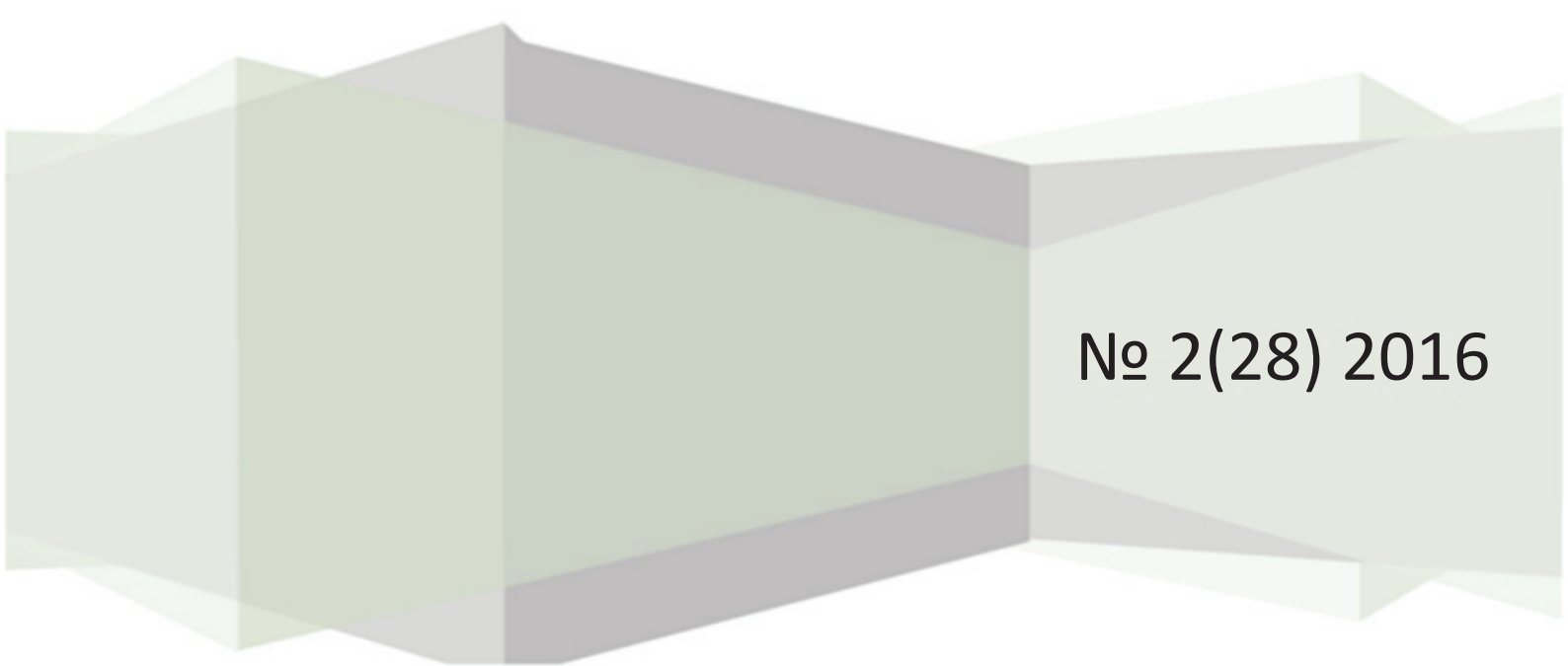


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## Qualimetric Quality Assessment of Construction Equipment Maintenance

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**Key words and phrases:** service; quality; qualimetry.

**Abstract:** The article deals with the qualimetric approach to the quality assessment of construction machinery maintenance. The general stages of building qualimetric models are studied, a qualimetric model of service from the perspective of the consumer and the producer is proposed. The model incorporates complex and individual quality indicators, the approaches to setting weights of the qualimetric models are explored.

Objective assessment of the quality of service of construction machinery and equipment is important for improving the competitiveness of service enterprises, as well as for making management decisions in construction companies on the selection of contractors and partners.

Machinery and equipment (bulldozers, excavators, graders, scrapers and others) occupy a significant and important part of the construction industry, which is constantly increasing as technology advances. It determines the need for maintenance of vehicles in working condition; reduction in the rate of wear of parts, components and assemblies; prevention of faults and failures, as well as diagnostics of equipment for timely prevention of failures.

Construction companies must ensure the maintenance works (**MW**) and repairs in accordance with the requirements contained in the "Technical description and user manual" of the manufacturer, and recommendations on the organization of maintenance and repair of building machines for safety regulations. Timely and qualitative execution of maintenance and repair of construction machinery and equipment is carried out by service organizations.

The main objective of improving the service of vehicles in construction is the development and practical implementation of tools and methods of maintenance and repair of machines to ensure high quality of service, which includes primarily technical reliability and efficiency.

Achieving the optimal quality of service of machines and equipment, as well as the development of new advanced methods for the organization of maintenance and repair is one of the most important problems of the construction industry. The choice of a service company for the correct frequency of service and repair, selection of tools and equipment allows the construction companies to obtain savings by reducing repair costs and significantly increase the service life of the machinery, reduce the need for the vehicles and improve the efficiency of fixed assets of a construction company. Quality service solves the problem of technical operation by ensuring normal technical condition of vehicles.

Management and optimization of the quality of service of vehicles and equipment in the construction organizations include the need to identify the content of the service quality

parameters and their evaluation.

In the scientific literature, there are many definitions of “quality of service” category. It includes the provision of non-material services to the customer, and material services, which include the relocation and conversion of material objects. Various authors define the concept of quality of service differently. For example, Srinivas Vegesna defines it as factors that directly affect the consumer’s desire to “buy” and come back; V.A. Kashtanov defines it as a complex category, one of the most important indicators of the efficiency of enterprise performance.

The author considers the concept of quality of service in accordance with the theory of TQM (Total quality management) as the degree of conformity of inherent characteristics of the service to the requirements of all stakeholders, including consumers (construction companies), government, partners, investors, employees and shareholders of the service organization.

Due to the presence of non-numeric and indeterminate indicators characterizing the level of service, quality assessment requires the application of qualimetric approaches. In theory, the principles of quality control are designed to build valuation models, which include the construction of a set of properties that make up the object under study; assigning measurable parameters to the properties; selection of basic parameters; establishing the proportion of the importance of individual quality indicators; calculation of complex quality indicators [2].

The aim of this study is to construct a model of qualimetric assessment of the quality of services of construction machinery and equipment, including the composition of the individual indicators and objective weights for individual indicators.

