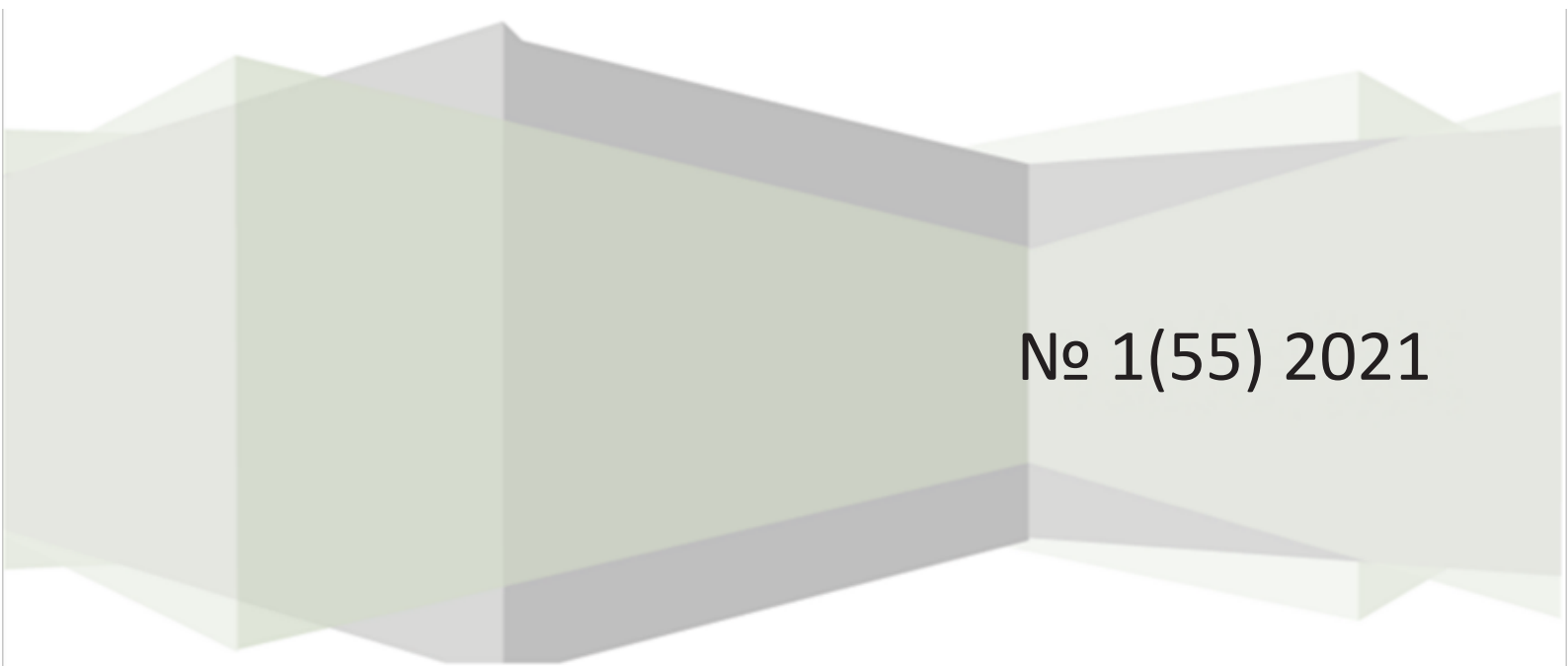


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On the Quality Management Principle “Customer Orientation”

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Key words and phrases: educational service; customer orientation; quality management system; customer satisfaction.

Abstract. The purpose of this research is to develop and implement measures to implement the quality management principle “customer orientation” in a professional educational organization. The hypothesis is that the implementation of the quality management principle “customer orientation” will increase customer satisfaction and loyalty; improve management processes; have a positive impact on the organization’s image; and achieve sustainable success. The research methodology includes modeling, observation and surveys; scientific search; generalization; comparison; systematization; analysis; experiment; survey, registration and analysis of research results. The practical significance of the research results lies in the real possibility of using the developed model for implementing the “customer orientation” principle to improve the quality of educational services.

Today, the problem of improving the quality of education is one of the main trends in the modernization of Russian education. In this regard, it is necessary to carry out activities to develop innovative approaches to finding solutions to this problem. Designing and implementing the quality management system and its basic principles is an effective tool for ensuring a high level of education quality.

An important aspect of solving the problem of improving the quality of education is its compliance with the expectations and needs of both individuals and society as a whole. An educational service is a special type of product that is created in the educational industry and has a consumer value and price, i.e. it meets the educational needs of the individual, society and the state, and its price is determined by the cost of production and marketing of the service.

When improving the quality of educational activities, the relationship between pedagogical principles and the principles of quality management (customer orientation; leadership; employee interaction; process approach; improvement; evidence-based decision-making; relationship management) is of particular importance, which, in our opinion, is reflected in the Federal state educational standards of professional education. In this study, we will take a closer look at the “customer orientation” principle.

One of the key elements of an educational organization's success is customer satisfaction. In accordance with the requirements of GOST R ISO 9000-2015, sustainable success is achieved when an organization gains and retains the trust of consumers and other interested parties. Every aspect of interaction with the consumer makes it possible to create more value for the consumer. Understanding the current and future needs of consumers and other stakeholders contributes to the organization's sustainable success [1].

Questions of quality management in education were considered in the works of A.A. Avetisov, G.V. Vorobyov, E.A. Gorbashko, A.L. Denisova, V.A. Kachalova, E.D. Kolegova, E.M. Korotkov, V.M. Levshina, S.V. Mishchenko, V.N. Nuzhdin, M.N. Potashnik, A.I. Subetto, N.A. Selezneva, V.P. Solovyov, Yu.G. Tatura, V.N. Ushakov, and others. The main methods of marketing research are considered, in particular, in the works of such authors as L.A. Ivanov, Sh.Sh. Magomedov, T.I. Savenkova, and others.

ISO 9000 series standards offer a methodology for developing and implementing a quality management system, taking into account changes in consumer expectations and requests. The system itself will ensure and maintain the quality of services provided at a high level, which will ensure a high degree of customer satisfaction.

According to GOST R ISO 9001-2015, the organization should monitor data related to consumers' perception of the degree of satisfaction of their needs and expectations. The organization must determine how to obtain, monitor, and analyze this information [2].

Customer satisfaction with the quality of educational services provided is one of the basic criteria for independent evaluation of the activities of educational organizations, which is formulated in article 95.2 of the Federal law "On education in the Russian Federation" No. 273-FZ of 29.12.2012.

The considered professional educational organization trains qualified, competitive personnel who are able to effectively solve production tasks, ready for constant self-development and career growth. The college is a leading institution of secondary vocational education in the region for training specialists and workers for the food and processing industry. The quality management system of an educational institution functions in a competitive environment, which is formed by the requirements and expectations of consumers and is regulated by the requirements of GOST R ISO 9001-2015, the Federal State Educational Standard, and the requirements of current legislation in the field of education. Development and implementation of measures in the field of quality management is one of the most promising areas of professional educational organizations. In this regard, the implementation of the quality management principle "customer orientation" is strategically important for the further development of the organization.

