, designed for top, middle and lower-level managers [Urdiales de Trazegnies, Salceda C., 2005].

This system allows to monitor the implementation of subordinate (slave) departments and divisions records. Figure 1 shows an example of departments workload analysis according to registered documents for execution by administration office.
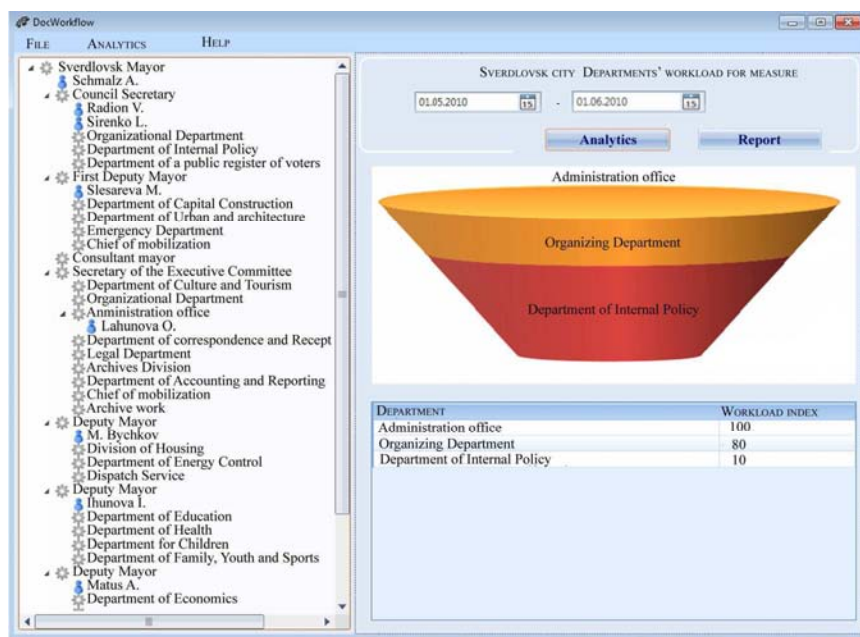
Fig. 1. Departments workload analysis according to registered records by administration office

The introduction of analytical framework allowed a qualitative assessment of incoming treatments, to determine Sverdlovsk city administration [Official site] changing treatments trends. Such automation of analytical processing of documents does not preclude the persistence of traditional information processing technology in government, can be carried out in parallel, or could be it final stage.

Analysts unit enables intuitive graphical representation of data mining results for all levels management to make good operational, tactical and strategic decisions.

The functionality of the analytical unit includes work with an operational and archival information.

Working with operational information:
- classification and selection of treatments according to the predefined headings and criteria;
- identify treatments of particular importance (by term of execution);
- making of information bulletins and reports on the number and nature of complaints;
- identification of departments workload of the executive committee;
- formation of materials for the media and periodic reporting by heads of executive bodies about treatments execution results for a certain period of time.

Working with archival information:
- collecting data from various sources;
- accumulation and storage (archiving);
- archive categorization;
- data mining, including fuzzy search;
- creating reports in various sample sections, including multivariate data mining;
- construction of causal chains of data to identify trends and directions of development of the situation.

Such information and analytical reporting is particularly relevant for the operational management. It provides a rapid response to changes, that is very important for a large dynamic decision-making situation.

CONCLUSIONS

Implementation of information technologies at the municipal level will allow the effective management of such complex systems, such as city and state. And information and communication component will improve public management, as an integrated socio-economic system.

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ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ В ПРАКТИКЕ ГОСУПРАВЛЕНИЯ

Анна Воронова

Аннотация. Рассматриваются процессы информатизации муниципальных органов власти. Разработан аналитический блок информационной системы администрации города, для обеспечения информационно-аналитической поддержки руководства всех уровней в процессе принятия управления решений.

Ключевые слова: информационные технологии, процессы информатизации, администрация, государственное управление, управленческие решения, информационно-аналитическая отчетность.

PROBLEMS OF FINANCIAL MONITORING PROCEDURES IN BANKS

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Summary. The article defines fundamental issues of financial monitoring as a master link in package to fight against illegal money-laundering, and some suggestions for its elimination.