Integrated Quality of Service ( $K$ ) can be considered from two sides: from the perspective of the manufacturer and the consumer (the client) [2]. From the manufacturer’s perspective the organization providing services should regard quality as self-assessment of services in accordance with the criteria for of quality [1; 3]. The composition of indicators in this approach includes performance indicators and performance capabilities of the organization, taking into account industry-specific type of maintenance and repair of machines and equipment for construction companies [1; 3]. From the client’s perspective the quality assessment is based on the indicators that are most relevant to the client. They include the following parameters: the functional purpose of service, reliability and efficiency; responsiveness of customer orders; polite and helpful staff; speed of service; payment terms, etc.

In accordance with the qualimetric approach, the integrated indicator of service quality ( $K$ ) is represented by the formula:

$$K = \sum y^*k,$$

where  $y$  is the weight of integrated quality indicator;  $k$  is the value of a single quality indicator.

In order to establish the significance of specific weights of indicators one can use several approaches [2]: regression analysis and multivariate regression coefficients; the method of limit and the nominal values of quality indicators; the method of equivalent ratios of parameters dynamics; expert methods.

In most cases, for assessing the quality of service organization the basic method for determining the weights is the expert method. The simplest method of mathematical processing of expert determination of coefficients of quality indicators is to determine the average values of the coefficients, which is not objective. To improve the accuracy of taken decisions it is required to use statistics theory for objects of non-numerical nature and fuzzy sets [2], in particular the use of Kemeny median as the most objective approach to multi-criteria assessments.

Application of qualimetric models of quality assessment of service companies will allow

analyzing the quality dynamics and quality ranking; identifying positive and negative trends in the organization activities; strengthening relationships with customers (construction companies) and partners; determining optimal and efficient allocation of efforts and resources for the organization.

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### Квалиметрическая оценка качества сервиса строительных машин

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**Ключевые слова и фразы:** сервис; качество; квалиметрия.

**Аннотация:** Статья посвящена исследованию квалиметрической оценке качества сервиса строительных машин. Рассмотрены общие этапы построения квалиметрических моделей, предложено построение квалиметрической модели сервиса с позиции потребителя и производителя, включающее комплексные и единичные показатели качества. Рассмотрены подходы к установлению удельных весов в квалиметрических моделях.

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## A New State of Matter – Plasma Quantum Condensate

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**Key words and phrases:** a new state of matter; plasma quantum condensate; non-ideal pinching plasma; energy release; razer; generation of corpuscular radiation; acceleration on the front of the MHD-shock waves; acceleration in plasma focus; alternative, renewable and sustainable energy.

**Abstract:** The authors theoretically predicted and experimentally confirmed the existence of a new state of matter called “plasma quantum condensate”, combining features of normal liquid and ionized plasma. The theoretical foundation of plasma condensate formation is given. It is shown that in the phase transformation up to 1 MJ/g of latent heat is released, exceeding the heat of the most efficient fuels. Seven basic properties of energy release in the formation of non-ideal pinching plasma were found: formation of specific ionized conglomerate, pulse energy release, in which plasma liquid becomes a laser (or razer), spontaneous generation of magnetic field, self-similarity of the process in laser and pinching plasma, etc. The calculations of energy release when plasma quantum condensate is formed are given; the possibility of its application in science, engineering and technology is described. Corpuscular radiation generation process is designed in quantum non-ideal plasma, flowing in two modes: acceleration on the front of the MHD-shock waves and acceleration in plasma focus. Plasma quantum condensate is fundamentally new, alternative, renewable and sustainable energy source. This source is environmentally friendly, does not pollute the atmosphere of the planet; its use makes the environment cleaner.

Condition of liquefied plasma (quantum condensate) is a completely new state of matter, combining the features of ordinary liquid (fluidity, surface tension, internal correlations) and ionized plasma in the usual sense. Theoretical aspects of this condition are based on the quantum theory of exchange forces in condensed media [1–3]. The main feature of these forces

is their collective (unpaired) character, which determines, ultimately, a long-range order in the atomic interactions. In general, the molecular forces, and especially the forces that determine the long-range order, are of a purely quantum nature. The main idea is that the electron shells in liquefied plasma (for example, a discharge plasma) overlap, and this overlapping has an intermingled character, i.e. overlapping with the diffraction peaks and dips of the wave function, however, effectively results in the emergence of quantum attraction forces between discharge ions.

Quantum forces are a natural fact, which has been proved by experimenters dealing with discharges. The exchange interaction of electrons under such conditions leads to ion attraction to each other; the latter binding energy becomes negative. Such conditions are often implemented spontaneously in nature. Quantum forces are caused by consistent overlap of electron shells, belonging to neighboring atoms or ions. This overlap creates the effect of the first order with respect to the de Broglie wavelength for ion-ion distance. If the substances being in the normal phase state the overlap also exists but with an increase in distance between atoms it decreases exponentially, in the plasma (as the spectrum of the quantum energy states is continuous) the effect of reducing the intensity of the shell overlaps with an increase in interparticle distance slows down substantially and has power dependence. As a result, the intermeshing of the particles occurs, which corresponds to a chain of successively overlapping electron clouds, with each of the branches of the chain stretching over a distance of about the screening radius. In general, the chain covers the entire plasma: the plasma ions “snatched” by this circuit are attracted to each other, causing a phase transformation of the plasma. The transition to a new state is accompanied by the release of energy equal to the heat of transformation.

Under the above concentrations the quantum forces provide strong adhesion of the particles of matter, ie, create attraction, and the binding energy between them becomes negative. The fact that the overlap of the electron shells leads to effective bonding is well known in chemical bonding theory. Let us look at the classical theory of the Heitler-London molecular forces, in which such forces are detected in the calculation of simple molecules based on variations. Variation methods in physics are categorized as intuitive, a posteriori. Consistently heuristic could be just a theory based on the direct solution of the fundamental equations of quantum theory – the Schrödinger equation. The perturbation theory is common to the class of the states of the continuous spectrum being implemented in respect of states of the electrons in the plasma. Taking into account the exchange forces (the Pauli exclusion principle), it makes it possible to explain the already observed features of plasma phase, as well as to predict the properties of this phase, which can and should be employed with modern technology [1; 2].