In order to carry out successful activities in this area, a model for implementing the "customer orientation" principle was developed for the professional educational organization under consideration, which reflects the relationship of components in accordance with the requirements of GOST R ISO 9001-2015. The model consists of 4 sections. The target section is aimed at defining the strategy and goals of a professional educational organization and includes factors that determine the implementation of the "customer orientation" principle: the analysis of legal requirements, according to which it is necessary to conduct an independent assessment of the quality of an educational organization and increase the competitiveness of educational services; the measures aimed at the implementation of the principle are to plan and implement the activities of a professional educational organization in order to meet the requirements of consumers and strive to exceed their expectations in order to achieve sustainable success; The content section assumes the existence of measures in accordance with the requirements of GOST R ISO 9001-

2015, GOST R 54732-2011/ISO/TS 10004: 2010. The organizational section represents the qualitative characteristics of the process of implementation of the principle of acting regulatory factors: goal orientation, relationship goals, content, methods, tools and results; correlation of analytical, design, technology and test and evaluation activities. The evaluation section presents criteria for evaluating the implementation of the principle of “customer orientation”. The results of the implementation of the principle are high degree of customer satisfaction, improvement of the quality of pre-delivered educational services, increasing the competitiveness of the organization in the market of educational services. At all stages of the model, the organization’s consumers participate, and all work on implementing the principle is based on their needs and preferences.

In the course of this research, an algorithm of actions has been developed that includes the following key stages: forming a working group; informing employees about the implementation of the principle; identifying the main groups of consumers, identifying their needs and expectations, and forming consumer requirements; describing the process of evaluating consumer satisfaction and its regulation in the form of an organization’s standard; developing criteria for evaluating customer satisfaction and questionnaires for conducting research; evaluating consumer satisfaction; analysis of results, reporting to management; communicating to employees the identified needs and expectations of consumers, as well as the results of their satisfaction assessment; developing measures for improvement; linking the organization’s goals with the needs and expectations of consumers.

External consumers for professional educational organizations are society, employers, enterprises and organizations, and partners. Internal consumers include students, their family members, employees, and customers – the state (founders). In addition, the following needs and expectations of the main consumers of the college are defined: the state (founders), society as a whole – compliance with educational activities in accordance with the Federal State Educational Standard, compliance with the requirements of legislation in the field of education; students, their family and parents; graduates the possibility of obtaining high-quality secondary vocational education, development of general and professional competences; employers: competence, employability, social and professional adaptability of graduates; employees – opportunity for professional and career growth, availability of necessary resources for the implementation of all processes, clear leadership, continuous improvement of the quality of work.

To ensure the efficiency and effectiveness of the process of assessing the satisfaction of key consumers, the management of the organization decided to develop the organization’s standard “assessment of customer satisfaction”, which regulates the procedure and responsibility of interested parties for organizing and performing work in this direction.

The monitoring of information concerns the perception of consumers of the compliance of the educational process and the graduate specialist with the established requirements. Surveys of students, employees and employees and registration of requests, complaints, complaints, and letters are effective methods of obtaining such information. The survey includes the following steps: planning a consumer survey; developing questionnaires; survey; processing survey results, analyzing customer satisfaction; generating a report to management.

In the study of consumer satisfaction of the educational organization under consideration, students of all training areas took part, with special attention paid to first-and final-year students (separate questionnaires were developed), as well as parents of students, employees and employers. The study was conducted in several stages using the online service “Webanketa”, which allowed full automation of the process.

In general, the conducted research allows us to conclude that the consumers of the

considered professional educational organization are satisfied with the quality of educational services provided, but problems that need to be solved and aspects of improving educational activities were identified. The results of the customer satisfaction assessment, the list of measures developed, as well as the identified needs and expectations of consumers were brought to the attention of the collection at various meetings, meetings, and meetings of management bodies. The work plans of the structural divisions were formed based on the information provided on customer satisfaction. Based on the results of the analysis of customer satisfaction, an improvement plan was developed, and the main goals of the organization were adjusted to reflect the data on customer satisfaction.

At the present stage of development, educational institutions require management innovations. It is necessary to use business technologies, create and implement a quality management system based on ISO 9000 series standards, which will solve the issues of general quality management, quality planning, quality assurance, quality monitoring, maintaining and improving the quality management system; implementation of quality management principles, which will ensure the effectiveness of internal processes, as well as the participation of consumers and stakeholders in solving strategic problems of improving the competitiveness of the educational institution. In this regard, this research is of practical significance for the innovative and harmonious development of the professional educational organization under consideration.

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О реализации принципа менеджмента качества «Ориентация на потребителей»

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Ключевые слова и фразы: образовательная услуга; ориентация на потребителей; система менеджмента качества; удовлетворенность потребителей.

Аннотация. Целью представленного исследования является разработка и проведение мероприятий по реализации принципа менеджмента качества «Ориентация на потребителей» в профессиональной образовательной организации. Гипотеза данной работы состоит в предположении, что проведение данного исследования обеспечит повышение удовлетворенности и лояльности потребителей, совершенствование процессов управления,

благоприятное воздействие на имидж организации, достижение организацией устойчивого успеха. Методологией исследования является моделирование, наблюдение и опросы; научный поиск; обобщение; сравнение; систематизация; анализ; эксперимент; анкетирование; регистрация и анализ результатов исследования. Практическая значимость результатов исследования состоит в реальной возможности использования разработанной модели реализации принципа «Ориентация на потребителей» для повышения качества образовательных услуг.

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UDK 69

Development of a Method for Selecting Organizational and Technological Solutions for Establishment of Building Enclosures and Structures in the Elimination of Emergency Situations Consequences

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Key words and phrases: emergency situations; enclosing structures; organizational solutions; technological solutions.

Abstract. Currently, there is an active development of the Siberian and Far Eastern federal districts, which are territories with difficult natural and climatic conditions, where there is a constant threat of emergencies and man-made disasters. Among the adverse consequences that emergencies entail is the destruction of buildings and structures for industrial, public and residential purposes, causing damage to the population and the economy. In this regard, the study of methods for organizing integrated development and technology for the construction of building objects in emergency situations is becoming increasingly important. The purpose of this article is to develop a methodology for choosing rational methods for organizing integrated development and technology for erecting buildings in an emergency. To achieve this goal, the following tasks were completed: methods of organizing the construction of complex development of prefabricated buildings for various purposes in conditions of emergency situations on the example of Siberia and the Far East have been analyzed; analysis of technologies for construction of buildings for various purposes was carried out; a methodology for choosing rational methods of organizing construction and building technology was developed; recommendations were given for the implementation of the developed methodology; modeling of the consequences of emergencies and design solutions was carried out in order to make a rational choice of methods of organizing construction and technology for the construction of buildings for various purposes; an assessment of the economic efficiency of the application of the developed methodology in the conditions of emergencies is given.

During the research, the author of the article used the method of expert assessments. The results of the study confirmed that the developed methodology makes it possible to choose the most acceptable and effective organizational and technological solutions for the construction of buildings in emergency situations.

Introduction

Decree of the Government of the Russian Federation No. 1120 of 07/27/2020 provided for the compilation of a list of houses located in emergency zones, and the receipt by citizens whose houses were destroyed as a result of emergency situations, new housing according to a simplified procedure [1].