Key words: : financial monitoring, money-laundering, "Financial Action Task Force on Money Laundering" (FATF), bank, Public Committee of Financial Monitoring , National Bank of Ukraine **.**

TARGET SETTING

Illegal money-laundering has been amplifying on an international scale and constituting a menace to integrity, safety and stability of finance and credit and government system of our country. Financial monitoring underestimation in banks is a cause of financial offences and abuses in the country.

Research activities, regarding to illegal money-laundering resistance, written by Borets L.V, Berezko V, Gavrilishin A.P., Golubev V., Kalman O.G., Kovch T.B., Koldovsky M.V., Litvin Y.A., Ostapovich G.M., Polyschuk O.L., Saitarly T., Shkurkin V., Shestopalova N. , make it clear that criminal communities' activity has become more professional and we can see their smarter money-laundering devices.

To stand up against such negative social phenomenon as illegal money-laundering, it takes to create national counteractive system for money-laundering resistance, drawing on other countries experience and references from international organizations, which agents are both state authorities and financial institutions. [Rymaruk 2008].

OBJECTS AND PROBLEMS

The object of the Article is analysis of financial monitoring in Ukraine in bank field , legal authorities, regarding to illegal money-laundering, identification of present defects and suggestions for their elimination, adjusted for international standards.

Parent material. In July, 1989, according to the resolution, taken at highest-level Summit talks by "Group of seven" in Paris, it was decided to set up "Financial Action Task Force on Money Laundering" (FATF), consisting of G7, European Comission, and other eight countries. It is an intergovernmental body aimed at policy design to stand up against money-laundering both at national and international levels. The principal direction of the financial action is a list of national jurisdictions, which don't collaborate with FATF, in other words don't make sufficient measures for money-laundering control. This list includes those countries and territories which are not FATF members (or are not in FATF membership), whose actions put obstacles in the way of international efforts to stand up against illegal money-laundering. In 1990 FATF adopted Forty references, which are recognozed as an international standard for money-laundering control (with alterations in 1996)[Zelinskaya 2007].

Ukrainian govenment opposed FATF requirements regarding to insersion of money-laundering control into implimenting legislation of Ukraine. As a result of it, from December, 20, 2002 to February, 14, 2003 – the country was inscribed on FATF black-list, that entailed stoppage of currency transactions for the banks like agents of foreign-economic activity. In year 2002, Verkhovna Rada (literal Supreme Soviet) passed the law " About illegal money-laundering control". And in August, 21 it extended purview of the law by making alterations.

The most essential in the Law of Ukraine "About illegal money-laundering control" is criteria for financial monitoring. They have been subjected to expert criticism more than once.

Concept definition "financial monitoring" gives answers to such questions as : "What are money-laundering prevention procedures?" and "Who exercises financial monitoring?" ; "Who is necessary to be checked and identified and which transactions are to be checked (depending on economic legal status and depending on legal-organizational status and spectrum of roles of economic investigation service)?" [Berizko 2008].

According to financial glossary, financial monitoring is interpreted as fixed auditing of the most important current economic results of any interprise in market environment, which oppotunities are unsteady. The monitoring objectives are: early detection of prospective incomes bend, that reduces to financial decline ; cousre isolation of the bend ; adjustment of some financing activities with the object of their normalization and effectiveness increase. [Zagorodniy 2009].

At the moment, reputable scientists don't have consensus of opinion about the "financial monitoring" as a concept definition. Klimenko A. defins financial monitoring as a specific type of financial screening, handled by authorized public bodies in economic domain and low-key monitoring agents, and it is aimed at illegal money-laundering detection. [Klimenko 2005].

Gavrilishin A. P. accentuates that "financial monitoring" is understood as cumulative action of financial monitoring agents with the object to detection, information analysis and data vetting in order to rate them to illegal money-laundering and to place under law machinery. [Gavrilishin 2008].

Scientific analysis makes it clear that one of the reasons of ineffective money-laundering prevention is mainly law fallibility in spite of its continual improving. We entirely share Kalman's opinion on the investigating question that one of problems of

financial monitoring procedure is law fallibility and contradictions in legislative instruments which regulate it in a direct or indirect way. [Kalman 2003].