In today's plasma physics, almost all research efforts are focused in the field of high-temperature plasma. The emphasis is on “hot” fusion, which is difficult to implement in terrestrial conditions. At the same time, there are plasma-phase energy sources, defined by the collective character of the interaction of particles, and most clearly manifested in a sufficiently dense plasma (with a concentration of particles  $n = 10^{19} - 10^{21} \text{ sm}^{-3}$ ) in the low-temperature region [1]. It turns out that the plasma is much simpler than plasma intended for nuclear fusion. One way to obtain this compression of the plasma is a pulsed electric discharge.

At relatively low temperatures plasma becomes strongly coupled because Coulomb interaction energy of particles in plasma is comparable with the energy of the thermal background. However, the main feature of such plasma, and this is fundamental, is that its condition is determined essentially by quantum forces arising in it. According to an ordinary qualification, plasma does not degenerate, and at the same time the average inter-electron distance is several times bigger the de Broglie wavelength of thermal electrons that characterize the quantization of

a system of particles, hilew the interatomic dis-tance satisfies the following [1; 2]:

$$r < 10\lambda < r_d, \quad (1)$$

i.e. the screening radius exceeds the Debye radius by an order of magnitude.

Such conditions occur (and often) in gas discharges, however, remain unexplored due to lack of control and lack of understanding of the processes occurring in them.

Quantum forces create the effect of power range order in the plasma, which is known to cause a phase transformation in the material. With increased concentrations of plasma the exchange coupling between the electron-ion complexes increases sharply, so that the plasma forms a kind of condensate in which the degree of ionization is maintained, but at the same time they exhibit phase state inherent to the liquid, causing phase transformation. The latter, as in the conventional phase transitions in sub-stances, is accompanied by the release of energy, which, however, is much greater than in conventional phase processes.

Specific energy release (in the calculation per gram), corresponding to the latent heat of phase transformation has the following value [1]:

$$E_0 = 10z^3 e 2n^{1/3} / m_i, \quad (2)$$

where  $e = -4.8 \times 10^{-10}$  cgs is electron charge,  $z$  is the degree of ionization of atoms,  $m_i$  is ion mass.

Assuming that  $n = 10^{21} \text{ sm}^{-3}$ , for evaluation of  $z = 2$ ,  $m_i = 2 \times 10^{-23} \text{ g}$ , we obtain  $E_0 = 10^{13} \text{ erg/g} = 1 \text{ MJ/kg}$ , which exceeds the energy release of the most efficient fuels (except for nuclear materials).

Energy sources of the type under consideration have a number of properties that deserve special attention to the considered physical phenomenon:

1. The energy is not associated with nuclear transformations or chemical reactions and the forma-tion of a specific ionized conglomerate, which has the properties inherent to light liquid, in particular surface tension, which increases its resistance to decay.

2. The energy release in pinching plasma occurs in the form of intense light or X-rays. Pulse output of energy is possible, under the implementation of which the liquid plasma becomes laser (or, respectively, raser).

3. In the considered plasma modification, the phase transformation in the plasma focus is accom-panied by spontaneous generation of a magnetic field [1]. A condition in which the orbit (and hence magnetic) points of the orbital electrons are oriented in the same direction is energetically favorable.

The intensity of the magnetic field is estimated by the formula [1]:

$$H = 4\pi n\mu = \sim 10^6 - 10^7 \text{ gs.} \quad (3)$$

Here,  $\mu \sim 10^{-19}$  cgs is orbital magnetic moment of electrons in the plasma.

In the formation of these fields, a quite intense radio emission is generated.

4. The process of formation of quantum non-ideal plasma is self-similar and carried out both at the plasma values of the above, and in laser and pinching plasma.

5. In the natural state plasma modifications resulting from the phase transitions are realized, for example, in ball lightning (b.l.) [6]. Energy release in it is determined by the formula (1), in which  $z = 1$ , because the temperature of matter b.l. is unlikely to exceed one to two thousand

degrees. In this case we get an upper estimate of the energy release in b.l. of about 100 kJ, which agrees well with the observational data.

Plasma states Analyzed here are, apparently, relatively common in space and stellar conditions. In our opinion, the transitions into quantum non-ideal modification leads to disasters such as solar flares, explosive phenomena in the atmosphere and inner layers of stars.

6. Plasma containing carbon ions, nitrogen, oxygen and other elements belonging to the middle group of Mendeleev's table is most close to non-ideal state. At such, it is not important what kind of connections include these elements in the seed material, but it is important to ensure a sufficient degree of ionization of the elements. It follows that the starting material for the realization of the phase transformation processes is industrial wastes, wastes of mining tailings, landfills, etc. This fact has a great ecological value.

The above phenomena can trigger the creation of new industries producing mineral (including rare) materials with desired physical and chemical properties through chemical reactions in the process of "phase" of the plasma processing.

7. Plasma tapes in liquid modified state relatively easily generate magnetic fields and, obviously, in turn, are effectively controlled by external magnetic fields. Therefore, such plasma can be used as a coolant in MHD generators.

Various studies have received experimental confirmation of the existence of the quantum plasma condensate: the required degree of plasma compression in intermediate between the adiabatic and iso-thermal conditions [3] is achieved in pinching plasma, and non-ideal aspects of quantum origin plasma are manifested in gases [4; 5].

It should be noted that the exchange binding is proportional to the cube of the charge of the ions, so the binding and the energy release is realized only in the case of plasma formed by multiply charged ions. In the case of a monovalent ionization, for example, alkali metals, the energy gain would be less than the power reduction achieved in chemical reactions or the formation of complexes, associates of ions and atoms. That is why up to now the phenomenon discussed here has not been experimentally observed: the experiments were carried out mainly on the alkaline compounds.

The phase transition (such as phase transitions of the first type of conventional materials) in the condensed state of such plasma becomes possible at temperatures of several thousand degrees, ion concentration of  $n$  pressure  $p$  with the order of several tens of atmospheres. The energy spent on ionization, compression and heating (in terms of 1 g of substance) is equal to

$$W_1 = \frac{zI}{m_i} + \frac{kT}{m_i} \frac{1}{(\gamma-1)}, \quad (4)$$

where  $z \leq 6$  is ion charge;  $m_i$  is its mass;  $I$  is ionization energy calculated per electron;  $k$  is the Boltzmann constant;  $T$  is temperature. Assuming  $T \sim 4 \times 10^3$  °K;  $m_i = 2 \times 10^{-23}$  g;  $I = 10^{-11}$  erg, we obtain  $W_1 \approx 3 \times 10^{12}$  erg/g,  $\gamma \approx 5/3$ .