Of great importance in the construction of buildings and structures is the choice organizational and technological solutions, which are understood as a set of measures that ensure timely commissioning of construction objects of the required quality, rational use of material and technical and labor resources, increase in productivity, including through the automation of work processes.

Depending on the sphere of origin, the following types of factors are distinguished that affect the choice of these decisions:

- economic (the amount of funds allocated by the state per one square meter, the planned construction and settlement time of the facility);
- labor (attracting workers, ensuring their household needs);
- technical (providing construction with machines and mechanisms, connecting the future object to engineering networks and communications);
- material (manufacturing of products from local raw materials, transportation of raw materials for structures to the installation site, the use of the selected design and technological solution in the conditions of the construction area) [2–4].

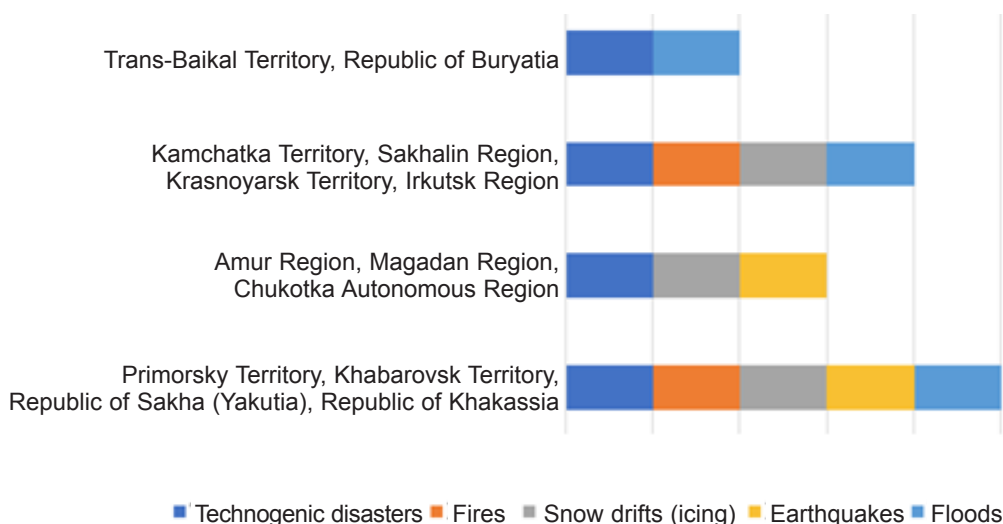


Fig. 1. Emergency forecast (data based on the report of the Ministry of Emergency Situations of Russia 2018–2020)

Construction technologies and structural features of enclosures	Types of enclosures
Small-piece	Brick, foam- and gas-concrete, expanded clay concrete, slag concrete, vermiculite, polystyrene concrete, three-layer blocks
Monolithic	Permanent formwork / removable formwork
Wooden	From chopped or rounded logs, from calibrated glued laminated timber or veneer
Frame, frame-panel, panel	Wooden or metal frame, monolithic reinforced concrete frame, chipboard or particle board
Combined	Walls made of small-piece elements with subsequent insulation brick or monolithic walls with external insulation and a ventilated façade monolithic walls with insulation and facing with bricks or plaster

Fig. 2. Types of enclosing structures

Formulation of a scientific and technical hypothesis

Today, it is relevant to search for constructive solutions, in which the object under construction would meet the requirements of energy saving, and the technology of its construction would be low-cost in terms of time and resources. Such important technical and economic indicators of a construction object as energy saving cost and labor costs required for its construction depend on the properties of the used wall fences. Therefore, the choice of wall protection is an important step in the construction of a building or structure.

Wall enclosing structures, depending on their features and construction technology, can be divided into five groups (Fig. 2).

Algorithm for choosing a rational constructive and technological solution is presented in Fig. 3.

The method used to confirm the hypothesis, solve the problem

The following methods are most commonly used in scientific research.

1. Empirical or measuring (suitable for carrying out material research, the subject of which are quantities that have physical parameters that can be measured).
2. Theoretical (used in cases where objects of research are not accessible to human perception, for example, space objects).
3. Quantitative or statistical (these are methods for studying phenomena and processes based on quantitative indicators; they are used when information is available in mass quantities).
4. Qualitative research methods make it possible to reveal the significance of the factors of any phenomenon through the analysis of competent opinions [5].

In the case of studying the impact of organizational and technological solutions on construction production lacks measurable physical parameters, objects that are inaccessible to perception, and large volumes of statistical data. Therefore, the author of the article selected the method of expert evaluation for the study. The results of the survey of experts were subjected to a mathematical analysis, during which the correctness of the collected data was established by determining the degree of agreement of experts' opinions.

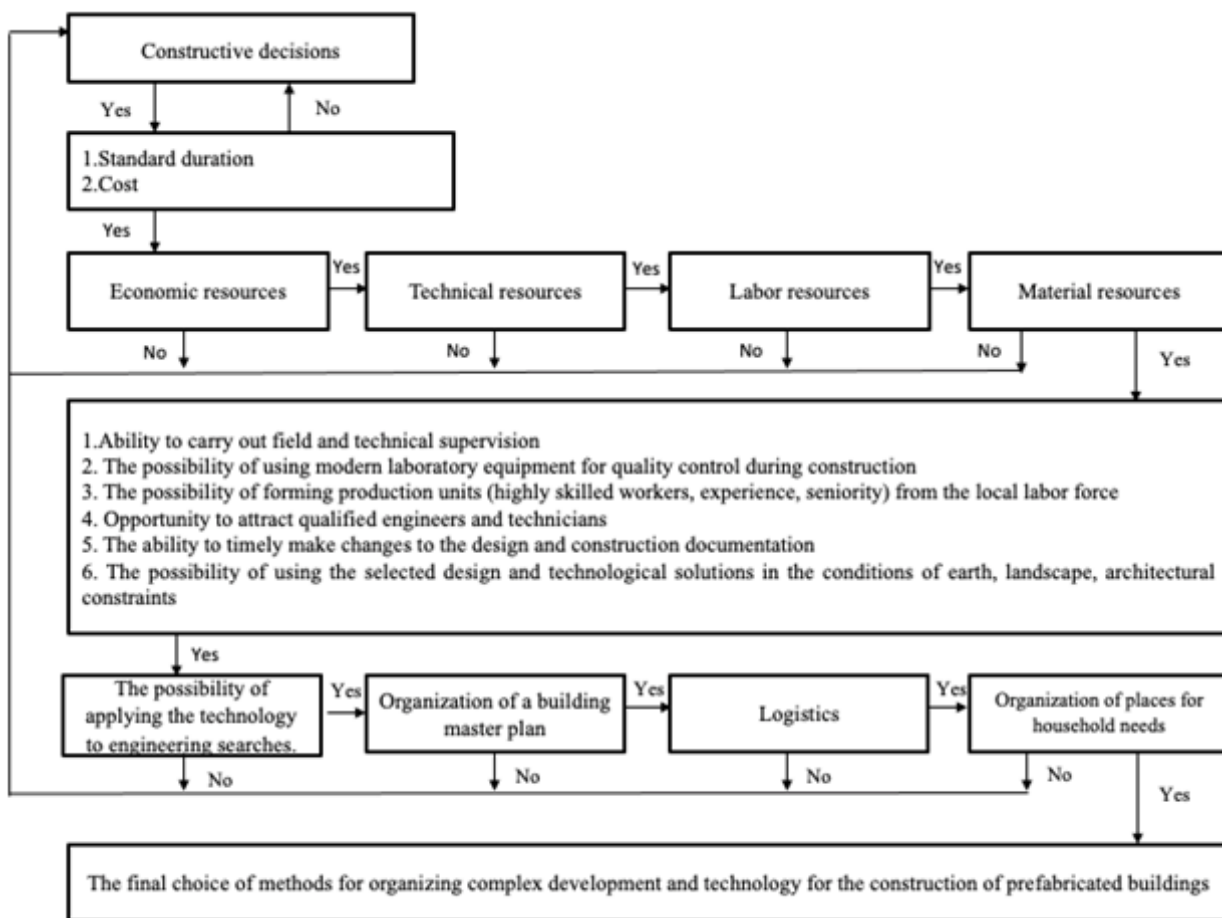


Fig. 3. Algorithm for choosing a rational constructive and technological solution