The crucial issue is the fact, that the concept "dirty money" is understood differently in Ukraine and in the West. For the whole world "dirty mobey" is money, earned from drug traffic, prostitution, corruption. Therefore the most important thing is money conversion from cash into cashless for further legal investment. In this sense scope of money-laundering operations is minimal. In the main, resources of this kind don't demand any cashless legalization, they are right for cash. Economic and social progress is not enough for having a task to legalize this money. Therefore, we consider banking system doesn't deal with this money at all. Ukraine defines dirty money laundering as tax optimization and so on. The problem is we don't have "dirty money" legalization.

Financial monitoring by its contemporary way is still a new business process for Ukrainian banks. The banks are faced with the fact of generation of not only new business process (being demanded to have first-class quality at once), but re-engineering of present executions.

So, the spectrum of roles regarding to security service power, international settlement sub-units and legal services was given to executors' institution of financial monitoring service. But redistribution of roles and reorganization of business couldn't be done immediately because it takes time and methodological provision. Methodical providing from the National Bank of Ukraine (later NBU) is limited by the issue "Methodical Points" on the page "Financial Monitoring" at the official site of NBU. It doesn't contain any notifications on procedure, descriptions of superior practice, world experience about the matter, it just provides the explanations about tags counting in a file-report, which is sent to the authorized body.

But non-coordination of statutory and legal acts is much worse than lack of methodical support. "Regulations about financial monitoring at banks" stipulate the necessity of identification data of the clients as holders of legal entities. But at the same time, the scope of data for identification is not indicated. NBU description " Establishing and keeping of national currency and foreign currency accounts" lists the documents of legal entitis without mentioning the holders' names. So, gathering of informantion about holders is made by NBU itself as an interior bank freak (as the clients see it).

The next issue concerns to the concept of bank secrecy. One of the money-laundering prevention methods in banking system is identification data of the client. The bank that identifies its client has the right to obtain the information from the other bank.

The absence of clients' data which are open to general use to banks induces them to collaboration, or otherwise to information exchange. At the same time, as Ann Stinn affirms " The field of money-laundering is not a place of banks' competition. Quite the contrary, they take interest in consolidation»[Shestopalova 2009]

Identification inquiries at a bank are quite legal. The law of Ukraine "About banks and banking" declares this right. But some assets of the same law introduce into practice bank secrecy, stipulate bank responsibilities for privacy and lay down strict rules to clue. Banks are not mentioned in the list of organizations which are entitled to get inquiries. [1].

Polyschuk O. also accentuates that under the pretext of bank and trade secret, banks don't submit information about cash flow and financial transactions to law machinery, and it complicates or even renders impossible to recognize "dirty money" and other illegal property. [Polyschuk 2009].

Then there is a need to emphasize the question of financial monitoring arrangement.

The law stipulates arrangement of initial financial monitoring by means of executive institution application(institution of executors). Status and spectrum of roles of an executor are described in the law in a way of his/her being independent in his/her role and accountable to a manager of initial financial monitoring agent. In accordance with the resolution of National Bank executive committee" About bank financial monitoring" a bank executor is a director ex efficio. [3]

In action, in each branch there are executors who are not directors ex efficio, but all spectrum of roles and responsibilities are applied to them. Specifically they are: elaboration and representation for approval, inner financial monitoring, rule evaluation and financial monitoring execution. The Statute accentuates that financial monitoring principles are approved by bank administration on executor's submitting. However, any procedure, including financial monitoring, is to be ruled over and controled when it is undergone under a single structure regulation.

Internal inspection rules must be unified and involve an order of documentary recording of necesary data, privacy protection, personnel qualifying requirements as well as entry criteria and features of uncommon transactions, taking banking peculiarity into consideration.

As for qualifying requirements, the important thing is that bank clerks, who are responsible for identification data of the client, are to know about NBU references and minimal requirements, worked out by FATF as an illustration of international standard for money-laundering prevention steps in the bank field.

The imperative minimum must involve intimate knowledge of the Law and some other statutory acts (National Bank regulations) in the area of bank legislation. It would be better for financial monitoring experts at least to have a general idea about FATF guidelines, irregularity statistics and judicial practice.

In spite of enterprising stand of most banks as for personnel retraining and instructing about financial monitoring, competence of many people is unsatisfactory.