The energy corresponding to the latent heat of phase transformation upon cooling and the resulting (regular or random) plasma when its parameters are such that the inequality (1) is negative and equal to [1; 2]:

$$W_2 = -\pi z^3 e^2 n^{-1/3} \Lambda / m_i, \quad (5)$$

where  $e = 4.8 \times 10^{-10}$  sgc is electron charge;  $\Lambda$  is several units – the Coulomb logarithm type. Assuming that  $n \sim 10^{19}$ ,  $z=6$ ,  $\Lambda=4$ , we find  $W_2 = 6 \times 10^{13}$  erg/g. This value exceeds the

specific energy yield from the combustion of gasoline nearly by an order of magnitude. The produced radiation energy can be used in a variety of ways: for heating, lighting, transformation through photocells or MHD movements into electrical energy. The ratio  $W_2/W_1 = 20$  defines an adequate supply for the use of excess energy in the demonstration and industrial aspects. This means that plasma with a certain composition can “burn” (as in the chemical process) and release energy of “burning”. Of course, this energy is of a continuous origin: here, plasma behaves as a single molecule – a unitary environment.

We find the energy released in a spherical volume under the transition of the discharge plasma into a new state of collective quantum action forces (1):

$$E = \frac{z^3}{r_d} e^2 n R^3, \quad (6)$$

where  $z$  is ions charge;  $n$  is their concentration;  $R$  is radius of the sphere covering plasma.

Let us assume for estimates  $T^{(0)} = 2\,000\text{ °K}$  ( $T = 4 \times 10^{-13}$  erg);  $n \sim 3 \times 10^{19}$  sm<sup>-3</sup>;  $r_d = 10^{-7}$  sm;  $z = 10$  (plasma containing easily ionizable elements).

Energy which can be obtained for  $R = 10$  sm is equal to:

$$E = 10^3 \times 2 \times 10^{-19} \times 10^7 \times 3 \times 10^{19} \times 10^3 = 3 \times 10^{22} = 6 \times 10^{13} \text{ erg} = 6 \text{ MJ}.$$

This is considerable energy comparable to the energy of nuclear fusion in one liter of sea water. However, it does not require the implementation of a thermonuclear reaction.

The energy release of plasma ball can occur relatively slowly due to decay. This ball emits energy at a rate determined by the luminosity:

$$L = 4\pi R^2 \sigma_{St} T^{(0)4}, \quad (7)$$

where  $\sigma_{St} \approx 0,5 \times 10^{-4}$  cgs is Stefan’s constant; assuming  $T^0 = 2\,000\text{ °K}$ , we obtain:  $L \sim 10^{11}$  erg/s = 10 kWt.

Consequently, the duration of radiation:

$$\tau = E/L = 600 \text{ s}. \quad (8)$$

One can implement the conditions under which the discharge region (“furnace” level) serves all the new portions of the hot dense gas. Then the process is continuous. It is noteworthy that the energy expended on heating (the creation of the category), get less energy if:

$$k_b \times T^{(0)} \ll (z^3/r_d)e^2, \quad (9)$$

which usually holds.

Similar phenomena (though still in “uncontrollable” form and random circumstances) are observed in laboratory, and other conditions. For example, similar emission coming from some clots were observed in the submarine near the aircraft when flying in the air, in the experiments with high voltages. These phenomena are sometimes described by eyewitnesses, who treat them as a nuisance.

The liquid (conductive) plasma is easily operated by the magnetic field and can form closed loops and jets, which can be directed into the working portion of the MHD generator



and determine the transfer of jet energy into electromagnetic energy. Plasma appears to be sufficiently chemically inert that will remove many technological problems. The resulting product, a liquefied material (but with a relatively low density) is a special chemical compound, different from the material that is loaded in the power generator. In this sense, the thermodynamic cycle is not closed (the ashes of burned wood should not be turned back into wood). However, the processed material may have a special interest in chemical technology.

The analyzed plasma states are implemented and, apparently, are relatively common in space. At the same time, transitions in non-ideal modification of the quantum result into disasters such as solar flares, explosive phenomena in the atmosphere and the inner layers of stars.

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**Новое состояние вещества – плазменный квантовый конденсат**А.В. Кулаков<sup>1</sup>, В.М. Тютюнник<sup>2</sup><sup>1</sup>*Экспертно-аналитический центр Министерства образования и науки РФ;*<sup>2</sup>*Международный Информационный Нобелевский Центр (МИНЦ),  
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**Ключевые слова и фразы:** новое состояние вещества; плазменный квантовый конденсат; неидеальная пинчирующая плазма; энерговыделение; разер; генерация корпускулярного излучения; ускорение на фронте МГД-ударной волны; ускорение в плазменном фокусе; альтернативная, возобновляемая, экологически чистая и устойчивая энергия.

**Аннотация:** Теоретически предсказано и экспериментально подтверждено существование нового состояния вещества, названного авторами «плазменный квантовый» и соединяющего признаки обычной жидкости и ионизированной плазмы. Даны теоретические основы образования плазменного конденсата. Показано, что при фазовой трансформации выделяется до 1 МДж/г скрытой теплоты, что превышает выделение энергии самых эффективных топлив. Выявлено 7 основных свойств энерговыделений при образовании неидеальной пинчирующей плазмы: образование специфического ионизованного конгломерата, импульсный выход энергии, при котором плазменная жидкость становится лазером (или разером), спонтанная генерация магнитного поля, автомодельность процесса в лазерной и пинчирующей плазме и др. Приведены расчёты энерговыделений при образовании плазменного квантового конденсата, показаны возможности его применения в науке, технике и технологиях. Рассчитан процесс генерации корпускулярного излучения в квантовой неидеальной плазме, протекающий в двух режимах: ускорение на фронте МГД-ударной волны; ускорение в плазменном фокусе. Плазменный квантовый конденсат является принципиально новым, альтернативным, возобновляемым и устойчивым источником энергии. Этот источник является экологически чистым, не загрязняет атмосферу планеты; его использование очищает окружающую среду.

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UDK 007

## Features of Information Technology Used in Distance Learning

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**Key words and phrases:** management training, distance learning, self-learning, informatization of education.

**Abstract:** Models of distance learning differ in technologies used and the degree of control and responsibility of the teacher and students. Educational institutions and educators retain learning management functions in some models, as in the case of traditional classroom learning system. Informatization is an integral part of distance education involving collection, processing, storage, and exchange of information.