The required number of experts was determined by the formula (1):

$$E = (h^2 \cdot r_a \cdot r_o) / \Delta^2, \quad (1)$$

where E is the minimum required number of experts; h is the confidence factor; r_a is the proportion of sample elements with this feature; r_o is the proportion of sample elements with the absence of this feature; Δ is the error of representativeness.

As an analytical model of the study, expression (1) was used, the value of which is the final complex effectiveness of the application of this organizational and technological solution:

$$f(V) = K \cdot \sum_{i=1}^n V_i = K \cdot (V_1 + V_2 + \dots + V_n), \quad (2)$$

where $f(V)$ is an indicator of the solution's effectiveness; K is a coefficient depending on the number of evaluation criteria; V_i is the assessment of the given organizational and technological solution according to the criterion having the serial number i ; n is the number of evaluation criteria.

Based on equation (2), the final efficiency of the considered organizational and technological solutions was calculated. The model values for each of the criteria were also calculated as the arithmetic mean of the expert survey data from the summary tables [6].

Conclusion

The choice of organizational and technological solutions during construction is always aimed at the delivery of objects of the required quality in a timely manner, rational use of resources, increasing productivity, while taking into account economic, labor, technical and material factors. When choosing enclosing structures and technologies for their construction, priority remains with decisions that provide for the use of low-cost construction technologies and the commissioning of facilities with high energy saving parameters.

In the case of the implementation of construction projects in an emergency, the existing man-made and natural threats should be additionally taken into account. In the study under consideration, the assessment of such threats in the regions of Siberia and the Far East was carried out on the basis of data from the Russian Emergencies Ministry.

Using the technique described in this article, it is possible to objectively assess the effectiveness of the application of methods of organization and construction technologies for buildings for various purposes. The recommendations given by the author make it possible to analyze and select the most suitable organizational and technological solutions for the construction of buildings in emergency conditions, taking into account all the specific features of this kind of construction.

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Разработка методики выбора организационных и технологических решений по возведению ограждающих конструкций зданий и сооружений при ликвидации последствий чрезвычайных ситуаций

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Ключевые слова и фразы: ограждающие конструкции; организационные решения; технологические решения; чрезвычайные ситуации.

Аннотация. На современном этапе наблюдается активное развитие Сибирского и Дальневосточного федеральных округов, представляющих собой территории с трудными природно-климатическими условиями, где существует постоянная угроза возникновения чрезвычайных ситуаций (ЧС) и техногенных катастроф. К числу неблагоприятных последствий, которые влекут за собой ЧС, относится разрушение зданий и сооружений промышленного, общественного и жилого назначения, причиняющее ущерб населению и экономике. В связи с этим исследование методов организации комплексной застройки и технологии возведения строительных объектов в условиях ЧС приобретает все большую актуальность.

Целью настоящей статьи является разработка методики выбора рациональных методов организации комплексной застройки и технологии возведения зданий в условиях ЧС.

Для достижения поставленной цели были выполнены следующие задачи:

- проанализированы методы организации строительства комплексной застройки быстровозводимых зданий различного назначения в условиях последствий ЧС на примере Сибири и Дальнего Востока;
- проведен анализ технологий строительства зданий различного назначения;
- разработана методика выбора рациональных методов организации строительства и технологии возведения зданий;
- даны рекомендации по внедрению разработанной методики;
- проведено моделирование последствий ЧС и конструктивных решений с целью рационального выбора методов организации строительства и технологии возведения зданий различного назначения;
- дана оценка экономической эффективности применения разработанной методики в условиях последствий ЧС.

Автор статьи в процессе исследования использовал метод экспертных оценок. Результаты исследования подтвердили, что разработанная методика позволяет выбрать наиболее приемлемые и эффективные организационные и технологические решения при возведении зданий в условиях ЧС.

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UDK 378

Environmental Education of Young People and the Formation of Household Waste Management Culture

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Key words and phrases: environment; educational activities; students; waste management; environmental knowledge; ecology.

Abstract. This article is devoted to the actualization of problems related to the disposal of waste that affect environmental pollution. The aim of the study was to confirm the possibility of conducting environmental education among students to draw the attention of young people to measures to protect the environment. The research methods are search-based, comparative, descriptive, as well as methods of analysis, systematization and generalization. The hypothesis of the study is connected with the assumption that today the student youth as an active stratum of the population should be aware of the possibility of turning our planet into a big dump. The development of environmental education of the younger generation cultivates a way of thinking, which in turn affects the actions of young people in relation to nature. The results of the study allow us to talk about the formation of the younger generation of a social-value personal approach in interaction with the surrounding world, which contributes to overcoming consumer attitudes towards nature and its resources, creates conditions for practical environmental activities, the development of natural-like cultural norms by eliminating the inadequate impact of humanity on the environment.

In the era of globalization and the development of economic, scientific and technological potential, the problem of waste management is becoming more urgent and health concerns of every inhabitant of the planet are growing. Currently, humanity is making significant investments to eliminate air pollution. This problem is so complex that it requires long-term monitoring of changes associated with the consequences of harmful human impact on the environment. Scientists have identified a pattern of waste generation from the standard of living of the population and its security. The higher the standard of living, the more waste is generated and the problems of their disposal.

In Russia, within the framework of the national project "Ecology", billions of rubles were

allocated to address the issue of waste management. Landfills began to close and a course was chosen to improve the environment. The garbage business was monopolized and given to regional operators who made attempts to improve their financial situation on the garbage issue. Serious economic ambitions of Regional operators in most regions of Russia, including the Moscow region, have led to disinterest in the development of a system of separate collection of secondary raw materials, lack of containers for separate collection of waste of secondary raw materials, allocation of insufficient resources for sorting waste. So, hundreds of enterprises for waste processing (i.e. the use of waste in the production of products) were left without secondary raw materials. Today, no more than 5 % of waste is sorted at waste sorting complexes built under the Ecology program.

At the end of 2019, a solution was proposed: burn garbage. Meanwhile, Europe, America and many other civilized countries refused to build incinerator plants, and actively began to develop the narrowest link, namely, the system of separate garbage collection and sorting [5–6]. The decision to incinerate waste entails ambiguous consequences: without establishing a system of garbage collection, sorting and recycling, we will not be able to create and develop a system of cyclical economy and waste processing in Russia. In the incinerator plants under construction, a three-stage system for cleaning the products of the combustion reaction of substances is planned instead of a five-stage system as in developed countries. In addition, the maximum permissible concentrations of toxic substances formed during combustion have been increased.