In most cases bank clerks quite the contrary are clients' advisers for keeping off intra-bank supervisory service control about financial monitoring or they desist from information submitting because of the risk to lose the bank's clients who make high commission. It would be possible to avoid both these kinds of cases and tardy submitting to "Gosfinmonitoring" body providing the consummation of computer-based information service. (Some bank already succeed in this kind of practicing). However, software modules application in "Bank-Client" and other operating programs will be of benefit just in conjunction with expert operated practice of personnel teaching and attestation (applying to bank subject-matters),as well as thorough improvement of statutory machinery, provided effective detection of real money-laundering figures and reduction of legal abuse.

Let's remind of the fact, that financial monitoring is one the business processes of present-day Ukrainian bank, and this process is standing and mandatory. Like any bank procedure, finacial monitoring is due to be under surveilliance by NBU.

As a rule, money-laundering is connected with currency values transactions. However, the skill level of NBU inspectors is not corresponding to the qualifying requirements. Functionaries don't usually orient themselves in legislation of exchange. From this it follows the lack of skills for travelling auditing as well.

A modern Ukrainian bank is a multi-purpose financinal interprise. So, apart bank transactions it deals with other procedures. Now, most bank (and their branches) register stock transactions. Stock trading is controlled by the Public Stock Comission (later PSC). Being governed by its rights and obligations as a Stock regulatory body, PSC ratified "Regulations of financial monitoring by public investment institutions, stock exchanges and other bidders" [9] We are to point out, that financial monitoring procedure (in other words, an executor's capacity and responsibilities) are worded in this document more carefully than in "Regulations of financial monitoring at banks " issued by NBU.

This case doesn't remove the main barrier. Any bank is an advanced holder of several regulatory bodies, which requirements for financial monitoring are not identical. The negging problem is identification data of the client. National Bank and PSC determine different lists of documents for identification. In this case, NBU formulates its demands clearly, but PSC doesn't specify them.

The problem is that law specification doesn't provide the possibility to exclude demands of one regulatory body when executing others. Therefore, banks must satisfy all claims.

In summary, our opinion concerns to incompact cooperation between the countries about the researching issue: they act differently as regards to money-laundering and financing of terrorism. There is a certain prejudice which makes certain countries consider that money-laundering is other's problem and think this money can let the population make up the deficiency of development financing lack.

The contradictions in economic interests between the countries make the question of money-laundering be political. Many countries satisfy only their own requirements, thinking higher about prospective profits than about international treaties.

Economic irregularity of world regions intensifies gap of advanced and undeveloped countries. Many developing countries prefer ignoring "shady capital", confronting with the dilemma whether to stand up against "dirty money" or to put up with money lack.

Judging contribution efficiency, Shkurkin V. affirms that even the most powerful stimulation of prevention of illegal money-laundering and financing of terrorism won't be effective if there is a country which lets criminal communities feel safe in their activity without considering them to be criminal.

However, for the time being, criminal communities continue profitting by lack of unified global money-laundering prevention strategy [Shkurkin 2010].

Ukraine has already taken the first steps in this course. For example, teaching and methodical centre of retraining and raising the level of bank clerks' skills for financial monitoring prevention of illegal money-laundering and financing of terrorism, which works under "Gosfinmonitoring", completed the agreement with International teaching

and methodical centres of financial monitoring (Russian Federation) and Central Easten Europian Institute of financial monitoring (Poland). According to the agreement conditions, educational institutions made a decision to communicate about the problem of money-laundering and financing of terrorism, conduct joint research, introduce educational attainment and other IA – systems in this field. [15] In our opinion, coordinated work will encourage more effective training of financial monitoring and provide common approach to educational and other actions, taking into account international standards.

CONCLUSIONS

General condition of finantinal monitoring in Ukraine depends on monitoring in banking system. For the purpose of monitoring normalization, it is advisable to take a number of steps, most important of which are:

1. Differentiation of illegal money-laundering and tax evasion
2. Securing of more precise methodological support.
3. Revision of National Bank actions in order to recognize and compose differences between them under the identification of clients by the banks.
3. Disambiguation in the Law of Ukraine "About banks and banking" on account of bank privacy and information interchange about the client between the banks in the process of identifying.
4. Training and certification of executors and bank supervisors.
5. Legislative setting of bank multi-regulating : Bank is one and indivisible administration and must be guided by unified demands for financial monitoring.
6. To unify specificity and to form an adjusted approach for the problem.