Using distant technologies in practice has determined the place of distance learning in the system of higher education. Currently, most universities offer distance learning courses to their students; however, this form of education remains optional, rather than basic. Despite the significant development of information and telecommunication technologies students have face-to-face classes. Higher education institutions in Russia, which offer fee-paying programs (about 60 %), use distance learning as a way to improve enrollment and, consequently, funding.

In the 1990s, higher education institutions started to introduce distance learning more intensively than primary and secondary educational institutions. Changes have taken place not only in universities, but also in commercial companies, which provide staff training through distance learning, thus reducing travel expenses. Distance learning organizations do not bear construction costs or rent of buildings, public utilities, etc.

Today, distance education is developing fast enough, and it has a great future for mass distribution in all educational institutions of different levels. It is important to predict the future of distance technologies in solving existing problems. About 95 % of online courses are available on the Internet. Some methods of training, such as correspondence courses and external studies are considered as means distance-learning methods.

The idea of distance education is based on information and telecommunication technologies. Distance learning is associated with an Internet education, but they are not identical. Online education is different from distant learning, focusing on technological specifics of using global resources. In the Internet education, it is possible to have classes in the computer lab connected to the World Wide Web.

The introduction of distance learning in the educational process has led to a change in the traditional model of interaction “teacher-student”, though all educational and distance classes have students, teachers and the educational process. The existing subjects of the educational process have been complemented with new subjects with new features: remote teacher, intramural teacher, technical instructor, coordinator or administrator of distance learning, local



coordinator, authors, designers of teaching materials. Any of these subjects can perform all of these functions.

There are two different approaches to distant learning. The first popular approach involves distance learning under the exchange of information between student and teacher. The student plays the role of the recipient of specific informational content and assignments. The teacher receives the results of independent work of the student and assess the student's progress.

Personal productive activity of students with the help of modern telecommunication means is dominant in the second approach, which involves integration of teaching and information technologies, provides an interactive consistency of subjects of education and the effectiveness of the educational process. The role of the auxiliary medium for the organization of productive educational activity of students plays the exchange and transfer of information. Training takes place simultaneously in real time (chat, video, "virtual whiteboards" with graphics, etc. The main features of this type of distance learning is creativity, engagement, communication to serve the main goal of learning – creative expression of the student.

Today, pedagogical and organizational distance learning potentials are realized with the help of available telecommunications services – conference in the Usenet, email, chat, ICQ, thematic lists, newsletters, e-zines, message boards, Web conferencing, and others. Given the current situation, e-mail includes the full range of services. Thus, the most intensive development of new educational technologies is based on e-mail, which is more important than more "advanced" video and TV technologies.

Experience shows the effectiveness of using the following activities in distance education:

- introductory classes give a brief idea of the course as a whole, and upcoming sessions. it is advisable to arrange it as a set of web pages in the educational server;
- individual lesson is a consultation carried out in various forms, taking into account the characteristics of each student;
- remote conference via e-mail requires the development of the structure and rules for discussion of the problem within the framework of remote correspondence;
- a chat lesson is organized in real time and requires a clear timetable and the wording of questions and problems;
- a web session has many options: remote classes based on web quests (specially prepared pages with links for studied topic), conferences in the form of forums, seminars, business games, etc.

Different models of distance learning differ in technology, the degree of control and responsibility of the teacher and students. Educational institutions and educators retain the classical management functions in the educational process in some models; in other cases, students themselves manage training. Distance education models, describing these two different approaches, are given below.

a) Distributed learning is an instructional model that allows instructor, students, and content to be located in different, noncentralized locations so that instruction and learning can occur independent of time and place. The distributed learning model can be used in combination with traditional classroom-based courses and traditional distance education courses. This model involves the following:

- training includes synchronous communication; teachers and students should be in a certain place at a certain time (at least once a week);
- the number of students is from one or more. Technical, logical and cognitive complexity depend on the number of students;
- it is more convenient for students to organize a study place at home or at work than in

an educational institution;

- schools can accommodate a small number of students who are in a particular place;
- facial expressions and other non-verbal forms of communication are not utilized.

b) Independent learning model frees students from the need to be at a certain time in a certain place. Students are provided with a set of materials, including the course summary, detailed program and have the opportunity to appeal to the faculty specialist, answering students' questions and assessing the work.

Student and instructor communicate by telephone, computer conferencing, electronic and ordinary mail. Characteristics of the model:

- students study independently guided by detailed requirements of the program;
- students interact with the teacher and rarely with other students;
- substantial part of the course is represented by print media, electronic media, which students can learn at any suitable time;
- course materials are the result of the development process, in which the creators of the course experts and specialists in the teaching environment are involved.

c) "Open learning + class" – a model that includes both a printed course material, and other learning tools (electronic media), allowing students to study a course at their own pace combined with telecommunication technologies for the organization of the work of students.

Characteristics of the model:

- substantial part of the course is represented by print media, electronic media, which students can learn at any appropriate time, in a group or individually;
- course materials are used for more than one semester (for example, video lectures);
- learners meet regularly to discuss and conduct classes with the teacher, using interactive technologies (in accordance with the distribution of a class model);
- classes are held in order to discuss and clarify the basic concepts, develop necessary skills, do laboratory work, group work, simulations, problem solving and other practical studies.

Using the potential of artificial intelligence systems creates a strong prerequisite for the organization of independent learning process; promotes the intellectualization of training activities; initiates generation of analytic-synthetic forms of thinking, formation of theoretical thinking. All this enhances the processes of personal development of the learner.

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**Виды информационных технологий,  
применяемых в дистанционном образовании**

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**Ключевые слова и фразы:** управление обучением, дистанционное обучение, самостоятельное обучение, информатизация обучения.

**Аннотация:** Виды дистанционного обучения различаются используемыми технологиями и степенью участия педагога и студентов. Учебное заведение и преподаватели, в отдельных моделях сохраняют классические функции управления в образовательном процессе, как и в случае традиционной системы классного обучения. Сегодня дистанционное обучение характеризуется процессом информатизации, глобального социального процесса, его особенность заключается в том, что преобладающим видом деятельности в сфере общественного производства является сбор, обработка, хранение, информационный обмен.

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UDK 33

## Human Capital in the Hospitality Industry in Russia

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**Key words and phrases:** human capital; hospitality industry, innovation.

**Abstract:** Human capital is increasingly becoming the object of attention in the hospitality industry. Personnel potential of the Russian Federation is not used in full: having significant human resources characterized by a high level of professionalism and knowledge, Russia has opportunities in the hospitality industry and innovation development. With the right incentives and the proper support, human resources can become a key to economic recovery in the country and promote its integration into the world market. The Russian Federation can get a double benefit from the human capital involved in the hospitality industry by information technology and educational resources.