At the same time, individual stakeholders and structures are doing everything possible to simplify the EIA system (Environmental Impact Assessment and environmental assessment) for the incinerator plants and to minimize the possibility of taking into account and influencing public and expert opinion. Meanwhile, incineration of garbage is an extremely dangerous and unecological method of waste disposal. The radius of damage from only one incinerator plant, including air, soil and water pollution due to the transfer of air masses and the deposition of pollutants, most of which have carcinogenic properties, can reach tens of kilometers, and for individual elements hundreds. Recent studies show the danger of a number of products of burning various substances for human health, so in the list (pyramid) developed countries have put incineration in the penultimate place, the last-the disposal of non-recyclable waste, and the first-the reduction of waste.

In the Moscow Region, since 2018, a separate waste collection system has been created to reduce the risk of burning substances that give toxic reaction products. It should be noted that the creation of a system of separate waste collection in developed countries took more than a decade, and scientific studies show that the education of the eco-culture of the population leads to the possibility of solving global environmental problems of our time.

The fundamental influence on the process of development and strengthening of environmental principles in the life of society is played by the state environmental policy of the country, which determines state priorities and uses national traditions in the process of educating public and personal environmental culture. The system of environmental education includes: family-kindergarten-school-university-professional activity. Of course, preschool children are a priority element in environmental education. A team of social ecological movement of the city district of Stupino, Moscow region “EcoStupino”, which includes people of different ages and strata of the population (students and school pupils to pensioners), members of the Public chamber and professional ecologists, organized a company on eco-education of citizens. A program was developed and implemented to inform the public about the separate collection of waste: from master classes for schoolchildren and students to a training regional seminar

“45 minutes to save the planet” for primary school teachers. Work on informing the population was conducted simultaneously with the work of the administration of Stupino infrastructure for the separate collection of waste and system for separate removal of separately collected waste. By 2019, 500 multi-colored containers with information for citizens were installed in the district. In addition to the above, the activists of “EcoStupino” developed visual materials, which included posters; wall newspapers with photos of the environmental work carried out for schools and universities; a poster for the coverage of the district competition dedicated to the World Cat Day; information leaflets for both containers and the “Garbage Chic” festival. As a confirmation of the success of its environmental and educational activities, the Stupino branch of Moscow Aviation Institute was awarded the annual award of the Governor of the Moscow Region “Our Moscow Region” in 2016 for the project “EcoStupino”.

Today, the younger generation regularly participates in the improvement of coastal recreation areas on the Oka River, Lake Rezvan, city pond and other places. On coastal beaches, containers appeared, funds for which were collected during crowdfunding campaigns. World Cleanliness Day, the “Run and Collect” campaign, and the “Plant a Tree” campaign allow young people to feel like they are part of a large team of conservationists [4].

Schoolchildren and students are participants and organizers of the annual environmental art project “Garbage Chic”, the district competition dedicated to the World Cat Day, the competition “Eco-chic”, environmental sites for the Day of the city of Stupino. On the territory of one of the Stupino’s schools, an “Apothecary’s garden” with medicinal herbs was laid out [4].

The involvement of young people in the implementation of eco-activities has a positive impact on the civic position of the younger generation [1–3]. The main goal of education is to educate the “new ecological conscience” of humanity, which is based on generally accepted moral and ethical norms of behavior and the extension of these norms and rules to the entire ecosystem.

In addition to the above, a sociological survey was conducted in the group “EcoStupino” in VKontakte and Instagram to collect the opinions of residents of the Stupino city district to the current situation. The concept of the sociological study revealed that the majority of respondents as of January 15, 2021 (74 % in VKontakte and 95 % in Instagram) expressed a negative attitude to the construction of incinerator plants, justifying their refusal as a health hazard and not the prospect of such construction from the point of view of the economy. 92 % (100 %) of respondents consider waste recycling to be safe for public health and cost-effective 81 % (95 %). The current situation with waste confirms that Russia is only at the beginning of a long journey. The growing discontent and irritation of citizens due to the increase in tariffs for the treatment of solid municipal waste management, due to problems with the separate collection of waste, the deterioration of public health result in a hopeless future of incinerator plants.

Summing up, the authors of this article would like to draw attention to innovative ways to solve current problems of nature management and environmental protection: the need for wider use of the experience of developed countries, which have already built an effective waste management system and organized the issue of information dissemination, the possibility of obtaining environmental education by the population as the younger generation, and the adult population in the context of the use and disposal of solid household waste.

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Экологическое просвещение молодежи и формирование культуры обращения с отходами потребления

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Ключевые слова и фразы: окружающая среда; просветительская деятельность; студенты; управление отходами; экологические знания; экология.

Аннотация. Данная статья посвящена актуализации проблем, связанных с утилизацией отходов, которые влияют на загрязнение окружающей среды. Целью исследования было подтверждение возможности проведения экологического просвещения среди студентов для привлечения внимания молодежи к мерам по защите окружающей среды. Методы исследования: поисковый, сравнительный, описательный, метод анализа, систематизации и обобщения. Гипотеза исследования состоит в предположении о том, что сегодня студенческая молодежь как активная прослойка населения должна быть осведомлена о возможности превращения нашей планеты в большую свалку. Развитие экологического образования подрастающего поколения культивирует образ мышления, что в свою очередь сказывается на действиях молодежи по отношению к природе. Результаты исследования позволяют нам говорить о формировании у подрастающего поколения социально-ценностного личного подхода при взаимодействии с окружающим миром, что способствует преодолению потребительских установок в отношении к природе и ее ресурсам, создает условия для практической экологической деятельности и выработки природосообразных культурных норм посредством устранения неадекватного воздействия человечества на окружающую среду.

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Research into Technologies of 3D Printing of Concrete Structures in Construction

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Key words and phrases: 3D printers; 3D printing; Autodesk; concrete structures.

Abstract. The main purpose of the article is to analyze the adaptation of the technology of 3D printing of concrete structures. Additive technologies (3D printing) are some of the forms of additive manufacturing technologies, where a three-dimensional object is created by overlaying successive layers of material (printing, growing) according to a digital model. Printing is carried out by a special device – a 3D printer. The creation of the object takes place by sequential application of plastic material. 3D printers are generally faster, more affordable and easier to use than other additive manufacturing equipment. 3D printers offer the ability to print parts with multiple materials and different mechanical and physical properties in a single printing process. 3D printing allows you to convert models obtained in CAD systems into finished products. In real life, the 3D printing process requires preliminary preparation and post-processing of printed parts to achieve their required quality. The main types and principles of operation of 3D printers and technologies for 3D printing of concrete structures are analyzed. The design and operation of a laboratory 3D printer are analyzed.

Construction 3D printing

Since concrete is one of the main building materials, one of the innovative technologies that could work with this material is a technology similar to the FDM deposition method. However, 3D printing technology in construction can be based on other methods, depending on the material used, such as D-Shape technology.

Without looking far into the future, we can say that the technology has already found a good niche for itself. The Chinese company WinSun achieved the greatest success in terms of technological and economic indicators. The largest deal in the construction 3D printing market is a \$ 1.5 billion contract between WinSun and Saudi Arabia's All Mobily Contracting Company.