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ПРОБЛЕМЫ ОСУЩЕСТВЛЕНИЯ ФИНАНСОВОГО МОНИТОРИНГА В БАНКОВСКОЙ СФЕРЕ

Павел Житный, Татьяна Гудима

Аннотация: В статье определены основные проблемы финансового мониторинга как центрального звена в комплексе мероприятий по противодействию легализации (отмыванию) доходов, полученных преступным путем, в банковской сфере и предоставлены некоторые предложения по их устранению.

Ключевые слова: финансовый мониторинг, легализация (отмывание) доходов, Международная организация по борьбе с отмыванием преступных доходов (FATF), банк, Государственный комитет финансового мониторинга, Национальный банк Украины**.**

COMPETITIVENESS OF AN ENTERPRISE
AND METHODS OF ITS ESTIMATION

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Summary. Methodical approaches to estimation of the level of competitiveness of enterprises are considered in article. Certain methods of estimation of the level of competitiveness of enterprises are described in detail. Basic factors (indexes), which using in the indicated methods, are analyzed.

Key words: competitiveness, methods of estimation, level of competitiveness, enterprise.

INTRODUCTION

Competition is the inalienable line of modern economy. Its "invisible hand" always takes place at the market, not having regard to the changes of economic relations and level of government control of economy. It forces to pay attention to competitiveness of enterprises, which provides their maintenance on a certain market segment. Universally (regardless of level of display) a competitiveness is determined as immanent to the economic subject (to the physical, legal person or of industry, sector, economies of country, and on synthetic are countries on the whole) ability (state) to take part in a market economy in the conditions of competition at the increase of profits, expansion of production, increase of level and quality of life of participants of economic process

RESEARCH OBJECT

Scientific researches of questions of enterprise' competitiveness are widespread. Many scientists devoted their research to competitiveness, its constituents, its features in different industries and on the different types of enterprises, its forming under various conditions forming and under influence of various factors, foreign experience, conceptions, methods of estimation, analysis, increase, support, management, marketing, management, strengthening, development, planning, diagnostics and motivation of competitiveness of countries, regions, industries, enterprises, products etc.

In spite of the great number of approaches, today there is still no unitary definition of such a complicated and many-sided concept as competitiveness of enterprise. At the same time, depending on understanding of this definition, scientists proposed different views on methods of estimation of enterprises' competitiveness.

At present the actual question is remained about the estimation of level of competitiveness of an enterprise which is reliable and accessible for enterprises has remained. This causes the necessity to examine the variety of existent methods of its evaluation. In addition, the research of the different methodic approaches to the evaluation of level of competitiveness of an enterprise forms a common idea about the aggregate of the methods worked out by other scientists.

RESULTS OF TEORETICAL RESEARCH

The theoretical approach to the evaluation of competitiveness of enterprises includes its classification into different amounts of groups by different characteristics. For example, V. Ulanchuk and N. Lysenko distinguished two basic groups of competitiveness's estimation: analytical and graphic [12]. Z. Borisenko, while describing the methods of evaluation of competitiveness of an enterprise, distinguished also graphic methods, which included matrix and tabular methods. The graphic method of evaluation of the level of competitiveness is based on the construction of the so-called "radial diagram of competitiveness" or "polygon of competitiveness". A construction to the polygon came true by the division of circle by radial evaluation scales on even sectors, the amount of which equaled the amount of select criteria on radial lines. It was graduated so that all values of criteria were into an evaluation circle; the values of criteria increased on the measure of removal from the center of circle. The corresponding scale of measuring points which answered the value of criteria were marked on every landmark; and the curve line, formed by the points accordingly for each enterprise, was drawn [3, p. 153]. Yet A. Oliv'e, A. Dayan, R. Urse suggested to study strengths and weaknesses of an enterprise by means of polygon of competitiveness, using eight basic criteria: quality, price, finances, trade, after sale service, foreign policy, preparation before a sale, conception of commodity by which its activity was founded [2, p. 512]. The matrix methods of evaluation of level of competitiveness of an enterprise are based on the use of matrix - table of well-organized on lines and columns of elements [3, p. 159], and tabular method - which is a variation of a matrix method [3, p. 165]. The next groups of indexes were estimated by foreign scientists for the estimation of level of competitiveness. They included finances, productive potential, composition of labour force, technology and research potential, organization and management, marketing [14, p. 23; 15, p. 53]. The matrix method, worked out by the Boston consulting group, is based on the analysis of competitiveness of an enterprise taking into account the life cycle of its commodity (services). Essence of evaluation process consists in the analysis of a matrix, built by the principle of the system of co-ordinates, : for horizontals - rates of increase (reduction) of amount of sales in a linear scale; for vertical lines is relative part of commodity (services) at the market [1, p. 130].