Many problems of the Russian hospitality industry are connected with workforce. According to many researchers, despite the growing role of services in the global economy, the prestige of working in this industry is still very low. The analysis of the most popular existing areas of training, professions and forms of education shows that the majority of young people are pursuing higher education, while the country has a shortage of skilled workers. Another reason for their unpopularity, of course, is the low level of wages, particularly in the regions. Thus, the question of keeping staff at hotel enterprises at the appropriate level in terms of limited benefits is an open question. All these factors have a negative impact on the loyalty of professionals and newcomers to the industry in relation to the employers. This may lead to a high level of “staff turnover” in the hotel business, especially among in the catering business. To neutralize these negative trends hoteliers seek to allocate funds for the recruitment and training of personnel, however, this does not always guarantee the high levels of service.

Over the past few decades, the hotel market has acquired the status of one of the most significant in the service sector. The massive development of tourism, increasing business activity and communications have contributed to the development of the hospitality industry. The Russian experience of economic development in 1998-2000 and during the global financial crisis of 2008 confirmed that the market for hotel services respond to crises as actively as any other. The effects of the crisis on the hotel enterprises in terms of business strategy, work organization, innovative aspects is the main theme of the works of many Russian and foreign scientists. However, some of the theoretical and practical aspects of the study and measurement

of the impact of the crisis in the hotel industry are still poorly understood. It is well known that it is impossible to avoid the economic crisis in the majority of cases, but studying the impact of the crisis and assessing the effectiveness of the preventive measures can mitigate the negative effects.

Recently, there are signs of recovery in the Russian market of hospitality related services. Until 1997, there was limited demand for specialists and experts for the tourism and hospitality industry, which had either to work for very low wages, or change jobs or emigrate. Therefore, since August 1998, companies engaged in hospitality industry, IT and Mass Communications have been actively hiring new staff, and offering attractive salaries by Russian standards.

The applicant's suitability to work in a particular field of business is not always obvious. Especially when the candidate is considering the possibility of working abroad, it is important to determine what characteristics or skills will be needed in a particular country and in a particular industry. In this regard, the issues of qualification requirements, language skills are becoming more relevant.

Servicing of Russian customers requires the limited knowledge of the Russian language, as many Russians do not speak English or any other foreign language. Nevertheless, one cannot deny the importance of English in communications in the hospitality industry. In St. Petersburg, a competitive advantage for the competitor is the Finnish language skills, as geographical proximity leads to an annual increase in tourist flow from Finland.

Other important characteristics are the flexibility, learning, patience, stress, communication skills and sense of humor. These characteristics make it possible to survive in a foreign country and to succeed in a hotel or restaurant business. Willingness to continuously learn and improve their skills, according to some respondents, it is required not only at work, but also in everyday life.

Having a degree is valuable for the hotel and restaurant business, but it is often not the most important criterion when considering the admission of the applicant to work. Experience and beliefs are also important. A good resume is not always a guarantee of subsequent success. Admission of foreign applicants is based on the analysis of negative and positive personal characteristics; employers want to see responsible, punctual and loyal employees.

Innovation has not been so popular in the industry because the conservative character of the structure is not conducive to innovation. In 2008, it was found that the most innovative ideas in the hospitality industry came from those who stood in front of the prospect of becoming an outsider if they failed to review the existing paradigm.

Tourism and hotel business refer to the scope of services. Researchers seek to help to achieve a deeper understanding of innovation in the tourism industry. Innovative theory in tourism has certain limits. Professor Anne-Mette Hyalanger, Head of the Danish Center for Tourism, Innovation and Culture, analyzed the use of the term "innovation" in the field of tourism and came to the conclusion that innovation policy needs to draw the sources and ways to improve the sustainability and initiatives from other industries. Joseph Poon, the founder of the corporation Abraham Innovation Systems analyzed the technological innovations and their impact on the tourism industry. One of the most important aspects is the question of the application of technological innovation in small tourism businesses. Some researchers believe that small tourism companies are less inclined to innovate than small businesses in other sectors. One of the authors in their research concluded that innovation also appears in the tourism industry in various forms. In May 2007, the World Tourism Organization (the UNWTO) held the International Conference "Innovations in Tourism – Adaptation to Change" in Bled (Slovenia). The conference emphasized the role of innovation to adapt to the constant changes

in the sector. Three main groups were identified: innovation in information and communication technology, innovation of tourism products and innovative solutions and recommendations for addressing the main problems the industry. The key position in innovation in information technology is the development of mobile applications, the emergence of smartphones and online booking, designed to enhance guest satisfaction. Innovation in tourism products is gaining more and more attention, as all tourism-related products require constant updating. The reason for this is the growing needs that have to be met. In recent years, there has been the spread of medical tourism, eco-tourism, cultural tourism, etc. Innovative solutions for the problem of climate change, improvement of the stability and leveling of seasonality have also been in the center of attention and discussion.

The tourism sector is not only part of the services sector, but also the “industry of experience”. If the purpose of the service sector is to solve customer problems, the industry of experience has an emotional impact. The industry of experience includes entertainment industry, art, culture (cinema, theater, music, TV), museums, gastronomy, computer games and augmented reality, and of course, last but not least, the tourism industry.

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### Понятие человеческого капитала в индустрии гостеприимства в России

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**Ключевые слова и фразы:** человеческий капитал; индустрия гостеприимства; инновации.

**Аннотация:** Поскольку человеческий капитал все чаще становится объектом пристального внимания в индустрии гостеприимства он особенно значим. Кадровый потенциал Российской Федерации не использован в полном объеме: обладая значительными человеческими ресурсами, характеризующимися высоким уровнем профессионализма и знаний, Россия имеет соответствующие возможности в сфере



гостиничного бизнеса и инновационного развития. При правильном стимулировании и должной поддержке, человеческие ресурсы могут стать залогом возрождения экономики в стране и способствовать ее интеграции в мировой рынок. Российская Федерация может извлечь двойную выгоду из человеческого капитала, вовлеченного в индустрию гостеприимства за счет информационных технологий и образовательных ресурсов.

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## Banking Strategies to Attract Customers and Increase Their Loyalty

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**Key words and phrases:** banking marketing strategies; banking products; service quality; customers; loyalty; case studies; financial instruments.