Under the contract, the Saudi Arabian company will lease 100 WinSun construction 3D printers for the construction of 3D printed buildings with a total area of about 30,000,000 m². Basically, it is planned to print cheap housing for the relatively poor.

Technology use problems

The main problems are selection of the optimal composition of the concrete mix, and improvement of the hardware. It is in these areas that the main work is being carried out. The selection of the concrete mix is the most important problem. Whatever the construction 3D printer is, if the mixture does not meet the required requirements, then the structure may be damaged.

The concrete mix, first of all, must be of a certain consistency. It should not harden or get stuck inside the printing device and other parts of the system. At the same time, the mixture should not spread after laying and keep the specified parameters of the printed layer. It should also set quickly enough after laying and be elastic enough so as not to deform under the pressure of subsequent layers. Shrinkage after complete drying of the structure should be minimal. Also, the mixture must meet certain requirements for strength and thermal efficiency. To achieve these requirements, it is necessary to use special additives and select the proportions of water and cement, additives and, if required, reinforcing fiber.

When selecting components, it is important to remember that the cost of concrete mix can play an important role.

As simple as the FDM technology on which construction printing technology is based, it has some drawbacks that hold back the massive use of 3D printing in construction. First of all, these are the dimensions of the installation. Most of the construction 3D printers that are currently in use mimic the design of desktop 3D printers using FDM technology. They are similar to a portal crane, with attachments for feeding material for printing. The design has a large number of supporting elements (supports for vertical movement of the printing device, support for mounting the extruder, supports or rails for moving the extruder in a horizontal plane, as well as elements for making the structure more stable). Therefore, the installation of such a structure will take a lot of time. Also, such a structure may require more thorough preparation of the construction site.

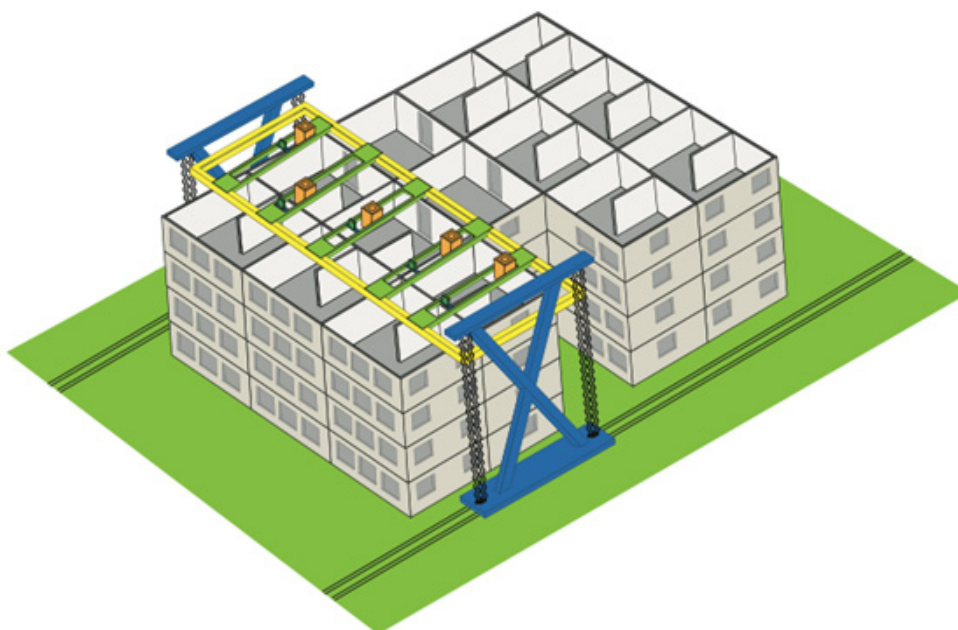


Fig. 1. Printer option for more mobility within the project

It is necessary to level the territory not only for the construction of the structure itself, but also for the placement of the printer.

The influence of weather conditions on the printed design and the printer itself also plays an important role.

In winter, icing may appear on printer parts, and the mixture itself may freeze during pumping.

Consequently, for printing at negative temperatures, either internal heating is required along the entire path of pumping the mixture, or the construction of a so-called "hothouse" – a tent in which it is possible to maintain a positive temperature. You should also take into account the operating temperature range of moving parts and drives. The effect of wind is just as important to both the printer and the printed structure. The wind can shake the structure of the printer; hence the use of a tent is necessary.

There are many electronic components in the printer, and if the control unit (computer and other control parts) can be portable and in a closed position, then the sensors and actuators that are located directly on the printer must be protected from precipitation.

Also, the printed design itself may suffer from precipitation, and the drying time of the printed design will increase.

The temperature has the least influence, since it does not affect the printed structure too much, but, on the contrary, provides a shorter curing time for concrete.

The main advantages of construction 3D printing

There are two main positive aspects of using 3D printing in construction. Firstly, the ability to create objects of complex configuration that are impossible or very difficult to create using traditional construction methods. Secondly, a decrease in the cost of printing, achieved by a number of factors.

The use of 3D printing can reduce labor resources. All the main work is performed by a machine, which is monitored by one person – the operator. There are still labor costs for laying fittings and laying communications.

The cost of construction is also reduced by reducing the duration of construction. The printer can work 24 hours a day and build walls pretty quickly. The current printing speed is approximately 1.5 m² of living space per hour. That is, it is quite realistic to print a one-story structure with an area of 36 m² in just a day.

The use of 3D CAD systems of computer-aided design in additive technologies

Programs like AutoCAD and Photoshop have automated many processes, but they are being replaced by a generation of generative software, which allows new hypotheses of what a finished object might look like.

Generative software and services companies Adobe is a renowned design software (software) developer that integrates machine learning and generative design elements into the paid Creative Cloud suite of services.

Autodesk, one of the renowned suppliers of CAD solutions for the construction and industrial production, has been developing a new generation of software that uses generative algorithms for several years as part of the Dreamcatcher project. This package allows you to solve applied design and engineering problems, taking into account various requirements for materials, production method, efficiency: the user sets the design requirements, the system finds many algorithmically synthesized solutions and offers them to the user.

Analysis of existing 3D printing technologies

Building structures are 3D printed in a variety of ways and materials.

The main 3D printing technologies include the following.

1. Layer-by-layer production of an object, which consists in cutting various sheet materials with a laser beam, and then the obtained layers are glued together with heated rollers.
2. Melting modeling is a 3D printing technology in which an object is created using a thread of plastic, which is fed through an extruder to the work surface, where it solidifies.
3. Stereolithography is a three-dimensional printing technology when a photopolymer changes its shape under the action of laser light radiation.
4. Selective laser sintering is similar to the previous technology, but the raw material is a powdery thermoplastic material, which is sintered layer by layer with a laser. The powder in the working chamber is heated to a temperature close to melting, then it is leveled by a laser beam and gets the required shape.
5. Stereoscopic printing is a method based on laser technology. Printers of this design are provided with two ingredients. The working chamber of each printer consists of two parts: the first is the powder supply chamber, the second is the construction chamber, in which the 3D model is built up.
6. Sintering of photopolymer is the method based on the fact that a model template should be created on a glass plate with a special toner. Above a thin layer of photopolymer, which is on the desktop, the created photomask is placed, which must be further exposed by an ultraviolet lamp. The photopolymer layer corresponding to the used template hardens.