The group of research workers of Institute of strategy and competitiveness of Harvard school of business in the USA under the direction of M. Porter offered methodology of calculation of "index of microeconomic competitiveness". It is based on the theory of competitiveness, according to which the competition strategy and the quality of business-environment play a decision role in creation of competitive edges of enterprise. According to it sub-index "activity and strategy of enterprises" includes on 16 indexes, and sub-index "quality of business-environment" includes a 31 index. Thus influence of the first sub-index was determined by a coefficient 0,37, and the second - 0,63 [12].

Three approaches to the estimation of competitiveness of an enterprise and construction of its indexes were distinguished by A. Brutman. Among these approaches are the followings: the first - was based on the system design of activity of enterprises in the conditions of vagueness, second - leaned against ideology to extrapolation, third, - behaved to logical high-quality prognostication [4, p. 159]. V. Pavlov also distinguished three methodical approaches to the evaluation of competitiveness of enterprise (products): by the size of complex index of competitiveness of concrete commodities on concrete markets on the basis of middle and relative sizes; by the size of complex index on the basis of combination of index of competitiveness of commodities and indexes of efficiency of organizationally-economic mechanism of management of an enterprise; by intuitional descriptions of competition status on the basis of the applied models [9, p. 83]. Other scientists suggested to systematize the existent methods of estimation of competitiveness of an enterprise by such groups: methods, based on the analysis of comparative advantages; methods which are based on the theory of equilibrium of firms and industry; methods, built on the basis of theory of effective competition; methods, based on the theory of quality of commodity; matrix methods of estimation; complex (integral) methods [11; 1, p. 113-135].

The above-mentioned systematization of approaches to the methods of evaluation of competitiveness of enterprise was supported by U. Ivanova, O. Tyshenko, V. Samulyak and R. Feschur. But they also named method, based on the theory of cartoonist, the method of determination of position in a competition from the point of view of strategic potential of enterprise, and method, based on comparing to the standard.

Methodologies of estimation of the level of competitiveness, basis of which is the systematized set of indexes, have priority position. But with the condition - to use the reliable expert estimations [10].

Will expose some methods of evaluation of level of competitiveness of enterprise in detail. As known, determination and calculation of indexes are based on quantitative interpretation of all spheres of activity of enterprise and factors of influence on it. Part of indexes presents a commercial secret and is inaccessible for the process of evaluation. The intuition prevails in aggregating and quantitative interpretation of indexes. Studying criteria and indexes of competitiveness of enterprise, V. Pavlova came to the conclusion, that the general competitiveness of enterprise includes providing of competitiveness of products, which produces or will realize an enterprise, and competitiveness of its resource potential which forms key descriptions of the state [9, p. 65]. I. Nadtochiy considered that to carry out an evaluation competitiveness of

enterprise expediently on the basis of integral index of competitiveness of commodity of enterprise and stability (to efficiency) of its functioning [7].

V. Oberemchuk suggested to estimate to the competitiveness of enterprise by means of integral index which can be calculated after a formula:

$$Kn = \sqrt[8]{0{,}22P_1 * 0{,}14P_2 * 0{,}1P_3 * 0{,}19P_4 * 0{,}14P_5 * 0{,}07P_6 * 0{,}04P_7 * 0{,}1P_8} \ , \qquad (1)$$

where: P1 – competitiveness of products; P2 – financial state of enterprise; P3 – efficiency selling off and advancement of commodities; P4 – efficiency of production; P5 – competition potential; P6 – ecofriendlyness of production; P7 – social efficiency; P8 - image of enterprise [8, p. 7]. It is necessary to mention that the competitiveness of products is formed under act of efficiency of her production, sale and advancement. Thus, the indicated method of calculation of competitiveness of enterprise includes for itself indexes, which characterize the competitiveness of enterprise and those which are derivatives from them. It can result in duality of account of certain factors and incorrect results of evaluation.