**Abstract:** The article discusses the sociological aspects of the implementation of banking marketing strategies in the Russian financial market; financial tools aimed at attracting customers, increasing their loyalty and improving the quality of service in conditions of crisis have been analyzed.

Structural transformations of the Russian financial market made in recent years, have dramatically changed economic realities, in which the banking system functions. Financial sanctions, the sharp devaluation of the national currency, the growth of crisis and the high economic uncertainty have become a real test of strength for the Russian banks. Many of the participants of the banking market faced with a need to adapt quickly to the crisis economic conditions and search for new financial instruments to attract customers and increase their loyalty. In this connection, special importance is the development of marketing strategies that increase the share of regular customers, maintain their loyalty and attract new corporate and retail customers.

An important place in the development of this problem belongs to sociological studies of banking business processes related to the implementation of products and services, building relationships with customers and improve the quality of their service. Sociology of banking strategies includes such basic areas as case studies of customer loyalty, study of the structure of the customer base, study of the transformation of consumer behavior in today's crisis conditions, identification of the dominant social status and social roles of corporate and retail customers. This article focuses on the most important direction of sociology of banking marketing strategies in the current crisis conditions, the study of the strategies to attract customers and improve their loyalty.

As is known, M. Porter, the founder of the "positioning school" in marketing, formulated the main approaches to the formation of marketing strategies. He identified three options for such strategies: strategy of leadership in costs, differentiation strategy, and focus strategy. The use of each of these strategies in the banking market is only advisable under certain market conditions associated with the formation of supply and demand in the proposed range of banking services and increase in their consumer appeal.

Leadership strategy for costs should be used to minimize the ongoing costs of the bank, which will determine a significant competitive advantage in the market of monotonous banking products. Differentiation strategy is most appropriate for the bank, selling on the market a unique banking product, far superior in quality products of competitors. Application of the focus strategy



is expedient if the opportunities of the bank in the broader market are limited, but it is able to carry out their activities in a market niche and offer products adapted to the specific needs of clients of the group.

It should be noted that in late 2015 there was a need to develop a new integrated development strategy for the financial sector in the medium and long term, able to take into account both the changes in the Russian economy and the new challenges that the banking sector may face. The strategy reflects the main objectives of all the participants of the financial market: the economic and social objectives of the Russian Government, the regulator's position, the banking community opinion, the needs of business customers and banks.

In order to analyze the current state of the banking sector it is important to assess the retail lending. Interest rates on loans to individuals (excluding the Sberbank of Russia), although they declined to 27 %, but remained relatively high. One reason for the continued high level of interest rates is rising costs for reserves along with the outstripping growth of bad debts. In addition, the continuing decline in real disposable income and wages of the population does not allow banks to increase lending, which resulted in the steady decline in retail loan portfolio during the first six months of 2015, and losses of 5.3 % of its volume.

The accumulated problems in the banking system led ultimately to the growth of the total losses of banks in July 2015 to 337.2 billion rubles and an increase in the number of unprofitable credit institutions to 234 billion rubles. A substantial part of the loss falls on the retail banks: six of the ten largest retail banks in the first half of 2015 accounted for 74 % of all losses. For example, the net loss of the bank "Russian Standard" for the first half of 2015 reached 22 billion rubles, against a loss of 4.7 billion rubles for the same period last year. The loss was larger than Standard & Poor's and UBS analysts' expectations, predicting its previous level of 15–16 billion rubles [5]. At the same time, many banks were essentially in a vicious circle, with the growth in interest rates leading to an increase of bad debts and losses not covered by current revenues.

Analysts and managers of the banks stress the complex, critical state of the banking sector in 2016; they note that most of the demand for banking products is limited and determined by the dynamics of household incomes, although the correlation between consumer expectations and the dynamics of the new loans are not as pronounced. At the same time, potential customers waiting to improve their well-being exercise caution when receiving new loans. In addition, as noted above, marketing strategies of banks are focused on more careful selection of new borrowers to maintain the quality of its assets.

Taking into account all these factors, in 2016 you can expect some improvement in the dynamics of the issuance of new loans, whereby reduction of loan portfolio growth is not as significant as in 2015. At the same time, demand restriction will have a significant impact on the banking market. For example, analysis of consumer activity Promsvayzbank clients shows that this activity is more often associated with the negative dynamics of household income [6]. According to official statistics, real monetary incomes of the population of Russia in 2015 decreased by 4 %, and in January 2016 – by 6.3 %.

Many of the banks are faced with such a problem as a decrease in customer loyalty. In order not to lose profits, banks are forced to move to a policy of cost optimization. For customers, this translates into an increase in interest rates on loan products, reducing or leaving on the same level interest rates on deposits, increase in tariffs for transfers. All this leads to a decrease in the level of loyalty of existing clients of the bank and the outflow of potential customers who are forced to seek more favorable lending conditions in other organizations. Hence, the need to develop new instruments of customer is the most essential part of the marketing strategies of banks.

One of such tools is the development of strategies to improve the quality of banking services through the establishment of an effective system of bank customer service that can have a significant impact on their loyalty [7]. In domestic studies, the quality of customer service is commonly understood as “a set of mechanisms, activities, rules, and attributes that influence customer satisfaction in contact with the bank” [8]. One can agree with this definition, but it is necessary define the features of quality services to corporate and retail customers more thoroughly.

It seems that the formation of an effective system of service of the customer service will contribute to the creation of an integrated network structure of corporate and retail customers, with the most important characteristics of the clients, their dominant positions of status, role and functions of consumer motivation. Constant monitoring of the dynamics of a network structure, sociological research to identify the causes of outflow of clients and analysis of these reasons will allow improving the marketing strategy of the bank based on the identified needs and preferences of customers and finding new and more effective tools for improving bank customer loyalty.

The most popular banking services for consumers today are conservation and protection of funds. These services should be a priority for the marketing strategies of Russian banks wishing to increase customer loyalty in today's crisis conditions.

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**Банковские стратегии по привлечению клиентов и повышению их лояльности**

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**Ключевые слова и фразы:** банковские маркетинговые стратегии; банковские продукты; качество обслуживания; клиенты; лояльность; социологические исследования; финансовые инструменты.

**Аннотация:** В статье рассматриваются социологические аспекты реализации банковских маркетинговых стратегий на российском финансовом рынке, анализируются финансовые инструменты привлечения клиентов в современных кризисных условиях, повышение уровня их лояльности и качества сервисного обслуживания.

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UDK 33

## Foundations of Economic Security of the State

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**Key words and phrases:** globalization; world economic system; national interests; economic security.