Proposal to optimize 3D printing technology for concrete structure

An innovative project for 3D printing of construction objects is associated with the improvement of equipment for 3D printing of concrete structures. For the construction of objects of significant volume, an improved technology of three-dimensional printing has been developed, which consists in the development of an improved printer design. Three-dimensional printer in the form of a moving structure 1–3 with manipulator 7. Hopper 19 is installed on the manipulator (Fig. 2). A pipeline is attached to the metal structures, with the help of which the concrete mixture is supplied from the concrete pump, which is installed next to the supports 1 and 2 into the hopper 19. When moving the cart 4, beam 5 and platform 6, the manipulator is set to the initial position of the concrete mixture supply. The vertical movement of the rotary manipulator is performed by the drive 13.

The developed design (Fig. 2) allows:

- increasing the productivity of 3D printing;
- improving the technological capabilities of the process;
- expanding the range of materials used;
- implementing complex architectural solutions.

Practical implementation of 3D printing of concrete structures

In order to calculate the costs for 1 sq., you need to model some structure on which the options for the enclosing structures will be calculated. In this case, the living area of the building must be constant for each design option.

Printing low-rise buildings is quite a solvable task. Since the calculation of the cost of 1 sq. living space is very conditional due to the dependence of the cost of the structure on many

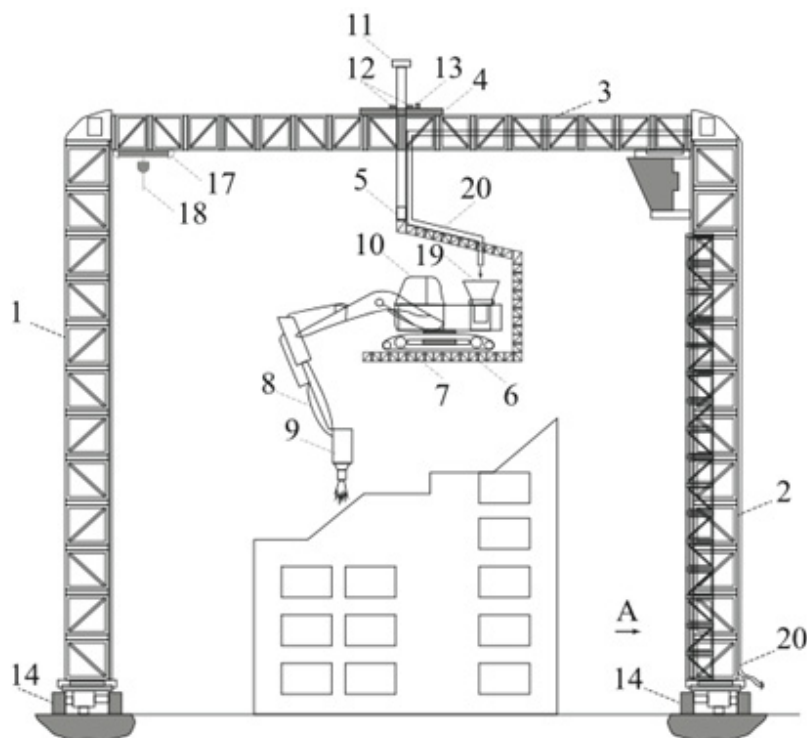


Fig. 2. Printing technology with a construction printer with a manipulator:
 1, 2 – supports; 3 – bridge; 4 – cart; 5 – beam; 6 – platform; 7 – manipulator; 8 – telescopic equipment; 9 – print head; 10 – cabin; 11 – toothed rack; 12 – gears; 13 – gear drive; 14 – caterpillar carts; 17 – cargo cart; 18 – hook suspension; 19 – receiving bunker; 20 – pipeline

factors, then to carry out an economic calculation, it is enough to create a version of the structure of the outer wall of the building. Since it is the enclosing structure that is considered in the work, the interior partitions in the structure being developed are not taken into account. Thus, the final design structure is only the enclosing structure of the outer wall of a one-story house.

Output

1. The pace of development of additive technologies is growing every year, new materials and methods for reproducing objects appear, and already existing methods are developing in order to obtain a higher quality of the object.
2. The application of three-dimensional printing is at the stage of formation and development in the construction industry.
3. Designs created using 3D printing technology are more heat efficient. This is achieved through the use of various material combinations.

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Исследования технологий трехмерной печати бетонных конструкций в строительстве

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Ключевые слова и фразы: 3D-принтеры; Autodesk; бетонные конструкции; трехмерная печать.

Аннотация. Основной целью статьи является анализ адаптации технологии трехмерной печати бетонных конструкций. 3D-печать – одна из форм технологий аддитивного производства, где трехмерный объект создается путем наложения последовательных слоев материала (печать, выращивание) по данным цифровой модели. Печать осуществляется специальным устройством – 3D-принтером. Создание объекта происходит путем последовательного наложения пластического материала.

3D-принтеры, как правило, быстрее, более доступные и простые в использовании, чем другое оборудование для технологии аддитивного производства. 3D-принтеры предлагают возможность печати деталей из нескольких материалов и с различными механическими и физическими свойствами при одном процессе печати.

3D-печать позволяет преобразовывать модели, полученные в CAD-системах, в готовые изделия. В реальных условиях процесс 3D-печати требует предварительной подготовки и последующей обработки напечатанных деталей для достижения требуемого качества.

Проанализированы основные типы и принципы работы 3D-принтеров и технологии трехмерной печати бетонных конструкций. Проанализированы конструкция и принцип работы лабораторного 3D-принтера.

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Coping Strategies as a Method of Increasing Motivation for Work in Managers with Professional Burnout Syndrome

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Key words and phrases: chronic stress; coping strategies; emotional exhaustion; professional burnout syndrome.

Abstract. The purpose of the article is to substantiate the expediency of using coping strategies to prevent professional burnout syndrome and increase the labor motivation of middle managers. The objectives of the study are to determine the role and place of coping strategies in increasing the motivation for work, as well as the prospects for their use as measures to prevent and overcome the syndrome of professional burnout. The research hypothesis is as follows: coping strategies are one of the methods of increasing the work motivation of managers with professional burnout syndrome. Analytical research methods were used in the work. As a result of the study, the expediency of using coping strategies to increase the level of labor motivation of managers of competitive enterprises with professional burnout syndrome has been substantiated.

The beginning of the 21st century can be characterized by a new leap in business modernization caused by the emergence of new generation digital technologies [1]. The digital transformation of the personnel management system and the modernization of labor organization models are placing ever higher demands on the managers and personnel of competitive enterprises. Against this background, the issues of demotivation and professional burnout become more relevant than ever, since these phenomena directly affect the dynamics of business development, leading to economic losses [2].

As a rule, employees of such professions as doctors, teachers, employees of the Federal Penitentiary Service, police officers, sales managers, as well as heads of different management levels feel especially emotional exhaustion. One of the key problems faced by representatives of these professions is the high emotional load that arises in the process of performing official duties. Despite the fact that many works have been written about the syndrome of professional burnout as a state of emotional exhaustion resulting from chronic stress since the seventies of the last century, the issue of the effectiveness of measures to prevent it is still controversial.