At the calculation of level of competitiveness of enterprise the different aggregate of indexes are used. For example, the conception, which is based on the unsystematized and systematized set of indexes, distinguishes such indexes: competitiveness of products and effect from their realization, relation of cost of the sold products to their amount for a current period, ratio of income to the total revenue, relation of total revenue to the cost of material inputs; a relation of total revenue to the cost of assets; ratio of sum of account receivable to the general volume of sale; loading of production capacities; brief-case of orders and size of capital investments [6, p. 250]. Internal and external investments influence on the competitiveness of enterprises and country in general. After produced by E. Bojar, T. Zminda, J. Bis comparative analysis of the use of direct foreign investments was in polish and irish regions also was made a conclusions about its influence on competitiveness [15].

I. Bulah offered a method, which is based on the mathematical model of estimation of competitiveness of enterprise, which is built with the use of vehicle of fuzzy logic and neuron networks [5, p. 26]. Due to the hierarchical construction of mathematical model of estimation the completes account of the state of factors of internal and external environment of concrete enterprise takes place at certain moment of time which is the necessary condition of realization of high-quality competition analysis. The use of vehicle of neuron networks and fuzzy sets has certain advantages at the estimation of competitiveness and acceptance of administrative decisions: complexity, system approach, account of dynamic of indexes in space and time, account of specific of activity of enterprises, possibility of adjusting and model studies on the real data, that assists the reasonable choice of competition strategy.

The most productive approach to the construction of the system of indexes of competitiveness of an enterprise was considered by V. Ulanchuk. He suggested classifying the methods in such a way: functional setting (application domain), functional scope of effective streams, and factor model of competitiveness. Coming from the functional setting of indexes he supported an idea to select the tactical and strategic modules of indexes of competitiveness or indexes of express and fundamental diagnostics of competitiveness. He included indexes, which characterize internal effective streams and which settle accounts only on the basis of the public accounting

(ratified forms), to the tactical module of indexes of competitiveness of an enterprise. And the formation of financial indexes, indexes of assets and top - descriptions of enterprise, indexes of the productivity and allocation of resources of enterprise were considered by him to be the base the system of the tactical module of indexes of competitiveness of an enterprise. Depending upon a functional scope, the indexes of competitiveness of an enterprise were distinguished in two groups: indexes, which characterize internal effective streams, and indexes which characterize the external effective streams of enterprise [12].

A list of the above enumerated methods and methodical approaches to the estimation of level of competitiveness of enterprises is inexhaustible. However from represents the general of modern scientific achievements in this sphere.

CONCLUSIONS

Thus, the existence of different scientific works about the competitiveness of an enterprise and considered methods of its evaluation testify the absence of a single method of evaluation of the level of enterprise competitiveness. It should be noted, that the modern scientific researches to the evaluation of level of competitiveness of an enterprise are aimed to adaptation of existent methods to the branch features of different enterprises and modern economic terms. At the same time the determination of level of competitiveness of an enterprise is insufficient for describing its activity and making administrative decisions. Therefore the attention should be paid to determination of level of stability of enterprises' competitiveness as a critical attribute of competitiveness of every enterprise for clarification of estimation of its level.

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КОНКУРЕНТОСПОСОБНОСТЬ ПРЕДПРИЯТИЯ
И МЕТОДЫ ЕЕ ОЦЕНКИ

Инна Житная, Елена Ефременко

Аннотация. В статье рассмотрены различные методические подходы к оценке уровня конкурентоспособности предприятий. Некоторые различные методы оценки уровня конкурентоспособности предприятий описаны более детально. Проанализировано основные факторы (показатели), используемые в указанных методах.

Ключевые слова: конкурентоспособность, метод оценки, уровень конкурентоспособности, предприятие.

CONTENT