**Abstract:** The article discusses with the essence of national interests of states in the context of globalization and the impact of globalization on the economic security of individual states. A number of questions related to national interests and economic security have been studied, indicators characterizing the economic security have been presented, and factors ensuring economics security have been calssified.

Globalization leads to the fact that elements of the national economy are united in a single economic system not only on the basis of the international division of labor, but also on the basis of scale, global production and sales, global financial system and information network system. They have become an integral part of the world economic system.

Observations show that the process of globalization is changing the role of national and international economic mechanisms. At the beginning, the national economy played the leading role. Currently, with the development of financial and commodity markets, production and sales structures, the international economic relations play the leading role. Even the most developed countries have to build their own internal relations in accordance with the requirements of the global economy. Transformation of international economic relations into the basic factor regulating the relations on a global scale contributed to a decrease in the role of individual states in international processes, as they are unable to manage the processes that occur beyond national borders. In addition, in accordance with international agreements, states are limited in the rights of using customs barriers, currency regulation and other traditional means used in macroeconomic regulation. They have to adapt to the requirements of international economic organizations, large multinational companies. In this respect, the influence of transnational industrial and banking corporations has been intensified in the globalization processes. Therefore, the national states, being the subjects of the global world economy, are compelled to renounce many of international rights [3, p. 60, 69].

Increased globalization of the world system, acceleration of integration processes, building up relationships and interdependence of countries, including an increase in the possible negative impact of these processes on the economies of individual countries brings to the fore the provision of their economic security. Economic security, as an integral part of national security, creates conditions for social stability in society, ensuring a balanced development of the country's defense capability [4, p. 61, 72, 112, 124].

In the economic literature, there are different opinions about the essence of economic security. For example, the Russian scientist V. Senchagov notes that in order to explain economic security it is necessary to determine economic interests of the major components [9]. Another group of economists believe that economic security represents protection of national economic and social interests of the state. Here the basis is the interests of the general public, including protection from adverse effects of internal and external factors. According to Academician L. Abalkin, economic security requires adherence to the following three conditions [2; 3; 5, p. 143–156]:

- the economic freedom, i.e., full government control over all national resources and industry, making independent economic decisions;
- ensuring the sustainability and stability of the national economy;
- the ability of the economy for self-development.

This shows that one of the main factors ensuring economic security is the nation's understanding of their interests, the creation and strengthening of statehood as a guarantor of the protection of these interests. The development of the country depends on its economic security, i.e., neutralization of all the negative factors hindering this development. With this in mind, you can conclude that economic security reflects the elimination of internal and external factors adversely affecting the economic interests of the country, including creation of conditions for the realization of these interests in the planning period [3, p. 4].

This brings me to the conclusion that economic security is such a qualitative characteristic of the economic system, which determines the normal activity of the population, development of the economy, and ultimately the possibility of implementation of national public interests [10, p. 126; 145]. Economic security meets the needs of all sectors of society, ensures efficient operation of the economy and implementation of the country's economic interests, provides neutralization of all the factors of the negative impact on the normal course of economic development.

It is noteworthy that the economy tries to satisfy the endless needs of the people and find solutions to the problem within limited resources. A group of researchers, economists from Azerbaijan (M. Ahmedov, J. Veliyev) point out that national economic security is intended to ensure security of the state and the market, together with nationals of the country. Hence, the security of citizens and market is tailored to the needs of society and reflects the implementation of economic interests.

Taking into account the aforementioned, the economic interests of the country can be described as:

- Ensuring the economic security of the country. This reflects the neutralization of external influences, i.e., ensuring the possibility of taking free decisions in the allocation and use of national resources.
- Modernization and development of the economy, improvement of life and competitiveness of local products in the world market. This includes the efficient allocation and use of resources in terms of continuous improvement of the economic structure, ensuring extended reproduction in the country, “freezing” inefficient and uneconomic production sectors.
- The country's active participation in the integration process. This could include the participation of the country as an exporter of finished products in the field of foreign trade, improving the structure of foreign trade, protection of the domestic market and other problems.
- Creation of a mechanism of self-protection and self-development of the economy. This involves the development of linkages between sectors and participation of all sectors of the economy in the economic turnover (raising efficiency of the real and financial sectors,

development of processing industries and growth of the export potential, sustainable development of financial and banking systems), expansion of intra-modernization, development of production of scientific and technological potential of the country, strengthening of the legal framework, etc.

– Ensuring social orientation of the economy. It involves the human capital development, improving living standards, protection and income growth, satisfaction of social needs, etc. [5; 7].

Thus, based on the experience of individual countries, the above indicators of economic security can be divided into five groups [8; 9].

1. Indicators of the economic growth characterize an increase in the volume and quality of production and services. Economic growth contributes to improving the living standards of the population, resource efficiency, efficient solution of existing problems in the country, building a rational structure of foreign economic relations. The indicators of economic growth include GDP, the share of individual sectors in its structure, volume and dynamics of the national income, the level of aggregate savings, including the shadow economy.

2. Indicators of resource potential. The resource potential is the main driving force behind the reconstruction and economic development, improve people's living standards. Resource potential comprises scientific and technical potential, along with the natural resources. In general, indicators that reflect the natural resources, scientific and technical potential are the main indicators of the economic security. It also includes indicators of volume and use of resources, scientific and technological potential of the country, quality indicators of the development of science, funding indicators for science, etc.

3. Indicators of economic stability. Economic stability influences largely the development of entrepreneurship, the real sector, the efficiency of investment and on that basis of economic security.

4. Social indicators. These include state regulation of social processes and the solution of social problems. These indicators reflect the quality of life – the level of provision of the population with food, material and moral values, the increase in life expectancy, living standards, income of the population, the degree of differentiation of the distribution of income, proportion of the population with incomes below the subsistence minimum, the level of education and health service, unemployment, etc.

5. Indicators foreign economic relations. Ensuring the efficiency of foreign economic relations, including protection of the economic interests of each country, is one of the most important tasks of each country.

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### Основы обеспечения экономической безопасности государства

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**Ключевые слова и фразы:** глобализация; мировая экономическая система; национальные интересы; экономическая безопасность.

**Аннотация:** В статье рассмотрена сущность национальных интересов государств в условиях глобализации, отражено влияние глобализации на экономическую безопасность отдельных государств. Изучен комплекс вопросов национальных интересов и экономической безопасности, представлены показатели, характеризующие экономическую безопасность, дана классификация факторов, обеспечивающих эту безопасность.

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