To date, the issue related to the effectiveness of using coping strategies has not been

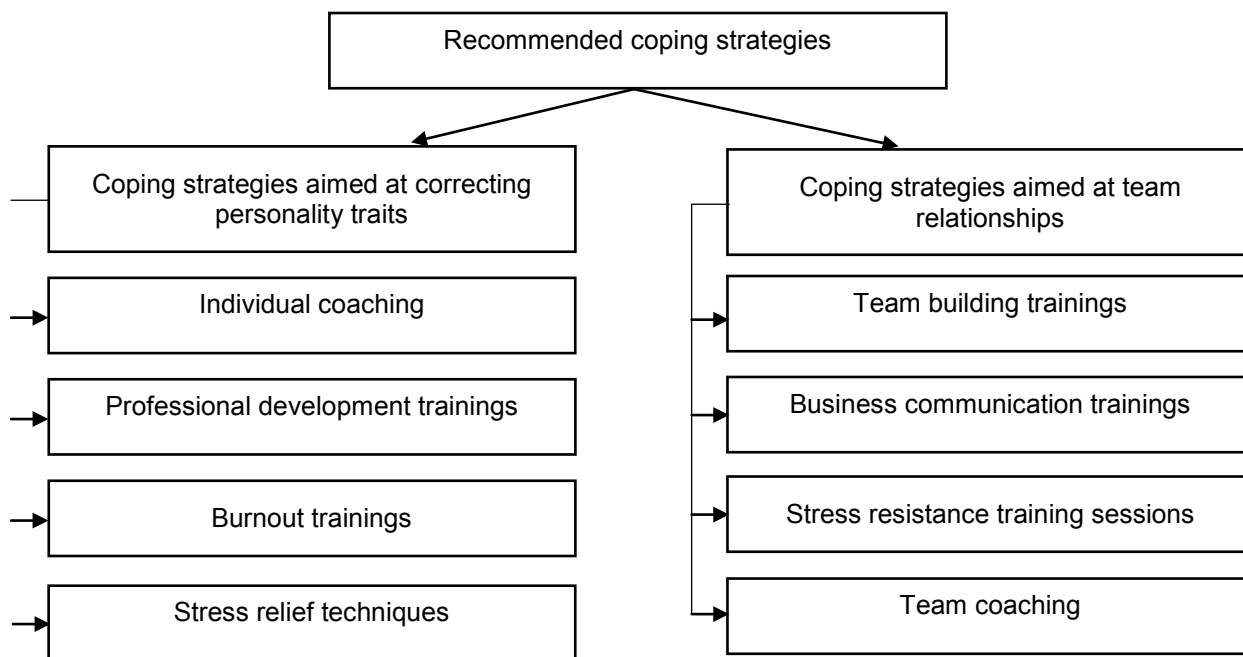


Fig. 1. Recommended coping strategies in the prevention and overcoming of the syndrome of professional burnout of managers

sufficiently studied. Currently, coping as a form of overcoming is used in different aspects and contexts, but its psychological purpose is the ability to adapt to the situation and build overcoming behavior. According to a number of authors, coping is a dynamic process that is subject to constant transformations. The dynamics of coping is directly related to the issue of building one or another predictive behavior of employees in a stressful situation [3].

Applying the right coping strategies can help burnout managers learn to master the situation or mitigate its negative impact. Taking into account the specifics of the work of middle managers, we propose in this article to consider two groups of coping strategies, one of which is aimed at correcting personal characteristics, the other is aimed at relationships in the team (Fig. 1).

We give a brief description of the strategies presented in the figure. Individual coaching is designed to solve problems related to the development of managerial competencies and the transformation of thinking [4]. As a result of using this strategy, the leader will be able to learn how to overcome personal limitations that prevent the development of constructive relationships, develop leadership skills, reveal their potentialities related to managerial activities, maintain a high level of work motivation and learn the skills of effective conflict management. Professional and personal development training sessions contribute to the disclosure of professional skills of a manager, to improve the individual qualities of a leader. As a result of training, managers will be able to consolidate the skills of mastering managerial competencies, master the techniques of effective leadership, form and consolidate their positive image, learn to competently and effectively set achievable goals for themselves and the team, as well as use the knowledge gained to solve organizational problems. Trainings on overcoming the syndrome of professional burnout are necessary to get acquainted with the concept of “burnout”, its causes, stages, consequences and methods of prevention, as well as to find ways to counteract emotional exhaustion. As a result of training, managers will be able to identify the factors influencing the formation of professional burnout syndrome, learn to use correction programs to activate personal resource states. The final coping strategy in the first group is aimed at overcoming

stressful situations. The main goal of stress relief techniques is to master stress management skills, instant stress relief techniques, and emotional self-regulation. The result of using this strategy can be the development of an algorithm for working with negative emotions.

The second group of strategies includes a series of trainings and team coaching. Thus, team building trainings are designed to increase loyalty, reduce the level of tension in the team and improve relationships with colleagues and subordinates. As a result of training, managers will master the skills of solving non-standard situations, learn how to correctly distribute informal roles in a team, and manage organizational and interpersonal conflicts. Business communication trainings are used to develop communication competencies and master the skills of effective business communication. As a result, managers will learn to develop tactics focused on achieving compromise and cooperation, make the right management decisions, master various communication styles, learn to build an atmosphere of trust in business interactions, gain skills in resisting manipulation, working with objections, public speaking and self-presentation, and increase confidence in itself. Stress resistance training sessions are necessary to increase the adaptive capacity to minimize stressful effects on work motivation and professional activity. As a result, the leaders and teams with which they manage, master the techniques of self-regulation, gain knowledge about the mechanism of stress management, master the skills of confident behavior in stressful situations. The use of team coaching will allow you to build an effective dialogue between different levels of management, consolidate corporate values and development priorities, and better understand the motivational sphere of employees.

In conclusion, we note that the groups of coping strategies considered in this article cannot be called exhaustive. Our task was to show the possibility of using this approach in the prevention and overcoming of the syndrome of professional burnout of managers in order to increase their work motivation, since these two concepts are closely interconnected with each other. The choice of a specific coping strategy depends on the results of the study of the presence of the professional burnout syndrome, the category of employees subject to it and the styles of interaction between managers and the team.

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Копинг-стратегии как метод повышения мотивации трудовой деятельности руководителей с синдромом профессионального выгорания

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Ключевые слова и фразы: копинг-стратегии; синдром профессионального выгорания; хронический стресс; эмоциональное истощение.

Аннотация. Цель статьи – обоснование целесообразности использования копинг-стратегий для профилактики синдрома профессионального выгорания и повышения трудовой мотивации руководителей среднего звена. Задачи исследования заключаются в определении роли и места копинг-стратегий в повышении мотивации трудовой деятельности, а также перспективах их использования в качестве мер профилактики и преодоления синдрома профессионального выгорания. Гипотеза исследования: копинг-стратегии представляют собой один из методов повышения трудовой мотивации руководителей с синдромом профессионального выгорания. В работе использованы аналитические методы исследования. В результате исследования обоснована целесообразность использования копинг-стратегий для повышения уровня мотивации трудовой деятельности руководителей конкурентоустойчивых предприятий с синдромом профессионального выгорания.

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